Massachusetts Water Resources Authority

Actuarial Valuation and Review of Other Postemployment Benefits (OPEB)

Measured at December 31, 2019

This report has been prepared at the request of the Massachusetts Water Resources Authority to assist in administering the Plan. This valuation report may not otherwise be copied or reproduced in any form without the consent of the Massachusetts Water Resources Authority and may only be provided to other parties in its entirety. The measurements shown in this actuarial valuation may not be applicable for other purposes.

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May 8, 2020

Mr. Robert Belkin
Massachusetts Water Resources Authority
100 First Avenue, Building 39
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Boston, MA 02129

Dear Mr. Belkin:

We are pleased to submit this report on our actuarial valuation of postemployment welfare benefits as of December 31, 2019. The purpose of this report is to calculate an Actuarially Determined Contribution for the Massachusetts Water Resources Authority Other Postemployment Benefit (OPEB) Plan for the fiscal year ending June 30, 2020. It summarizes the actuarial data used in the valuation and analyzes the experience and changes in assumptions since the prior valuation. The GASB Statements No. 74 and 75 disclosure information for the Authority for the fiscal year ending June 30, 2020 will be provided in a separate report when the June 30, 2020 financial information is available.

This report is based on information received from the Massachusetts Water Resources Authority and vendors employed by the Massachusetts Water Resources Authority. Segal does not audit the data provided. The accuracy and comprehensiveness of the data is the responsibility of those supplying the data. Segal, however, does review the data for reasonableness and consistency.

The measurements shown in this actuarial valuation may not be applicable for other purposes. Accordingly, additional determinations may be needed for other purposes, such as judging benefit security at termination of the plan, or determining short-term cash flow requirements.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: retiree group benefits program experience or rates of return on assets differing from that anticipated by the assumptions; changes in 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 retiree group benefits program provisions or applicable law. Retiree group benefits models necessarily rely on the use of approximations and estimates, and are sensitive to changes in these approximations and estimates. Small variations in these approximations and estimates may lead to significant changes in actuarial measurements.

The actuarial valuation has been completed in accordance with generally accepted actuarial principles and practices. The actuarial calculations were directed under our supervision. We are members of the American Academy of Actuaries and collectively meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein. To the best of our knowledge, the information supplied in the actuarial valuation is complete and accurate. Further, in our opinion, the assumptions as approved by the Massachusetts Water Resources Authority are reasonably related to the experience of and the expectations for the Plan.

We look forward to discussing this with you at your convenience.

Sincerely,

Segal

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

Daniel J. Rhodes, FSA, MAAA
Vice President and Consulting Actuary

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Section 1: Actuarial Valuation Summary

Purpose and basis

This report presents the results of our actuarial valuation of the Massachusetts Water Resources Authority (MWRA) other postemployment welfare benefit (OPEB) plan as of December 31, 2019. The purpose of this report is to calculate a recommended Actuarially Determined Contribution for the OPEB plan for the fiscal year ending June 30, 2020. Determinations for other purposes may be significantly different from the results reported here. This valuation is based on:

- The provisions of the OPEB plan;
- The characteristics of covered active members, terminated vested members, and retired members and beneficiaries as of December 31, 2019 provided by the MWRA;
- The assets of the Plan as of December 31, 2019, provided by the MWRA;
- Economic assumptions regarding future salary increases and investment earnings;
- Health care assumptions regarding per capita costs, trend rates and participation; and
- Other actuarial assumptions regarding employee terminations, retirement, death, etc.

Highlights of the valuation

- The discount rate used to determine the liabilities that are the basis of the Actuarially Determined Contribution is the expected return on assets. Based on the current investment allocation of the OPEB trust assets invested in the State Retiree Benefits Trust Fund, we recommend maintaining the 7.00% expected return on assets.
- The unfunded actuarial accrued liability (UAAL) as of December 31, 2019 is $89,989,000 based on an actuarial accrued liability (AAL) of $129,051,000, and an actuarial value of assets of $39,062,000. Going forward, net unfunded plan obligations will be expected to change due to normal plan operations, which consist of continuing accruals for active members, plus interest on the unfunded actuarial accrued liability, less employer contributions. Future valuations will analyze the difference between actual and expected unfunded actuarial accrued liabilities.
- As of December 31, 2019 the ratio of assets to the AAL (the funded ratio) is 30.27% compared to 16.66% in the prior valuation. This funded percentage is not necessarily appropriate for assessing the sufficiency of OPEB assets to cover the estimated cost of settling the benefit obligations or the need for or the amount of future contributions.

