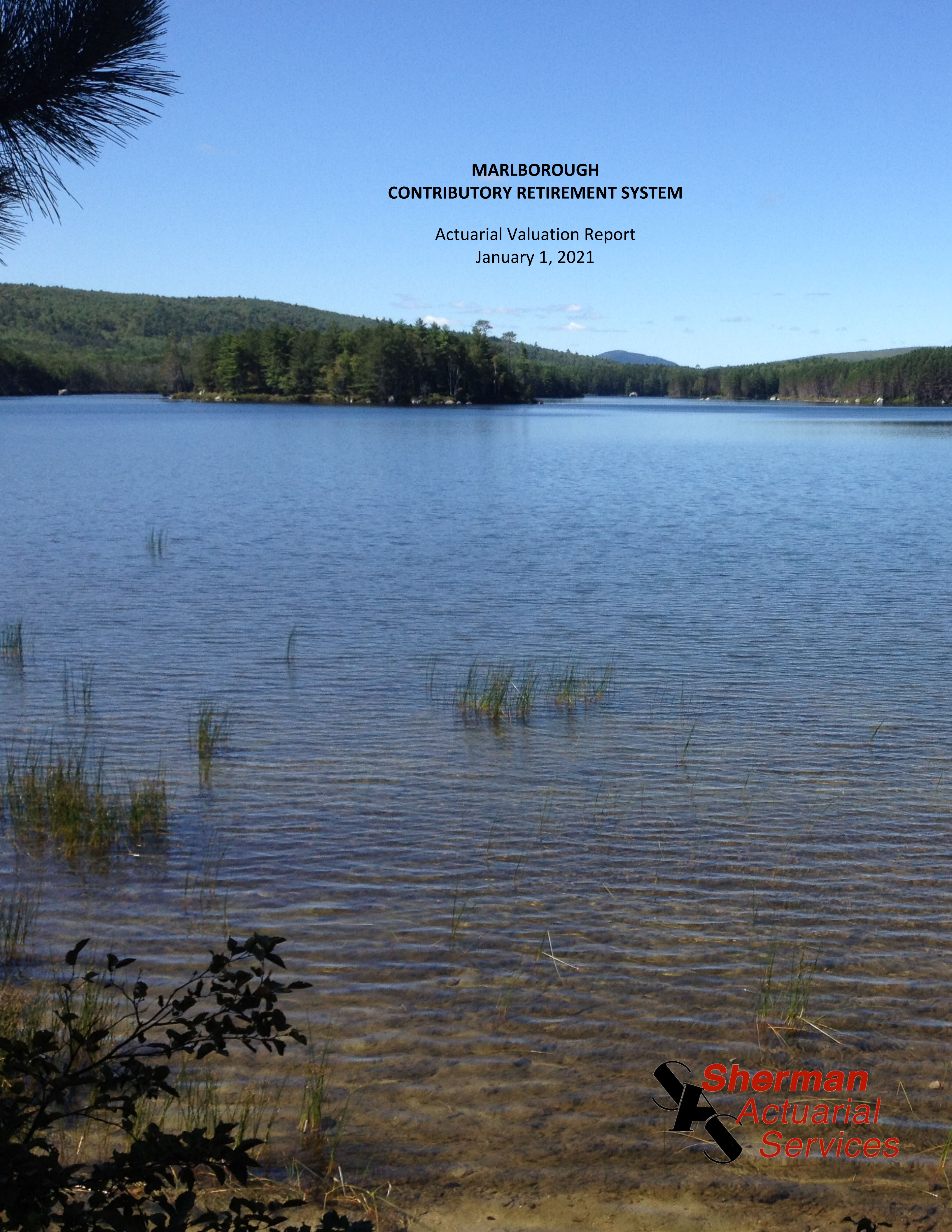
MARLBOROUGH
CONTRIBUTORY RETIREMENT SYSTEM

