

**MASSACHUSETTS WATER RESOURCES AUTHORITY
CONTRIBUTORY RETIREMENT SYSTEM**

Actuarial Valuation Report

January 1, 2011

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Report Summary:

<u>Highlights</u>	<u>January 1, 2010</u>	<u>January 1, 2011</u>
<u>Contributions</u>		
Funding Schedule FY 2012	\$5,488,792	\$5,488,792
Funding Schedule FY 2013	5,637,044	5,750,085
<u>Funded Ratios</u>		
GAS No. 25	86.4%	87.6%
<u>Participants</u>		
Actives	1,108	1,110
Retirees and Beneficiaries	262	287
Inactives	114	102
Disabled	<u>51</u>	<u>54</u>
Total	1,535	1,553
<u>Payroll</u>		
Payroll of Active Members	\$81,961,863	\$82,870,385
Average Payroll	73,973	74,658
<u>Normal Cost</u>		
Employer	\$1,316,468	\$1,453,267
Employee	7,126,834	7,210,710
Administrative Expenses	<u>0</u>	<u>0</u>
Total	\$8,443,302	\$8,663,977
<u>Actuarial Accrued Liabilities</u>		
Actives	\$239,241,058	\$251,924,672
Retirees, Beneficiaries, Disabilities and Inactives	<u>80,634,867</u>	<u>89,596,176</u>
Total	\$319,875,925	\$341,520,848
<u>Actuarial Value of Assets</u>	<u>276,269,602</u>	<u>299,331,117</u>
<u>Unfunded Actuarial Accrued Liabilities</u>	\$43,606,323	\$42,189,731

Introduction

This report presents the findings of an actuarial valuation as of January 1, 2011, 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, 2011
- 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, 2011.

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 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 year, the total unfunded actuarial accrued liability under the entry age normal cost method decreased by 3.3% to \$42,189,731. The decrease is mostly due to salary gains. The sources of the (gain)/loss are as follows:

Investment	6,676,749
Salary Increases	(9,135,854)
New Participants	234,247
Active - Retirements	975,232
Active - Terminations	1,071,440
Active - Mortality	249,486
Active - Disabilities	84,385
Inactive - Mortality and data adjustments	3,349,698
Total Contributions	(3,788,851)
Other, including service buybacks	<u>(490,957)</u>
Total (gain)/loss	(774,425)

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, 2010</u>	<u>January 1, 2011</u>
Superannuation	\$6,693,059	\$6,768,726
Termination	635,867	639,217
Death	569,109	571,031
Disability	545,267	685,003
Administrative Expenses	<u>0</u>	<u>0</u>
Total Normal Cost	\$8,443,302	\$8,663,977
% of Pay	10.3%	10.5%
Employee Contributions	7,126,834	7,210,710
% of Pay	8.7%	8.7%
Employer Normal Cost	\$1,316,468	\$1,453,267
% of Pay	1.6%	1.8%

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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, 2010</u>	<u>January 1, 2011</u>
Actives		
Superannuations	\$219,251,285	\$232,439,294
Termination	2,964,509	2,714,674
Death	10,341,811	10,790,930
Disability	6,683,453	5,979,774
Retirees and Inactives		
Retirees and Beneficiaries	\$59,608,542	\$66,150,425
Terminated (Refund)	4,828,721	4,407,217
Disabled	<u>16,197,604</u>	<u>19,038,534</u>
Total	\$319,875,925	\$341,520,848

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, 2010</u>	<u>January 1, 2011</u>
Actives		
Superannuation	\$271,873,585	\$284,108,663
Termination	5,535,209	5,215,397
Death	14,782,932	15,153,853
Disability	11,084,817	11,254,904
Retirees and Inactives		
Retirees and Beneficiaries	\$59,608,542	\$66,150,425
Terminated (Refund)	4,828,721	4,407,217
Disabled	<u>16,197,604</u>	<u>19,038,534</u>
Total	\$383,911,410	\$405,328,993

