

**Massachusetts Water Resource
Authority Employees'
Retirement System**

**Actuarial Valuation and Review as of
January 1, 2017**





116 Huntington Ave., 8th Floor Boston, MA 02116
T 617.424.7300 www.segalco.com

June 26, 2017

Retirement Board

Massachusetts Water Resource Authority Employees' Retirement System

Two Griffin Way

Chelsea, MA 02150

Dear Board Members:

We are pleased to submit this Actuarial Valuation and Review as of January 1, 2017. It summarizes the actuarial data used in the valuation, establishes the funding requirements for fiscal 2017 and later years and analyzes the preceding two years' experience.

This report was prepared in accordance with generally accepted actuarial principles and practices at the request of the Board to assist in administering the Retirement System. The census information and financial information on which our calculations were based was prepared by the staff of the Massachusetts Water Resource Authority (MWRA) Employees' Retirement System. That assistance is gratefully acknowledged.

The measurements shown in this actuarial valuation may not be applicable for other purposes. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period); and changes in plan provisions or applicable law.

The actuarial calculations were directed under the supervision of Kathleen A. Riley, FSA, MAAA, EA. She is a member of the American Academy of Actuaries and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein. To the best of her knowledge, the information supplied in the actuarial valuation is complete and accurate. Further, in her opinion, the assumptions as approved by the Board are reasonably related to the experience of and the expectations for the Plan.

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

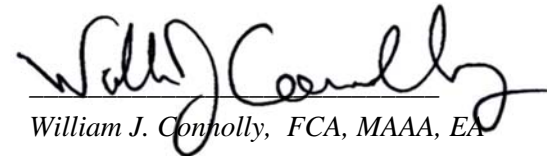
Sincerely,

Segal Consulting, a Member of The Segal Group, Inc.

By:



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



*William J. Connolly, FCA, MAAA, EA
Consulting Actuary*

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SECTION 1: Valuation Summary for the Massachusetts Water Resource Authority Employees' Retirement System

Purpose

This report has been prepared by Segal Consulting to present a valuation of the Massachusetts Water Resource Authority Employees' Retirement System as of January 1, 2017. The valuation was performed to determine whether the assets and contributions are sufficient to provide the prescribed benefits and to provide certain disclosure information required by Governmental Accounting Standards Board Statements No. 67 and 68 as of December 31, 2016. This report is based on:

- The benefit provisions of Massachusetts General Law Chapter 32;
- The characteristics of covered active participants, inactive participants, and retired participants and beneficiaries as of January 1, 2017;
- The assets of the System as of December 31, 2016;
- Economic assumptions regarding future salary increases and investment earnings; and
- Other actuarial assumptions, regarding employee terminations, retirement, death, etc.

Significant Issues in Valuation Year

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

1. The actuarial valuation report as of January 1, 2017 is based on financial information as of that date. Changes in the value of assets subsequent to that date are not reflected.
2. During the plan years ended 2015 and 2016, the market value rates of return were 0.45% and 5.46%, respectively. Because the actuarial value of assets gradually recognizes market value fluctuations over a five-year period, the actuarial rates of return for the plan years ended 2015 and 2016 were 6.60% and 6.72%, respectively. The actuarial value of assets as of December 31, 2016 was \$493.4 million, or 106.0% of the market value of assets of \$465.6 million reported in the Annual Statement. As of December 31, 2014, the actuarial value of assets was 98.6% of the market value.
3. As indicated in Section 2, the total unrecognized investment loss as of December 31, 2016 is \$27.8 million. This investment loss will be recognized in the determination of the actuarial value of assets for funding purposes in the next few years, to the extent it is not offset by recognition of investment gains derived from future experience. This implies that earning the assumed rate of return on a market value basis will result in investment losses on the actuarial value of assets in the next few years. The deferred losses are reflected in the funding schedule in Section 2, Chart 16.

SECTION 1: Valuation Summary for the Massachusetts Water Resource Authority Employees' Retirement System

4. This valuation reflects the following changes in assumptions:
- The net investment return assumption was lowered from 7.75% to 7.50%.
 - The pre-retirement mortality assumption was changed from the RP-2000 Employee Mortality Table projected generationally from 2005 with Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2009 with Scale BB2D.
 - The post-retirement mortality assumption for non-disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table projected generationally from 2005 with Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2009 with Scale BB2D.
 - The mortality assumption for disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table set forward 2 years projected generationally from 2005 with Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2015 with Scale BB2D.
 - The salary increase assumption was changed as follows:

Years of Service	Rate	
	Current	Previously
0	5.75%	6.00%
1	5.25%	5.50%
2	5.25%	5.50%
3	5.00%	5.25%
4	5.00%	5.25%
5	4.50%	4.75%
6	4.50%	4.75%
7	4.25%	4.50%
8	4.25%	4.50%
9+	4.00%	4.25%

- The reduction in liability to account for anticipated net 3(8)(c) reimbursements was increased from \$7.2 million to \$8.7 million based on the average net 3(8)(c) payments in 2015 and 2016.

Changing these assumptions resulted in a net increase in the unfunded liability of \$14.6 million and a decrease in the employer normal cost of \$160,000.

SECTION 1: Valuation Summary for the Massachusetts Water Resource Authority Employees' Retirement System

5. This valuation reflects the following changes in plan provisions:
 - As permitted by Section 19, Chapter 188 of the Acts of 2010, the Board has increased the Cost of Living Adjustment (COLA) base from \$12,000 to \$13,000 effective July 1, 2016.
 - The Board has increased the Section 101 allowance from \$6,000 to \$9,000.
 - The Board has increased the Member-Survivor Minimum Allowance from \$250 per month to \$500 per month.

Changing these plan provisions resulted in a net increase in the unfunded liability of \$2.1 million and an increase in the employer normal cost of \$55,000.
6. The unfunded liability has increased from \$7.6 million as of January 1, 2015 to \$18.0 million as of January 1, 2017. After reflecting the additional contributions made in 2015 and 2016, the unfunded liability was expected to decrease to \$2.0 million. The difference between the expected unfunded liability of \$2.0 million and the actual unfunded liability of \$18.0 million is \$16.0 million and is attributable to an investment loss on an actuarial basis over the two-year period of \$9.8 million and the assumption and plan changes noted above, partially offset by a gain from salary increases less than expected of \$5.7 million and a miscellaneous gain of \$4.8 million.
7. The contribution for fiscal 2018 is equal to the previously budgeted amount of \$3,277,369. The results of this valuation will first be reflected in the fiscal 2019 appropriation.

The funding schedule adopted by the board with the prior valuation fully funds the System by June 30, 2024. The deferred investment losses are reflected in the projection of the unfunded actuarial accrued liability and account for the increase in the unfunded liability through fiscal 2021 and the corresponding increase in the appropriation. Chart 16 shows the recommended contribution through fiscal 2024 based on this funding schedule. The fiscal 2019 appropriation is \$7,962,791.
8. On a market value basis, the funded ratio has decreased from 99.6% as of January 1, 2015 to 91.0% as of January 1, 2017. On an actuarial basis, the funded ratio has decreased from 98.3% as of January 1, 2015 to 96.5% as of January 1, 2017.

SECTION 1: Valuation Summary for the Massachusetts Water Resource Authority Employees' Retirement System

9. Section 5 shows the disclosure information required by Governmental Standards Accounting Board (GASB) Statements No. 67 and 68.
 - The Net Pension Liability (NPL) is equal to the difference between the Total Pension Liability (TPL) and the Plan's Fiduciary Net Position. The Plan's Fiduciary Net Position is equal to the market value of assets and therefore, the NPL measure is very similar to an Unfunded Actuarial Accrued Liability (UAAL) on a market value basis. The NPL increased from \$28.7 million as of December 31, 2015 to \$45.8 million as of December 31, 2016 and the Plan's Fiduciary Net Position as a percent of the TPL decreased from 91.93% to 91.04%.
 - The NPL was measured as of December 31, 2016 and 2015 and determined based upon the results of the actuarial valuations as of January 1, 2017 and January 1, 2015, respectively.
 - The discount rate used to determine the TPL and NPL was 7.50% as of December 31, 2016 and 7.75% as of December 31, 2015.

SECTION 1: Valuation Summary for the Massachusetts Water Resource Authority Employees' Retirement System

Summary of Key Valuation Results

	2017	2015
Contributions for fiscal year beginning July 1:		
Recommended for fiscal 2018 and 2016	3,277,369	\$8,159,521
Recommended for fiscal 2019 and 2017	7,962,791	3,132,624
Recommended for fiscal 2020 and 2018	11,328,934	3,277,369
Actual contribution for fiscal 2016	--	8,159,521
Actual contribution for fiscal 2017	--	4,632,624
Funding elements for plan year beginning January 1:		
Normal cost, including administrative expenses	\$11,832,822	\$11,162,881
Market value of assets	465,602,173	441,820,644
Actuarial value of assets	493,403,059	435,841,439
Actuarial accrued liability	511,406,247	443,487,357
Unfunded actuarial accrued liability	18,003,188	7,645,918
Funded ratio using actuarial value of assets	96.5%	98.3%
Funded ratio using market value of assets	91.0%	99.6%
Demographic data for plan year beginning January 1:		
Number of retired participants and beneficiaries	536	476
Number of inactive participants with a vested right to a deferred or immediate benefit	53	48
Number of inactive participants entitled to a return of their employee contributions	52	47
Number of active participants	1,095	1,090
Total payroll	\$89,755,173	\$85,537,485
Average payroll	81,968	78,475

SECTION 1: Valuation Summary for the Massachusetts Water Resource Authority Employees' Retirement System

Important Information About Actuarial Valuations

An actuarial valuation is a budgeting tool with respect to the financing of future projected obligations of a pension plan. It is an estimated forecast – the actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.

In order to prepare a valuation, Segal Consulting (“Segal”) relies on a number of input items. These include:

- **Plan of benefits** Plan provisions define the rules that will be used to determine benefit payments, and those rules, or the interpretation of them, may change over time. Even where they appear precise, outside factors may change how they operate. It is important to keep Segal informed with respect to plan provisions and administrative procedures, and to review the plan summary included in our report to confirm that Segal has correctly interpreted the plan of benefits.
- **Participant data** An actuarial valuation for a plan is based on data provided to the actuary by the Massachusetts Water Resource Authority Employees' Retirement System. Segal does not audit such data for completeness or accuracy, other than reviewing it for obvious inconsistencies compared to prior data and other information that appears unreasonable. It is important for Segal to receive the best possible data and to be informed about any known incomplete or inaccurate data.
- **Assets** The valuation is based on the market value of assets as of the valuation date, as provided by the Massachusetts Water Resource Authority Employees' Retirement System. The Massachusetts Water Resource Authority Employees' Retirement System uses an “actuarial value of assets” that differs from market value to gradually reflect year-to-year changes in the market value of assets in determining the contribution requirements.
- **Actuarial assumptions** In preparing an actuarial valuation, Segal projects the benefits to be paid to existing plan participants for the rest of their lives and the lives of their beneficiaries. This projection requires actuarial assumptions as to the probability of death, disability, withdrawal, and retirement of each participant for each year. In addition, the benefits projected to be paid for each of those events in each future year reflect actuarial assumptions as to salary increases and cost-of-living adjustments. The projected benefits are then discounted to a present value, based on the assumed rate of return that is expected to be achieved on the plan’s assets. There is a reasonable range for each assumption used in the projection and the results may vary materially based on which assumptions are selected. It is important for any user of an actuarial valuation to understand this concept. Actuarial assumptions are periodically reviewed to ensure that future valuations reflect emerging plan experience. While future changes in actuarial assumptions may have a significant impact on the reported results, that does not mean that the previous assumptions were unreasonable.

