



**BRISTOL COUNTY
CONTRIBUTORY RETIREMENT SYSTEM**

Actuarial Valuation Report
January 1, 2016

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Report Summary:

<u>Highlights</u>	<u>January 1, 2014</u>	<u>January 1, 2016</u>
<u>Contributions</u>		
Funding Schedule FY 2017	\$35,950,086	\$35,950,086
Funding Schedule FY 2018	38,286,842	37,650,045
<u>Funded Ratios</u>		
GAS No. 25	61.4%	65.7%
<u>Participants</u>		
Actives	3,119	3,193
Retirees and Beneficiaries	2,041	2,119
Inactives	714	672
Vested	0	0
Disabled	<u>277</u>	<u>274</u>
Total	6,151	6,258
<u>Payroll</u>		
Payroll of Active Members	\$141,877,055	\$152,406,793
Average Payroll	45,488	47,732
<u>Normal Cost</u>		
Employer	4,164,647	2,504,210
Employee	12,263,065	13,225,260
Administrative Expenses	<u>1,275,000</u>	<u>1,275,000</u>
Total	17,702,712	17,004,470
<u>Actuarial Accrued Liabilities</u>		
Actives	361,162,447	376,165,445
Retirees, Beneficiaries, Disabilities and Inactives	<u>479,139,261</u>	<u>531,859,640</u>
Total	840,301,708	908,025,085
<u>Actuarial Value of Assets</u>	<u>516,075,699</u>	<u>596,531,897</u>
<u>Unfunded Actuarial Accrued Liabilities</u>	\$324,226,009	\$311,493,188

Introduction

This report presents the findings of an actuarial valuation as of January 1, 2016, of Bristol County Contributory Retirement System.

The actuarial valuation is based on:

- Provisions Chapter 32 of the Massachusetts General Laws, "M.G.L", as of January 1, 2016.
- Employee data provided by the Retirement Board
- Asset information reported to the Public Employee Retirement Administration Commission by the Bristol County Contributory Retirement System
- Actuarial assumptions approved by the Retirement Board

The valuation and appropriation forecast are prepared in accordance with Chapter 32 of the M.G.L. as of January 1, 2016.

The valuation and forecast do not account for:

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

Actuarial Experience

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

During the last two years, based on the 2014 actuarial assumptions and plan provisions, the total unfunded actuarial accrued liability decreased by 2.2% to \$322,881,058. The decrease is a result of net favorable actuarial experience during the preceding years. The sources of actuarial (gains) and losses are as follows:

Assets	(9,663,383)
Retirements	(5,292,614)
Terminations	1,399,661
Death while active	1,521,891
Disabled while active	(2,889,741)
Salary	5,175,297
New Participants	5,791,156
Inactive Mortality and data	(2,245,213)
Other	<u>763,617</u>
Total (Gain) / Loss	(5,439,330)

In Addition, the COLA base was increased to \$18,000, increasing the unfunded actuarial accrued liability by \$8,062,908. The 2015 Experience Study for the Bristol County, along with the 2015 Experience Study of several Massachusetts Public Sector plans, required changes in the actuarial assumptions. In addition to the demographic assumptions, the investment rate of return was lowered to 7.75% and the salary scale is now based on years of service. These changes reduced the unfunded actuarial accrued liability by \$13,807,975, and the employer Normal Cost by \$1,783,389.

Actuarial Costs and Liabilities:

Normal Costs

The normal cost is the sum of the individual normal costs determined for each member as if the assumptions underlying the cost determinations had been exactly realized. An individual normal cost represents that part of the cost of a member's future benefits which are assigned to the current year as if the costs are to remain level as a percentage of the member's pay. Benefits payable under all circumstances (i.e., retirement, death, disability, and terminations) are included in this calculation. Anticipated employee contributions to be made during the year are subtracted from the total normal cost to determine employer normal cost. The total normal cost is divided by total payroll to determine the normal cost as a percent of pay. The normal cost is shown in Table I.

Table I

	<u>January 1, 2012</u>	<u>January 1, 2016</u>
Superannuation	\$11,000,912	\$8,126,492
Termination	1,459,892	5,338,231
Death	777,607	727,145
Disability	3,189,301	1,537,602
Administrative Expenses	<u>1,275,000</u>	<u>1,275,000</u>
Total Normal Cost	17,702,712	17,004,470
% of Pay	12.5%	11.2%
Employee Contributions	12,263,065	13,225,260
% of Pay	8.6%	8.7%
Employer Normal Cost	\$5,439,647	\$3,779,210
% of Pay	3.8%	2.5%