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, 2010</u>	<u>January 1, 2011</u>
Cash equivalents	\$5,395,361	\$3,738,172
Short term investments	0	0
Domestic fixed income securities	84,440,818	91,926,013
Domestic equities	60,473,212	78,445,619
International	61,914,625	71,389,988
Real Estate	9,375,219	10,840,374
Venture Capital	0	0
Other	32,536,138	39,889,827
Accounts receivable	14,697	594
Accounts payable	(319,628)	(248,047)
Accrued income	<u>197</u>	<u>338</u>
Total Market Value	\$253,830,639	\$295,982,876
Total Actuarial Value	\$276,269,602	\$299,331,117

Sum of values may not equal total due to rounding.

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, 2011 is presented in Table V.

Table V

	<u>January 1, 2011</u>
(1) Market value at January 1, 2010	\$253,830,639
(2) 2010 Contributions	\$16,460,617
(3) 2010 Payments	(\$8,632,860)
(4) Net interest adjustment at 8.0% on (1), (2) and (3) to December 31, 2010	\$20,619,561
(5) Expected market value on January 1, 2011	\$282,277,957
(1) + (2) + (3) + (4)	
(6) Actual market value on January 1, 2011	\$295,982,876
(7) 2010 (Gain) / Loss	(\$13,704,919)
(8) 80% of 2010 (Gain) / Loss	(\$10,963,935)
(9) 2009 (Gain) / Loss	(\$29,705,996)
(10) 60% of 2009 (Gain) / Loss	(\$17,823,598)
(11) 2008 (Gain) / Loss	\$80,118,919
(12) 40% of 2008 (Gain) / Loss	\$32,047,568
(13) 2007 (Gain) / Loss	\$441,031
(14) 20% of 2007 (Gain) / Loss	\$88,206
(15) Actuarial value on January 1, 2011, (6) + (8) + (10) + (12) + (14) but not less than 90% nor greater than 110% of (6)	\$299,331,117
(16) Ratio of actuarial value to market value	101.13%
(17) Actuarial Value Return for 2009	21.45%
(18) Actuarial Value Return for 2010	5.44%
(19) Market Value Return for 2009	22.49%
(20) Market Value Return for 2010	13.32%

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, 2010</u>	<u>January 1, 2011</u>
Actuarial Accrued Liability	\$319,875,925	\$341,520,848
Actuarial Assets	<u>276,269,602</u>	<u>299,331,117</u>
Unfunded Actuarial Accrued Liability	\$43,606,323	\$42,189,731
Funded Status	86.4%	87.6%

Appropriations

The pension appropriation for the upcoming fiscal years have been calculated in accordance with the requirements set forth in Sections 22D and 22F of Chapter 32 of the Massachusetts General Laws. These amounts were calculated to comply with the June 30, 2040, 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
 \$ 42,189,731 over 13 years with 4.5% increasing payments
- Interest adjustment for payments deposited at the beginning of the fiscal year.

The pension appropriation is shown in Table VII.

Table VII

	<u>January 1, 2010</u>	<u>January 1, 2011</u>
Normal cost	\$1,316,468	\$1,510,279
Amortization payment of the unfunded accrued liability	<u>3,824,697</u>	<u>3,978,513</u>
Total cost	\$5,141,165	\$5,488,792
% of Pay	6.3%	6.6%
Fiscal 2012 cost	\$5,488,792	\$5,488,792
Fiscal 2013 cost	\$5,637,044	\$5,750,085

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 13 years until the unfunded liabilities are completely paid off, at which time only the normal cost will remain. The total FYE13 cost represents 6.6% of payroll, decreasing to 5.4% by the time the unfunded liabilities are fully paid off, leaving a normal cost of only 0.3% in 2025. The decrease in the cost as a percentage of payroll is a result of the increase in member deductions.

Beginning in 2028, the Total Employer Cost is projected to be negative. Although this implies that MWRA would be receiving payments from the fund, we expect the MWRA contribution would be \$0 and that the system would become overfunded.