Actuarial Valuation Report
January 1, 2021



Sherman Actuarial Services

TABLE OF CONTENTS

Report Summary:

Highlights	**January 1, 2019**	**January 1, 2021**
Contributions		
Funding Schedule FY 2022	$9,524,575	$9,524,576
Funding Schedule FY 2023	9,873,569	$10,275,549
Funded Ratios		
GAS No. 25	75.0%	79.0%
Participants		
Actives	644	640
Retirees and Beneficiaries	400	419
Inactives	220	237
Disabled	34	37
Total	1,298	1,333
Payroll		
Payroll of Active Members	$35,950,698	$38,068,187
Average Payroll	55,824	59,482
Normal Cost		
Employer	911,080	874,219
Employee	3,194,316	3,423,826
Administrative Expenses	243,000	297,000
Total	4,348,396	4,595,045
Actuarial Accrued Liabilities		
Actives	98,905,616	102,745,875
Retirees, Beneficiaries, Disabilities and Inactives	134,957,693	149,026,185
Total	233,863,309	251,772,060
Actuarial Value of Assets	175,456,238	198,863,212
Unfunded Actuarial Accrued Liabilities	$58,407,071	$52,908,848

Introduction

This report presents the findings of an actuarial valuation as of January 1, 2021, of Marlborough Contributory Retirement System.

The actuarial valuation is based on:

- Provisions Chapter 32 of the Massachusetts General Laws, "M.G.L", as of January 1, 2021.
- Employee data provided by the Retirement Board
- Asset information reported to the Public Employee Retirement Administration Commission by the Marlborough 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, 2021.

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 2019 actuarial assumptions and plan provisions, the total unfunded actuarial accrued liability decreased to $52,908,848. The decrease is the result of net unfavorable actuarial experience during the preceding year, offset by payments against the unfunded actuarial liability. The sources of change in the unfunded liability are as follows:

Expected Unfunded Actuarial Accrued Liability	47,166,883
Asset gain	(1,097,341)
Salary loss	1,162,915
New Entrants	1,745,015
Actives - Retirements	(1,883,274)
Actives - Terminations	(764,138)
Actives – Mortality	(81,601)
Actives - Disabilities	534,575
Inactive Mortality	4,874,026
Other	62,038
Benefit Payments	1,189,750
Unfunded Actuarial Accrued Liability	52,908,848

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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, 2019	January 1, 2021
Superannuation	$2,453,224	$2,549,433
Termination	1,085,826	1,136,221
Death	131,714	138,351
Disability	434,632	474,040
Administrative Expenses	243,000	297,000
Total Normal Cost	4,348,396	4,595,045
% of Pay	12.1%	12.1%
Employee Contributions	3,194,316	3,423,826
% of Pay	8.9%	9.0%
Employer Normal Cost	$1,154,080	$1,171,219
% of Pay	3.2%	3.1%

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, 2019	January 1, 2021
Actives		
Superannuations	$96,448,106	$100,035,367
Termination	(2,514,675)	(2,523,234)
Death	1,265,504	1,325,472
Disability	3,706,681	3,908,270
Retirees and Inactives		
Retirees and Beneficiaries	113,909,397	125,159,827
Terminated (Refund)	2,019,902	2,643,327
Disabled	19,028,394	21,223,031
Total	$233,863,309	$251,772,060

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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, 2019	January 1, 2021
Actives		
Superannuation	$113,714,984	$118,105,233
Termination	$5,879,669	6,400,681
Death	$2,197,267	2,316,249
Disability	$6,855,455	7,391,548
Retirees and Inactives		
Retirees and Beneficiaries	113,909,397	125,159,827
Terminated (Refund)	2,019,902	2,643,327
Disabled	19,028,394	21,223,031
Total	$263,605,068	$283,239,896