Present Value of Actuarial Accrued Liabilities

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

Table II

	<u>January 1, 2012</u>	<u>January 1, 2016</u>
Actives		
Superannuations	\$324,897,974	\$366,422,043
Termination	5,917,205	(16,300,827)
Death	10,510,053	10,259,442
Disability	19,837,215	15,784,787
Retirees and Inactives		
Retirees and Beneficiaries	381,095,181	431,078,382
Terminated (Refund)	6,534,991	6,909,909
Vested	0	0
Disabled	<u>91,509,089</u>	<u>93,871,349</u>
Total	\$840,301,708	\$908,025,085

Present Value of Future Benefits

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

Table III

	<u>January 1, 2014</u>	<u>January 1, 2016</u>
Actives		
Superannuation	\$407,710,006	\$420,285,894
Termination	11,697,225	22,051,005
Death	16,129,364	15,000,023
Disability	47,480,376	26,042,566
Retirees and Inactives		
Retirees and Beneficiaries	381,095,181	431,078,382
Terminated (Refund)	6,534,991	6,909,909
Vested	0	0
Disabled	<u>91,509,089</u>	<u>93,871,349</u>
Total	\$962,156,232	\$1,015,239,128

Funded Status and Appropriations:

Market Value of Plan Assets

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

Table IV

	<u>January 1, 2014</u>	<u>January 1, 2016</u>
Cash equivalents	\$10,687,990	\$12,443,532
Short term investments	0	0
Fixed income securities	99,062,916	105,002,177
Equities	219,190,493	218,224,530
International	171,675,958	156,037,333
Real Estate	12,224,520	17,533,176
Venture Capital	0	0
Other	49,126,083	61,756,311
Accounts receivable	2,041,646	3,262,149
Accounts payable	(1,968,496)	(3,091,265)
Accrued income	<u>407,735</u>	<u>430,177</u>
Total Market Value	\$562,448,845	\$571,598,120
Total Actuarial Value	\$516,075,699	\$596,531,897

Actuarial Value of Assets

The actuarial value of assets is determined by projecting the market value of assets as of the beginning of the prior plan year with the assumed rate of return during that year (8%) and accounting for deposits and disbursements with interest at the assumed rate of return. An adjustment is then applied to recognize the difference between the actual investment return and expected return over a five year period. This preliminary actuarial value is not allowed to differ from the market value of assets by more than 20%. The calculation of the actuarial value of assets as of January 1, 2016 is presented in Table V.

Table V

	<u>January 1, 2016</u>
(1) Market value at January 1, 2015	\$582,964,087
(2) 2015 Contributions	\$52,682,120
(3) 2015 Payments	(\$61,178,394)
(4) Net interest adjustment at 8% on (1), (2), and (3) to December 31, 2015	\$46,297,276
(5) Expected market value on January 1, 2016	\$620,765,088
(1) + (2) + (3) + (4)	
(6) Actual market value on January 1, 2016	\$571,598,120
(7) 2015 (Gain) / Loss	\$49,166,968
(8) 80% of 2015 (Gain) / Loss	\$39,333,575
(9) 2014 (Gain) / Loss	\$17,603,266
(10) 60% of 2014 (Gain) / Loss	\$10,561,960
(11) 2013 (Gain) / Loss	(\$47,627,787)
(12) 40% of 2013 (Gain) / Loss	(\$19,051,115)
(13) 2012 (Gain) / Loss	(\$29,553,213)
(14) 20% of 2012 (Gain) / Loss	(\$5,910,643)
(15) Actuarial value on January 1, 2016, (6) + (8) + (10) + (12) + (14) but not less than 80% nor greater than 120% of (6)	\$596,531,897
(16) Ratio of actuarial value to market value	104.36%
(17) Actuarial Value Return for 2014	10.88%
(18) Actuarial Value Return for 2015	7.09%
(19) Market Value Return for 2014	4.85%
(20) Market Value Return for 2015	-0.50%

Unfunded Actuarial Accrued Liabilities

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

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

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

Table VI

	<u>January 1, 2014</u>	<u>January 1, 2016</u>
Actuarial Accrued Liability	\$840,301,708	\$908,025,085
Actuarial Assets	<u>516,075,699</u>	<u>596,531,897</u>
Unfunded Actuarial Accrued Liability	\$324,226,009	\$311,493,188
Funded Status	61.4%	65.7%

Appropriations

The pension appropriation for the upcoming fiscal years have been calculated in accordance with the requirements set forth in Section 22D of Chapter 32 of the Massachusetts General Laws. These amounts were calculated to comply with the June 30, 2040, full funding mandate for all accrued liabilities. The pension appropriation is the sum of the:

- Employer normal cost,
- Increasing amortization of the unfunded actuarial accrued liability by June 30, 2028
 \$ 304,383,464 over 12 years with 4.5% increasing payments
- Level amortization of the 2010 Early Retirement Incentive by June 30, 2022
 \$ 318,165 over 6 years
- Increasing amortization of the 2002 Early Retirement Incentive by June 30, 2023
 \$ 4,856,804 over 7 years with 4.5% increasing payments
- Level amortization of the 2003 Early Retirement Incentive by June 30, 2022
 \$ 1,934,755 over 6 years
- Interest adjustment for payments deposited at the beginning of the fiscal year.

