BRISTOL COUNTY
CONTRIBUTORY RETIREMENT SYSTEM

Actuarial Valuation Report

January 1, 2018

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Report Summary:

Highlights	**January 1, 2016**	**January 1, 2018**
Contributions		
Funding Schedule FY 2019	$39,173,625	$39,173,625
Funding Schedule FY 2020	40,760,427	42,307,515
Funded Ratios		
GAS No. 25	65.7%	67.7%
Participants		
Actives	3,193	3,220
Retirees and Beneficiaries	2,119	2,219
Inactives	672	772
Vested	0	0
Disabled	274	281
Total	6,258	6,492
Payroll		
Payroll of Active Members	$152,406,793	$164,456,820
Average Payroll	47,732	51,074
Normal Cost		
Employer	2,504,210	2,443,107
Employee	13,225,260	14,447,101
Administrative Expenses	1,275,000	1,500,000
Total	17,004,470	18,390,208
Actuarial Accrued Liabilities		
Actives	376,165,445	395,317,143
Retirees, Beneficiaries, Disabilities and Inactives	531,859,640	597,338,364
Total	908,025,085	992,655,507
Actuarial Value of Assets	596,531,897	672,172,677
Unfunded Actuarial Accrued Liabilities	$311,493,188	$320,482,830

Introduction

This report presents the findings of an actuarial valuation as of January 1, 2018, 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, 2018.
- 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, 2018.

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 2016 actuarial assumptions and plan provisions, the total unfunded actuarial accrued liability increased by 1.2% to $320,482,830. The increase is a result of net unfavorable actuarial experience during the preceding years. The sources of actuarial (gains) and losses are as follows:

Assets	4,381,469
Retirements	(6,130,216)
Terminations	6,588,443
Death while active	(714,088)
Disabled while active	3,190,718
Salary	7,437,859
New Participants	8,042,863
Inactive Mortality and data	21,988,872
Benefit Payments	(1,607,853)
Other	1,508,216
Total (Gain) / Loss	44,686,285

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

	January 1, 2016	January 1, 2018
Superannuation	$8,126,492	$8,612,144
Termination	5,338,231	5,802,430
Death	727,145	778,991
Disability	1,537,602	1,696,643
Administrative Expenses	1,275,000	1,500,000
Total Normal Cost	17,004,470	18,390,208
% of Pay	11.2%	11.2%
Employee Contributions	13,225,260	14,447,101
% of Pay	8.7%	8.8%
Employer Normal Cost	$3,779,210	$3,943,107
% of Pay	2.5%	2.4%

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 inactives. 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

	January 1, 2016	January 1, 2018
Actives		
Superannuations	$366,422,043	$384,937,250
Termination	(16,300,827)	(17,241,323)
Death	10,259,442	10,788,369
Disability	15,784,787	16,832,847
Retirees and Inactives		
Retirees and Beneficiaries	431,078,382	483,497,971
Terminated (Refund)	6,909,909	9,052,044
Vested	0	0
Disabled	93,871,349	104,788,349
Total	$908,025,085	$992,655,507

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

	January 1, 2016	January 1, 2018
Actives		
Superannuation	$420,285,894	$442,229,626
Termination	22,051,005	24,315,318
Death	15,000,023	15,926,763
Disability	26,042,566	28,164,648
Retirees and Inactives		
Retirees and Beneficiaries	431,078,382	483,497,971
Terminated (Refund)	6,909,909	9,052,044
Vested	0	0
Disabled	93,871,349	104,788,349
Total	$1,015,239,128	$1,107,974,719

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

	January 1, 2016	January 1, 2018
Cash equivalents	$12,443,532	$12,377,224
Short term investments	0	0
Fixed income securities	105,002,177	112,686,008
Equities	218,224,530	177,175,336
International	156,037,333	241,448,142
Real Estate	17,533,176	45,073,601
Venture Capital	0	0
Other	61,756,311	92,791,222
Accounts receivable	3,262,149	4,004,610
Accounts payable	(3,091,265)	(5,294,993)
Accrued income	430,177	346,599
Total Market Value	$571,598,120	$680,607,749
Total Actuarial Value	$596,531,897	$672,172,677

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 (7.75%) 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, 2018 is presented in Table V.