Section 1: Actuarial Valuation Summary

- The following assumptions were revised with this valuation:
  - The per capita health costs and contributions were updated to reflect current experience.
  - The per capita health cost trend assumptions were revised to reflect current experience and future expectations.
  - The impact of the excise tax on high cost health plans (part of the Patient Protection and Affordable Care Act) was removed, as the tax was repealed effective December 20, 2019.
  - The percent married assumption was changed from 75% to 65% based on recent experience.
- The UAAL of $89,989,000 as of December 31, 2019 represents a decrease of $31,970,000 from $121,959,000 as shown in the December 31, 2017 valuation. The unfunded liability had been expected to increase by $4,201,000 due to normal plan operations. The difference between the actual decrease and expected increase was the net effect of the following:

	(In Millions)
December 31, 2017 unfunded actuarial liability	$122.0
December 31, 2019 expected unfunded actuarial liability	126.2
Change due to:	
• Experience gain	-4.3
• Updating per capita costs and contributions	-21.0
• Updating future trends	-5.7
• Removal of excise tax projection	-0.6
• Updating percent married assumption	-4.6
Net decrease	-$36.2
December 31, 2019 unfunded actuarial accrued liability	$90.0

- The Actuarially Determined Contribution (ADC) for fiscal year 2020 is $8,997,000. The ADC is calculated using a 28-year amortization of the UAAL, with payments increasing at 3.0% per year.
- We have included a funding schedule that reflects the Authority's policy to contribute 50% of the Actuarially Determined Contribution per year to the OPEB trust. The MWRA will pay projected benefits plus a contribution to the OPEB trust through 2034. In fiscal 2035, a larger payment to the OPEB trust will be made, at which point all benefit payments will be made from the trust. The contribution to the OPEB trust in fiscal 2036 will be the employer normal cost payment. The OPEB liabilities are projected to be fully funded when the June 30, 2035 payment is made, assuming that there are no assumption or plan changes and that experience develops as assumed.

- The Coronavirus (COVID-19) pandemic is rapidly evolving and is having a significant impact on the US economy in 2020, including most retiree health plans, and will likely continue to have an impact in the future. Our results do not include the impact of the following:
  - Short-term increases in health plan costs related to the testing or treatment of COVID-19;
  - Changes in the market value of plan assets since December 31, 2019;
  - Changes in interest rates since December 31, 2019;
  - Short-term or long-term impacts on mortality of the covered population; or
  - The potential for federal or state fiscal relief.

Other considerations

Employer decisions regarding plan design, cost sharing between the Employer and its retirees, actuarial cost method, amortization techniques, and integration with Medicare are just some of the decisions that affect the magnitude of OPEB obligations. We are available to assist you with any investigation of such options you may wish to undertake.

Calculations are based on the benefits provided under the terms of the substantive plan in effect at the time of the valuation and on the pattern of sharing costs between the employer and plan members. The projection of benefits does not incorporate the potential effect of legal or contractual funding limitations on the pattern of cost sharing between the employer and plan members in the future.

Actuarial calculations reflect a long-term perspective, and the methods and assumptions use techniques designed to reduce short-term volatility in accrued liabilities and the actuarial value of assets, if any.

The calculation of an accounting obligation does not, in and of itself, imply that there is any legal liability to provide the benefits valued, nor is there any implication that the Employer is required to implement a funding policy to satisfy the projected expense.

Actuarial valuations involve estimates of the value of reported amounts and assumptions about the probability of events far into the future, and the actuarially determined amounts are subject to continual revision as actual results are compared to past expectations and new estimates are made about the future.