SECTION 1: Valuation Summary for the Massachusetts Water Resource Authority Employees' Retirement System

The user of Segal's actuarial valuation (or other actuarial calculations) should keep the following in mind:

- The actuarial valuation is prepared at the request of the Massachusetts Water Resource Authority Employees' Retirement System. Segal is not responsible for the use or misuse of its report, particularly by any other party.
- An actuarial valuation is a measurement of the plan's assets and liabilities at a specific date. Accordingly, except where otherwise noted, Segal did not perform an analysis of the potential range of future financial measures. The actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.
- If the Massachusetts Water Resource Authority Employees' Retirement System is aware of any event or trend that was not considered in this valuation that may materially change the results of the valuation, Segal should be advised, so that we can evaluate it.
- Segal does not provide investment, legal, accounting, or tax advice. Segal's valuation is based on our understanding of applicable guidance in these areas and of the plan's provisions, but they may be subject to alternative interpretations. The Massachusetts Water Resource Authority Employees' Retirement System should look to their other advisors for expertise in these areas.

As Segal Consulting has no discretionary authority with respect to the management or assets of the Plan, it is not a fiduciary in its capacity as actuaries and consultants with respect to the Plan.

SECTION 2: Valuation Results for the Massachusetts Water Resource Authority Employees' Retirement System

A. PARTICIPANT DATA

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

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

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

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

CHART 1
Participant Population: 2009 – 2016

Year Ended December 31	Active Participants	Inactive Participants	Retired Participants and Beneficiaries	Ratio of Non-Actives to Actives
2009	1,108	114	313	0.39
2010	1,110	102	341	0.40
2012	1,091	106	397	0.46
2014	1,090	95	476	0.52
2016	1,095	105	536	0.59

SECTION 2: Valuation Results for the Massachusetts Water Resource Authority Employees' Retirement System

Active Participants

Plan costs are affected by the age, years of service and payroll of active participants. In this year's valuation, there were 1,095 active participants with an average age of 51.6, average years of service of 18.1 years and average payroll of \$81,968. The 1,090 active participants in the prior valuation had an average age of 51.9, average service of 18.2 years and average payroll of \$78,475.

Among the active participants, there were none with unknown age and/or service information.

Inactive Participants

In this year's valuation, there were 53 participants with a vested right to a deferred or immediate vested benefit and there were 52 participants entitled to a return of their employee contributions.

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

CHART 2
Distribution of Active Participants by Age as of December 31, 2016

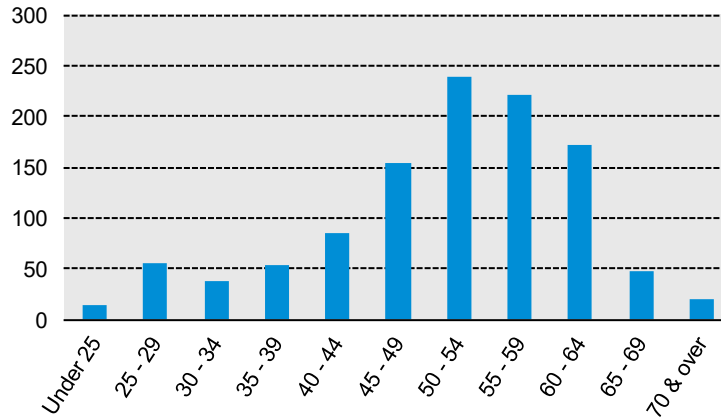
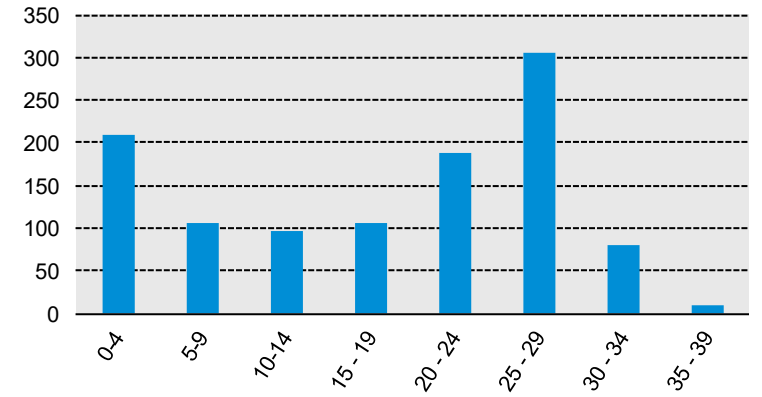


CHART 3
Distribution of Active Participants by Years of Service as of December 31, 2016



SECTION 2: Valuation Results for the Massachusetts Water Resource Authority Employees' Retirement System

Retired Participants and Beneficiaries

As of December 31, 2016, 468 retired participants and 68 beneficiaries were receiving total monthly benefits of \$1,498,090. For comparison, in the previous valuation, there were 415 retired participants and 61 beneficiaries receiving monthly benefits of \$1,214,815.

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

- Beneficiaries
- Accidental Disability
- Ordinary Disability
- Superannuation

CHART 4
Distribution of Retired Participants and Beneficiaries by Type and by Monthly Amount as of December 31, 2016

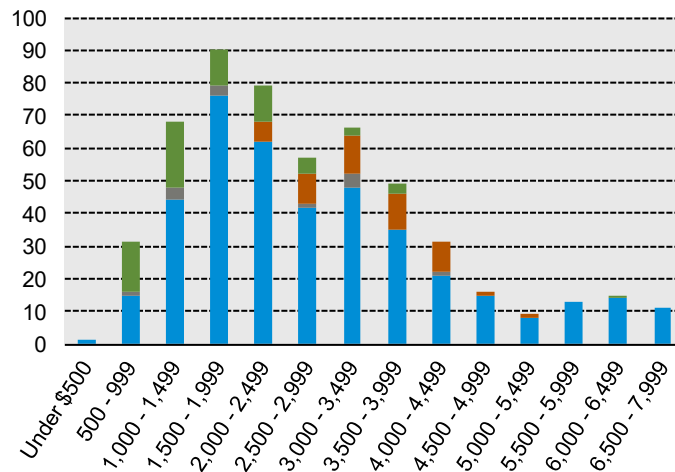
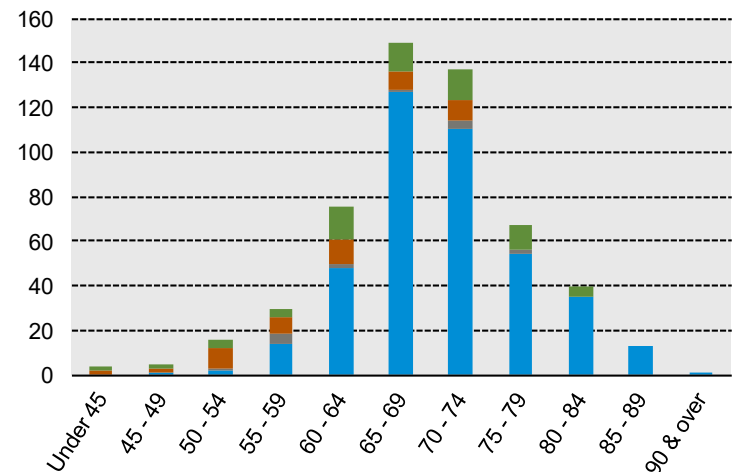


CHART 5
Distribution of Retired Participants and Beneficiaries by Type and by Age as of December 31, 2016



SECTION 2: Valuation Results for the Massachusetts Water Resource Authority Employees' Retirement System

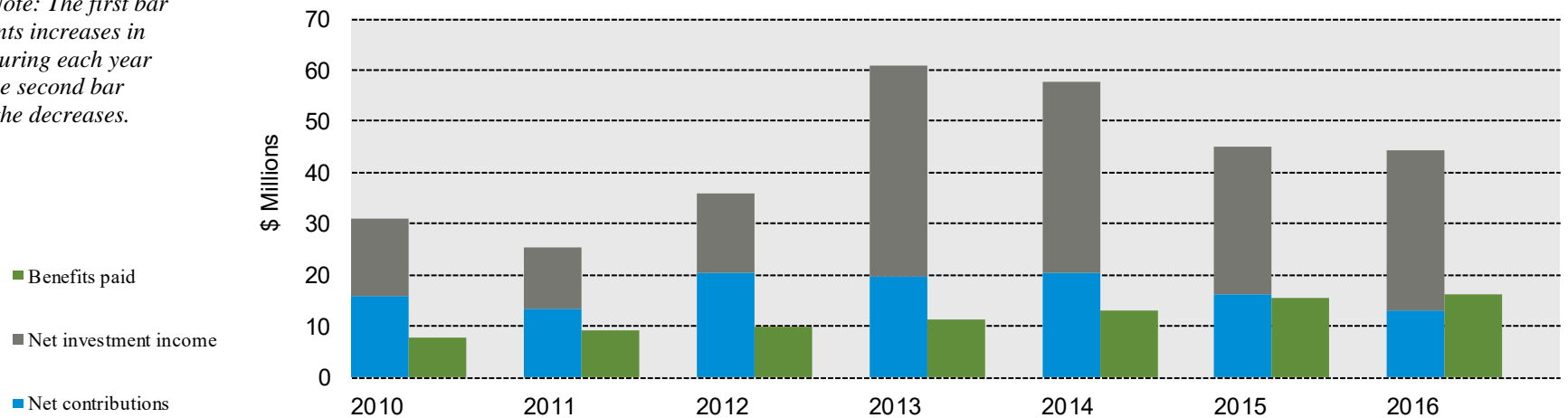
B. FINANCIAL INFORMATION

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

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

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

CHART 6
Comparison of Increases and Decreases in the Actuarial Value of Assets for Years Ended December 31, 2010 – 2016



SECTION 2: Valuation Results for the Massachusetts Water Resource Authority Employees' Retirement System