Appropriation Forecast

Fiscal Year	Employee Payroll*	Employee Contribution	Employer Normal Cost with Interest	Amortization Payments with Interest	Employer Total Cost with Interest	Employer Total Cost % of Payroll	Funded Ratio %**
2012	\$82,870,385	\$7,210,710	\$1,510,279	\$3,978,513	\$5,488,792	6.6	87.6
2013	\$86,599,552	\$7,632,552	\$1,477,062	\$4,273,023	\$5,750,085	6.6	88.6
2014	\$90,496,532	\$8,077,758	\$1,437,798	\$4,465,309	\$5,903,107	6.5	89.6
2015	\$94,568,876	\$8,547,577	\$1,392,008	\$4,666,247	\$6,058,255	6.4	90.6
2016	\$98,824,476	\$9,043,322	\$1,339,186	\$4,876,229	\$6,215,415	6.3	91.5
2017	\$103,271,577	\$9,566,375	\$1,278,790	\$5,095,659	\$6,374,449	6.2	92.5
2018	\$107,918,798	\$10,118,190	\$1,210,248	\$5,324,963	\$6,535,211	6.1	93.4
2019	\$112,775,144	\$10,700,297	\$1,132,947	\$5,564,587	\$6,697,534	5.9	94.3
2020	\$117,850,025	\$11,314,304	\$1,046,238	\$5,814,993	\$6,861,231	5.8	95.2
2021	\$123,153,276	\$11,961,903	\$949,431	\$6,076,668	\$7,026,099	5.7	96.1
2022	\$128,695,174	\$12,644,875	\$841,793	\$6,350,118	\$7,191,911	5.6	97.0
2023	\$134,486,457	\$13,365,092	\$722,545	\$6,635,873	\$7,358,418	5.5	98.0
2024	\$140,538,347	\$14,124,522	\$590,860	\$6,934,488	\$7,525,348	5.4	99.0
2025	\$146,862,573	\$14,925,237	\$445,860	\$0	\$445,860	0.3	100.0
2026	\$153,471,389	\$15,769,414	\$286,614	\$0	\$286,614	0.2	100.0
2027	\$160,377,601	\$16,659,343	\$112,133	\$0	\$112,133	0.1	100.0
2028	\$167,594,593	\$17,597,432	(\$78,632)	\$0	(\$78,632)	0.0	100.0
2029	\$175,136,350	\$18,389,317	(\$82,171)	\$0	(\$82,171)	0.0	100.0
2030	\$183,017,486	\$19,216,836	(\$85,868)	\$0	(\$85,868)	0.0	100.0
2031	\$191,253,272	\$20,081,594	(\$89,732)	\$0	(\$89,732)	0.0	100.0
2032	\$199,859,670	\$20,985,265	(\$93,770)	\$0	(\$93,770)	0.0	100.0
2033	\$208,853,355	\$21,929,602	(\$97,990)	\$0	(\$97,990)	0.0	100.0
2034	\$218,251,756	\$22,916,434	(\$102,399)	\$0	(\$102,399)	0.0	100.0
2035	\$228,073,085	\$23,947,674	(\$107,007)	\$0	(\$107,007)	0.0	100.0
2036	\$238,336,374	\$25,025,319	(\$111,823)	\$0	(\$111,823)	0.0	100.0
2037	\$249,061,511	\$26,151,459	(\$116,855)	\$0	(\$116,855)	0.0	100.0
2038	\$260,269,278	\$27,328,274	(\$122,113)	\$0	(\$122,113)	0.0	100.0
2039	\$271,981,396	\$28,558,047	(\$127,608)	\$0	(\$127,608)	0.0	100.0
2040	\$284,220,559	\$29,843,159	(\$133,351)	\$0	(\$133,351)	0.0	100.0
2041	\$297,010,484	\$31,186,101	(\$139,352)	\$0	(\$139,352)	0.0	100.0
2042	\$310,375,956	\$32,589,475	(\$145,622)	\$0	(\$145,622)	0.0	100.0
2043	\$324,342,874	\$34,056,002	(\$152,175)	\$0	(\$152,175)	0.0	100.0