Summary of key valuation results

	December 31, 2019 (7.0% discount rate)	December 31, 2017 (7.0% discount rate)
Actuarial Accrued Liability (AAL) by Participant Category		
1. Current retirees, beneficiaries and dependents	$55,909,249	$53,020,834
2. Current active employees	69,117,633	87,531,841
3. Current vested terminated employees	4,024,077	5,786,162
4. Total AAL: (1) + (2) + (3)	$129,050,959	$146,338,837
5. Actuarial value of assets	39,062,150	24,379,552
6. Unfunded actuarial accrued liability (UAAL): (4) - (5)	$89,988,809	$121,959,285
7. Funded ratio: (5) / (4)	30.27%	16.66%
Actuarially Determined Contribution for fiscal year ending	June 30, 2020	June 30, 2018
8. Normal cost, including adjustment for interest	$3,691,427	$4,475,732
9. Amortization method for UAAL	28-year closed, increasing at 3.0% per year	30-year closed, increasing at 3.0% per year
10. Amortization payment on UAAL, including adjustment for interest	5,305,486	6,923,858
11. Total Actuarially Determined Contribution: (8) + (10)	$8,996,913	$11,399,590
12. Projected benefit payments	4,923,207	4,467,865

Note: Payments are assumed to be made in the middle of the fiscal year.

Projection of the Actuarially Determined Contribution

Fiscal Year Ending June 30	(1) Normal Cost	(2) Amortization of UAAL	(3) Actuarially Determined Contribution: (1) + (2)	(4) Projected Benefit Payments to be paid by MWRA	(5) Contributions to OPEB Trust	(6) Total Cost to MWRA: (4) + (5)	(7) Assets at Mid Fiscal-Year	(8) AAL at Mid Fiscal-Year	(9) UAAL at Mid Fiscal-Year: (8) - (7)
2020	$3,691,427	$5,305,486	$8,996,913	$4,923,207	$5,962,457	$10,885,664	$39,062,150	$129,050,959	$89,988,809
2021	3,807,873	5,335,990	9,143,863	5,440,161	4,571,932	10,012,093	47,964,114	136,626,293	88,662,179
2022	3,927,992	5,419,255	9,347,247	6,190,813	4,673,623	10,864,436	56,050,845	144,151,010	88,100,165
2023	4,051,901	5,456,221	9,508,122	6,961,629	4,754,061	11,715,690	64,808,838	151,475,093	86,666,255
2024	4,179,718	5,448,575	9,628,293	7,699,284	4,814,147	12,513,431	74,263,096	158,696,973	84,433,877
2025	4,311,567	5,388,373	9,699,940	8,432,179	4,849,970	13,282,149	84,441,305	165,773,588	81,332,283
2026	4,447,575	5,272,559	9,720,134	9,145,328	4,860,067	14,005,394	95,369,045	172,748,739	77,379,694
2027	4,587,874	5,093,428	9,681,302	9,766,470	4,840,651	14,607,121	107,072,170	179,610,677	72,538,507
2028	4,732,598	4,857,066	9,589,664	10,316,808	4,794,832	15,111,640	119,574,430	186,555,210	66,980,780
2029	4,881,888	4,551,646	9,433,534	10,814,363	4,716,767	15,531,129	132,904,453	193,539,882	60,635,429
2030	5,035,887	4,179,868	9,215,755	11,201,245	4,607,878	15,809,122	147,086,826	200,734,241	53,647,415
2031	5,194,744	3,737,200	8,931,944	11,662,969	4,465,972	16,128,941	162,149,329	208,224,782	46,075,453
2032	5,358,612	3,193,666	8,552,278	12,246,117	4,276,139	16,522,256	178,119,419	215,815,483	37,696,064
2033	5,527,649	2,529,700	8,057,349	12,858,423	4,028,674	16,887,097	195,011,051	223,489,113	28,478,062
2034	5,702,019	1,720,874	7,422,893	13,501,344	3,711,446	17,212,790	212,829,118	231,225,928	18,396,810
2035	5,881,889	736,256	6,618,145	0	13,574,907	13,574,907	231,566,306	239,003,427	7,437,121
2036	6,067,433	0	6,067,433	0	6,067,433	6,067,433	246,796,083	246,796,083	0

Notes:
The fiscal 2020 contribution is set equal to the budgeted amount from the prior valuation.
Assumes payment at the end of the fiscal year.
Normal cost is projected to increase 3.0% per year for inflation and 0.15% per year for mortality improvement and does not reflect the future impact of pension reform for new hires.
Assets are assumed to return 7.0% per year.