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

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

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

CHART 7 Determination of Actuarial Value of Assets

	Year Ended	
	December 31, 2016	December 31, 2015
1. Market value of assets, December 31, 2016 and 2015		
	\$465,602,173	\$444,584,437
2. Calculation of unrecognized return	Original Amount	Unrecognized Return
(a) Year ended December 31, 2016	-\$10,149,767	-\$8,119,814
(b) Year ended December 31, 2015	-32,266,091	-19,359,655
(c) Year ended December 31, 2014	-14,931,148	-5,972,459
(d) Year ended December 31, 2013	28,255,206	5,651,041
(e) Year ended December 31, 2012	13,366,332	<u>0</u>
(f) Total unrecognized return		<u>2,673,266</u>
3. Preliminary actuarial value: (1) - (2f)		-27,800,886
4. Adjustment to be within 10% corridor		-20,796,212
5. Final actuarial value of assets as of December 31, 2016 and 2015: (3) + (4)		493,403,059
6. Actuarial value as a percentage of market value: (5) ÷ (1)		0
7. Amount deferred for future recognition: (1) - (5)		\$493,403,059
		<u>\$465,380,649</u>
		106.0%
		104.7%
		-\$27,800,886
		-\$20,796,212

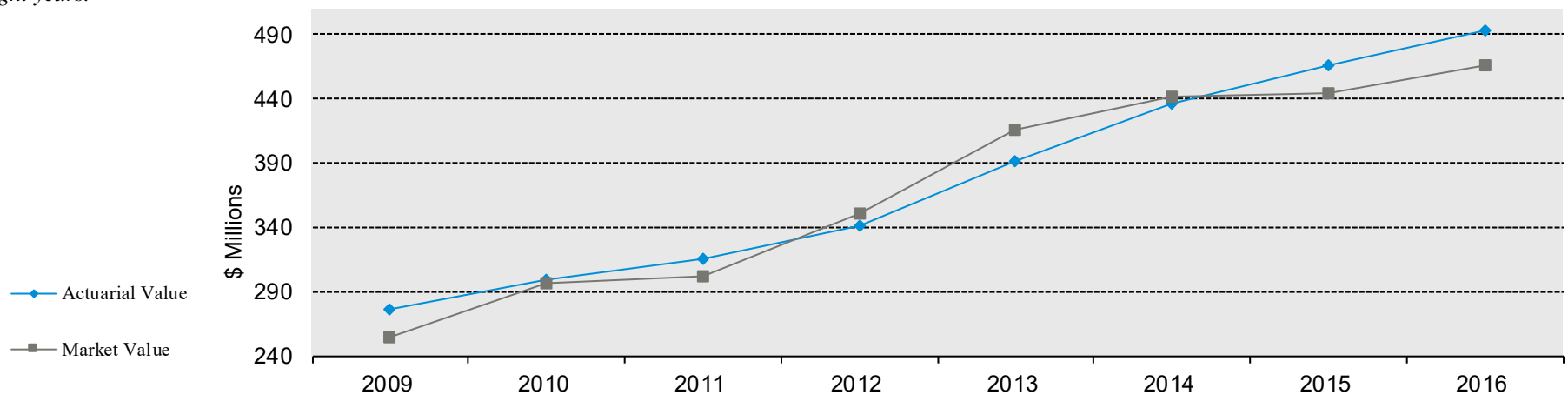
Note: Unrecognized return is the difference between the total return and expected return on a market value basis and is recognized over a five-year period.

SECTION 2: Valuation Results for the Massachusetts Water Resource Authority Employees' Retirement System

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

This chart shows the change in the actuarial value of assets versus the market value over the past eight years.

CHART 8
Actuarial Value of Assets vs. Market Value of Assets as of December 31, 2009 – 2016



SECTION 2: Valuation Results for the Massachusetts Water Resource Authority Employees' Retirement System

C. ACTUARIAL EXPERIENCE

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

Taking account of experience gains or losses in one year without making a change in assumptions reflects the belief that the single year's experience was a short-term

development and that, over the long term, experience will return to the original assumptions. For contribution requirements to remain stable, assumptions should approximate experience.

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

The net experience gain for the two-year period ending December 31, 2016 is \$696,173. A discussion of the major components of the actuarial experience is on the following pages.

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

CHART 9
Actuarial Experience for Two-Year Period Ended December 31, 2016

1. Net loss from investments*	-\$9,784,085
2. Net gain from administrative expenses	250,554
3. Net gain from other experience**	<u>10,229,704</u>
4. Net experience gain: (1) + (2) + (3)	\$696,173

* Details in Chart 10

** Details in Chart 13

SECTION 2: Valuation Results for the Massachusetts Water Resource Authority Employees' Retirement System

Investment Rate of Return

A major component of projected asset growth is the assumed rate of return. The assumed return should represent the expected long-term rate of return, based on the MWRA Employees' Retirement System's investment policy. For valuation purposes, the assumed rate of return on the actuarial value of assets was 7.75% for the years ending December 31, 2015 and December 31, 2016. The actual rate of return on an actuarial basis for the 2016 and 2015 plan years were 6.72% and 6.60%, respectively.

Since the actual return for the year was less than the assumed return, the MWRA Employees' Retirement System experienced an actuarial loss of \$9,784,085 with regard to its investments.

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

**CHART 10
Actuarial Value Investment Experience**

	Year Ended	
	December 31, 2016	December 31, 2015
1. Actual return	\$31,187,552	\$28,779,853
2. Average value of assets	463,798,078	436,221,118
3. Actual rate of return: (1) ÷ (2)	6.72%	6.60%
4. Assumed rate of return	7.75%	7.75%
5. Expected return: (2) x (4)	\$35,944,351	\$33,807,137
6. Actuarial gain/(loss): (1) – (5)	<u>-\$4,756,799</u>	<u>-\$5,027,286</u>

SECTION 2: Valuation Results for the Massachusetts Water Resource Authority Employees' Retirement System

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

Based upon this experience and future expectations, we have lowered the assumed rate of return from 7.75% to 7.50%.

CHART 11

Investment Return – Actuarial Value vs. Market Value: 2009 - 2016

Year Ended December 31	Actuarial Value Investment Return		Market Value Investment Return	
	Amount	Percent	Amount	Percent
2009	N/A	21.45%	N/A	22.49%
2010	\$15,233,758	5.44	\$34,324,480	13.32
2011	12,041,642	3.99	1,969,318	0.66
2012	15,544,568	4.85	37,954,768	12.35
2013	41,012,736	11.86	56,636,985	15.96
2014	37,258,485	9.44	18,623,808	4.44
2015	28,779,853	6.60	2,004,433	0.45
2016	<u>31,187,552</u>	6.72	<u>24,182,878</u>	5.46
Total	\$181,058,594		\$175,696,670	
	Five-year average return	7.84%		7.09%
	Seven-year average return	7.12%		6.96%

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

Returns are net of investment and administrative expenses prior to 2013 and net of investment expenses thereafter.

SECTION 2: Valuation Results for the Massachusetts Water Resource Authority Employees' Retirement System

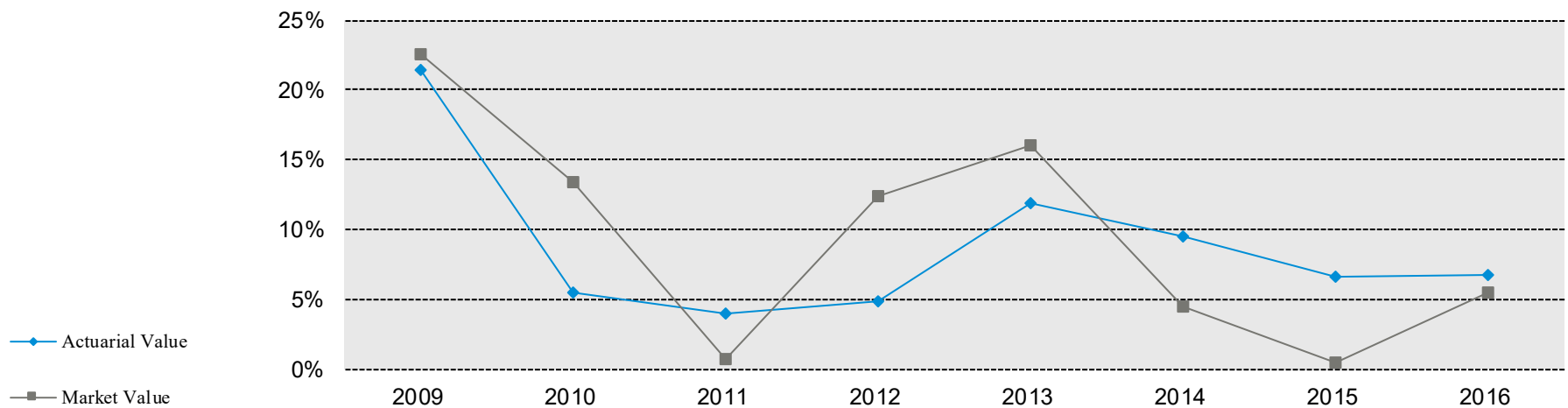
Subsection B described the actuarial asset valuation method that gradually takes into account fluctuations in the market value rate of return. The effect of this is to stabilize the actuarial rate of return, which contributes to leveling pension plan costs.

Administrative Expenses

Administrative expenses for the years ended December 31, 2015 and 2016 were \$412,414 and \$426,053, respectively, compared to the assumption of \$525,000 for calendar year 2015 and \$546,000 for calendar year 2016. This resulted in a gain of \$250,554. Based on budgeted expenses provided by the System, we have reset the assumption to \$525,000 for calendar year 2017, increasing 3.00% per year thereafter.

This chart illustrates how this leveling effect has actually worked over the years 2009 - 2016.

CHART 12
Market and Actuarial Rates of Return for Years Ended December 31, 2009 - 2016



SECTION 2: Valuation Results for the Massachusetts Water Resource Authority Employees' Retirement System

Other Experience

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

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

The net gain from this other experience for the two-year period ending December 31, 2016 amounted to \$10,229,704 which is 2.0% of the actuarial accrued liability.

A brief summary of the demographic gain/(loss) experience of the MWRA Employees' Retirement System for the two-year period ending December 31, 2016 is shown in the chart below.

This valuation reflects the following changes in assumptions:

- The net investment return assumption was lowered from 7.75% to 7.50%.
- The pre-retirement mortality assumption was changed from the RP-2000 Employee Mortality Table projected generationally from 2005 with Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2009 with Scale BB2D.
- The post-retirement mortality assumption for non-disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table projected generationally from 2005 with Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2009 with Scale BB2D.
- The mortality assumption for disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table set forward 2 years projected generationally from 2005 with Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2015 with Scale BB2D.

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

CHART 13

Experience Due to Changes in Demographics for Two-Year Period Ended December 31, 2016

1. Salary increases less than expected for continuing actives	\$5,675,858
2. Miscellaneous experience gain, including fewer retirements than expected	<u>4,553,846</u>
3. Total	\$10,229,704

SECTION 2: Valuation Results for the Massachusetts Water Resource Authority Employees' Retirement System

- The salary increase assumption was changed as follows:

Years of Service	Rate	
	Current	Previously
0	5.75%	6.00%
1	5.25%	5.50%
2	5.25%	5.50%
3	5.00%	5.25%
4	5.00%	5.25%
5	4.50%	4.75%
6	4.50%	4.75%
7	4.25%	4.50%
8	4.25%	4.50%
9+	4.00%	4.25%

- The reduction in liability to account for anticipated net 3(8)(c) reimbursements was increased from \$7.2 million to \$8.7 million based on the average net 3(8)(c) payments in 2015 and 2016.