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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, 2019	January 1, 2021
Cash equivalents	$151,380	$2,283,197
Short term investments	0	0
Fixed income securities	70,697,007	62,581,375
Equities	52,033,629	84,425,563
International	27,827,277	46,776,479
Real Estate	7,504,031	6,975,593
Venture Capital	0	0
Other	3,907,974	8,989,306
Accounts receivable	143,351	61,490
Accounts payable	(315,594)	(76,725)
Accrued income	507	20,477
Total Market Value	$161,949,562	$212,036,755
Total Actuarial Value	$175,456,238	$198,863,212

Actuarial Value of Assets

The actuarial value of assets is determined by projecting the actuarial value of assets as of the beginning of the prior plan year with the assumed rate of return during that year (7.5%) 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, 2021 is presented in Table V.

Table V

		January 1, 2021
(1)	Market value at January 1, 2020	$187,520,456
(2)	2020 Contributions	$13,835,194
(3)	2020 Benefit Payments	($16,205,196)
(4)	Net interest adjustment at 7.5% on (1), (2), and (3) to December 31, 2020	$13,975,159
(5)	Expected market value on January 1, 2021 (1) + (2) + (3) + (4)	$199,125,613
(6)	Actual market value on January 1, 2021	$212,036,755
(7)	2020 (Gain) / Loss	($12,911,142)
(8)	80% of 2020 (Gain) / Loss	($10,328,914)
(9)	2019 (Gain) / Loss	($15,787,591)
(10)	60% of 2019 (Gain) / Loss	($9,472,555)
(11)	2018 (Gain) / Loss	$20,842,725
(12)	40% of 2018 (Gain) / Loss	$8,337,090
(13)	2017 (Gain) / Loss	($8,545,820)
(14)	20% of 2017 (Gain) / Loss	($1,709,164)
(15)	Actuarial value on January 1, 2021, (6) + (8) + (10) + (12) + (14)	$198,863,212
(16)	but not less than 80% nor greater than 120% of (6)	$198,863,212
	Ratio of actuarial value to market value	93.79%
	2020 Market Value Return on investments	14.43%
	2020 Actuarial Value Return on investments	8.96%
	2019 Market Value Return on investments	17.32%
	2019 Actuarial Value Return on investments	5.70%

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, 2019	January 1, 2021
Actuarial Accrued Liability	$233,863,309	$251,772,060
Actuarial Assets	175,456,238	198,863,212
Unfunded Actuarial Accrued Liability	$58,407,071	$52,908,848
Funded Status	75.0%	79.0%

Appropriations

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

- Employer normal cost,
- Increasing amortization of the unfunded actuarial accrued liability by June 30, 2028
  $ 52,908,848 over 7 years with 4.0% increasing payments
- Interest adjustment for payments deposited at the beginning of the fiscal year.

The pension appropriation is shown in Table VII.

Table VII

	January 1, 2019	January 1, 2021
Normal cost	$1,154,080	$1,171,219
Amortization payment of the accrued liability	7,381,397	8,329,222
Total cost	$8,535,477	$9,500,441
% of Pay	23.7%	25.0%
Fiscal 2022 cost	$9,524,575	$9,524,576
Fiscal 2023 cost	$9,873,569	$10,275,549

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 2037 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 6 years until the unfunded liabilities are substantially paid off, at which time only the normal cost will remain. The total cost represents about 25% of payroll, increasing to 25.5% by the time the unfunded liabilities are fully paid off, leaving only a normal cost of about 2.5% thereafter. The decrease in the cost as a percentage of payroll is a result of the increase in member deductions.