The pension appropriation is shown in Table VII.

Table VII

	<u>January 1, 2014</u>	<u>January 1, 2016</u>
Normal cost	\$5,439,647	\$3,779,210
Amortization payment of the prior accrued liability	26,254,215	29,851,817
Amortization payment of 2010 ERI liability	63,726	63,390
Amortization payment of 2002 ERI liability	699,842	759,174
Amortization payment of 2003 ERI liability	<u>387,516</u>	<u>385,474</u>
Total cost	\$32,844,946	\$34,839,065
% of Pay	23.2%	22.9%
Fiscal 2017 cost	\$35,950,086	\$35,950,086
Fiscal 2018 cost	\$38,286,842	\$37,650,045

Appropriation Forecast

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

Note that the forecast is based upon an "open group" method. This method assumes that sufficient employees will be hired each year to keep the number constant. The total payroll of the system is expected to increase 4.0% per year. The employee contribution rate is expected to increase to 10.5% by 2041 as members contributing base percentages 5%, 7%, and 8% are replaced by new members, whose base contribution is 9%. Payments are assumed to be made at the beginning of the year.

The employer total cost is expected to increase during the next 11 years until the unfunded liabilities are substantially paid off, at which time only the normal cost will remain. The total cost represents 23.8% of payroll, decreasing to 23.2% by the time the unfunded liabilities are fully paid off, leaving only a normal cost of about 1.5% thereafter. The decrease in the cost as a percentage of payroll is a result of the increase in member deductions.

Appropriation Forecast

Fiscal Year	Employee Payroll*	Employee Contribution	Employer Normal Cost with Interest	Amortization Payments with Interest	Employer Total Cost with Interest	Employer Total Cost % of Payroll	Funded Ratio %**
2017	\$152,406,793	\$13,225,260	\$3,922,922	\$32,027,164	\$35,950,086	23.6	65.7
2018	\$158,503,065	\$13,874,627	\$3,954,906	\$33,695,139	\$37,650,045	23.8	68.3
2019	\$164,843,187	\$14,554,782	\$3,983,172	\$35,190,453	\$39,173,625	23.8	70.9
2020	\$171,436,915	\$15,267,151	\$4,007,371	\$36,753,056	\$40,760,427	23.8	73.6
2021	\$178,294,391	\$16,013,222	\$4,027,133	\$38,385,977	\$42,413,110	23.8	76.3
2022	\$185,426,167	\$16,794,550	\$4,042,064	\$40,092,379	\$44,134,443	23.8	79.1
2023	\$192,843,214	\$17,612,764	\$4,051,746	\$41,409,636	\$45,461,382	23.6	81.9
2024	\$200,556,942	\$18,469,564	\$4,055,736	\$42,200,652	\$46,256,388	23.1	84.8
2025	\$208,579,220	\$19,366,727	\$4,053,562	\$44,099,681	\$48,153,243	23.1	87.7
2026	\$216,922,389	\$20,306,112	\$4,044,725	\$46,084,167	\$50,128,892	23.1	90.6
2027	\$225,599,284	\$21,289,661	\$4,028,695	\$48,157,954	\$52,186,649	23.1	93.7
2028	\$234,623,256	\$22,319,404	\$4,004,912	\$50,325,062	\$54,329,974	23.2	96.8
2029	\$244,008,186	\$23,397,463	\$3,972,779	\$0	\$3,972,779	1.6	100.0
2030	\$253,768,513	\$24,526,056	\$3,931,669	\$0	\$3,931,669	1.5	100.0
2031	\$263,919,254	\$25,707,501	\$3,880,912	\$0	\$3,880,912	1.5	100.0
2032	\$274,476,024	\$26,944,219	\$3,819,805	\$0	\$3,819,805	1.4	100.0
2033	\$285,455,065	\$28,238,743	\$3,747,600	\$0	\$3,747,600	1.3	100.0
2034	\$296,873,268	\$29,593,717	\$3,663,507	\$0	\$3,663,507	1.2	100.0
2035	\$308,748,198	\$31,011,908	\$3,566,690	\$0	\$3,566,690	1.2	100.0
2036	\$321,098,126	\$32,496,204	\$3,456,266	\$0	\$3,456,266	1.1	100.0
2037	\$333,942,051	\$34,049,625	\$3,331,301	\$0	\$3,331,301	1.0	100.0
2038	\$347,299,733	\$35,675,326	\$3,190,810	\$0	\$3,190,810	0.9	100.0
2039	\$361,191,723	\$37,376,603	\$3,033,748	\$0	\$3,033,748	0.8	100.0
2040	\$375,639,392	\$39,156,901	\$2,859,017	\$0	\$2,859,017	0.8	100.0
2041	\$390,664,967	\$41,019,822	\$2,665,453	\$0	\$2,665,453	0.7	100.0
2042	\$406,291,566	\$42,660,614	\$2,772,071	\$0	\$2,772,071	0.7	100.0
2043	\$422,543,229	\$44,367,039	\$2,882,954	\$0	\$2,882,954	0.7	100.0
2044	\$439,444,958	\$46,141,721	\$2,998,272	\$0	\$2,998,272	0.7	100.0
2045	\$457,022,756	\$47,987,389	\$3,118,203	\$0	\$3,118,203	0.7	100.0
2046	\$475,303,666	\$49,906,885	\$3,242,931	\$0	\$3,242,931	0.7	100.0
2047	\$494,315,813	\$51,903,160	\$3,372,649	\$0	\$3,372,649	0.7	100.0
2048	\$514,088,445	\$53,979,287	\$3,507,555	\$0	\$3,507,555	0.7	100.0