Changing these assumptions resulted in a net increase in the unfunded liability of \$14.6 million and a decrease in the employer normal cost of \$160,000.

This valuation reflects the following changes in plan provisions:

- As permitted by Section 19, Chapter 188 of the Acts of 2010, the Board has increased the Cost of Living Adjustment (COLA) base from \$12,000 to \$13,000 effective July 1, 2016.
- The Board has increased the Section 101 allowance from \$6,000 to \$9,000.
- The Board has increased the Member-Survivor Minimum Allowance from \$250 per month to \$500 per month.

Changing these plan provisions resulted in a net increase in the unfunded liability of \$2.1 million and an increase in the employer normal cost of \$55,000.

SECTION 2: Valuation Results for the Massachusetts Water Resource Authority Employees' Retirement System

The unfunded liability was expected to decrease from \$7.6 million as of January 1, 2015 to \$2.0 million as of January 1, 2017. The actual unfunded liability as of January 1, 2017 of \$18.0 million is \$16.0 million higher than expected as detailed in Chart 14 below.

CHART 14
Development of Unfunded Actuarial Accrued Liability

	Year Ended	
	December 31, 2016	December 31, 2016
1. Unfunded actuarial accrued liability at beginning of year	\$3,124,466	\$7,645,918
2. Normal cost at beginning of year	11,609,396	11,162,881
3. Total contributions	-13,390,164	-16,561,659
4. Interest		
(a) For whole year on (1) + (2)	\$1,141,874	\$1,457,682
(b) For half year on (3)	<u>-469,220</u>	<u>-580,356</u>
(c) Total interest	<u>672,654</u>	<u>877,326</u>
5. Expected unfunded actuarial accrued liability	\$2,016,352	\$3,124,466
6. Changes due to:		
(a) Net experience gain	-\$696,173	
(b) Assumption changes	14,632,734	
(c) Plan provision changes	<u>2,050,275</u>	
(d) Total changes	<u>15,986,836</u>	
7. Unfunded actuarial accrued liability at end of year	<u>\$18,003,188</u>	<u>\$3,124,466</u>

SECTION 2: Valuation Results for the Massachusetts Water Resource Authority Employees' Retirement System

D. RECOMMENDED CONTRIBUTION

The amount of annual contribution required to fund the Plan is comprised of an employer normal cost payment and a payment on the unfunded actuarial accrued liability.

The contribution for fiscal 2018 is equal to the previously budgeted amount of \$3,277,369. The results of this valuation will first be reflected in the fiscal 2019 appropriation.

The funding schedule adopted by the board with the prior valuation fully funds the System by fiscal 2024 with amortization payments that are calculated to increase 4.5% per year. The deferred investment losses are reflected in the projection of the unfunded actuarial accrued liability and account for the increase in the unfunded liability through fiscal 2021 and the corresponding increase in the appropriation. Chart 16 shows the recommended contribution through fiscal 2024 based on this funding schedule. The fiscal 2019 appropriation is \$7,962,791.

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

CHART 15
Recommended Contribution

	Year Beginning January 1			
	2017		2015	
	Amount	% of Payroll	Amount	% of Payroll
1. Total normal cost	\$11,307,822	12.11%	\$10,637,881	11.93%
2. Administrative expenses	525,000	0.56%	525,000	0.59%
3. Expected employee contributions	<u>-9,069,815</u>	<u>-9.72%</u>	<u>-8,567,063</u>	<u>-9.61%</u>
4. Employer normal cost: (1) + (2) + (3)	\$2,763,007	2.96%	\$2,595,818	2.91%
5. Actuarial accrued liability	511,406,247		443,487,357	
6. Actuarial value of assets	<u>493,403,059</u>		<u>435,841,439</u>	
7. Unfunded actuarial accrued liability: (5) - (6)	\$18,003,188		\$7,645,918	
8. Employer normal cost projected to July 1, 2017 and 2015	2,804,146	2.96%	2,647,225	2.91%
9. Projected unfunded actuarial accrued liability	18,666,103		7,936,670	
10. Payment on projected unfunded actuarial accrued liability	473,223	0.50%	5,512,296	6.06%
11. Recommended contribution: (8) + (10),	<u>\$3,277,369</u>	<u>3.46%</u>	<u>\$8,159,521</u>	<u>8.97%</u>
12. Projected payroll	\$94,743,350		\$90,934,803	

Notes: Recommended contributions are assumed to be paid on July 1.

Recommended contributions are set equal to budgeted amounts determined with the prior valuation.

SECTION 2: Valuation Results for the Massachusetts Water Resource Authority Employees' Retirement System

CHART 16

Funding Schedule – Fully Funded by June 30, 2024 with amortization payments calculated to increase 4.5% per year

(1) Fiscal Year Ended June 30	(2) Employer Normal Cost	(3) Amortization Payment	(4) Total Plan Cost: (2) + (3)	(5) Unfunded Actuarial Accrued Liability at Beginning of Fiscal Year	(6) Percent Increase in Total Cost
2018	\$2,804,146	\$473,223	\$3,277,369	\$18,666,103	--
2019	2,906,001	5,056,790	7,962,791	28,301,078	142.96%
2020	3,011,471	8,317,463	11,328,934	39,330,039	42.27%
2021	3,120,682	11,428,289	14,548,971	43,834,937	28.42%
2022	3,233,765	13,067,947	16,301,712	38,119,957	12.05%
2023	3,350,853	13,656,004	17,006,857	26,930,911	4.33%
2024	3,472,089	14,270,525	17,742,614	14,270,525	4.33%

Notes: Assumes contribution of budgeted amount for fiscal year 2018.

Recommended contributions are assumed to be paid on July 1.

Item (2) reflects 3.0% growth in payroll as well as a 0.15% adjustment to total normal cost to reflect the effects of mortality improvement due to the generational mortality assumption.

Projected normal cost does not reflect the future impact of pension reform for new hires.

Amortization payments are calculated to increase at 4.50% per year.

Unfunded actuarial accrued liability reflects deferred investment losses. Recognizing deferred investment losses means the System is anticipating investment losses on an actuarial basis.

SECTION 3: Supplemental Information for the Massachusetts Water Resource Authority Employees' Retirement System

EXHIBIT A

Table of Plan Coverage

Category	Year Ended December 31		Change From Prior Year
	2016	2014	
Active participants. in valuation:			
Number	1,095	1,090	0.5%
Average age	51.6	51.9	N/A
Average years of service	18.1	18.2	N/A
Total payroll	\$89,755,173	\$85,537,485	4.9%
Average payroll	81,968	78,475	4.5%
Member contributions	113,774,756	108,668,016	4.7%
Inactive participants entitled to a return of employee contributions	52	47	10.6%
Inactive participants with a vested right to a deferred or immediate benefit	53	48	10.4%
Retired participants:			
Number in pay status	405	354	14.4%
Average age	70.6	69.8	N/A
Average monthly benefit	\$2,927	\$2,626	11.5%
Disabled participants:			
Number in pay status	63	61	3.3%
Average age	61.6	60.6	N/A
Average monthly benefit	\$3,147	\$2,972	5.9%
Beneficiaries in pay status:			
Number in pay status	68	61	11.5%
Average age	66.4	65.1	N/A
Average monthly benefit	\$1,682	\$1,702	-1.2%

SECTION 3: Supplemental Information for the Massachusetts Water Resource Authority Employees' Retirement System

EXHIBIT B

**Participants in Active Service as of December 31, 2016
By Age, Years of Service, and Average Payroll**

Age	Years of Service								
	Total	0-4	5-9	10-14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39
Under 25	13	13	--	--	--	--	--	--	--
	\$46,939	\$46,939	--	--	--	--	--	--	--
25 - 29	55	46	9	--	--	--	--	--	--
	\$52,387	\$51,876	\$54,999	--	--	--	--	--	--
30 - 34	38	23	11	4	--	--	--	--	--
	\$62,217	\$56,538	\$71,721	\$68,732	--	--	--	--	--
35 - 39	53	29	11	11	2	--	--	--	--
	\$64,406	\$59,852	\$62,777	\$73,970	\$86,811	--	--	--	--
40 - 44	84	24	18	15	12	14	1	--	--
	\$77,062	\$66,137	\$68,598	\$80,055	\$90,833	\$91,214	\$83,350	--	--
45 - 49	154	30	16	12	24	39	33	--	--
	\$79,246	\$61,514	\$69,800	\$86,407	\$82,628	\$89,535	\$82,721	--	--
50 - 54	239	25	17	18	21	41	91	25	1
	\$87,389	\$70,898	\$78,869	\$74,050	\$90,845	\$92,109	\$92,910	\$88,542	\$87,244
55 - 59	222	16	16	12	15	43	87	32	1
	\$88,746	\$60,233	\$78,779	\$82,462	\$95,036	\$94,103	\$92,506	\$90,330	\$77,237
60 - 64	171	--	5	19	22	34	70	15	6
	\$89,806	--	\$69,336	\$79,218	\$97,248	\$90,986	\$87,492	\$91,259	\$129,796
65 - 69	47	2	3	3	7	11	15	5	1
	\$91,269	\$87,033	\$70,507	\$71,047	\$87,013	\$85,784	\$103,090	\$93,980	\$121,936
70 & over	19	--	--	2	2	5	8	2	--
	\$82,888	--	--	\$77,667	\$90,074	\$72,682	\$79,666	\$119,326	--
Total	1,095	208	106	96	105	187	305	79	9
	\$81,968	\$59,498	\$70,618	\$78,358	\$90,558	\$90,868	\$90,571	\$90,906	\$118,355

SECTION 3: Supplemental Information for the Massachusetts Water Resource Authority Employees' Retirement System

EXHIBIT C

Summary Statement of Income and Expenses on an Actuarial Value Basis

	Year Ended December 31, 2016	Year Ended December 31, 2015
Net assets at actuarial value at the beginning of the year	\$465,380,649	\$435,841,439
Contribution income:		
Employer contributions	\$4,632,624	\$8,159,521
Employee contributions	8,757,540	8,402,138
Less administrative expenses	<u>-426,053</u>	<u>-412,414</u>
Net contribution income	12,964,111	16,149,245
Net investment income	<u>31,187,552</u>	<u>28,779,851</u>
Total income available for benefits	\$44,151,663	\$44,929,096
Less benefit payments:		
Pensions	-\$13,015,806	-\$11,685,750
Net 3(8)(c) reimbursements	872,827	849,506
Refunds, annuities, & Option B refunds	-4,306,344	-4,112,066
Workers compensation settlements	21,000	25,000
Net transfers	<u>299,070</u>	<u>-466,576</u>
Net benefit payments	-\$16,129,253	-\$15,389,886
Change in reserve for future benefits	\$28,022,410	\$29,539,210
Net assets at actuarial value at the end of the year	\$493,403,059	\$465,380,649

SECTION 3: Supplemental Information for the Massachusetts Water Resource Authority Employees' Retirement System

EXHIBIT D

Development of the Fund Through December 31, 2016

Year Ended December 31	Employer Contributions	Employee Contributions	Other Contributions	Net Investment Return*	Administrative Expenses	Benefit Payments	Actuarial Value of Assets at End of Year
2010	\$8,136,240	\$7,563,665	\$13,815	\$15,233,758	\$0	\$7,885,963	\$299,331,117
2011	5,488,792	7,734,335	22,732	12,041,642	0	9,037,060	315,581,558
2012	12,326,022	7,952,164	15,871	15,544,568	0	9,905,160	341,515,023
2013	12,431,514	7,690,025	15,824	41,012,736	410,778	11,191,188	391,063,156
2014	12,629,475	8,332,936	16,000	37,258,485	407,574	13,051,038	435,841,439
2015	8,159,521	8,402,138	0	28,779,852	412,414	15,389,886	465,380,649
2016	4,632,624	8,757,540	0	31,187,552	426,053	16,129,253	493,403,059

* Net of investment fees for 2013 and later and net of investment fees and administrative expenses prior to 2013.