Important information about actuarial valuations

An actuarial valuation is a budgeting tool with respect to defining future uncertain obligations of a postretirement health plan. As such, it will never forecast the precise future stream of benefit payments. It is an estimated forecast – the actual cost of the plan will be determined by the benefits and expenses paid, not by the actuarial valuation. In order to prepare a valuation, 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. For example, a plan may provide health benefits to post-65 retirees that coordinates with Medicare. If so, changes in the Medicare law or administration may change the plan's costs without any change in the terms of the plan itself. It is important for the Massachusetts Water Resources Authority 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 plan. 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 not necessary to have perfect data for an actuarial valuation: the valuation is an estimated forecast, not a prediction. The uncertainties in other factors are such that even perfect data does not produce a "perfect" result. Notwithstanding the above, 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 Resources Authority..
Actuarial assumptions	In preparing an actuarial valuation, Segal starts by developing a forecast of the benefits to be paid to existing plan participants for the rest of their lives and the lives of their beneficiaries. To determine the future costs of benefits, Segal collects claims, premiums, and enrollment data in order to establish a baseline cost for the valuation measurement, and then develops short- and long-term health care cost trend rates to project increases in costs in future years. This forecast also requires actuarial assumptions as to the probability of death, disability, withdrawal, and retirement of each participant for each year, as well as forecasts of the plan's benefits for each of those events. The forecasted benefits are then discounted to a present value, typically based on an estimate of the rate of return that will be achieved on the plan's assets or, if there are no assets, a rate of return based on a yield or index rate for 20-year, tax-exempt general obligation municipal bonds with an average rating of AA/Aa or higher (or equivalent quality on another rating scale). All of these factors are uncertain and unknowable. Thus, there will be a range of reasonable assumptions, and the results may vary materially based on which assumptions the actuary selects within that range. That is, there is no right answer (except with hindsight). It is important for any user of an actuarial valuation to understand and accept this constraint. The actuarial model necessarily uses approximations and estimates that may lead to significant changes in our results but will have no impact on the actual cost of the plan. In addition, the actuarial assumptions may change over time, and while this can have a significant impact on the reported results, it does not mean that the previous assumptions or results were unreasonable or wrong.

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

The actuarial valuation is prepared for use by the Massachusetts Water Resources Authority. It includes information for compliance with accounting standards and for the plan's auditor. Segal is not responsible for the use or misuse of its report, particularly by any other party.
If the Massachusetts Water Resources Authority 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.
An actuarial valuation is a measurement at a specific date – it is not a prediction of a plan's future financial condition. Accordingly, Segal did not perform an analysis of the potential range of financial measurements, except where otherwise noted. 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.
Sections of this report include actuarial results that are not rounded, but that does not imply precision.
Critical events for a plan include, but are not limited to, decisions about changes in benefits and contributions. The basis for such decisions needs to consider many factors such as the risk of changes in plan enrollment, emerging claims experience, health care trend, and investment losses, not just the current valuation results.
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 Resources Authority should look to their other advisors for expertise in these areas.
While Segal maintains extensive quality assurance procedures, an actuarial valuation involves complex computer models and numerous inputs. In the event that an inaccuracy is discovered after presentation of Segal's valuation, Segal may revise that valuation or make an appropriate adjustment in the next valuation.
Segal's report shall be deemed to be final and accepted by the Massachusetts Water Resources Authority upon delivery and review. Massachusetts Water Resources Authority should notify Segal immediately of any questions or concerns about the final content.

As Segal 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: Supporting Information

Exhibit I: Summary of participant data

	December 31, 2019	December 31, 2017
Retirees, Beneficiaries and Dependents		
Number	802	746
Average age	69.8	69.2
Active Employees Covered for Medical Benefits		
Number	941	960
Average age	51.3	51.9
Average years of service	17.1	17.5
Average age at hire	34.3	34.4
Terminated Vesteds		
Number	35	41
Average age	54.3	55.1

Exhibit II: Actuarial assumptions and actuarial cost method

Data:	Detailed census data, premium rates and summary plan descriptions for postemployment welfare benefits were provided by the Massachusetts Water Resources Authority.
Actuarial Cost Method:	Entry Age Normal – Level percentage of payroll.
Per Capita Cost Development:	Per capita costs were based on the fully insured premium rates effective July 1, 2019. Premiums were combined by taking a weighted average based on the number of participants in each plan, and were then trended to the midpoint of the valuation year at assumed trend rates. Actuarial factors were applied to the premium to estimate individual retiree and spouse costs by age and by gender.
Actuarial Valuation Date:	December 31, 2019
Roll-Forward Techniques:	The results of the December 31, 2019 actuarial valuation are used to determine the Actuarially Determined Contribution for the fiscal years ending June 30, 2020 and later.
Expected Return:	7.0% The long-term expected rate of return on OPEB investments was determined using a building-block method in which best-estimate ranges of expected future real rates of return (expected returns, net of investment expenses and inflation) are developed for each major asset class. These ranges are combined to produce a 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.
Discount Rate:	7.0%. The discount rate is equal to the expected return on assets.

