

City of Manchester Employees'
Contributory Retirement System
Annual Actuarial Valuation Report
December 31, 2017



Contents

Section	Page	
1-2		<i>Introduction</i>
A		<i>Valuation Results</i>
	1	Executive Summary
	2	Summary Statement of System Resources and Obligations
	3	Asset Information
	4-5	Valuation Assets and Unfunded Actuarial Accrued Liability
	6	Derivation of Experience Gain (Loss)
	7-9	Computed Contributions
	10-15	Comments & Observations
	16-20	Comparative Statements
	21-23	Unfunded Actuarial Accrued Liability Schedules
B		<i>Benefit Provisions and Valuation Data</i>
	1-3	Summary of Benefit Provisions
	4-8	Retired Life Data
	9	Inactive Vested Members
	10-11	Active Member Data
C		<i>Valuation Methods and Assumptions</i>
	1	Actuarial Cost Method
	2-7	Actuarial Assumptions
	8	Miscellaneous and Technical Assumptions
D		<i>Operation of the Retirement System</i>
	1-2	Financial Objective
	3	Financing Diagram
	4	Flow of Money
	5	Glossary



April 17, 2018

Board of Trustees
City of Manchester Employees'
Contributory Retirement System
1045 Elm Street, Suite 403
Manchester, New Hampshire 03101-1824

Dear Board Members:

The results of the December 31, 2017 **Annual Actuarial Valuation of the City of Manchester Employees' Contributory Retirement System (MECRS)** are presented in this report. The purposes of the valuation were:

- to measure the System's funding progress; and
- to calculate the employer contribution rate for the City's fiscal year 2019.

The results of this valuation may not be applicable for other purposes.

The valuation results summarized in this report involve actuarial calculations that require assumptions about future events. We believe that the assumptions and methods used in this report are reasonable and appropriate for the purpose for which they have been used. However, other assumptions and methods could also be reasonable and could result in materially different results. In addition, because it is not possible or practical to consider every possible contingency, we may use summary information, estimates or simplifications of calculations to facilitate the modeling of future events. We may also exclude factors or data that are deemed to be immaterial.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to: actual plan experience differing from assumed; changes in economic or demographic assumptions; changes in funding policy; changes in plan provisions or applicable law; etc. An analysis of the potential range of such future measurements was beyond the scope of this valuation.

Information required for GASB Statements No. 67 and No. 74 will be provided in separate reports.

If there is other information that you need in order to make an informed decision regarding the matters discussed in this report, please contact us.

The valuation was based upon information, furnished by the Retirement System, concerning Retirement System benefits, financial transactions, and individual members, terminated members, retirees and beneficiaries. Data was checked for year-to-year consistency, but was not audited.

This report has been prepared by individuals who have substantial experience valuing public employee retirement systems. To the best of our knowledge, this report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board of the American Academy of Actuaries. The actuarial assumptions used for the valuation produce results which, individually and in the aggregate, are reasonable. We certify that the information contained in this report is accurate and fairly presents the actuarial position of MECSRS as of December 31, 2017. GRS is not responsible for unauthorized use of this report.

This report replaces our preliminary report dated March 9, 2018. Results presented in this report are unchanged from those presented in the preliminary report.

Heidi G. Barry is a Member of the American Academy of Actuaries (MAAA), and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. The signing individuals are independent of the plan sponsors.

Respectfully submitted,



Kenneth G. Alberts



Heidi G. Barry, ASA, FCA, MAAA

KGA/HGB:bd



SECTION A

VALUATION RESULTS

Executive Summary

Funding Objective

The funding objective of the Retirement System is to establish and receive contributions which, when expressed as percents of active member payroll, will remain approximately level from year to year and will accumulate sufficient assets over each member's working lifetime to finance promised benefits throughout retirement.

Contribution Rates

The Retirement System is supported by member contributions, City contributions and investment income from Retirement System assets.

Contributions which satisfy the funding objective are determined by the annual actuarial valuation and are sufficient to:

- Cover the actuarial present value of benefits allocated to the current year by the actuarial cost method described in Section C (the normal cost); and
- Finance over a period of future years the actuarial present value of benefits not covered by valuation assets and anticipated future normal costs (unfunded actuarial accrued liability).

The computed pension contribution rate for the City's fiscal year 2019 is 25.12% of covered payroll. **The computed health subsidy contribution rate** for the City's fiscal year 2019 is 1.75% of covered payroll. The details of these contribution rates are shown on pages A-7 and A-8.

The contribution rates are sufficient to finance the employer normal cost and to amortize the unfunded pension actuarial accrued liability (full funding credit) as a level percent-of-payroll over a period of 22 years for pension benefits, and 22 years for health subsidy benefits.