SECTION 3: Supplemental Information for the Massachusetts Water Resource Authority Employees' Retirement System

EXHIBIT E

Definitions of Pension Terms

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

Assumptions or actuarial assumptions:

The estimates on which the cost of the Plan is calculated including:

- (a) Investment return — the rate of investment yield that the Plan will earn over the long-term future;
- (b) Mortality rates — the death rates of employees and pensioners; life expectancy is based on these rates;
- (c) Retirement rates — the rate or probability of retirement at a given age;
- (d) Turnover rates — the rates at which employees of various ages are expected to leave employment for reasons other than death, disability, or retirement.

Normal cost:

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

Actuarial accrued liability for actives:

The equivalent of the accumulated normal costs allocated to the years before the valuation date.

Actuarial accrued liability for pensioners:

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

Unfunded actuarial accrued liability:

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

SECTION 3: Supplemental Information for the Massachusetts Water Resource Authority Employees' Retirement System

Amortization of the unfunded actuarial accrued liability:

Payments made over a period of years equal in value to the Plan's unfunded actuarial accrued liability.

Investment return:

The rate of earnings of the Plan from its investments, including interest, dividends and capital gain and loss adjustments, computed as a percentage of the average value of the fund. For actuarial purposes, the investment return often reflects a smoothing of the capital gains and losses to avoid significant swings in the value of assets from one year to the next.

SECTION 4: Reporting Information for the Massachusetts Water Resource Authority Employees' Retirement System

EXHIBIT I

Summary of Actuarial Valuation Results

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

1. Retired participants as of the valuation date (including 63 beneficiaries in pay status)	536
2. Participants active during the year ended December 31, 2016 with total accumulated contributions of \$113,774,756 and projected 2017 payroll of \$93,353,397	1,095
3. Inactive participants with a right to a return of their employee contributions as of December 31, 2016	52
4. Inactive participants with a vested right to a deferred or immediate benefit as of December 31, 2016	538

The actuarial factors as of January 1, 2017 are as follows:

1. Normal cost, including administrative expenses	\$11,832,822
2. Expected employee contributions	<u>-9,069,815</u>
3. Employer normal cost: (1) + (2)	\$2,763,007
4. Actuarial accrued liability	511,406,247
Retired participants and beneficiaries	\$179,180,324
Active participants	318,791,528
Inactive participants	13,434,395
5. Actuarial value of assets (\$465,602,173 at market value as reported in the Annual Statement)	493,403,059
6. Unfunded actuarial accrued liability: (4) – (5)	18,003,188

The actuarial factors projected to July 1, 2017 are as follows:

1. Employer normal cost projected to July 1, 2017	\$2,804,146
2. Projected unfunded actuarial accrued liability	18,666,103
3. Payment on projected unfunded actuarial accrued liability	473,223
4. Recommended contribution: (1) + (3)	3,277,369
5. Projected payroll	94,743,350
6. Recommended contribution as a percentage of projected payroll: (4) ÷ (5)	3.46%

Notes: Recommended contribution is assumed to be paid on July 1.

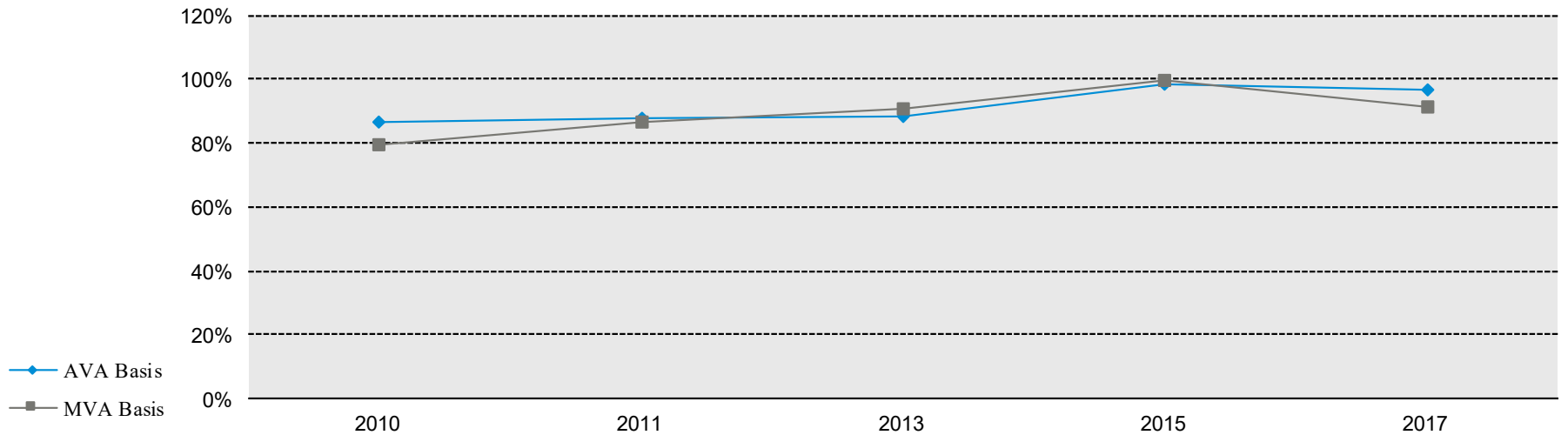
Recommended contribution is set equal to budgeted amount determined with the prior valuation.

SECTION 4: Reporting Information for the Massachusetts Water Resource Authority Employees' Retirement System

**EXHIBIT II
Funded Ratio**

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

The chart below depicts a history of the funded ratios for this plan. On a market value basis, the funded ratio has decreased from 99.6% as of January 1, 2015 to 91.0% as of January 1, 2017. On an actuarial basis, the funded ratio has decreased from 98.3% as of January 1, 2015 to 96.5% as of January 1, 2017.



SECTION 4: Reporting Information for the Massachusetts Water Resource Authority Employees' Retirement System

EXHIBIT III

Actuarial Assumptions and Actuarial Cost Method

Mortality Rates:

Pre-Retirement:

RP-2000 Employee Mortality Table projected generationally from 2009 with Scale BB2D (previously, RP-2000 Mortality Table projected generationally from 2005 using Scale AA)

Healthy:

RP-2000 Healthy Annuitant Mortality Table projected generationally from 2009 with Scale BB2D (previously, RP-2000 Mortality Table projected generationally from 2005 using Scale AA)

Disabled:

RP-2000 Healthy Annuitant Mortality Table projected generationally from 2015 with Scale BB2D (previously, RP-2000 Mortality Table set forward 2 years projected generationally using Scale AA)

The mortality tables reasonably reflect the projected mortality experience of the Plan as of the measurement date based on historical and current demographic data. As part of the analysis, a comparison was made between the actual number of retiree deaths and the projected number based on the prior year's assumptions over the three most recent valuations. The mortality tables were then adjusted to future years using generational projection under Scale BB2D to reflect future mortality improvement.

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Termination Rates before Retirement:

Age	Rate (%)			Disability
	Male	Female	Mortality	
20	0.03	0.02		0.01
25	0.04	0.02		0.02
30	0.04	0.03		0.03
35	0.08	0.05		0.05
40	0.11	0.07		0.10
45	0.15	0.11		0.15
50	0.21	0.17		0.19
55	0.30	0.25		0.24
60	0.49	0.39		0.28

*Notes: Mortality rates do not reflect generational projection.
55% of the disability rates shown represent accidental disability.
40% of the accidental disabilities will die from the same cause as the disability.
55% of the death rates shown represent accidental death.*

SECTION 4: Reporting Information for the Massachusetts Water Resource Authority Employees' Retirement System

Withdrawal Rates:	Years of Service	Rate per year (%)
	0	15.0
	1	12.0
	2	10.0
	3	9.0
	4	8.0
	5	7.6
	6	7.5
	7	6.7
	8	6.3
	9	5.9
	10	5.4
	11	5.0
	12	4.6
	13	4.1
	14	3.7
	15	3.3
	16 – 20	2.0
	21 – 29	1.0
	30+	0.0

The termination rates and disability rates were based on historical and current demographic data, adjusted to reflect economic conditions of the area and estimated future experience and professional judgment. As part of the analysis, a comparison was made between the actual number of terminations and disability retirements and the projected number based on the prior year's assumptions over the three most recent valuations.

SECTION 4: Reporting Information for the Massachusetts Water Resource Authority Employees' Retirement System

Retirement Rates:	Age	Rate per year (%)	
		Male	Female
	50	0.750	1.125
	51	0.750	1.125
	52	0.750	1.500
	53	0.750	1.875
	54	1.500	1.875
	55	1.500	4.125
	56	1.875	4.875
	57	1.875	4.875
	58	3.750	4.875
	59	4.875	4.875
	60	9.000	3.750
	61	15.000	9.750
	62	22.500	11.250
	63	18.750	9.375
	64	16.500	13.500
	65	30.000	11.250
	66	18.750	15.000
	67	18.750	15.000
	68	22.500	18.500
	69	22.500	15.000
	70	100.000	100.000

The retirement rates were based on historical and current demographic data, adjusted to reflect economic conditions of the area and estimated future experience and professional judgment. As part of the analysis, a comparison was made between the actual number of retirements by age and the projected number based on the prior year's assumptions over the three most recent valuations.

SECTION 4: Reporting Information for the Massachusetts Water Resource Authority Employees' Retirement System

Retirement Age for Inactive Vested Participants:	Age 55 The retirement age for inactive vested participants was based on historical and current demographic data, adjusted to reflect economic conditions of the area and estimated future experience and professional judgment.
Unknown Data for Participants:	Same as those exhibited by participants with similar known characteristics.
Family Composition:	80% of participants are assumed to be married. None are assumed to have dependent children. Females are assumed to be three years younger than their spouses.
Benefit Election:	All participants are assumed to elect Option A. The benefit election reflects the fact that all benefit options are actuarially equivalent.
Net Investment Return:	7.50%, net of investment expenses (previously, 7.75% net of investment expenses) The net investment return assumption is a long-term estimate derived from historical data, current and recent market expectations, and professional judgment. As part of the analysis, a building block approach was used that reflects inflation expectations and anticipated risk premiums for each of the portfolio's asset classes, as well as the Plan's target asset allocation.