Section 2: Supporting Information

Salary Increases:	

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

Asset Valuation Method: Market Value

Mortality Rates:

Pre-Retirement: RP-2014 Blue Collar Employee Mortality Table projected generationally with Scale MP-2017

Healthy: RP-2014 Blue Collar Healthy Annuitant Mortality Table projected generationally with Scale MP-2017

Disabled: RP-2014 Blue Collar Healthy Annuitant Mortality Table projected generationally with Scale MP-2017 set forward 1 year

The underlying tables with generational projection to the ages of participants as of the measurement date reasonably reflect the mortality experience of the plan as of the measurement date. The mortality tables were then adjusted to future years using generational projection to reflect future mortality improvement between the measurement date and those years.

Annuitant Mortality Rates:

	Rate per year (%)	
Age	Male	Female
60	0.85	0.57
70	1.97	1.40
80	5.19	3.82
90	14.64	11.19

Note: Rates shown are before generational projection.

Termination Rates before Retirement:

	Rate per year (%)		
	Mortality		
Age	Male	Female	Disability
20	0.05	0.02	0.01
25	0.06	0.02	0.02
30	0.06	0.02	0.03
35	0.07	0.03	0.05
40	0.08	0.04	0.10
45	0.13	0.07	0.15
50	0.22	0.12	0.19
55	0.36	0.19	0.24
60	0.61	0.27	0.28

Notes: 55% of the disability rates shown represent accidental disability.
20% of the death rates shown represent accidental death.
Rates shown are before generational projection.

Withdrawal Rates:

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

Section 2: Supporting Information

Retirement Rates:

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

Dependents:

For current retirees, the spouse date of birth was obtained from the companion pension data if applicable and available; otherwise, husbands were assumed to be three years older than their spouses. For future retirees, husbands were assumed to be three years older than their wives. For future retirees who elect to continue their health coverage at retirement, 65% (previously 75%) were assumed to have an eligible spouse who also opts for health coverage at that time.

Section 2: Supporting Information

Per Capita Health Costs:

Calendar 2020 medical and prescription drug claims costs are shown in the table below for retirees and for spouses at selected ages. These costs are net of deductibles and other benefit plan cost sharing provisions.

	Non-Medicare Plans				Medicare Plans			
	Retiree		Spouse		Retiree		Spouse	
Age	Male	Female	Male	Female	Male	Female	Male	Female
45	$8,323	$10,441	$5,163	$7,794	N/A	N/A	N/A	N/A
50	9,879	11,252	6,900	9,035	N/A	N/A	N/A	N/A
55	11,732	12,112	9,233	10,458	N/A	N/A	N/A	N/A
60	13,933	13,056	12,361	12,129	N/A	N/A	N/A	N/A
65	16,547	14,065	16,547	14,065	$4,374	$3,718	$4,374	$3,718
70	19,178	15,157	19,178	15,157	5,069	4,007	5,069	4,007
75	20,353	16,315	20,667	16,315	5,463	4,313	5,463	4,313
80+	22,256	17,589	22,256	17,589	5,883	4,650	5,883	4,650

Weighted Average Annual Retiree Contribution Amounts:

	Retired on or before July 1, 1994 and surviving spouses	Retired after July 1, 1994 and before October 1, 2009	Retired after October 1, 2009
Non-Medicare:	$1,168	$1,727	$2,286
Medicare:	539	769	1,000

Section 2: Supporting Information

Health Care Cost Trend Rates:	Health care trend measures the anticipated overall rate at which health plan costs are expected to increase in future years. The rates shown below are "net" and are applied to the net per capita costs shown above. The trend shown for a particular plan year is the rate that is applied to that year's cost to yield the next year's projected cost.