Table V

		January 1, 2018
(1)	Market value at January 1, 2017	$597,784,367
(2)	2017 Contributions	$56,910,441
(3)	2017 Payments	($66,915,031)
(4)	Net interest adjustment at 7.75% on (1), (2), and (3) to December 31, 2017	$45,940,611
(5)	Expected market value on January 1, 2018 (1) + (2) + (3) + (4)	$633,720,388
(6)	Actual market value on January 1, 2018	$680,607,749
(7)	2017 (Gain) / Loss	($46,887,361)
(8)	80% of 2017 (Gain) / Loss	($37,509,889)
(9)	2016 (Gain) / Loss	$9,812,294
(10)	60% of 2016 (Gain) / Loss	$5,887,376
(11)	2015 (Gain) / Loss	$49,166,968
(12)	40% of 2015 (Gain) / Loss	$19,666,787
(13)	2014 (Gain) / Loss	$17,603,266
(14)	20% of 2014 (Gain) / Loss	$3,520,653
(15)	Actuarial value on January 1, 2018, (6) + (8) + (10) + (12) + (14) but not less than 80% nor greater than 120% of (6)	$672,172,677
(16)	Ratio of actuarial value to market value	98.76%
(17)	Actuarial Value Return for 2016	7.44%
(18)	Actuarial Value Return for 2017	7.89%
(19)	Market Value Return for 2016	6.02%
(20)	Market Value Return for 2017	15.66%

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

	January 1, 2016	January 1, 2018
Actuarial Accrued Liability	$908,025,085	$992,655,507
Actuarial Assets	596,531,897	672,172,677
Unfunded Actuarial Accrued Liability	$311,493,188	$320,482,830
Funded Status	65.7%	67.7%

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
  $ 314,969,407 over 10 years with 4.5% increasing payments
- Level amortization of the 2010 Early Retirement Incentive by June 30, 2022
  $ 227,493 over 4 years
- Increasing amortization of the 2002 Early Retirement Incentive by June 30, 2023
  $ 3,902,554 over 5 years with 4.5% increasing payments
- Level amortization of the 2003 Early Retirement Incentive by June 30, 2022
  $ 1,383,377 over 4 years
- Interest adjustment for payments deposited at the beginning of the fiscal year.

For the first 4 years the increase is limited to 8% per year. The pension appropriation is shown in Table VII.

Table VII

	January 1, 2016	January 1, 2018
Normal cost	$3,779,210	$3,943,107
Amortization payment of the prior accrued liability	29,851,817	36,011,712
Amortization payment of 2010 ERI liability	63,390	63,390
Amortization payment of 2002 ERI liability	759,174	829,037
Amortization payment of 2003 ERI liability	385,474	385,474
Total cost	$34,839,065	$41,232,719
% of Pay	22.9%	25.1%
Fiscal 2019 cost	$39,173,625	$39,173,625
Fiscal 2020 cost	$40,760,427	$42,307,515

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 9 years until the unfunded liabilities are substantially paid off, at which time only the normal cost will remain. The total cost represents 24.7% of payroll, increasing to 26.2% 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 Ending	Employee Contribution	Employer Normal Cost with Interest	Amortization Payments with Interest	Employer Total Cost with Interest	Employer Total Cost % of Payroll	Unfunded Accrued Liability	Funded Ratio %**
2019	$14,447,101	$4,093,051	$35,080,574	$39,173,625	23.8	$320,482,830	67.7
2020	$15,158,335	$4,118,353	$38,189,162	$42,307,515	24.7	$305,140,692	70.8
2021	$15,903,352	$4,139,129	$41,552,987	$45,692,116	25.7	$286,823,223	73.9
2022	$16,683,718	$4,154,978	$45,192,507	$49,347,485	26.7	$265,219,449	77.1
2023	$17,501,067	$4,165,473	$46,915,987	$51,081,460	26.6	$239,990,682	80.3
2024	$18,357,110	$4,170,159	$47,954,789	$52,124,948	26.1	$211,251,853	83.5
2025	$19,253,636	$4,168,555	$50,112,754	$54,281,309	26.1	$179,268,748	86.7
2026	$20,192,511	$4,160,150	$52,367,828	$56,527,978	26.1	$142,630,972	89.9
2027	$21,175,691	$4,144,404	$54,724,381	$58,868,785	26.2	$100,879,869	93.2
2028	$22,205,217	$4,120,742	$57,186,978	$61,307,720	26.2	$53,516,830	96.6
2029	$23,283,225	$4,088,555	$0	$4,088,555	1.7	$0	100.0
2030	$24,411,944	$4,047,201	$0	$4,047,201	1.6	$0	100.0
2031	$25,593,708	$3,995,996	$0	$3,995,996	1.5	$0	100.0
2032	$26,830,954	$3,934,220	$0	$3,934,220	1.4	$0	100.0
2033	$28,126,230	$3,861,108	$0	$3,861,108	1.4	$0	100.0
2034	$29,482,198	$3,775,852	$0	$3,775,852	1.3	$0	100.0
2035	$30,901,642	$3,677,598	$0	$3,677,598	1.2	$0	100.0
2036	$32,387,470	$3,565,442	$0	$3,565,442	1.1	$0	100.0
2037	$33,942,721	$3,438,429	$0	$3,438,429	1.0	$0	100.0
2038	$35,570,572	$3,295,551	$0	$3,295,551	1.0	$0	100.0
2039	$37,274,344	$3,135,741	$0	$3,135,741	0.9	$0	100.0
2040	$39,057,504	$2,957,874	$0	$2,957,874	0.8	$0	100.0
2041	$40,923,677	$2,760,760	$0	$2,760,760	0.7	$0	100.0
2042	$42,560,624	$2,871,190	$0	$2,871,190	0.7	$0	100.0
2043	$44,263,049	$2,986,038	$0	$2,986,038	0.7	$0	100.0
2044	$46,033,571	$3,105,479	$0	$3,105,479	0.7	$0	100.0
2045	$47,874,914	$3,229,698	$0	$3,229,698	0.7	$0	100.0
2046	$49,789,911	$3,358,886	$0	$3,358,886	0.7	$0	100.0
2047	$51,781,507	$3,493,242	$0	$3,493,242	0.7	$0	100.0
2048	$53,852,768	$3,632,971	$0	$3,632,971	0.7	$0	100.0
2049	$56,006,878	$3,778,290	$0	$3,778,290	0.7	$0	100.0
2050	$58,247,153	$3,929,422	$0	$3,929,422	0.7	$0	100.0