SECTION 4: Reporting Information for the Massachusetts Water Resource Authority Employees' Retirement System

Salary Increases:

Years of Service	Rate	
	Current	Previously
0	5.75%	6.00%
1	5.25%	5.50%
2	5.25%	5.50%
3	5.00%	5.25%
4	5.00%	5.25%
5	4.50%	4.75%
6	4.50%	4.75%
7	4.25%	4.50%
8	4.25%	4.50%
9+	4.00%	4.25%

The salary scale assumption is a long-term estimate derived from historical data, current and recent market expectations, and professional judgment.

Interest on Employee Contributions: 3.50%

Administrative Expenses: \$525,000 for calendar 2017 based on budgeted expenses provided by the System, increasing 3.00% per year (previously, \$525,000 for calendar 2015, increasing 4.00% per year).

2016 Salary: 2016 salaries are equal to salaries provided in the data, except for new hires where salaries were annualized based on date of hire.

Total Service: Total creditable service reported in the data.

Net 3(8)(c) Liability: Estimated based on the average annual net 3(8)(c) benefits of the prior two years (\$8.7 million reduction for 2017) (previously, \$7.2 million reduction for 2015).

Actuarial Value of Assets: Market value of assets as reported in the System's Annual Statement less unrecognized return in each of the last five years. Unrecognized return is equal to the difference between the actual market value return and the expected market value return and is recognized over a five-year period, further adjusted, if necessary, to be within 10% of the market value.

SECTION 4: Reporting Information for the Massachusetts Water Resource Authority Employees' Retirement System

Actuarial Cost Method:	Entry Age Normal Actuarial Cost Method. Entry Age is the age of the participant less Total Service as defined above. Normal Cost and Actuarial Accrued Liability are calculated on an individual basis and are allocated by salary. Normal Cost is determined using the plan of benefits applicable to each participant.
Changes in Assumptions:	<p>Based on past experience and future expectations, the following assumptions were changed as of January 1, 2017:</p> <ul style="list-style-type: none">➤ The net investment return assumption was lowered from 7.75% to 7.50%.➤ The pre-retirement mortality assumption was changed from the RP-2000 Employee Mortality Table projected generationally from 2005 with Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2009 with Scale BB2D.➤ The post-retirement mortality assumption for non-disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table projected generationally from 2005 with Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2009 with Scale BB2D.➤ The mortality assumption for disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table set forward 2 years projected generationally from 2005 with Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2015 with Scale BB2D.

SECTION 4: Reporting Information for the Massachusetts Water Resource Authority Employees' Retirement System

- The salary increase assumption was changed as follows:

Years of Service	Rate	
	Current	Previously
0	5.75%	6.00%
1	5.25%	5.50%
2	5.25%	5.50%
3	5.00%	5.25%
4	5.00%	5.25%
5	4.50%	4.75%
6	4.50%	4.75%
7	4.25%	4.50%
8	4.25%	4.50%
9+	4.00%	4.25%

- The reduction in liability to account for anticipated net 3(8)(c) reimbursements was increased from \$7.2 million to \$8.7 million based on the average net 3(8)(c) payments in 2015 and 2016.

SECTION 4: Reporting Information for the Massachusetts Water Resource Authority Employees' Retirement System

EXHIBIT IV

Summary of Plan Provisions

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

Plan Year: January 1 – December 31

Retirement Benefits

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

For employees hired prior to April 2, 2012, the annual amount of the retirement allowance is based on the member's final three-year average salary multiplied by the number of years and full months of creditable service at the time of retirement and multiplied by a percentage according to the following table based on the age of the member at retirement:

Age Last Birthday at Date of Retirement

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

SECTION 4: Reporting Information for the Massachusetts Water Resource Authority Employees' Retirement System

A member's final three-year average salary is defined as the greater of the highest consecutive three-year average annual rate of regular compensation and the average annual rate of regular compensation received during the last three years of creditable service prior to retirement.

For employees hired on April 2, 2012 or later, the annual amount of the retirement allowance is based on the member's final five-year average salary multiplied by the number of years and full months of creditable service at the time of retirement and multiplied by a percentage according to the following tables based on the age and years of creditable service of the member at retirement:

For members with less than 30 years of creditable service:

Age Last Birthday at Date of Retirement

Percent	Group 1	Group 2	Group 4
2.50	67 or over	62 or over	57 or over
2.35	66	61	56
2.20	65	60	55
2.05	64	59	54
1.90	63	58	53
1.75	62	57	52
1.60	61	56	51
1.45	60	55	50

For members with 30 years of creditable service or greater:

Age Last Birthday at Date of Retirement

Percent	Group 1	Group 2	Group 4
2.500	67 or over	62 or over	57 or over
2.375	66	61	56
2.250	65	60	55
2.125	64	59	54
2.000	63	58	53
1.875	62	57	52
1.750	61	56	51
1.625	60	55	50

SECTION 4: Reporting Information for the Massachusetts Water Resource Authority Employees' Retirement System

A member's final five-year average salary is defined as the greater of the highest consecutive five-year average annual rate of regular compensation and the average annual rate of regular compensation received during the last five years of creditable service prior to retirement.

For employees who became members after January 1, 2011, regular compensation is limited to 64% of the federal limit found in 26 U.S.C. 401(a)(17). In addition, regular compensation for members who retire after April 2, 2012 will be limited to prohibit "spiking" of a member's salary to increase the retirement benefit.

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

Employee Contributions

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

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

Employees hired after 1983 who voluntarily withdraw their contributions with less than 10 ten years of credited service receive 3% interest on their contributions.

Employees in Group 1 hired on or after April 2, 2012 with 30 years of creditable service or greater will pay a base contribution rate of 6%.

Retirement Benefits (Superannuation)

Members of Group 1, 2 or 4 hired prior to April 2, 2012 may retire upon the attainment of age 55. For retirement at ages below 55, twenty years of creditable service is required.

SECTION 4: Reporting Information for the Massachusetts Water Resource Authority Employees' Retirement System

Members hired prior to April 2, 2012 who terminate before age 55 with ten or more years of creditable service are eligible for a retirement allowance upon the attainment of age 55 (provided they have not withdrawn their accumulated deductions from the Annuity Savings Fund of the System).

Members of Group 1 hired April 2, 2012 or later may retire upon the attainment of age 60. Members of Group 2 or 4 hired April 2, 2012 or later may retire upon the attainment of age 55. Members of Group 4 may retire upon attainment of age 50 with ten years of creditable service.

Members hired April 2, 2012 or later who terminate before age 55 (60 for members of Group 1) with ten or more years of creditable service are eligible for a retirement allowance upon the attainment of age 55 (60 for members of Group 1) provided they have not withdrawn their accumulated deductions from the Annuity Savings Fund of the System.

Ordinary Disability Benefits

A member who is unable to perform his or her job due to a non-occupational disability will receive a retirement allowance if he or she has ten or more years of creditable service and has not reached age 55. The annual amount of such allowance shall be determined as if the member retired for superannuation at age 55 (age 60 for Group 1 members hired on or after April 2, 2012), based on the amount of creditable service at the date of disability. For veterans, there is a minimum benefit of 50 percent of the member's most recent year's pay plus an annuity based on his or her own contributions.

Accidental Disability Benefit

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

SECTION 4: Reporting Information for the Massachusetts Water Resource Authority Employees' Retirement System

Death Benefits

In general, the beneficiary of an employee who dies in active service will receive a refund of the employee's own contributions. Alternatively, if the employee were eligible to retire on the date of death, a spouse's benefit will be paid equal to the amount the employee would have received under Option C. The surviving spouse of a member who dies with two or more years of credited service has the option of a refund of the employee's contributions or a monthly benefit regardless of eligibility to retire, if they were married for at least one year. There is also a minimum widow's pension of \$500 per month (previously, \$250), and there are additional amounts for surviving children.

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

Upon the death of a job-connected disability retiree who retired prior to November 7, 1996 and could not elect an Option C benefit, a surviving spouse will receive an allowance of \$9,000 (previously, \$6,000) if the member dies for a reason unrelated to the cause of disability.

"Heart And Lung Law" And Cancer Presumption

Any case of hypertension or heart disease resulting in total or partial disability or death to a uniformed fireman, permanent member of a police department, or certain employees of a county correctional facility is presumed to have been suffered in the line of duty, unless the contrary is shown by competent evidence. Any case of disease of the lungs or respiratory tract resulting in total disability or death to a uniformed fireman is presumed to have been suffered in the line of duty, unless the contrary is shown by competent evidence. There is an additional presumption for uniformed firemen that certain types of cancer are job-related if onset occurs while actively employed or within five years of retirement.

SECTION 4: Reporting Information for the Massachusetts Water Resource Authority Employees' Retirement System

Options

Members may elect to receive a full retirement allowance payable for life under Option A. Under Option B a member may elect to receive a lower monthly allowance in exchange for a guarantee that at the time of death any contributions not expended for annuity payments will be refunded to the beneficiary. Option C allows the member to take a lesser retirement allowance in exchange for providing a survivor with two-thirds of the lesser amount. Option C pensioners will have benefits converted from a reduced to a full retirement if the beneficiary predeceases the retiree.

Post-Retirement Benefits

The Board has adopted the provisions of Section 51 of Chapter 127 of the Acts of 1999, which provide that the Retirement Board may approve an annual COLA in excess of the Consumer Price Index but not to exceed a 3% COLA on the first \$13,000 (previously, \$12,000) of a retirement allowance.

Changes in Plan Provisions

The following changes in plan provisions are reflected in this valuation:

- As permitted by Section 19, Chapter 188 of the Acts of 2010, the Board has increased the Cost of Living Adjustment (COLA) base from \$12,000 to \$13,000 effective July 1, 2016.
- The Board has increased the Section 101 allowance from \$6,000 to \$9,000.
- The Board has increased the Member-Survivor Minimum Allowance from \$250 per month to \$500 per month.

SECTION 5: Accounting Information for the Massachusetts Water Resource Authority Employees' Retirement System

EXHIBIT 1

Net Pension Liability

The components of the net pension liability of the Massachusetts Water Resource Authority Employees' Retirement System are as follows:

	December 31, 2016	December 31, 2015
Total pension liability	\$511,406,247	\$473,333,700
Plan fiduciary net position	465,602,171	444,584,437
System's net pension liability	45,804,076	28,749,263
Plan fiduciary net position as a percentage of the total pension liability*	91.04%	93.93%

* These funded percentages are not necessarily appropriate for assessing the sufficiency of Plan assets to cover the estimated cost of settling the Plan's benefit obligation or the need for or the amount of future contributions.