* Calendar basis

** Beginning of Fiscal Year

PERAC Annual Statement
APPENDIX PAGE 3
ACTUARIAL VALUATION AND ASSUMPTIONS

The most recent actuarial valuation of the System was prepared by Sherman Actuarial Services as of January 1, 2016.

The normal cost for employees on that date was:	\$13,225,260	8.7% of pay
The normal cost for the employer was:	2,504,210	1.6% of pay
The actuarial liability for active members was:		\$376,165,445
The actuarial liability for retired and inactive members was:		531,859,640
Total actuarial accrued liability:		908,025,085
System assets as of that date:		596,531,897
Unfunded actuarial accrued liability:		\$311,493,188

The ratio of system's assets to total actuarial liability was 65.7%

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

Investment Return:	7.75%
Rate of Salary Increase:	Varies

SCHEDULE OF FUNDING PROGRESS

Actuarial Valuation Date	Actuarial Value of Assets	Actuarial Accrued Liability	Unfunded Actuarial Accrued Liability	Funded Ratio	Covered Payroll	UAAL as a percent of Covered Payroll
	(a)	(b)	(b-a)	(a/b)	(c)	(b-a)/c
01/01/16	\$596,531,897	\$908,025,085	\$311,493,188	65.7%	\$152,406,793	204.4%
01/01/14	516,075,699	840,301,708	324,226,009	61.4%	141,877,055	228.5%
01/01/12	460,572,977	776,734,414	316,161,437	59.3%	137,231,288	230.4%
01/01/09	396,683,194	697,604,462	300,921,268	56.9%	158,880,971	189.4%
01/01/07	390,706,111	593,767,462	203,061,051	65.8%	146,988,086	138.1%
01/01/05	334,319,614	535,755,874	201,436,260	62.4%	134,953,427	149.3%
01/01/03	291,903,656	440,692,634	148,788,978	66.2%	122,142,724	121.8%
01/01/01	275,463,114	373,562,277	98,099,163	73.7%	121,345,005	80.8%
01/01/99	226,836,196	311,255,734	84,419,538	72.9%	95,169,522	88.7%