Summary Statement of System Resources and Obligations

December 31, 2017

Present Resources and Expected Future Resources

	Pension	Health
A. Actuarial value of System assets:		
1. Net assets from System financial statements	\$219,277,973	\$12,535,536
2. Funding value adjustment	(2,194,031)	(125,427)
3. Valuation assets	217,083,942	12,410,109
B. Present value of expected future employer contributions:		
1. For normal costs	36,804,233	0
2. For unfunded actuarial accrued liabilities	127,334,354	13,658,967
3. Totals	164,138,587	13,658,967
C. Present value of expected future member contributions:	17,842,982	5,947,661
D. Total Present and Expected Future Resources	\$399,065,511	\$32,016,737

Actuarial Present Value of Expected Future Benefit Payments

	Pension	Health
A. To retirees and beneficiaries:	\$184,072,365	\$13,433,829
B. To vested terminated members:	5,633,509	442,925
C. To present active members:		
1. Allocated to service rendered prior to valuation date	154,712,422	12,528,424
2. Allocated to service likely to be rendered after valuation date	54,647,215	5,611,559
3. Total	209,359,637	18,139,983
D. Total Actuarial Present Value of Expected Future Benefit Payments	\$399,065,511	\$32,016,737

Summary of Current Asset Information Furnished for the Valuation

Balance Sheet

Reported Assets - Actuarial Value as of December 31		
	2017	2016
Cash & Equivalents	\$ 4,556,531	\$ 3,158,371
Investments	227,878,034	199,669,533
Receivables	319,096	307,775
Property, Plant, Equipment	2,504	3,338
Accrued Interest & Dividends	28,887	35,853
Receivable for Add'l Contribution Calculator	50	500
Payable for Investments Purchased	(1,680)	(93,985)
Accounts Payable	(381,113)	(248,656)
Benefits Payable	(1,423,563)	(1,340,095)
Additional Contribution Account	834,763	894,303
Other	0	0
Market Value Total	231,813,509	202,386,937
Funding Value Adjustment	(2,319,458)	13,878,948
Total Valuation Assets	\$229,494,051	\$216,265,885

Revenues and Expenditures

	2017	2016
Funding Value - January 1	\$216,265,885	\$209,192,563
Revenues		
Employees' Contributions	3,022,314	3,068,947
Employer Contributions	12,937,285	8,841,353
Recognized Investment Income	16,713,431	13,737,690
Total	32,673,030	25,647,990
Expenditures		
Benefit Payments	17,560,065	16,668,123
Refund of Member Contributions	229,271	220,469
Expenses and Fees	1,655,528	1,686,076
Total	19,444,864	18,574,668
Funding Value - December 31	\$229,494,051	\$216,265,885
Rate of Return Recognized	7.4 %	6.3 %

Development of Funding Value of Assets

Year Ended December 31:	2015	2016	2017	2018	2019	2020	2021
A. Funding Value Beginning of Year	\$200,578,642	\$209,192,563	\$216,265,885				
B. Market Value End of Year	196,110,677	202,386,937	231,813,509				
C. Market Value Beginning of Year	202,146,990	196,110,677	202,386,937				
D. Non-Investment Net Cash Flow	(939,910)	(5,811,550)	(2,631,657)				
D1. Post-Valuation Adjustment	(81,290)	0	0				
E. Investment Income							
E1. Market Total: B - C - D - D1	(5,015,113)	12,087,810	32,058,229				
E2. Amount for Immediate Recognition (7.25%)	14,507,880	14,955,792	15,583,879				
E3. Amount for Phased-In Recognition: E1-E2	(19,522,993)	(2,867,982)	16,474,350				
F. Phased-In Recognition of Investment Income							
F1. Current Year: 0.20 x E3	(3,904,599)	(573,596)	3,294,870				
F2. First Prior Year	(1,330,034)	(3,904,599)	(573,596)	\$ 3,294,870			
F3. Second Prior Year	2,789,301	(1,330,034)	(3,904,599)	(573,596)	\$ 3,294,870		
F4. Third Prior Year	948,010	2,789,301	(1,330,034)	(3,904,599)	(573,596)	\$ 3,294,870	
F5. Fourth Prior Year	(3,456,727)	948,008	2,789,303	(1,330,036)	(3,904,597)	(573,598)	\$ 3,294,870
F6. Total Recognized Investment Gain	(4,954,049)	(2,070,920)	275,944	(2,513,361)	(1,183,323)	2,721,272	3,294,870
G. Preliminary Funding Value End of Year: A + D + E2 + F6	209,192,563	216,265,885	229,494,051				
H. Actuarial Value after Application of 20% Corridor Limit	209,192,563	216,265,885	229,494,051				
I. Difference between Market & Funding Value	(13,081,886)	(13,878,948)	2,319,458				
J. Recognized Rate of Return	4.8 %	6.3 %	7.4 %				
K. Market Rate of Return	(2.5)%	6.3 %	15.9 %				
L. Ratio of Funding Value to Market Value	106.7 %	106.9 %	99.0 %				

The Funding Value of Assets recognizes assumed investment income (line E2) fully each year. Differences between actual and assumed investment income (line E3) are phased-in over a closed 5-year period. During periods when investment performance exceeds the assumed rate, Funding Value of Assets will tend to be less than Market Value. During periods when investment performance is less than the assumed rate, Funding Value of Assets will tend to be greater than Market Value. The Funding Value of Assets is unbiased with respect to Market Value. At any time it may be either greater or less than Market Value. If actual and assumed rates of retirement income are exactly equal for four consecutive years, the Funding Value will become equal to Market Value.