* Calendar basis

** Beginning of Fiscal Year

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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, 2010</u>	<u>January 1, 2011</u>
(1) Actuarial Accrued Liability	\$319,875,925	\$341,520,848
(2) Actuarial Value of Assets	<u>276,269,602</u>	<u>299,331,117</u>
(3) Unfunded Actuarial Accrued Liability	\$43,606,323	\$42,189,731
(4) Funded Ratio (2)/(1)	86.4%	87.6%
(5) Covered Payroll	\$81,961,863	\$82,870,385
(6) UAAL as a percentage of payroll: (3)/(5)	53.2%	50.9%
(7) Annual Required Contribution (ARC)	\$5,342,856	\$5,488,792
(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, 2011.

The normal cost for employees on that date was:	\$7,210,710	8.7% of pay
The normal cost for the employer was:	1,453,267	1.8% of pay
The actuarial liability for active members was:		\$251,924,672
The actuarial liability for retired and inactive members was:		89,596,176
Total actuarial accrued liability:		\$341,520,848
System assets as of that date:		299,331,117
Unfunded actuarial accrued liability:		\$42,189,731
The ratio of system's assets to total actuarial liability was		87.6%

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
01/01/11	\$299,331	\$341,521	\$42,190	87.6%	\$82,870	50.9%
01/01/10	276,270	319,876	43,606	86.4%	81,962	53.2%
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

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Age/Service Distribution with Salary as of January 1, 2011

Attained Age	Average Salary	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
< 20										0
										0
20-24	2 38,784									2 38,784
25-29	11 43,620	3 53,041								14 45,639
30-34	12 41,813	14 56,852	2 60,629							28 50,677
35-39	20 54,751	9 65,201	16 67,334	12 67,948	2 61,484					59 62,670
40-44	20 57,562	13 71,108	31 57,964	54 74,014	32 66,888					150 66,731
45-49	15 48,414	20 58,280	35 71,742	46 75,933	110 75,632	9 67,983	2 70,607			237 71,596
50-54	14 61,969	17 67,770	28 70,096	45 79,031	104 74,500	12 80,598	1 66,521			221 73,848
55-59	10 54,022	21 68,202	26 81,205	41 72,029	89 73,920	12 81,806	10 89,525	3 73,231		212 74,116
60-64	6 48,753	2 69,385	17 78,104	27 70,228	59 79,011	12 78,438	13 86,896	1 60,825		137 76,267
65-69	2 69,292	2 62,811	3 59,190	11 73,982	14 67,207	6 109,175	1 73,348			39 74,997
70+			4 60,952	1 87,056	5 64,963			1 98,630		11 68,574
Total Employees	112	101	162	237	415	51	27	5	0	1,110
Average Salary	52,415	64,164	69,936	74,311	74,306	81,510	85,407	75,830	0	71,147

Retiree Distribution as of January 1, 2011

Attained Age	Number of Employees			Total Payments		
	Male	Female	Total	Male	Female	Total
< 20						
20-24	1		1	9,589		9,589
25-29						
30-34						
35-39						
40-44		1	1		11,174	11,174
45-49		2	2		36,041	36,041
50-54	2		2	27,537		27,537
55-59	9	14	23	223,064	214,870	437,934
60-64	35	22	57	1,134,953	406,601	1,541,554
65-69	54	25	79	1,395,018	549,463	1,944,481
70-74	35	28	63	858,892	475,702	1,334,594
75-79	31	14	45	918,377	235,440	1,153,817
80-84	10	2	12	190,753	70,136	260,889
85-89	1	1	2	21,498	8,920	30,418
90-94						
95-99						
Total	178	109	287	4,779,681	2,008,347	6,788,028
Average (Age/Payment)	69	67	68	26,852	18,425	23,652
Frequency Percent	62.0	38.0	100.0	70.4	29.6	100.0