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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 Liability	Funded Ratio %**
2022	$3,423,826	$1,214,346	$8,310,230	$9,524,576	25.0	$52,908,848	79.0
2023	$3,593,905	$1,228,574	$9,046,975	$10,275,549	26.0	$48,273,217	81.1
2024	$3,772,112	$1,241,997	$9,408,854	$10,650,851	25.9	$42,513,605	83.8
2025	$3,958,826	$1,254,529	$9,785,208	$11,039,737	25.8	$35,946,818	86.6
2026	$4,154,441	$1,266,076	$10,176,616	$11,442,692	25.7	$28,497,311	89.6
2027	$4,359,371	$1,276,539	$10,583,681	$11,860,220	25.6	$20,083,269	92.8
2028	$4,574,049	$1,285,814	$11,007,028	$12,292,842	25.5	$10,616,120	96.3
2029	$4,798,926	$1,293,788	$0	$1,293,788	2.6	($0)	100.0
2030	$5,034,474	$1,300,343	$0	$1,300,343	2.5	($0)	100.0
2031	$5,281,188	$1,305,352	$0	$1,305,352	2.4	($0)	100.0
2032	$5,539,584	$1,308,682	$0	$1,308,682	2.3	($0)	100.0
2033	$5,810,202	$1,310,189	$0	$1,310,189	2.2	($0)	100.0
2034	$6,093,606	$1,309,723	$0	$1,309,723	2.1	($0)	100.0
2035	$6,390,386	$1,307,123	$0	$1,307,123	2.1	($0)	100.0
2036	$6,701,159	$1,302,220	$0	$1,302,220	2.0	($0)	100.0
2037	$7,026,568	$1,294,833	$0	$1,294,833	1.9	($0)	100.0
2038	$7,367,289	$1,284,772	$0	$1,284,772	1.8	($0)	100.0
2039	$7,724,025	$1,271,834	$0	$1,271,834	1.7	($0)	100.0
2040	$8,097,512	$1,255,805	$0	$1,255,805	1.6	($0)	100.0
2041	$8,421,412	$1,306,037	$0	$1,306,037	1.6	($0)	100.0
2042	$8,758,269	$1,358,279	$0	$1,358,279	1.6	($0)	100.0
2043	$9,108,600	$1,412,610	$0	$1,412,610	1.6	($0)	100.0
2044	$9,472,944	$1,469,114	$0	$1,469,114	1.6	($0)	100.0
2045	$9,851,861	$1,527,879	$0	$1,527,879	1.6	($0)	100.0
2046	$10,245,936	$1,588,994	$0	$1,588,994	1.6	($0)	100.0
2047	$10,655,773	$1,652,554	$0	$1,652,554	1.6	($0)	100.0
2048	$11,082,004	$1,718,656	$0	$1,718,656	1.6	($0)	100.0
2049	$11,525,284	$1,787,402	$0	$1,787,402	1.6	($0)	100.0
2050	$11,986,296	$1,858,898	$0	$1,858,898	1.6	($0)	100.0
2051	$12,465,748	$1,933,254	$0	$1,933,254	1.6	($0)	100.0
2052	$12,964,378	$2,010,585	$0	$2,010,585	1.6	($0)	100.0
2053	$13,482,953	$2,091,008	$0	$2,091,008	1.6	($0)	100.0

** Beginning of Fiscal Year

EXHIBITS

Exhibit 1 - Age/Service Distribution with Salary as of January 1, 2021

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	35	0	0	0	0	0	0	0	0	35
	36,570	0	0	0	0	0	0	0	0	36,570
25-29	63	8	0	0	0	0	0	0	0	71
	40,200	62,838	0	0	0	0	0	0	0	42,751
30-34	23	33	8	0	0	0	0	0	0	64
	50,329	73,608	65,802	0	0	0	0	0	0	64,266
35-39	19	20	10	4	1	0	0	0	0	54
	42,841	63,959	98,679	54,863	0	0	0	0	0	61,588
40-44	20	12	10	10	5	0	0	0	0	57
	32,913	42,943	60,418	94,120	58,830	0	0	0	0	52,862
45-49	13	9	4	12	10	3	0	0	0	51
	32,842	38,474	57,678	85,379	92,155	127,106	0	0	0	65,321
50-54	21	15	23	13	14	11	7	0	0	104
	36,027	46,296	48,513	60,514	72,560	96,309	102,789	0	0	59,118
55-59	14	20	20	20	12	9	15	6	0	116
	39,999	56,326	42,546	55,877	60,858	87,603	95,148	108,362	0	62,509
60-64	11	5	8	15	9	6	6	3	2	65
	54,132	37,383	64,980	48,303	59,013	77,815	87,987	111,268	83,293	62,355
65-69	1	1	3	5	4	4	1	0	0	19
	25,864	48,581	52,729	52,896	48,532	38,858	103,924	0	0	50,031
70+	0	0	1	1	0	0	2	0	0	4
	0	0	29,691	49,415	0	0	55,812	0	0	47,683
Total Employees	220	123	87	80	55	33	31	9	2	640
Average Salary	40,033	57,959	57,730	64,098	67,038	86,408	93,232	109,331	83,293	57,332