Allocation of Funding Value of Assets Year Ended December 31, 2017

(A) Total Market Value	\$231,813,509
(B) Pension Market Value	\$219,277,973
(C) Ratio: (B)/(A)	94.5924%
(D) Total Funding Value	\$229,494,051
(E) Pension Funding Value: (D) x (C)	\$217,083,942
(F) Health Funding Value: (D) - (E)	\$ 12,410,109

Development of Unfunded Actuarial Accrued Liability Year Ended December 31, 2017

	Pension	Health
Present Value of Future Benefits - Retirees	\$184,072,365	\$13,433,829
Present Value of Future Benefits - Deferreds	5,633,509	442,925
Present Value of Future Benefits - Actives	209,359,637	18,139,983
Total Present Value of Future Benefits	\$399,065,511	\$32,016,737
Present Value of Future Normal Cost	54,647,215	5,611,559
Actuarial Accrued Liability	\$344,418,296	\$26,405,178
Actuarial Value of Assets	217,083,942	12,410,109
Unfunded Actuarial Accrued Liability	\$127,334,354	\$13,995,069
Funded Ratio	63.0%	47.0%

Derivation of Experience Gain (Loss) Year Ended December 31, 2017

Actual experience will never (except by coincidence) match exactly with assumed experience. Gains and losses often cancel each other over a period of years, but sizable year-to-year fluctuations are common. Detail on the derivation of the experience gain (loss) is shown below, along with a year-by-year comparative schedule.

	Pension	Health
(1) UAAL* at start of year	\$116,772,778	\$11,872,984
(2) Total normal cost from last valuation	6,605,720	629,368
(3) Actual contributions (employer & employee)	14,360,431	1,396,036
(4) Interest accrual: $[(1) + 1/2 ((2) - (3))] \times 0.0725$	8,184,918	833,000
(5) Expected UAAL before changes: (1) + (2) - (3) + (4)	117,202,985	11,939,316
(6) Change from new assumptions and methodology	9,866,319	2,188,276
(7) Change from ad-hoc COLA increases (above or below assumed)	(409,476)	N/A
(8) Change from Chapter 159 service upgrade	203,132	N/A
(9) Expected UAAL after changes: (5) + (6) + (7) + (8)	126,862,960	14,127,592
(10) Actual UAAL at end of year	127,334,354	13,995,069
(11) Gain (loss): (9) - (10)	(471,394)	132,523
(12) Gain (loss) as percent of actuarial accrued liabilities at start of year	(0.1)%	0.6 %

* *Unfunded Actuarial Accrued Liability.*

Valuation Date	Experience Gain (Loss) as % of Beginning Accrued Liability	
	Pension	Health
December 31		
2008	(14.3)%	(2.8)%
2009	(0.3)%	2.8 %
2010	(0.2)%	1.9 %
2011	(2.6)%	(2.8)%
2012	(4.2)%	(3.1)%
2013	(0.1)%	(0.1)%
2014	(0.8)%	(1.1)%
2015	(2.9)%	(6.2)%
2016	0.4 %	(0.8)%
2017	(0.1)%	0.6 %

Computed Contributions for the City's Fiscal Year 2019

Contributions For	Contributions Expressed as % of Active Member Payroll
Total Normal Cost	12.92%
Member Contributions	<u>3.75%</u>
Employer Normal Cost	9.17%
Unfunded Actuarial Accrued Liabilities*	15.95%
Employer Pension Total	25.12%
Health Contribution**	<u>1.75%</u>
Employer Total	26.87%
Valuation Payroll	\$ 53,364,536
Projected Payroll	\$ 55,580,888
Estimated Contribution Dollars	\$ 14,934,585
<u>Pension</u>	
Unfunded Actuarial Accrued Liabilities	\$127,334,354
Funded Status	63.0%
<u>Health</u>	
Unfunded Actuarial Accrued Liabilities	\$ 13,995,069
Funded Status	47.0%

* Unfunded actuarial accrued liabilities for pension are currently financed as a level percent of payroll over a remaining amortization period of 22 years.

** Currently based on a remaining 22-year amortization of unfunded actuarial accrued liabilities for Health.

Note: For each 1% ad-hoc COLA increase above the assumed COLA, the UAAL will increase by approximately \$1,841,000 and the employer contribution rate will increase by approximately 0.24% (based on current payroll and a 22-year amortization period). In developing these costs for the ad-hoc COLA increase, it was assumed that the increase would be a one-time permanent increase to all members retired as of December 31, 2017 and the additional liability would be amortized over 22 years. It was also assumed that the increase would be effective on January 1, 2018.

The computed contributed rate shown above is in compliance with the Board's funding policy. Users of this report should be aware that contributions made at that rate do not guarantee benefit security. Given the importance of benefit security to any retirement system, we recommend benefit security be considered when adopting a contribution rate. The Board is free to adopt a larger contribution rate than shown herein, if they believe it to be appropriate and if such larger contribution is based on sound actuarial funding, methods and assumptions.