Attach Copy of Current Approved Funding Schedule

EXHIBITS

Exhibit 1 - Age/Service Distribution with Salary as of January 1, 2016

Attained Age	Average Salary	<5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
< 20	3 24,311	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	3 24,311
20-24	58 33,586	1 47,047	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	59 33,814
25-29	178 39,715	22 43,879	1 42,700	0 0	0 0	0 0	0 0	0 0	0 0	0 0	201 40,186
30-34	122 43,602	80 53,750	20 55,298	0 0	0 0	0 0	0 0	0 0	0 0	0 0	222 48,313
35-39	106 34,586	55 60,069	73 61,329	26 56,845	0 0	0 0	0 0	0 0	0 0	0 0	260 49,711
40-44	126 32,213	72 38,568	79 54,634	78 68,405	29 69,474	1 82,558	0 0	0 0	0 0	0 0	385 48,272
45-49	132 29,514	102 37,280	90 44,466	93 57,866	74 76,943	46 82,622	3 79,190	0 0	0 0	0 0	540 49,655
50-54	109 33,176	99 32,232	113 40,220	87 43,239	40 65,559	49 74,304	40 83,002	0 0	0 0	0 0	537 45,991
55-59	66 36,927	84 36,470	103 38,032	123 41,095	52 46,555	47 62,135	35 76,723	15 80,891	5 79,492	5 45,491	530 45,491
60-64	26 37,680	36 39,926	51 37,924	65 38,005	54 41,950	38 56,556	14 54,212	14 79,031	8 74,749	8 44,769	306 44,769
65-69	10 26,076	11 54,033	17 37,571	18 38,052	24 44,341	14 44,467	10 39,052	2 30,750	2 38,510	2 38,510	108 40,690
70+	2 27,718	5 27,186	6 31,719	8 39,130	5 31,611	6 35,135	6 47,613	1 42,546	4 43,179	4 43,179	43 36,384
Total Employees	938	567	553	498	278	201	108	32	19	19	3,194
Average Salary	35,586	41,654	45,514	49,157	58,415	66,800	71,093	75,745	65,536	65,536	46,230

Exhibit 2 - Retiree Distribution as of January 1, 2016

Attained Age	Number of Employees			Total Payments		
	Female	Male	Total	Female	Male	Total
< 20	0	0	0	0	0	0
20-24	0	1	1	0	3,164	3,164
25-29	0	0	0	0	0	0
30-34	1	0	1	7780.08	0	7,780
35-39	0	1	1	0	44,725	44,725
40-44	0	3	3	0	180,957	180,957
45-49	3	5	8	57,202	93,862	151,064
50-54	8	16	24	157,077	422,650	579,727
55-59	51	81	132	578,850	3,132,407	3,711,257
60-64	124	144	268	2,196,250	5,552,766	7,749,016
65-69	251	223	474	4,762,776	7,297,138	12,059,914
70-74	223	195	418	3,766,507	5,001,824	8,768,331
75-79	144	130	274	2,122,475	3,255,930	5,378,405
80-84	149	85	234	2,123,832	1,498,223	3,622,055
85-89	103	59	162	1,121,100	969,016	2,090,116
90-94	65	26	91	544,622	245,307	789,928
95+	16	12	28	76,802	101,040	177,842
Total	1138	981	2119	17,515,272	27,799,010	45,314,282
Average (Age/Payment)	74.26	71.36	72.91	15,391	28,337	21,385
Frequency Percent	53.7	46.3	100	38.7	61.3	100

Exhibit 3 - Disabled Retiree Distribution as of January 1, 2016

Attained Age	Number of Employees			Total Payments		
	Female	Male	Total	Female	Male	Total
< 20	0	0	0	0	0	0
20-24	0	0	0	0	0	0
25-29	0	1	1	0	26,663	26,663
30-34	0	0	0	0	0	0
35-39	2	1	3	58,887	29,303	88,190
40-44	1	2	3	32,344	70,524	102,868
45-49	1	17	18	32,185	560,653	592,839
50-54	7	22	29	130,973	783,904	914,877
55-59	8	36	44	194,983	1,297,109	1,492,092
60-64	10	37	47	190,697	1,533,443	1,724,140
65-69	3	44	47	29,977	1,486,590	1,516,567
70-74	3	29	32	80,454	919,686	1,000,140
75-79	2	22	24	17,376	713,622	730,998
80-84	6	8	14	87,036	194,056	281,092
85-89	5	4	9	81,576	88,264	169,840
90-94	1	2	3	5,737	35,680	41,417
95-99	0	0	0	0	0	0
Total	49	225	274	942,226	7,739,497	8,681,724
Average (Age/Payment)	65.92	64.28	64.57	19,229	34,398	31,685
Frequency Percent	17.9	82.1	100	10.9	89.1	100

EXHIBIT 4 - CASHFLOW FORECAST:

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

Plan Year Ending	Benefit Payments	Employee Contributions	Employer Contributions	Investment Returns	Net change in plan assets
2016	\$41,103,767	\$13,225,260	\$35,950,086	\$45,908,322	\$53,979,901
2017	43,371,819	13,874,627	37,650,045	49,818,382	57,971,235
2018	45,731,111	14,554,782	39,173,625	54,273,800	62,271,096
2019	48,382,566	15,267,151	40,760,427	59,053,911	66,698,923
2020	50,993,114	16,013,222	42,413,110	64,181,420	71,614,637
2021	53,684,750	16,794,550	44,134,443	69,689,628	76,933,871
2022	56,339,101	17,612,764	45,461,382	75,596,726	82,331,770
2023	59,242,450	18,469,564	46,256,388	81,892,719	87,376,221
2024	62,133,317	19,366,727	48,153,243	88,622,316	94,008,969
2025	65,083,146	20,306,112	50,128,892	95,867,017	101,218,875
2026	67,997,184	21,289,661	52,186,649	103,675,315	109,154,442
2027	71,006,165	22,319,404	54,329,974	112,098,641	117,741,854
2028	74,039,171	23,397,463	3,972,779	119,231,484	72,562,555
2029	76,952,786	24,526,056	3,931,669	124,742,207	76,247,146
2030	79,882,132	25,707,501	3,880,912	130,538,100	80,244,381
2031	82,673,195	26,944,219	3,819,805	136,649,265	84,740,094
2032	85,561,777	28,238,743	3,747,600	143,105,392	89,529,958
2033	88,551,286	29,593,717	3,663,507	149,929,169	94,635,107
2034	91,645,247	31,011,908	3,566,690	157,144,922	100,078,273
2035	94,847,310	32,496,204	3,456,266	164,778,733	105,883,893
2036	98,161,253	34,049,625	3,331,301	172,858,578	112,078,251
2037	101,590,984	35,675,326	3,190,810	181,414,461	118,689,613
2038	105,140,549	37,376,603	3,033,748	190,478,580	125,748,381
2039	108,814,136	39,156,901	2,859,017	200,085,479	133,287,262
2040	112,616,076	41,019,822	2,665,453	210,272,239	141,341,438
2041	116,550,855	42,660,614	2,772,071	221,066,929	149,948,758
2042	120,623,115	44,367,039	2,882,954	232,523,072	159,149,950
2043	124,837,659	46,141,721	2,998,272	244,686,496	168,988,830
2044	129,199,457	47,987,389	3,118,203	257,606,416	179,512,551
2045	133,056,377	49,906,885	3,242,931	271,360,689	191,454,128

EXHIBIT 5 – SUMMARY OF PLAN PROVISIONS:

This summary is prepared in accordance with Chapter 32 as of January 1, 2016, and does not take into account any subsequent changes.

1. Administration

Each of the 104 contributory retirement systems for public employees of the Commonwealth of Massachusetts are guided by the applicable provisions of Chapter 32 of the Massachusetts General Laws and other applicable statutes. Although these boards operate semi-independently, there is a uniform set of rules governing benefits, eligibility, contributions, financing, and accounting.

2. Participation

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

There are four classes of membership as follows:

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

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

Chapter 176 of the Acts of 2011 created different plan provisions within these groups for those hired on or after April 2, 2012.

3. **Salary**

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

4. **Member Contributions**

Member contributions vary depending upon date hired as follows:

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

For Group 1 employees who become members on or after April 2, 2012, the Contribution Rate shall be 6% after the completion of 30 years of service.

5. **Average Salary**

Average salary is used to determine a participant's benefit. It is defined as the average salary during the three consecutive-year period that produces the highest average. (Alternatively, if a greater amount results, it is the average rate of salary earned during the period or periods, whether or not consecutive, that constitutes the last three years preceding retirement.). For employees who become members on or after April 2, 2012, the averaging period shall be five years.

6. **Creditable Service**

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

7. Service Retirement

a. Eligibility:

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

- (i) completion of 20 years of service
- (ii) for an employee hired prior to January 1, 1978, attainment of age 55 as an active member
- (iii) for an employee hired on or after January 1, 1978, attainment of age 55 as an active member and completion of ten years of service
- (iv) for a Group 1 employee hired on or after April 2, 2012, attainment of age 60 and completion of ten years of service

b. Benefit Amount:

The retirement allowance is determined as a product of the participant's Benefit Rate times Average Salary times Creditable Service, where Benefit Rate is determined from the following table for those hired prior to April 2, 2012:

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

For those hired after April 1, 2012 who retire with less than 30 years of service, the following rates are applied:

<u>Age at Retirement</u>	<u>Percentage of Average Salary</u>		
	<u>Group 1</u>	<u>Group 2</u>	<u>Group 4</u>
67 or Over	.0250	.0250	.0250
66	.0235	.0250	.0250
65	.0220	.0250	.0250
64	.0205	.0250	.0250
63	.0190	.0250	.0250
62	.0175	.0250	.0250
61	.0160	.0235	.0250
60	.0145	.0220	.0250
59		.0205	.0250
58		.0190	.0250
57		.0175	.0250
56		.0160	.0235
55		.0145	.0220
54			.0205
53			.0190
52			.0175
51			.0160
50			.0145

For those hired after April 1, 2012 who retire with at least 30 years of service, the following rates are applied:

Age at Retirement	Percentage of Average Salary		
	Group 1	Group 2	Group 4
67 or Over	.02500	.02500	.02500
66	.02375	.02500	.02500
65	.02250	.02500	.02500
64	.02125	.02500	.02500
63	.02000	.02500	.02500
62	.01875	.02500	.02500
61	.01750	.02375	.02500
60	.01625	.02250	.02500
59		.02125	.02500
58		.02000	.02500
57		.01875	.02500
56		.01750	.02375
55		.01625	.02250
54			.02125
53			.02000
52			.01875
51			.01750
50			.01625

8. Deferred Vested Retirement

a. Eligibility:

A participant who has completed ten or more years of creditable service is eligible for a deferred vested retirement benefit.

b. Benefit Amount:

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

c. Refund of Contributions:

In lieu of the deferred pension benefit, a member may elect to receive a refund of their accumulated contributions with interest.