Exhibit 2 - Retiree Distribution as of January 1, 2021

	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	0	0	0	0	0
35-39	0	0	0	0	0	0
40-44	0	0	0	0	0	0
45-49	0	0	0	0	0	0
50-54	0	4	4	0	137,291	137,291
55-59	10	13	23	210,563	765,462	976,025
60-64	28	29	57	412,408	1,386,312	1,798,720
65-69	49	42	91	935,077	2,046,372	2,981,449
70-74	48	46	94	968,714	1,823,407	2,792,121
75-79	34	40	74	783,649	1,574,701	2,358,350
80-84	22	12	34	433,708	404,189	837,897
85-89	17	10	27	378,248	282,781	661,029
90-94	5	4	9	71,178	77,996	149,174
95+	3	2	5	92,154	38,704	130,858
Total	216	202	418	4,285,697	8,537,216	12,822,913
Average (Age/Payment)	72.64	71.67	72.17	19,841	42,263	30,677
Frequency Percent	51.7	48.3	100.0	33.4	66.6	100.0

Exhibit 3 - Disabled Retiree Distribution as of January 1, 2021

	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	0	0	0	0	0
35-39	1	1	2	53,311	71,798	125,109
40-44	0	0	0	0	0	0
45-49	0	0	0	0	0	0
50-54	2	3	5	82,804	153,011	235,815
55-59	2	7	9	59,363	496,322	555,685
60-64	1	5	6	35,984	265,097	301,082
65-69	0	6	6	0	298,214	298,214
70-74	1	2	3	29,615	95,127	124,742
75-79	1	4	5	16,326	141,257	157,583
80-84	0	0	0	0	0	0
85-89	0	0	0	0	0	0
90-94	0	1	1	0	36,942	36,942
95-99	0	0	0	0	0	0
Total	8	29	37	277,403	1,557,768	1,835,171
Average (Age/Payment)	58.8	64.2	63.1	34,675	53,716	49,599
Frequency Percent	21.6	78.4	100.0	15.1	84.9	100.0

EXHIBIT 4 - CASHFLOW FORECAST:

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

Plan Year Ending	Benefit Payments	Employee Contributions	Employer Contributions	Investment Returns	Net change in plan assets
2021	$18,950,108	$3,423,826	$9,524,576	$14,492,750	$8,491,044
2022	17,157,313	3,593,905	10,275,549	15,235,665	11,947,806
2023	17,951,753	3,772,112	10,650,851	16,116,401	12,587,611
2024	18,773,853	1,765,812	11,039,737	17,044,710	11,076,406
2025	19,622,013	4,154,441	11,442,692	18,023,829	13,998,948
2026	20,425,522	4,359,371	11,860,220	19,059,967	14,854,036
2027	21,234,003	4,574,049	12,292,842	20,160,743	15,793,630
2028	21,955,276	4,798,926	1,293,788	20,914,405	5,051,843
2029	22,655,805	2,680,326	1,300,343	21,268,600	2,593,463
2030	23,378,686	5,281,188	1,305,352	21,614,263	4,822,117
2031	24,124,632	5,539,584	1,308,682	21,949,779	4,673,413
2032	24,894,379	5,810,202	1,310,189	22,273,389	4,499,402
2033	25,688,686	6,093,606	1,309,723	22,583,174	4,297,817
2034	26,508,337	6,390,386	1,307,123	22,877,045	4,066,218
2035	27,354,141	3,676,708	1,302,220	23,152,730	777,517
2036	28,226,932	7,026,568	1,294,833	23,407,758	3,502,228
2037	29,127,571	7,367,289	1,284,772	23,639,445	3,163,935
2038	30,056,947	7,724,025	1,271,834	23,844,878	2,783,790
2039	31,015,977	8,097,512	1,255,805	24,020,894	2,358,234
2040	32,005,606	8,421,412	1,306,037	24,161,592	1,883,435
2041	33,026,812	8,758,269	1,358,279	24,265,527	1,355,263
2042	34,080,601	9,108,600	1,412,610	24,328,662	769,271
2043	35,168,014	9,472,944	1,469,114	24,346,621	120,665
2044	36,290,123	9,851,861	1,527,879	24,314,669	(595,714)
2045	37,448,035	10,245,936	1,588,994	24,227,683	(1,385,423)
2046	38,642,893	10,655,773	1,652,554	24,080,121	(2,254,445)
2047	39,875,875	11,082,004	1,718,656	23,865,993	(3,209,223)
2048	41,148,198	11,525,284	1,787,402	23,578,822	(4,256,690)
2049	42,461,118	11,986,296	1,858,898	23,211,611	(5,404,313)
2050	43,728,686	12,465,748	1,933,254	22,760,013	(6,569,671)

EXHIBIT 5 – SUMMARY OF PLAN PROVISIONS:

This summary is prepared in accordance with Chapter 32 as of January 1, 2021, 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, if hired before April 2, 2012

(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 Retirement	Percentage of Average Salary 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	Percentage of Average Salary		
Retirement	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. <u>Deferred Vested Retirement</u>

a. Eligibility:

A participant who has completed ten or more years of creditable service is eligible for a deferred vested retirement benefit. If termination is involuntary, the participant is vested after six years.

b. Benefit Amount:

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

c. Refund of Contributions:

In lieu of the deferred pension benefit, a member may elect to receive a refund of their accumulated 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 $450 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 $12,000. All COLAs granted to members after 1981 and prior to July 1, 1998 are deemed to be an obligation of the State and are not the liability of the Retirement System.

13. Postretirement Death Benefits

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

(i) Option A – Life annuity

(ii) Option B – Life annuity with death benefit equal to excess of member contributions plus credited interest to retirement over annuity benefit paid to member

(iii) Option C – Life annuity with 66-2/3% of benefit continued after death of member to designated joint annuitant

EXHIBIT 6 – ACTUARIAL METHODS AND ASSUMPTIONS:

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

1. **Member Data**

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

2. **Valuation Date**

   January 1, 2021.

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 7.5% per annum.

5. **Salary Scale**

   It is assumed that salaries including longevity will increase at a rate of 3.75% per year.

6. **Cost-of-Living Increases**

   Cost-of-living increases have been assumed to be 3.0% of the lesser of the pension amount and $12,000 per year.

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	0.1500
5	0.1020	0.1000
10	0.0650	0.0600
15	0.0417	0.0600
20	0.0400	0.0000
30	0.0000	0.0000

9. Annual Rate of Mortality

It is assumed that mortality for is represented by the various SOA Pub-2010 Public Retirement Plans Mortality Tables specific to the Group, Pre-retirement versus Post, Disabled and Beneficiaries, with Scale MP-2018 improvements until 2025.