Computed Contributions for the City's Fiscal Year 2019

Contribution Rate Reconciliation	% of Payroll		
	Pension	Health	Total
Last Year's Rate	23.05 %	1.40 %	24.45 %
Normal Cost Change	(0.05)%	(0.02)%	(0.07)%
Miscellaneous Changes in Group Demographics	0.05 %	0.00 %	0.05 %
Assumption and Methodology Changes [#]	1.76 %	0.36 %	2.12 %
Employer Portion of SB 402 Purchases	0.01 %	0.00 %	0.01 %
COLA (portion above/(below) the assumption)	(0.05)%	0.00 %	(0.05)%
Payroll growth less than expected	0.29 %	0.03 %	0.32 %
Experience (Gain) Loss	0.06 %	(0.02)%	0.04 %
This Year's Rate	25.12%	1.75 %	26.87%

See Comments.

FY 2017 City True-Up Contributions Payable During City's Fiscal Year 2019*

	City Non-EPD and Parking	City EPD and Parking	Total City
(1) Projected Fiscal Year 2017 Payroll	\$29,971,706	\$2,782,872	\$32,754,578
(2) Actual Fiscal Year 2017 Payroll #	31,205,176	2,942,604	34,147,780
(3) True-Up Rate (2)/(1) - 1.00	4.12%	5.74%	4.25%
(4) FY 2017 Semi-Annual Contribution (Actual)			
Pension	\$ 3,309,878	\$ 307,322	\$ 3,617,200
Health	185,518	17,225	202,743
Total	\$ 3,495,396	\$ 324,547	\$ 3,819,943
(5) Semi-Annual Shortfall/(Overage)			
Pension	\$ 136,367	\$ 17,640	\$ 154,007
Health	7,643	989	8,632
Total	\$ 144,010	\$ 18,629	\$ 162,639
(6) Fiscal Year 2017 True-Up as of July 1, 2018			
(5) $*(1.0725^{0.5})*(1.07^{0.5})$			
Pension	\$ 146,083	\$ 18,897	\$ 164,980
Health	8,188	1,059	9,247
Total	\$ 154,271	\$ 19,956	\$ 174,227

This information was provided by the System in aggregate, by group, independent of the member data.

* This information will no longer be accounted for in future valuations.

The true-up is to account for the differences in actual and assumed payroll that would have affected the contribution had the City been making contributions on a payroll period basis.

Comments

Comment A

Results: The Retirement System is 63.0% funded for pension benefits and 47.0% funded for health subsidy benefits as of December 31, 2017. The pension Unfunded Actuarial Accrued Liability (UAAL) of \$127,334,354 is amortized over a closed 22-year period; the health subsidy UAAL of \$13,995,069 is amortized over a closed 22-year period.

Comment B

Experience: Experience during the year ended December 31, 2017 was less favorable than assumed for pension benefits and more favorable than assumed for the health subsidy, resulting in a net experience loss for pensions and an experience gain for the health subsidy. For pension benefits, the losses in retiree and deferred member experiences were partially offset by a 1.00% ad-hoc COLA being paid during 2017 (versus 1.25% assumed), pay increases less than assumed, and investment return on a funding value basis that was higher than expected (7.25% assumed versus 7.4% recognized). Overall, the pension experience loss was approximately 0.1% of beginning of year liabilities. The pension funding status decreased from 63.7% to 63.0% during the year. The primary source of experience gain for health was investment return. Overall, the health experience gain was approximately 0.6% of beginning of year liabilities. The health funding status decreased from 48.4% to 47.0% during the year. The primary reason for the decline in the funded status was the assumption changes adopted by the Board (see Comment C).

The recognized rate of return was 7.4%, despite the fact that the return on a market value basis was 15.9% (net of expenses). Due to the fact that investment experience above or below assumed is spread over 5 years, one fifth of this year's gain was added to the portion of gains and losses from the previous 4 years scheduled to be recognized this year, resulting in an overall gain. It is important to note that next year, we anticipate recognizing a market loss in total if the market rate of return is below 12% (after accounting for the gains and losses scheduled to be recognized next year), resulting in upward pressure on contributions.

Comments (Continued)

Comment C

A number of assumptions were modified as a result of the experience study for the 5-year period ended December 31, 2016.

Demographic Assumptions – Rates used to model mortality, salary increases, withdrawals, and retirements were updated for the December 31, 2017 valuation. Additionally, the COLA assumption for retired members was reduced from 1.25% to 1.00% and the load used to account for end of career payments that are not included in active valuation data was increased from 9% to 10%. The combined effect of these assumption changes resulted in an increase in accrued liability of approximately \$700,000 while their effect on the computed contribution was a decrease of about \$100,000 or 0.21% of active member payroll.

Economic Assumptions – The expected rate of investment return was lowered from 7.25% to 7.00% for the December 31, 2017 valuation. This change increased accrued liabilities by approximately \$9 million and increased the computed contribution by \$800,000 or 1.48% of active member payroll.

Administrative Expenses – To better reflect the System's observed historical administrative expenses, the normal cost load was increased from 0.5% to 1.0% of active member payroll.