** Beginning of Fiscal Year

EXHIBITS

Exhibit 1 - Age/Service Distribution with Salary as of January 1, 2018

Attained Age	Average Salary <5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
< 20	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
20-24	76	0	1	0	0	0	0	0	0	77
	41,080	0	53,813	0	0	0	0	0	0	41,246
25-29	197	21	1	0	0	0	0	0	0	219
	44,177	65,769	52,435	0	0	0	0	0	0	46,285
30-34	134	78	25	1	0	0	0	0	0	238
	47,486	57,011	60,238	57,490	0	0	0	0	0	51,989
35-39	120	59	73	21	0	0	0	0	0	273
	42,234	56,730	67,531	62,806	0	0	0	0	0	53,714
40-44	119	50	63	79	29	2	0	0	0	342
	33,538	50,039	57,731	68,713	83,980	60,651	0	0	0	52,968
45-49	139	95	88	84	76	32	3	0	0	517
	32,455	37,279	50,626	59,188	76,972	88,581	82,274	0	0	51,085
50-54	113	75	105	92	59	41	43	1	0	529
	31,803	37,780	39,885	50,855	69,462	79,844	87,498	100,489	0	50,149
55-59	80	74	113	124	59	25	42	11	2	530
	35,941	38,470	40,079	45,292	51,533	77,831	78,281	83,206	108,479	47,686
60-64	34	41	61	85	51	25	28	11	11	347
	34,410	38,866	42,725	41,838	43,382	56,528	66,541	77,500	86,681	46,745
65-69	11	10	17	20	16	19	8	1	3	105
	49,941	36,494	45,978	39,557	39,865	44,030	58,681	47,629	60,796	44,390
70+	6	3	10	5	6	1	6	2	3	42
	18,552	27,172	40,278	40,523	40,960	44,801	49,098	34,635	45,275	37,821
Total Employees	1,029	506	557	511	296	145	130	26	19	3,219
Average Salary	38,929	45,334	48,728	52,097	62,568	72,206	76,340	76,352	78,351	78,351

Exhibit 2 - Retiree Distribution as of January 1, 2018

	Number of Employees			Total Payments		
Attained Age	Female	Male	Total	Female	Male	Total
< 20	0	0	0	0	0	0
20-24	0	1	1	0	3,357	3,357
25-29	0	0	0	0	0	0
30-34	0	0	0	0	0	0
35-39	1	0	1	8,254	0	8,254
40-44	0	3	3	0	102,541	102,541
45-49	2	4	6	43,433	83,085	126,518
50-54	6	14	20	117,683	513,669	631,352
55-59	46	72	118	616,505	2,668,730	3,285,235
60-64	136	158	294	2,260,139	6,502,456	8,762,595
65-69	226	220	446	4,492,987	7,763,812	12,256,799
70-74	272	210	482	5,173,395	6,189,312	11,362,707
75-79	172	151	323	2,892,699	4,034,520	6,927,220
80-84	136	84	220	2,123,669	1,757,351	3,881,020
85-89	110	68	178	1,341,147	1,298,157	2,639,304
90-94	59	34	93	580,082	411,663	991,745
95+	25	9	34	161,631	91,889	253,520
Total	1191	1028	2219	19,811,625	31,420,541	51,232,166
Average (Age/Payment)	74.47	71.70	73.19	16,634	30,565	23,088
Frequency Percent	53.7	46.3	100	38.7	61.3	100