Year Ending December 31	Medical/Rx
2020	7.00%
2021	6.50%
2022	6.00%
2023	5.50%
2024	5.50%
2025	5.00%
2026 & later	4.50%

The trend rate assumption is the same as used in the Commonwealth of Massachusetts Postemployment Benefit Other than Pensions Actuarial Valuation as of June 30, 2019, dated January 23, 2020.

Retiree Contribution Increase Rate:	Retiree contributions for medical and prescription drug coverage are expected to increase with health care cost trend.
Administrative Expenses:	Administrative expenses are not added to fully insured premium rates, as these expenses are a component of the rate.
Participation and Coverage Election:	• 100% of active employees with medical coverage are assumed to elect retiree medical coverage • 100% of active employees with medical coverage are assumed to elect life coverage. • 100% of retirees over age 65 are assumed to remain with their current medical plan for life. • For future retirees and current retirees under age 65, 100% are assumed to be eligible for Medicare and enroll in a Medicare plan upon reaching age 65. • 80% of future and current terminated vesteds are assumed to elect retiree medical coverage with benefits assumed to commence at age 60, and to be eligible for Medicare and enroll in a Medicare plan upon reaching age 65. The participation and coverage election assumptions were based on a review of recent experience.
Plan Design:	Development of plan liabilities was based on the substantive plan of benefits in effect as described in Exhibit III.
Missing Participant Data:	With the exception of missing dates of birth for spouses, a missing census item for a given participant was assumed to equal the average value of that item over all other participants of the same status for whom the item is known.

Section 2: Supporting Information

Health Care Reform Assumption:	This valuation does not include the potential impact of any future changes due to the Patient Protection and Affordable Care Act (PPACA) and the Health Care and Education Reconciliation Act (HCERA) of 2010, including the excise tax on high cost health plans that was scheduled to begin in 2022. The excise tax was repealed effective December 20, 2019, and as such has been removed from this valuation.
Demographic and Salary Scale Assumptions:	The demographic and salary scale assumptions used in this valuation are the same as used in the Massachusetts Water Resources Authority Employees' Retirement System Actuarial Valuation and Review as of January 1, 2020, completed by Segal. A review of the demographic assumptions is beyond the scope of this assignment, however, we have no reason to doubt the reasonableness of the assumptions. The remaining demographic assumptions, such as percent married, relative ages of spouses and enrollment elections, were based on the experience of the Plan and the experience of similar plans.
Justification for Assumption Changes Since Prior Valuation:	Based on past experience and future expectations, the following actuarial assumptions were changed: • The per capita health care costs were updated to reflect recent experience. • The trend assumptions were revised to better reflect future expectations. • The impact of the excise tax on high cost health plans scheduled to begin in 2022 was repealed effective December 20, 2019 and as such has been removed with this valuation. • The percent married assumption was changed from 75% to 65% based on recent experience.

Exhibit III: Summary of plan

This exhibit summarizes the major benefit provisions as included in the valuation. To the best of our knowledge, the summary represents the substantive plans as of the measurement date. It is not intended to be, nor should it be interpreted as, a complete statement of all benefit provisions.

Eligibility:	Retired and receiving a pension from the Massachusetts Water Resources Authority Employees' Retirement System. • Members hired before April 2, 2012 – Retirees with at least 10 years of creditable service are eligible at age 55; – Retirees with at least 20 years of creditable service are eligible at any age. • Members hired on or after April 2, 2012 – Retirees with at least 10 years of creditable service are eligible at age 60.
Disability:	Accidental (job-related) Disability has no age or service requirement. Ordinary (non-job related) Disability has no age requirement but requires 10 years of creditable service.
Pre-Retirement Death:	Surviving spouses of members who die in active service on Accidental (job-related) Death are eligible at any age. Surviving spouses of members who die in active service on Ordinary (non-job related) Death are eligible after two years of service.
Post-Retirement Death:	Surviving spouse is eligible.
Benefit Types:	Medical and prescription drug benefits are provided to all eligible retirees through the Group Insurance Commission. The employer pays 50% of the retiree life insurance premium.
Duration of Coverage:	Lifetime.
Dependent Benefits:	Medical and Prescription Drugs.
Dependent Coverage:	Benefits are payable to a spouse for their lifetime, regardless of when the retirees dies.
Retiree Life:	$1,000
Retiree Contributions:	Premium rates and retiree contributions are summarized below:

Non-Medicare Actives and Retirees	Monthly Premium (eff. 7/1/2019)	Retiree Contributions: Retired on or before July 1, 1994, and Surviving Spouses	Retiree Contributions: Retired after July 1, 1994 and before October 1, 2009	Retiree Contributions: Retired after October 1, 2009
Fallon Direct				
Individual	$598.58	$59.86	$89.79	$119.72
Family	$1,510.16	$151.02	$226.52	$302.03
Fallon Select				
Individual	$808.96	$80.90	$121.34	$161.79
Family	$1,964.62	$196.46	$294.69	$392.92
Harvard Pilgrim Independence				
Individual	$886.55	$88.66	$132.98	$177.31
Family	$2,163.92	$216.39	$324.59	$432.78
Harvard Pilgrim Primary Choice				
Individual	$643.55	$64.36	$96.53	$128.71
Family	$1,640.74	$164.07	$246.11	$328.15
Health New England				
Individual	$568.82	$56.88	$85.32	$113.76
Family	$1,351.81	$135.18	$202.77	$270.36
Allways Health Partners Complete				
Individual	$644.67	$64.47	$96.70	$128.93
Family	$1,671.84	$167.18	$250.78	$334.37
Tufts Navigator				
Individual	$745.15	$74.52	$111.77	$149.03
Family	$1,815.72	$181.57	$272.36	$363.14

	Non-Medicare Actives and Retirees	Monthly Premium (eff. 7/1/2019)	Retiree Contributions: Retired on or before July 1, 1994, and Surviving Spouses	Retiree Contributions: Retired after July 1, 1994 and before October 1, 2009	Retiree Contributions: Retired after October 1, 2009
	Tufts Spirit				
	Individual	$563.94	$56.39	$84.59	$112.79
	Family	$1,354.20	$135.42	$203.13	$270.84
	Unicare Basic/CIC				
	Individual	$1,082.31	$154.47	$206.01	$257.57
	Family	$2,398.20	$345.11	$459.17	$573.23
	Unicare Community Choice				
	Individual	$515.71	$51.57	$77.36	$103.14
	Family	$1,272.51	$127.25	$190.88	$254.50
	Unicare Plus				
	Individual	$693.67	$69.37	$104.05	$138.73
	Family	$1,648.83	$164.88	$247.32	$329.77
	Medicare Retirees				
	Unicare OME/CIC	$385.58	$48.08	$66.83	$85.58
	HPHC Medicare Enhance	$389.76	$38.98	$58.46	$77.95
	Tufts Medicare Complement	$370.20	$37.02	$55.53	$74.04
	Tufts Medicare Preferred	$321.31	$32.13	$48.20	$64.26
Plan Changes Since Prior Valuation	None				

Exhibit IV: Definition of 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: 1. Investment return — the rate of investment yield that the Plan will earn over the long-term future; 2. Mortality rates — the death rates of employees and pensioners; life expectancy is based on these rates; 3. Retirement rates — the rate or probability of retirement at a given age; 4. Turnover rates — the rates at which employees of various ages are expected to leave employment for reasons other than death, disability, or retirement.
Actuarial Accrued Liability (AAL):	Present value of all future benefit payments for current retirees and active employees taking into account assumptions about demographics, turnover, mortality, disability, retirement, health care trends, and other actuarial assumptions.
Unfunded Actuarial Accrued Liability (UAAL):	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.
Normal Cost:	The amount of contributions required to fund the benefit allocated to the current year of service.
Actuarially Determined Contribution:	A target or recommended contribution to an OPEB plan for the reporting period based on the most recent measurement available.
Valuation Date:	The date at which the actuarial valuation is performed
Covered Employee Payroll:	The payroll of the employees that are provided OPEB benefits
Entry Age Actuarial Cost Method:	An actuarial cost method where the present value of the projected benefits for an individual is allocated on a level basis over the earnings or service of the individual between entry age and assumed exit age
Health Care Cost Trend Rates:	The rate of change in per capita health costs over time
Discount Rate:	The interest rate used to determine the actuarial present value of projected benefit payments.
Expected Return on Assets:	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.
Real Rate of Return:	The rate of return on an investment after removing inflation