The changes to demographic and economic assumptions described above had the effect of increasing health subsidy liabilities by \$1.3 million and \$0.8 million, respectively.

The Board-adopted assumptions were previously Alternate 2 from our Experience Study. However, the Board elected not to change the load for end of career payments as much as recommend in the study due to expectations that future experience will differ from past experience due to the expiration of certain temporary incentives. The Board also elected to accelerate the next experience study from 2022 to 2020. We believe the Board-adopted assumptions are reasonable.

Comments (Continued)

Comment D

Benefit Changes:

1. The previously adopted SB402 allows for members to upgrade their benefit multiplier under Chapter 159 from 1.5% to 2.0% per year of service rendered prior to 1999 when they choose. Liabilities increased approximately \$406,264 as a result of members electing to purchase this benefit during 2017. An additional \$203,132 in member contributions was contributed as a result of these elections.
2. COLA increases were assumed to be 1.25% of current pensions (future COLA increases are assumed to be 1.00%). In 2017, actual increases were 1.00% of current pensions.

Comment E

Retiree Health Benefits: Post-retirement health care benefits are funded in part by retired members (via co-pays, deductibles, etc.), but mostly by employer contributions to the Retirement System that are permitted (up to certain limits) by §401(h) of the U.S. Internal Revenue Code. IRC §401(h) permits a defined benefit plan to provide medical benefits for retired employees if, among other things:

- A separate medical care account is maintained.
- The benefits satisfy non-discrimination rules.
- The medical benefits, along with any life insurance provided by the plan, are subordinate to the retirement benefits. Benefits are considered subordinate if they do not exceed 25% of the aggregate contributions other than contributions to fund past service liabilities.

The health care contribution rate was determined to pass the 25% test for the 2019 City fiscal year as follows:

Employer Pension Rate (not more than normal cost)	9.17%
Employee Pension Rate	3.75%
Total Pension Rate*	<u>12.92%</u>
Maximum Health Rate (1/3 x Pension Rate)	4.31%
Employee Health Rate	1.25%
Maximum Employer Health Rate	<u>3.06%</u>
Actual Employer Health Rate	1.75%

* Smaller of actual contribution or projected unit credit normal cost rate.

Although the IRC §401(h) allows for a much more complicated test, the results of the simplified approach illustrated above indicate that the more complicated test is not warranted.

Comments (Concluded)

Comment F

Health Valuation: Post-retirement health subsidy valuation results were included in this valuation. Effective with the December 31, 2007 valuation, we set the utilization assumption at 60%. Effective with the December 31, 2012 valuation, this assumption is 55%.

New Retirements in Year	New Retirees	New Recipients Electing Health Care Subsidy	Election %
2006	35	17	48.6%
2007	38	19	50.0%
2008	36	20	55.6%
2009	39	18	46.2%
2010	34	18	52.9%
2011	50	28	56.0%
2012	55	30	54.5%
2013	51	26	51.0%
2014	52	29	55.8%
2015	89	55	61.8%
2016	53	27	50.9%
2017	55	32	58.2%

Comment G

Health Valuation: The calculations contained herein were not intended to satisfy the parameters of GASB Statement No. 74 and should not be used for that purpose. Separate calculations are needed for GASB Statement No. 74 which will be provided in a separate report.

Comments (Concluded)

Comment H

Increase in Final Average Earnings: As stated on page A-11, the load for end of career payments affecting the final average compensation was increased from 9% to 10%. Below is a historical schedule of these increases over the last 10 years.

Year Ended December 31,	Average Increase in Final Average Earnings from Expected Amount
2008	10.3%
2009	8.8%
2010	9.3%
2011	11.0%
2012	13.8%
2013	14.5%
2014	15.4%
2015*	17.4%
2016	10.1%
2017	11.9%
5-year Average	13.9%
10-year Average	12.3%

* *Final Average Earnings before and after lump sums in 2015 were calculated based on member data as well as option factors from the previous actuary. For all other years, this lump sum information was provided.*

In 2013 through 2015, the City provided a retirement incentive that increased end-of-career payments. This program has expired and is not expected to be re-opened.

Certification: We certify that the valuation is complete and accurate and was made in accordance with generally recognized actuarial methods. The actuarial assumptions summarized in Section C, are in aggregate, a reasonable representation of the past and anticipated future experience of the System.

Other Observations

General Implications of Contribution Allocation Procedure or Funding Policy on Future Expected Plan Contributions and Funded Status

Given the plan's contribution allocation procedure, if all actuarial assumptions are met (including the assumption of the plan earning 7.00% on the actuarial value of assets), it is expected that:

- 1) The employer normal cost as a percentage of pay will remain approximately level year to year*;
- 2) The unfunded actuarial accrued liability will be fully amortized after 22 years; and
- 3) The funded status of the plan will increase gradually toward a 100% funded ratio.