Exhibit 3 - Disabled Retiree Distribution as of January 1, 2018

	Number of Employees			Total Payments		
Attained Age	Female	Male	Total	Female	Male	Total
< 20	0	0	0	0	0	0
20-24	0	0	0	0	0	0
25-29	0	0	0	0	0	0
30-34	0	1	1	0	27,743	27,743
35-39	1	0	1	46,324	0	46,324
40-44	3	2	5	94,250	75,427	169,677
45-49	0	12	12	0	502,545	502,545
50-54	6	30	36	134,514	1,324,269	1,458,783
55-59	7	30	37	157,646	1,171,809	1,329,455
60-64	10	44	54	237,826	1,759,601	1,997,427
65-69	4	39	43	61,149	1,529,379	1,590,528
70-74	5	34	39	79,670	1,111,674	1,191,343
75-79	2	27	29	64,059	832,461	896,519
80-84	4	9	13	42,078	290,697	332,775
85-89	4	4	8	77,089	76,717	153,806
90-94	3	0	3	24,982	0	24,982
95-99	0	0	0	0	0	0
Total	49	232	281	1,019,585	8,702,323	9,721,907
Average (Age/Payment)	66.23	64.71	64.98	20,808	37,510	34,598
Frequency Percent	17.4	82.6	100	10.5	89.5	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
2018	$41,103,767	$14,447,101	$39,173,625	$55,288,362	$67,805,320
2019	43,371,819	15,158,335	42,307,515	59,126,186	73,220,217
2020	45,731,111	15,903,352	45,692,116	63,205,205	79,069,561
2021	48,382,566	16,683,718	49,347,485	67,534,606	85,183,243
2022	50,993,114	17,501,067	51,081,460	73,859,409	91,448,821
2023	53,684,750	18,357,110	52,124,948	80,813,442	97,610,750
2024	56,339,101	19,253,636	54,281,309	88,286,117	105,481,961
2025	59,242,450	20,192,511	56,527,978	96,360,030	113,838,070
2026	62,133,317	21,175,691	58,868,785	105,082,745	122,993,903
2027	65,083,146	22,205,217	61,307,720	114,513,568	132,943,358
2028	67,997,184	23,283,225	4,088,555	124,218,764	83,593,360
2029	71,006,165	24,411,944	4,047,201	130,573,032	88,026,012
2030	74,039,171	25,593,708	3,995,996	137,269,827	92,820,360
2031	76,952,786	26,830,954	3,934,220	144,342,639	98,155,027
2032	79,882,132	28,126,230	3,861,108	151,828,216	103,933,422
2033	82,673,195	29,482,198	3,775,852	159,766,813	110,351,668
2034	85,561,777	30,901,642	3,677,598	168,199,063	117,216,525
2035	88,551,286	32,387,470	3,565,442	177,159,460	124,561,086
2036	91,645,247	33,942,721	3,438,429	186,685,061	132,420,964
2037	94,847,310	35,570,572	3,295,551	196,815,677	140,834,490
2038	98,161,253	37,274,344	3,135,741	207,594,088	149,842,920
2039	101,590,984	39,057,504	2,957,874	219,066,267	159,490,660
2040	105,140,549	40,923,677	2,760,760	231,281,624	169,825,511
2041	108,814,136	42,560,624	2,871,190	244,281,254	180,898,932
2042	112,616,076	44,263,049	2,986,038	258,133,306	192,766,316
2043	116,550,855	46,033,571	3,105,479	272,899,108	205,487,302
2044	120,623,115	47,874,914	3,229,698	288,644,599	219,126,096
2045	124,837,659	49,789,911	3,358,886	305,440,690	233,751,829
2046	129,199,457	51,781,507	3,493,242	323,363,638	249,438,930
2047	133,056,377	53,852,768	3,632,971	342,520,459	266,949,822

EXHIBIT 5 – SUMMARY OF PLAN PROVISIONS:

This summary is prepared in accordance with Chapter 32 as of January 1, 2018, 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:

Date of Hire	Member Contribution Rate
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:

Age at	Percentage of Average Salary		
Retirement	Group 1	Group 2	Group 4
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:

Age at Retirement	Percentage of Average Salary Group 1	Group 2	Group 4
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, 2018.

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.

Service	Rate
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:

Service	General Employees	Police and Fire Employees
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-2014 Blue Collar 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-2014 Blue Collar 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:

Age	Male General Employees	Female General Employees	Male and Female Police and Fire Employees
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:

Age	Male General Employees	Female General Employees	Male and Female Police and Fire Employees
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:

Attained Age	General Employees	Police and Fire Employees
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 2018 is $1,500,000 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, 2018, 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

Daniel W. Sherman, ASA, MAAA

July, 2018

BREAKOUTS