9. Accidental Disability

a. Eligibility:

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

b. Benefit Amount:

The accidental disability amount is 72% of annual salary plus \$751.80 per year for each child plus an additional annuity based upon accumulated Member Contributions with credited interest.

10. Ordinary Disability

a. Eligibility:

An ordinary disability occurs when a member becomes permanently and totally disabled due to sickness or injury that is not job related. In order to be eligible for an ordinary disability benefit, a member must have ten years of service (and be less than age 55 or age 60 if hired on or after April 2, 2012).

b. Benefit Amount:

The ordinary disability amount is equal to the accrued retirement benefit as if the member were age 55 (age 60 if hired on or after April 2, 2012). If the member was a veteran, the benefit is 50% of the member's final rate of Salary during the preceding 12 months, plus an annuity based upon accumulated Member Contributions plus credited interest. If the participant is over age 55 (age 60 if hired on or after April 2, 2012), he will receive not less than the superannuation allowance to which he is entitled.

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

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

b. Non-Occupational Death:

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

c. Refund of Contributions:

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

12. Cost-of-Living Increases

In accordance with the adoption of Chapter 17 of the Acts of 1997, the granting of a cost-of-living adjustment will be determined by an annual vote by the Retirement Board. The amount of increase will be based upon the Consumer Price Index, limited to a maximum of 3.0%, beginning on July 1. All retirees, disabled retirees, and beneficiaries who have been receiving benefits payments for at least one year as of July 1 are eligible for the adjustment. The maximum amount of pension benefit subject to a COLA is \$18,000. All COLAs granted to members after 1981 and prior to July 1, 1998 are deemed to be an obligation of the State and are not the liability of the Retirement System.

13. Postretirement Death Benefits

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

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

EXHIBIT 6 – ACTUARIAL METHODS AND ASSUMPTIONS:

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

1. Member Data

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

2. Valuation Date

January 1, 2016.

3. Actuarial Cost Method

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

4. Rate of Investment Return

It is assumed that the assets of the fund will accumulate at a compound annual rate of 7.75% per annum.

5. Salary Scale

It is assumed that salaries including longevity will increase at the following rates.

<u>Service</u>	<u>Rate</u>
0 - 1	5.50%
2	4.00%
3 - 4	3.50%
5 - 7	3.00%
8 +	2.75%

6. Cost-of-Living Increases

Cost-of-living increases have been assumed to be 3.0% of the lesser of the pension amount and \$18,000 per year.

7. Value of Investments

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

8. Annual Rate of Withdrawal Prior to Retirement

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

<u>Service</u>	<u>General Employees</u>	<u>Police and Fire Employees</u>
0	0.2080	0.0150
5	0.1020	0.0150
10	0.0650	0.0150
15	0.0417	0.0150
20	0.0400	0.0000
30	0.0000	0.0000

9. Annual Rate of Mortality

It is assumed that both pre-retirement mortality and beneficiary mortality is represented by the RP-2014 Blue Collar Mortality with Scale MP-2014, fully generational. Mortality for retired members for Group 1 and 2 is represented by the RP-2000 Mortality Table set forward five years for males and 3 years for females, fully generational. Mortality for retired members for Group 4 is represented by the RP-2000 Mortality Table set forward three years for males, and six years for females, fully generational. Mortality for disabled members for Group 1 and 2 is represented by the RP-2000 Mortality Table set forward six years. Mortality for disabled members for Group 4 is represented by the RP-2000 Mortality Table set forward two years. Generational adjusting is based on Scale MP-2014.