Limitations of Funded Status Measurement

Unless otherwise indicated, a funded status measurement presented in this report is based upon the actuarial accrued liability and the actuarial value of assets. Unless otherwise indicated, with regard to any funded status measurements presented in this report:

- 1) The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations.
- 2) The measurement is inappropriate for assessing the need for or the amount of future employer contributions.
- 3) The measurement would produce a different result if the market value of assets were used instead of the actuarial value of assets, unless the market value of assets is used in the measurement.

Limitation of Project Scope

Actuarial standards do not require the actuary to evaluate the ability of the plan sponsor or other contributing entity to make required contributions to the plan when due. Such an evaluation was not within the scope of this project and is not within the actuary's domain of expertise. Consequently, the actuary performed no such evaluation.

* *Service rendered after 2000 has a higher benefit multiplier than service rendered before 2000, unless members elect to upgrade their pre-2000 service. Normal Costs are gradually increasing to the post-2000 benefit level as members with pre-2000 service are replaced or upgrade their service.*

Comparative Statement

Valuation Date December 31	Active Members				
	Number	Ratio to Retired	Valuation Payroll		% Increase
			Total	Average	
2008	1,323	2.23	\$ 50,740,516	\$ 38,353	4.7%
2009	1,300	2.08	50,547,690	38,883	1.4%
2010	1,285	2.01	51,399,670	40,000	2.9%
2011	1,228	1.83	51,117,552	41,627	4.1%
2012	1,200	1.70	51,881,338	43,234	3.9%
2013	1,194	1.64	53,315,564	44,653	3.3%
2014	1,200	1.59	54,267,183	45,223	1.3%
2015	1,195	1.46	52,953,903	44,313	(2.0)%
2016	1,180	1.38	52,888,074	44,820	1.1 %
2017	1,176	1.33	53,364,536	45,378	1.2 %

Valuation Date December 31	Retirees & Beneficiaries						Annual Contributions as a Percent-of-Payroll				
	Pension			Health			Member		Employer		Total
	Number	Annual Benefits	% of Payroll	Number	Annual Benefits	% of Payroll	Pension	Health	Pension	Health	
2008#	594	\$ 8,170,348	16.1%	162	\$ 245,670	0.5%	3.75%	1.25%	17.17%	0.93%	23.10%
2009#	625	8,460,381	16.7%	166	275,852	0.5%	3.75%	1.25%	17.65%	0.85%	23.50%
2010	638	8,730,024	17.0%	177	309,902	0.6%	3.75%	1.25%	17.71%	0.87%	23.58%
2011	672	9,551,437	18.7%	197	375,224	0.7%	3.75%	1.25%	18.75%	0.97%	24.72%
2012#	707	10,526,696	20.3%	218	458,179	0.9%	3.75%	1.25%	20.03%	0.93%	25.96%
2013	729	11,612,189	21.8%	232	529,007	1.0%	3.75%	1.25%	20.20%	0.93%	26.13%
2014	756	12,906,232	23.8%	242	607,239	1.1%	3.75%	1.25%	20.72%	0.99%	26.71%
2015	821	15,493,622	29.3%	291	791,658	1.5%	3.75%	1.25%	22.48%	1.26%	28.74%
2016	856	16,071,550	30.4%	310	880,155	1.7%	3.75%	1.25%	23.05%	1.40%	29.45%
2017#	882	17,033,836	31.9%	325	975,855	1.8%	3.75%	1.25%	25.12%	1.75%	31.87%

After changes in methods and/or assumptions.

Actuarial Accrued Liabilities and Valuation Assets Comparative Statement – Pension Only

Valuation Date December 31	Actuarial Accrued Liability (AAL)	Valuation Assets	Unfunded Actuarial Accrued Liability (UAAL)	Ratio of Present Assets to AAL*	Ratio of UAAL to Valuation Payroll
2005#	\$ 147,915,666	\$ 113,856,253	\$ 34,059,413	77.0 %	72.1 %
2006#	172,538,747	126,293,879	46,244,869	73.2 %	97.3 %
2007#	187,625,784	139,240,661	48,385,123	74.2 %	99.6 %
2008#	201,439,017	125,991,904	75,447,113	62.5 %	148.7 %
2009#	222,904,634	134,782,503	88,122,131	60.5 %	174.3 %
2010	234,039,084	145,933,282	88,105,802	62.4 %	171.4 %
2011	248,441,353	153,033,601	95,407,752	61.6 %	186.6 %
2012#	262,682,042	161,864,937	100,817,105	61.6 %	194.3 %
2013	280,332,480	177,961,782	102,370,698	63.5 %	192.0 %
2014	297,090,927	191,145,542	105,945,385	64.3 %	195.2 %
2015	314,355,740	198,932,682	115,423,058	63.3 %	218.0 %
2016	321,887,981	205,115,203	116,772,778	63.7 %	220.8 %
2017#	344,418,296	217,083,942	127,334,354	63.0 %	238.6 %

After changes in methods and/or assumptions.