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	0.0382
51	0.0405	0.0714	0.0351
52	0.0437	0.0562	0.0436
53	0.0366	0.0448	0.0527
54	0.0451	0.0488	0.0999
55	0.0477	0.0469	0.1110
56	0.0574	0.0518	0.1413
57	0.0632	0.0509	0.1292
58	0.0765	0.0552	0.1499
59	0.0917	0.0645	0.1679
60	0.1057	0.0774	0.1871
61	0.1224	0.1038	0.2073
62	0.1473	0.1168	0.2176
63	0.1777	0.1440	0.3338
64	0.2136	0.1708	0.5664
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	0.0191
51	0.0000	0.0000	0.0176
52	0.0000	0.0000	0.0436
53	0.0000	0.0000	0.0211
54	0.0000	0.0000	0.0266
55	0.0000	0.0000	0.0370
56	0.0000	0.0000	0.1060
57	0.0000	0.0000	0.1938
58	0.0000	0.0000	0.1499
59	0.0000	0.0000	0.1119
60	0.0477	0.0469	0.0936
61	0.0574	0.0518	0.1555
62	0.0632	0.0509	0.1741
63	0.0765	0.0552	0.2670
64	0.0917	0.0645	0.4720
65	0.1057	0.0774	0.2500
66	0.1224	0.1038	0.3000
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	0.2500	0.2000	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 20% of all disabilities are ordinary (80% are service connected). For police and fire employees, 10% of all disabilities are assumed to be ordinary (90% 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 2021 is $297,000 and is anticipated to increase at 4.5% 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 Marlborough Retirement System contributing as of January 1, 2021, 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

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Daniel W. Sherman, ASA, MAAA

August, 2021

BREAKOUTS

Breakouts

	Total	City	Fire	Police	School	Water and Sewer	Housing
(1) Payroll of Active Participants	$38,068,187	$9,390,064	$7,559,418	$7,527,500	$10,870,832	$2,225,925	$494,448
Pecentage of Total Payroll	100.00%	24.67%	19.86%	19.77%	28.56%	5.85%	1.30%
(2) Normal Cost							
(a) Employee	3,423,826	856,455	696,165	691,710	931,172	203,609	44,715
(b) Employer	874,219	133,975	201,568	178,918	314,032	34,613	11,114
(c) Expenses	297,000	68,440	62,034	60,161	86,045	16,461	3,858
(d) Total Employer Normal Cost	1,171,219	202,415	263,602	239,079	400,077	51,074	14,972
(3) Unfunded Accrued Liability							
(a) Accrued Liability	251,772,060	64,621,258	64,834,540	61,117,360	47,204,517	11,796,408	2,197,977
(b) Assets	198,863,212	51,041,370	51,209,832	48,273,802	37,284,685	9,317,442	1,736,081
(c) Unfunded Accrued Liability	52,908,848	13,579,888	13,624,708	12,843,558	9,919,832	2,478,966	461,896
(4) Total Employer Contribution							
(a) Amortizations	8,329,222	2,137,826	2,144,882	2,021,908	1,561,638	390,253	72,714
(b) Employer Normal Cost	874,219	133,975	201,568	178,918	314,032	34,613	11,114
(c) Administrative Expenses*	297,000	68,440	62,034	60,161	86,045	16,461	3,858
(d) Total Appropriation	$9,500,441	$2,340,241	$2,408,484	$2,260,987	$1,961,715	$441,327	$87,686
(e) As a percentage of Payroll	24.96%	24.92%	31.86%	30.04%	18.05%	19.83%	17.73%
(5) Fiscal 2023 Appropriation	$10,275,549	$2,531,173	$2,604,984	$2,445,453	$2,121,765	$477,334	$94,840
Percent of Total Appropriation	100.00%	24.63%	25.35%	23.80%	20.65%	4.65%	0.92%
(6) Fiscal 2024 Appropriation	$10,650,851	$2,623,621	$2,700,128	$2,534,771	$2,199,259	$494,768	$98,304
Percent of Total Appropriation	100.00%	24.63%	25.35%	23.80%	20.65%	4.65%	0.92%
(7) *Fiscal 2022 Based on Payroll*	$9,187,513	$6,462,497	N/A	N/A	$2,604,660	N/A	$120,356