Disabled Retiree Distribution as of January 1, 2011

Attained Age	Number of Employees			Total Payments		
	Male	Female	Total	Male	Female	Total
< 20						
20-24						
25-29						
30-34						
35-39						
40-44	1	1	2	24,926	15,001	39,927
45-49	8	1	9	212,806	54,900	267,706
50-54	6	4	10	215,200	106,773	321,973
55-59	8	2	10	264,577	63,677	328,254
60-64	10	2	12	335,977	77,578	413,555
65-69	9	1	10	281,922	7,268	289,190
70-74						
75-79						
80-84	1		1	25,269		25,269
85-89						
90-94						
95-99						
Total	43	11	54	1,360,677	325,197	1,685,874
Average (Age/Payment)	58	55	57	31,644	29,563	31,220
Frequency Percent	79.6	20.4	100.0	80.7	19.3	100.0

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
2011	\$15,610,909	\$7,210,710	\$5,488,792	\$24,222,389	\$21,310,982
2012	13,078,195	7,632,552	5,750,085	25,966,907	26,271,349
2013	15,066,899	8,077,758	5,903,107	28,032,236	26,946,201
2014	17,039,371	8,547,577	6,058,255	30,154,244	27,720,706
2015	19,064,408	9,043,322	6,215,415	32,338,303	28,532,632
2016	21,137,135	9,566,375	6,374,449	34,587,706	29,391,395
2017	23,430,462	10,118,190	6,535,211	36,899,525	30,122,464
2018	25,938,999	10,700,297	6,697,534	39,263,872	30,722,703
2019	28,453,613	11,314,304	6,861,231	41,678,607	31,400,530
2020	30,997,090	11,961,903	7,026,099	44,149,170	32,140,082
2021	33,662,266	12,644,875	7,191,911	46,676,991	32,851,512
2022	36,440,438	13,365,092	7,358,418	49,260,302	33,543,374
2023	39,276,932	14,124,522	7,525,348	51,899,829	34,272,766
2024	42,210,423	14,925,237	445,860	54,312,183	27,472,856
2025	45,152,939	15,769,414	286,614	56,455,861	27,358,950
2026	48,056,693	16,659,343	112,133	58,595,011	27,309,793
2027	50,763,110	17,597,432	(78,632)	60,741,183	27,496,873
2028	53,078,839	18,389,317	(82,171)	62,913,298	28,141,605
2029	55,500,208	19,216,836	(85,868)	65,135,691	28,766,451
2030	58,032,036	20,081,594	(89,732)	67,406,711	29,366,537
2031	60,679,362	20,985,265	(93,770)	69,724,314	29,936,447
2032	63,447,454	21,929,602	(97,990)	72,086,018	30,470,176
2033	66,341,822	22,916,434	(102,399)	74,488,857	30,961,070
2034	69,368,226	23,947,674	(107,007)	76,929,334	31,401,775
2035	72,532,690	25,025,319	(111,823)	79,403,356	31,784,162
2036	75,841,512	26,151,459	(116,855)	81,906,176	32,099,269
2037	79,301,276	27,328,274	(122,113)	84,432,328	32,337,213
2038	82,918,869	28,558,047	(127,608)	86,975,551	32,487,121
2039	86,701,491	29,843,159	(133,351)	89,528,711	32,537,028
2040	89,611,508	31,186,101	(139,352)	92,124,712	33,559,953

EXHIBIT 5 - SUMMARY OF PLAN PROVISIONS:

This summary is prepared in accordance with Chapter 32 as of January 1, 2011, and does not take into account any subsequent changes.

1. Administration

Each of the 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	9.0% of Salary
plus	
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 Member Contributions with credited interest.

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 \$729.84 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 Member 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, 2011.

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:

<u>Years of Service</u>	<u>Salary Scale</u>
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.

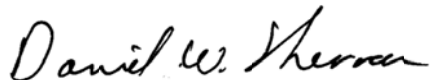
9. Vested Liability

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, 2011, in accordance with generally accepted actuarial principles applied consistently with the preceding valuation. In our opinion, each actuarial assumption used to compute actuarial accrued liability and normal cost is 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. 11-4086

July 2011