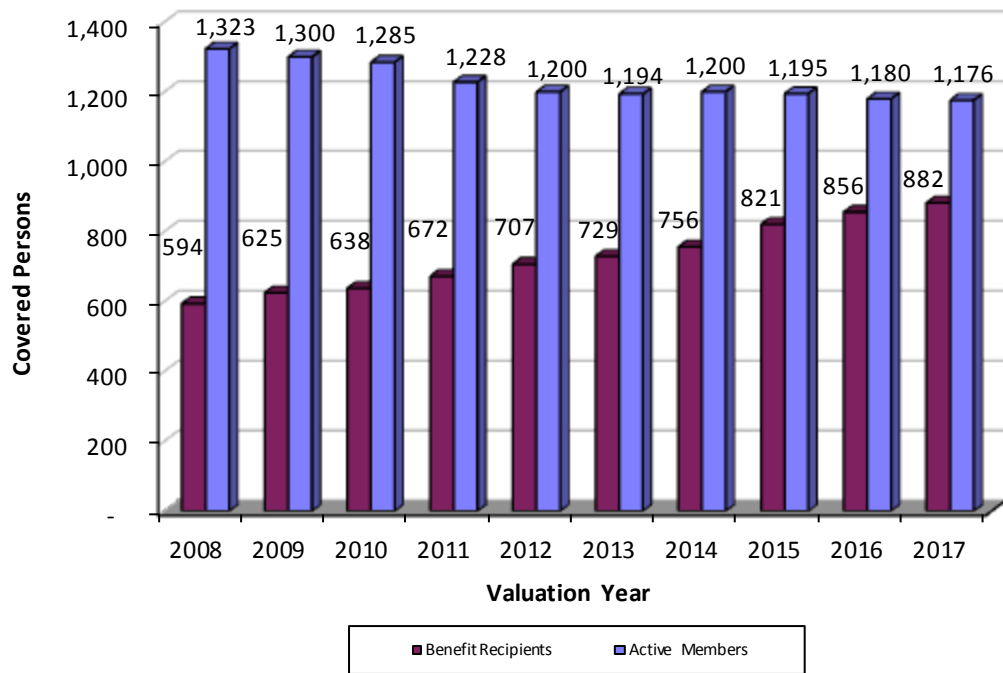
* The funded ratio shown herein is not appropriate for estimating the cost or ability to settle the Plan's obligations. A funded status of 100% or greater is not an indication of the need for future employer contribution. A funded status below 100% is an indication that future employer contributions are needed.

Actuarial Accrued Liabilities & Valuation Assets Comparative Statement – Health Subsidy Only

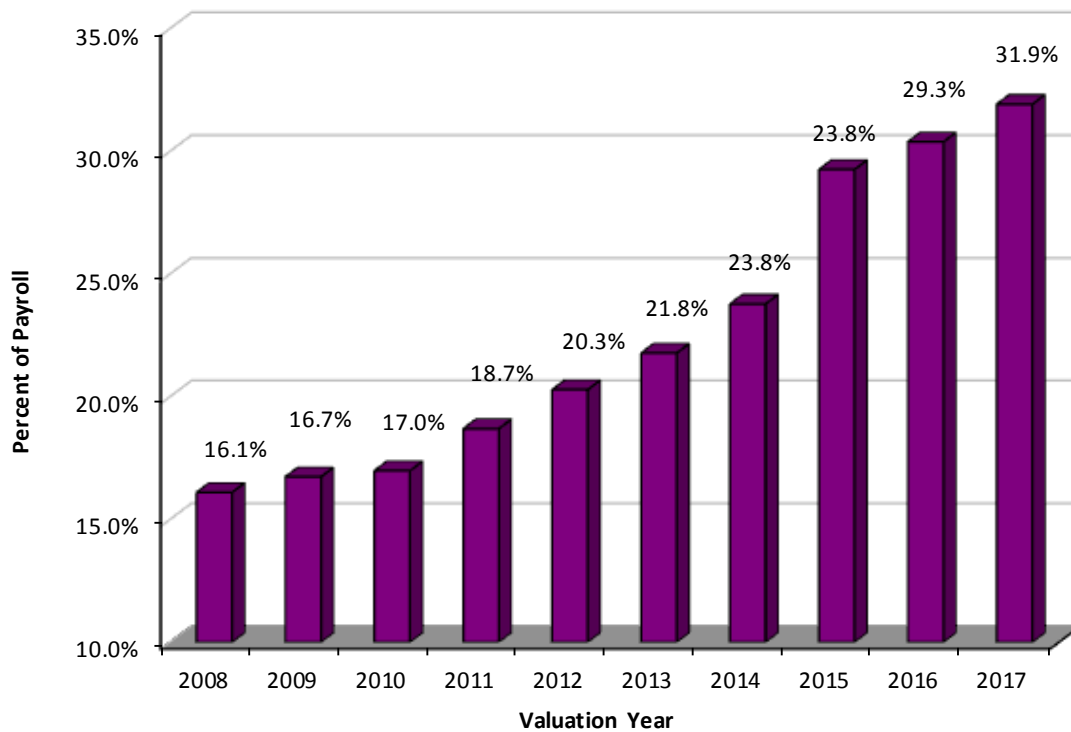
Valuation Date December 31	Actuarial Accrued Liability (AAL)	Valuation Assets	Unfunded Actuarial Accrued Liability (UAAL)	Ratio of Present Assets to AAL	Ratio of UAAL to Valuation Payroll
2007#	\$ 11,306,516	\$ 1,908,457	\$ 9,398,059	16.9 %	19.4 %
2008	12,425,929	2,605,141	9,820,788	21.0 %	19.4 %
2009#	13,090,488	3,748,342	9,342,146	28.6 %	18.5 %
2010	14,095,129	4,875,596	9,219,533	34.6 %	17.9 %
2011	15,600,362	5,837,021	9,763,341	37.4 %	19.1 %
2012#	16,595,623	6,870,093	9,725,530	41.4 %	18.7 %
2013	17,979,266	8,145,055	9,834,211	45.3 %	18.4 %
2014	19,426,059	9,433,100	9,992,959	48.6 %	18.4 %
2015	21,646,019	10,259,881	11,386,138	47.4 %	21.5 %
2016	23,023,666	11,150,682	11,872,984	48.4 %	22.4 %
2017#	26,405,178	12,410,109	13,995,069	47.0 %	26.2 %