Actuarial assumptions. The total pension liability as of December 31, 2016 was determined by an actuarial valuation as of December 31, 2016, using the following actuarial assumptions, applied to all periods included in the measurement:

Inflation	3.0% (previously, 4.0%) for 2017 and later years
Salary increases	Based on years of service, ranging from 5.75% at 0 years of service decreasing to 4.00% after 9 years of service (previously, 6.00% at 0 years of service decreasing to 4.25% after 9 years of service)
Investment rate of return	7.50%, net of pension plan investment expense, including inflation (previously, 7.75%)
Cost of Living Adjustment	3% of first \$13,000 (previously, 3% of first \$12,000)
Pre-Retirement:	RP-2000 Employee Mortality Table projected generationally from 2009 with Scale BB2D (previously, RP-2000 Employee Mortality Table projected generationally from 2005 with Scale AA)
Healthy Retiree:	RP-2000 Healthy Annuitant Mortality Table projected generationally from 2009 with Scale BB2D (previously, RP-2000 Healthy Annuitant Mortality Table projected generationally from 2005 with Scale AA)
Disabled Retiree:	RP-2000 Healthy Annuitant Mortality Table set forward two years projected generationally from 2009 with Scale BB2D (previously, RP-2000 Healthy Annuitant Mortality Table set forward 2 years projected generationally from 2005 with Scale AA)

SECTION 5: Accounting Information for the Massachusetts Water Resource Authority Employees' Retirement System

The long-term expected rate of return on pension plan investments was determined using a building-block method in which best-estimate ranges of expected future real rates of return (expected returns, net of pension plan investment expense and inflation) are developed for each major asset class. These ranges are combined to produce the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage and by adding expected inflation. Best estimates of arithmetic real rates of return for each major asset class included in the pension plan's target asset allocation as of December 31, 2016 and the target allocation as of December 31, 2016 are summarized in the following table:

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return
Domestic equity	21.00%	6.44%
International developed markets equity	15.00%	7.40%
International emerging markets equity	4.00%	9.42%
Core fixed income	13.00%	2.02%
High-yield fixed income	8.00%	4.43%
Real estate	7.00%	5.00%
Hedge fund, GTAA, Risk parity	23.00%	3.75%
Private equity	<u>9.00%</u>	10.47%
	100.00%	

Note: Some asset classes included in the pension plan's target asset allocation have been combined.

Discount rate: The discount rate used to measure the total pension liability was 7.50%. The projection of cash flows used to determine the discount rate assumed plan member contributions will be made at the current contribution rate and that contributions will be made at rates equal to the actuarially determined contribution rates. Based on those assumptions, the pension plan's fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Therefore, the long-term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the total pension liability.

SECTION 5: Accounting Information for the Massachusetts Water Resource Authority Employees' Retirement System

Sensitivity of the net pension liability to changes in the discount rate. The following presents the net pension liability, calculated using the discount rate of 7.50%, as well as what the net pension liability would be if it were calculated using a discount rate that is 1-percentage-point lower (6.50%) or 1-percentage-point higher (8.50%) than the current rate:

	1% Decrease (6.50%)	Current Discount (7.50%)	1% Increase (8.50%)
Massachusetts Water Resource Authority Employees' Retirement System's net pension liability as of December 31, 2016	\$110,415,417	\$45,804,076	-\$9,025,636

SECTION 5: Accounting Information for the Massachusetts Water Resource Authority Employees' Retirement System

EXHIBIT 2

Schedule of Changes in the Net Pension Liability – Last Ten Years

	Year End December 31,									
	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
Total pension liability										
Service cost	\$11,079,991	\$10,637,881	\$10,529,507							
Interest	36,917,053	34,598,348	33,587,256							
Differences between expected and actual experience	-9,143,704	0	-8,379,618							
Changes of assumptions	13,298,185	0	4,920,735							
Changes of benefit terms	2,050,275	0	0							
Benefit payments, including refunds of employee contributions	<u>-16,129,253</u>	<u>-15,389,886</u>	<u>-12,963,429</u>							
Net change in total pension liability	\$38,072,547	\$29,846,343	\$27,694,452							
Total pension liability - beginning	<u>473,333,700</u>	<u>443,487,357</u>	<u>415,792,905</u>							
Total pension liability - ending (a)	\$511,406,247	\$473,333,700	\$443,487,357							
Plan fiduciary net position										
Contributions - employer	\$4,632,624	\$8,159,521	\$12,629,474							
Contributions – employer – Military Service	0	0	16,000							
Contributions - employee	8,757,540	8,402,138	8,245,328							
Net investment income	24,182,876	-530,091	20,483,877							
Benefit payments, including refunds of employee contributions	-16,129,253	-15,389,886	-12,963,429							
Administrative expenses	<u>-426,053</u>	<u>-412,414</u>	<u>-407,574</u>							
Net change in fiduciary net position	\$21,017,734	\$229,268	\$28,003,676							
Plan fiduciary net position - beginning	<u>444,584,437</u>	<u>444,355,169</u>	<u>416,351,493</u>							
Plan fiduciary net position - ending (b)	\$465,602,171	\$444,584,437	\$444,355,169							
Net pension liability – ending: (a)-(b)	\$45,804,076	-\$28,749,263	-\$867,812							
Plan's fiduciary net position as a percentage of the total pension liability	91.04%	93.93%	100.20%							
Covered-employee payroll	\$89,755,173	\$89,168,911	\$85,537,485							
Net pension liability as a percentage of covered-employee payroll	51.03%	32.24%	-1.01%							

Notes: Covered-employee payroll for 2016 as estimated in the January 1, 2017 actuarial valuation.

Covered-employee payroll for 2015 and 2014 as estimated in the January 1, 2015 actuarial valuation.

SECTION 5: Accounting Information for the Massachusetts Water Resource Authority Employees' Retirement System

Notes to Schedule:

Changes in Assumptions:

The following changes were effective January 1, 2015:

- The net investment return assumption was lowered from 8.00% to 7.75%.
- The administrative expense assumption was increased from \$390,000 for calendar 2013 to \$525,000 for calendar 2015.
- The pre-retirement mortality assumption was changed from the RP-2000 Mortality Table projected 13 years using Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2005 with Scale AA.
- The post-retirement mortality assumption for non-disabled participants was changed from the RP-2000 Mortality Table projected 13 years using Scale AA to the RP-2000 Healthy Annuitant Mortality Table projected generationally from 2005 with Scale AA.
- The mortality assumption for disabled participants was changed from the RP-2000 Mortality Table set forward 2 years projected 13 years using Scale AA to the RP-2000 Healthy Annuitant Mortality Table set forward 2 years projected generationally from 2005 with Scale AA.
- The retirement rates were reduced by 25%.
- The salary increase assumption was changed as follows:

Years of Service	Rate	
	Current	Previously
0	6.00%	7.00%
1	5.50%	6.50%
2	5.50%	6.50%
3	5.25%	6.00%
4	5.25%	6.00%
5	4.75%	5.50%
6	4.75%	5.50%
7	4.50%	5.00%
8	4.50%	5.00%
9+	4.25%	4.75%

- The reduction in liability to account for anticipated net 3(8)(c) reimbursements was increased from \$5.2 million to \$7.2 million based on the average net 3(8)(c) payments in 2013 and 2014.

SECTION 5: Accounting Information for the Massachusetts Water Resource Authority Employees' Retirement System

The following changes were effective January 1, 2017:

- The net investment return assumption was lowered from 7.75% to 7.50%.
- The pre-retirement mortality assumption was changed from the RP-2000 Employee Mortality Table projected generationally from 2005 with Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2009 with Scale BB2D.
- The post-retirement mortality assumption for non-disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table projected generationally from 2005 with Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2009 with Scale BB2D.
- The mortality assumption for disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table set forward 2 years projected generationally from 2005 with Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2015 with Scale BB2D.
- The salary increase assumption was changed as follows:

Years of Service	Rate	
	Current	Previously
0	5.75%	6.00%
1	5.25%	5.50%
2	5.25%	5.50%
3	5.00%	5.25%
4	5.00%	5.25%
5	4.50%	4.75%
6	4.50%	4.75%
7	4.25%	4.50%
8	4.25%	4.50%
9+	4.00%	4.25%

- The reduction in liability to account for anticipated net 3(8)(c) reimbursements was increased from \$7.2 million to \$8.7 million based on the average net 3(8)(c) payments in 2015 and 2016.

Changes in Plan Provisions

The following changes were reflected in the January 1, 2017 actuarial valuation:

- As permitted by Section 19, Chapter 188 of the Acts of 2010, the Board has increased the Cost of Living Adjustment (COLA) base from \$12,000 to \$13,000 effective July 1, 2016.
- The Board has increased the Section 101 allowance from \$6,000 to \$9,000.
- The Board has increased the Member-Survivor Minimum Allowance from \$250 per month to \$500 per month.

SECTION 5: Accounting Information for the Massachusetts Water Resource Authority Employees' Retirement System

EXHIBIT 3

Schedule of Contributions – Last Ten Years

	Year End December 31,									
	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
Actuarially determined contribution	\$3,132,624	\$8,159,521	\$7,808,155							
Contributions in relation to the actuarially determined contribution	<u>4,632,624</u>	<u>8,159,521</u>	<u>12,629,474</u>							
Contribution deficiency (excess)	-\$1,500,000	\$0	-\$4,821,319							
Covered-employee payroll	\$89,755,173	\$89,168,911	\$85,537,485							
Contributions as a percentage of covered-employee payroll	5.16%	9.15%	14.76%							

(Historical information prior to implementation of GASB 67/68 is not required)

*Notes: Actuarially determined contribution for 2016 is based on the results of the January 1, 2015 actuarial valuation.
Actuarially determined contributions for 2015 and 2014 are based on the results of the January 1, 2013 actuarial valuation.*

SECTION 5: Accounting Information for the Massachusetts Water Resource Authority Employees' Retirement System

EXHIBIT 4

Pension Expense and Deferred Outflows/Inflows of Resources Related to Pensions

A. Pension expense for the year ended June 30, 2017

Service cost	\$11,079,991
Interest	36,917,053
Contributions – employee	-8,757,540
Projected earnings on pension plan investments	-34,332,644
Administrative expenses	426,053
Recognized portion of current-period difference between expected and actual experience	-1,523,951
Recognized portion of current-period difference between projected and actual earnings on pension plan investments	2,029,954
Recognized portion of current year period assumption change	2,216,364
Recognized portion of current year period plan change	2,050,275
Recognition of deferred outflows of resources	10,444,538
Recognition of deferred inflows of resources	<u>-1,396,603</u>
Pension expense for fiscal year ended June 30, 2017	<u>\$19,153,490</u>

B. Deferred outflows/inflows of resources related to pensions

	Deferred Outflows of Resources	Deferred Inflows of Resources
Differences between expected and actual experience	\$0	-\$11,809,561
Changes of assumptions	13,542,188	0
Net difference between projected and actual earnings on pension plan investments	<u>34,368,054</u>	<u>0</u>
Total	<u>\$47,910,242</u>	<u>-\$11,809,561</u>

C. Projected recognition of deferred outflows/(inflows)

	Year Ended June 30,	Recognition
	2018	\$11,770,302
	2019	11,770,301
	2020	9,145,294
	2021	2,722,367
	2022	692,417
	Thereafter	0

SECTION 5: Accounting Information for the Massachusetts Water Resource Authority Employees' Retirement System

EXHIBIT 5

Notes to Required Supplementary Information

Valuation date	Actuarial determined contributions for fiscal 2017 and 2018 are determined with the January 1, 2015 actuarial valuation.
Actuarial cost method	Entry Age Normal Cost Method
Amortization method	Payments increase at 4.50% per year
Remaining amortization period	9 years from July 1, 2015
Asset valuation method	Market value of assets as reported in the System's Annual Statement less unrecognized return in each of the last five years. Unrecognized return is equal to the difference between the actual market value return and the expected market value return and is recognized over a five-year period, further adjusted, if necessary, to be within 10% of the market value.
Actuarial assumptions:	
Investment rate of return	7.75%
Discount rate	7.75%
Inflation rate	4.0% for 2015 and later years
Projected salary increases	Based on years of service, ranging from 6.00% at 0 years of service decreasing to 4.25% after 9 years of service
Cost of living adjustments	3% of first \$12,000
Plan membership:	
Retired participants and beneficiaries receiving benefits	476
Inactive participants entitled to a return of their employee contributions	47
Inactive participants with a vested right to a deferred or immediate benefit	48
Active participants	<u>1,090</u>
Total	1,661

SECTION 5: Accounting Information for the Massachusetts Water Resource Authority Employees' Retirement System

Appendix A

Glossary

Definitions of certain terms *as they are used in Statement 68*; the terms may have different meanings in other contexts.