10. Service Retirement

Based on an analysis of experience, the assumed annual retirement rates are illustrated at the following ages for those hired prior to April 2, 2012:

<u>Age</u>	<u>Male General Employees</u>	<u>Female General Employees</u>	<u>Male and Female Police and Fire Employees</u>
50	0.0360	0.1019	0.0144
51	0.0405	0.0714	0.0144
52	0.0437	0.0562	0.0123
53	0.0366	0.0448	0.0210
54	0.0451	0.0488	0.0569
55	0.0477	0.0469	0.0879
56	0.0574	0.0518	0.0931
57	0.0632	0.0509	0.0897
58	0.0765	0.0552	0.0846
59	0.0917	0.0645	0.1022
60	0.1057	0.0774	0.1455
61	0.1224	0.1038	0.1844
62	0.1473	0.1168	0.2741
63	0.1777	0.1440	0.1984
64	0.2136	0.1708	0.4139
65	0.2615	0.1939	1.00000
66	0.2682	0.1959	1.00000
67	0.2500	0.2000	1.00000
68	0.2500	0.2000	1.00000
69	0.2500	0.2000	1.00000
70 to 76	0.2500	0.2500	1.00000
77 to 79	0.3500	0.2500	1.00000
80	1.0000	1.0000	1.00000

Based on an analysis of experience, the assumed annual retirement rates are illustrated at the following ages for those hired on or after April 2, 2012:

<u>Age</u>	<u>Male General Employees</u>	<u>Female General Employees</u>	<u>Male and Female Police and Fire Employees</u>
50	0.0000	0.0000	0.0072
51	0.0000	0.0000	0.0072
52	0.0000	0.0000	0.0062
53	0.0000	0.0000	0.0105
54	0.0000	0.0000	0.0105
55	0.0000	0.0000	0.0389
56	0.0000	0.0000	0.0631
57	0.0000	0.0000	0.0897
58	0.0000	0.0000	0.0846
59	0.0000	0.0000	0.1022
60	0.0477	0.0469	0.1455
61	0.0574	0.0518	0.1844
62	0.0632	0.0509	0.2741
63	0.0765	0.0552	0.1984
64	0.0917	0.0645	0.4139
65	0.1057	0.0774	1.0000
66	0.1224	0.1038	1.0000
67	0.1473	0.1168	1.0000
68	0.1777	0.1440	1.0000
69	0.2136	0.1708	1.0000
70	0.2615	0.1939	1.0000
70 to 76	0.2682	0.1959	1.0000
77 to 79	0.2500	0.2000	1.0000
80	1.0000	1.0000	1.0000

12. Annual Rate of Disability Prior to Retirement

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

<u>Attained Age</u>	<u>General Employees</u>	<u>Police and Fire Employees</u>
20	0.000100	0.000500
30	0.000152	0.000967
40	0.000663	0.002500
50	0.001271	0.007634

In addition, it is assumed for the general employees that 35% of all disabilities are ordinary (65% are service connected). For police and fire employees, 5% of all disabilities are assumed to be ordinary (95% are service connected).

13. Family Composition

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

14. Administrative Expenses

The normal cost is increased by an amount equal to the anticipated administrative expenses for the upcoming fiscal year. The amount for fiscal year 2016 is \$1,275,000 and is anticipated to increase at 4.0% per year.

EXHIBIT 7 – GLOSSARY OF TERMS:

This glossary summarizes the technical terms contained in this report.

1. Actuarial Accrued Liability

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

2. Actuarial Assumptions

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

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

3. Actuarial Cost Method

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

4. Actuarial Present Value

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

5. Forecast

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

6. Normal Cost

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

7. Unfunded Actuarial Accrued Liability

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

8. Valuation Method

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

9. Vested Liability

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

CERTIFICATION:

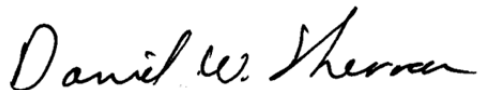
This report fairly represents the actuarial position of the Bristol County Retirement System contributing as of January 1, 2016, in accordance with generally accepted actuarial principles applied consistently with the preceding valuation. In our opinion, the actuarial assumptions used to compute actuarial accrued liability and normal cost are reasonably related to plan experience and to reasonable expectations, and represents our best estimate of anticipated plan experience.

The funded status measure is appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations. The funded status measure is appropriate for assessing the need for or the amount of future contributions. The funded status measure would be different if the measure reflected the market value of assets rather than the actuarial value of assets.

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 or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of our assignment, we did not perform an analysis of the potential range of such future measurements.

The report was prepared under the supervision of Daniel Sherman, an Associate of the Society of Actuaries and a Member of the American Academy of Actuaries, who takes responsibility for the overall appropriateness of the analysis, assumptions and results. Daniel Sherman is deemed to meet the General Qualification Standard and the basic education and experience requirement in the pension area. Based on over thirty years of performing valuations of similar complexity, Mr. Sherman is qualified by experience. Daniel Sherman has met the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Sherman Actuarial Services, LLC



Daniel W. Sherman, ASA, MAAA

August, 2016

BREAKOUTS