Active employees:	Individuals employed at the end of the reporting or measurement period, as applicable.
Actual contributions:	Cash contributions recognized as additions to a pension plan's fiduciary net position.
Actuarial present value of projected benefit payments:	Projected benefit payments discounted to reflect the expected effects of the time value (present value) of money and the probabilities of payment.
Actuarial valuation:	The determination, as of a point in time (the actuarial valuation date), of the service cost, total pension liability, and related actuarial present value of projected benefit payments for pensions performed in conformity with Actuarial Standards of Practice unless otherwise specified by the GASB.
Actuarial valuation date:	The date as of which an actuarial valuation is performed.
Actuarially determined contribution:	A target or recommended contribution to a defined benefit pension plan for the reporting period, determined in conformity with Actuarial Standards of Practice based on the most recent measurement available when the contribution for the reporting period was adopted.
Ad hoc cost-of-living adjustments (ad hoc COLAs):	Cost-of-living adjustments that require a decision to grant by the authority responsible for making such decisions.
Ad hoc postemployment benefit changes:	Postemployment benefit changes that require a decision to grant by the authority responsible for making such decisions.
Agent employer:	An employer whose employees are provided with pensions through an agent multiple-employer defined benefit pension plan.

SECTION 5: Accounting Information for the Massachusetts Water Resource Authority Employees' Retirement System

Agent multiple-employer defined benefit pension plan (agent pension plan):

A multiple-employer defined benefit pension plan in which pension plan assets are pooled for investment purposes but separate accounts are maintained for each individual employer so that each employer's share of the pooled assets is legally available to pay the benefits of only its employees.

Allocated insurance contract:

A contract with an insurance company under which related payments to the insurance company are currently used to purchase immediate or deferred annuities for individual employees. Also may be referred to as an annuity contract.

Automatic cost-of-living adjustments (automatic COLAs):

Cost-of-living adjustments that occur without a requirement for a decision to grant by a responsible authority, including those for which the amounts are determined by reference to a specified experience factor (such as the earnings experience of the pension plan) or to another variable (such as an increase in the consumer price index).

Automatic postemployment benefit changes:

Postemployment benefit changes that occur without a requirement for a decision to grant by a responsible authority, including those for which the amounts are determined by reference to a specified experience factor (such as the earnings experience of the pension plan) or to another variable (such as an increase in the consumer price index).

Closed period:

A specific number of years that is counted from one date and declines to zero with the passage of time. For example, if the recognition period initially is five years on a closed basis, four years remain after the first year, three years after the second year, and so forth.

Collective deferred outflows of resources and deferred inflows of resources related to pensions:

Deferred outflows of resources and deferred inflows of resources related to pensions arising from certain changes in the collective net pension liability.

Collective net pension liability:

The net pension liability for benefits provided through (1) a cost-sharing pension plan or (2) a single-employer or agent pension plan in circumstances in which there is a special funding situation.

SECTION 5: Accounting Information for the Massachusetts Water Resource Authority Employees' Retirement System

Collective pension expense:	Pension expense arising from certain changes in the collective net pension liability.
Contributions:	Additions to a pension plan's fiduciary net position for amounts from employers, nonemployer contributing entities (for example, state government contributions to a local government pension plan), or employees. Contributions can result from cash receipts by the pension plan or from recognition by the pension plan of a receivable from one of these sources.
Cost-of-living adjustments:	Postemployment benefit changes intended to adjust benefit payments for the effects of inflation.
Cost-sharing employer:	An employer whose employees are provided with pensions through a cost-sharing multiple-employer defined benefit pension plan.
Cost-sharing multiple-employer defined benefit pension plan (cost-sharing pension plan):	A multiple-employer defined benefit pension plan in which the pension obligations to the employees of more than one employer are pooled and pension plan assets can be used to pay the benefits of the employees of any employer that provides pensions through the pension plan.
Covered-employee payroll:	The payroll of employees that are provided with pensions through the pension plan.
Deferred retirement option program (DROP):	A program that permits an employee to elect a calculation of benefit payments based on service credits and salary, as applicable, as of the DROP entry date. The employee continues to provide service to the employer and is paid for that service by the employer after the DROP entry date; however, the pensions that would have been paid to the employee (if the employee had retired and not entered the DROP) are credited to an individual employee account within the defined benefit pension plan until the end of the DROP period.
Defined benefit pension plans:	Pension plans that are used to provide defined benefit pensions.

SECTION 5: Accounting Information for the Massachusetts Water Resource Authority Employees' Retirement System

- Defined benefit pensions:** Pensions for which the income or other benefits that the employee will receive at or after separation from employment are defined by the benefit terms. The pensions may be stated as a specified dollar amount or as an amount that is calculated based on one or more factors such as age, years of service, and compensation. (A pension that does not meet the criteria of a defined contribution pension is classified as a defined benefit pension for purposes of Statement 68.)
- Defined contribution pension plans:** Pension plans that are used to provide defined contribution pensions.
- Defined contribution pensions:** Pensions having terms that (1) provide an individual account for each employee; (2) define the contributions that an employer is required to make (or the credits that it is required to provide) to an active employee's account for periods in which that employee renders service; and (3) provide that the pensions an employee will receive will depend only on the contributions (or credits) to the employee's account, actual earnings on investments of those contributions (or credits), and the effects of forfeitures of contributions (or credits) made for other employees, as well as pension plan administrative costs, that are allocated to the employee's account.
- Discount rate:** The single rate of return that, when applied to all projected benefit payments, results in an actuarial present value of projected benefit payments equal to the total of the following:
1. The actuarial present value of benefit payments projected to be made in future periods in which (a) the amount of the pension plan's fiduciary net position is projected (under the requirements of Statement 68) to be greater than the benefit payments that are projected to be made in that period and (b) pension plan assets up to that point are expected to be invested using a strategy to achieve the long-term expected rate of return, calculated using the long-term expected rate of return on pension plan investments.
 2. The actuarial present value of projected benefit payments not included in (1), calculated using the municipal bond rate.

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Entry age actuarial cost method:	A method under which the actuarial present value of the projected benefits of each individual included in an actuarial valuation is allocated on a level basis over the earnings or service of the individual between entry age and assumed exit age(s). The portion of this actuarial present value allocated to a valuation year is called the <i>normal cost</i> . The portion of this actuarial present value not provided for at a valuation date by the actuarial present value of future normal costs is called the <i>actuarial accrued liability</i> .
Inactive employees:	Terminated individuals that have accumulated benefits but are not yet receiving them, and retirees or their beneficiaries currently receiving benefits.
Measurement period:	The period between the prior and the current measurement dates.
Multiple-employer defined benefit pension plan:	A defined benefit pension plan that is used to provide pensions to the employees of more than one employer.
Net pension liability:	The liability of employers and nonemployer contributing entities to employees for benefits provided through a defined benefit pension plan.
Nonemployer contributing entities:	Entities that make contributions to a pension plan that is used to provide pensions to the employees of other entities. For purposes of Statement 68, employees are not considered nonemployer contributing entities.
Other postemployment benefits:	All postemployment benefits other than retirement income (such as death benefits, life insurance, disability, and long-term care) that are provided separately from a pension plan, as well as postemployment healthcare benefits, regardless of the manner in which they are provided. Other postemployment benefits do not include termination benefits. ⁴
Pension plans:	Arrangements through which pensions are determined, assets dedicated for pensions are accumulated and managed, and benefits are paid as they come due.
Pensions:	Retirement income and, if provided through a pension plan, postemployment benefits other than retirement income (such as death benefits, life insurance, and disability benefits). Pensions do not include postemployment healthcare benefits and termination benefits.

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Plan members:	Individuals that are covered under the terms of a pension plan. Plan members generally include (1) employees in active service (active plan members) and (2) terminated employees who have accumulated benefits but are not yet receiving them and retirees or their beneficiaries currently receiving benefits (inactive plan members).
Postemployment:	The period after employment.
Postemployment benefit changes:	Adjustments to the pension of an inactive employee.
Postemployment healthcare benefits:	Medical, dental, vision, and other health-related benefits paid subsequent to the termination of employment.
Projected benefit payments:	All benefits estimated to be payable through the pension plan to current active and inactive employees as a result of their past service and their expected future service.
Public employee retirement system:	A special-purpose government that administers one or more pension plans; also may administer other types of employee benefit plans, including postemployment healthcare plans and deferred compensation plans.
Real rate of return:	The rate of return on an investment after adjustment to eliminate inflation.
Service costs:	The portions of the actuarial present value of projected benefit payments that are attributed to valuation years.
Single employer:	An employer whose employees are provided with pensions through a single-employer defined benefit pension plan.
Single-employer defined benefit pension plan (single-employer pension plan):	A defined benefit pension plan that is used to provide pensions to employees of only one employer.
Special funding situations:	<p>Circumstances in which a nonemployer entity is legally responsible for making contributions directly to a pension plan that is used to provide pensions to the employees of another entity or entities and either of the following conditions exists:</p> <p>The amount of contributions for which the nonemployer entity legally is responsible is <i>not</i> dependent upon one or more events or circumstances unrelated to the pensions.</p> <p>The nonemployer entity is the only entity with a legal obligation to make contributions directly to a pension plan.</p>

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Termination benefits:	Inducements offered by employers to active employees to hasten the termination of services, or payments made in consequence of the early termination of services. Termination benefits include early-retirement incentives, severance benefits, and other termination-related benefits.
Total pension liability:	The portion of the actuarial present value of projected benefit payments that is attributed to past periods of employee service in conformity with the requirements of Statement.