After changes in methods and/or assumptions.

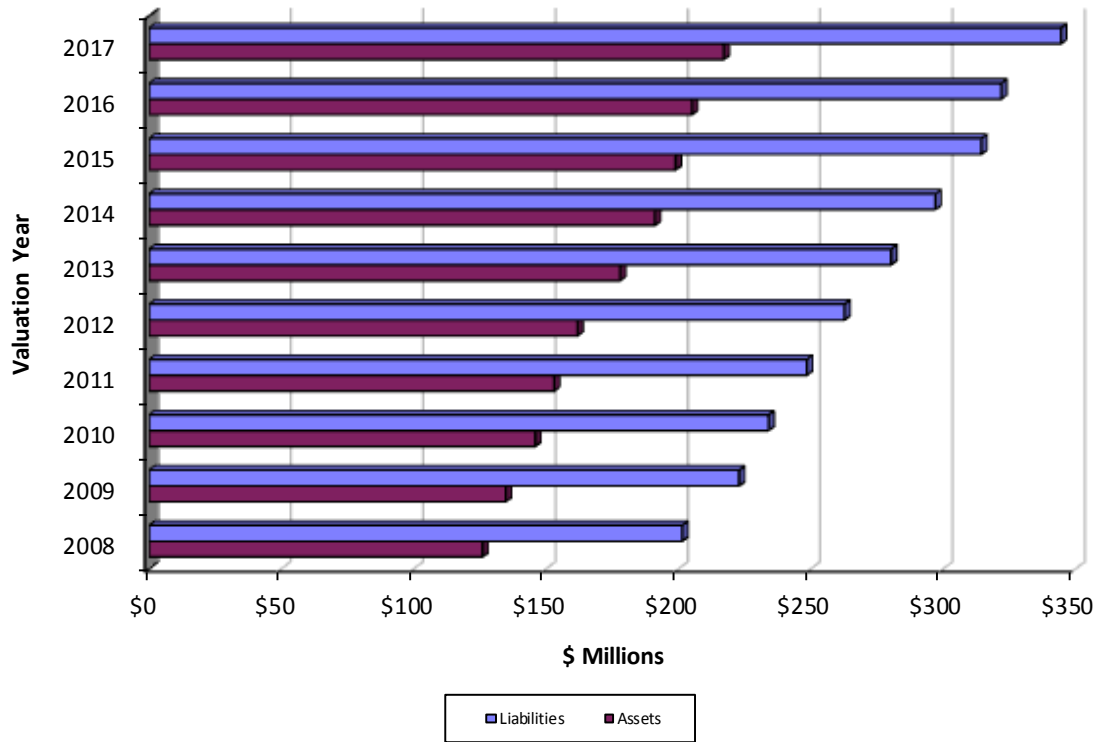
Active Members and Benefit Recipients



Pension Benefits as a Percent of Payroll



Assets and Accrued Liabilities (Pension Only)



Schedule of Changes in Unfunded Actuarial Accrued Liability Other than Annual Gains (Losses) (Pension Only)

Schedule of Changes in Pension UAAL Other than Gains (Losses)

Date Established	Original Amount	Description
01/01/1991	\$ 2,656,461	Initial Unfunded
01/01/1997	32,202	Plan Amendment
01/01/1997	588,165	1996 COLA
01/01/1998	602,888	1997 COLA
01/01/1999	4,750,497	Plan Amendment
01/01/1999	62,532	Assumption Change
01/01/1999	866,215	1998 COLA
01/01/2000	847,614	1999 COLA
01/01/2001	958,172	2000 COLA
01/01/2002	1,047,075	2001 COLA
01/01/2003	1,214,958	2002 COLA
01/01/2003	(3,319,777)	Assumption Change
01/01/2003	6,317,683	Plan Amendment
12/31/2004	231,803	Assumption Change
12/31/2004	1,809,405	2004 COLA
12/31/2005	1,310,995	2005 COLA
12/31/2005	5,368,777	Phase-in of COLA Assumption
12/31/2005	1,205,702	Chapter 159 Upgrade (Employer)
12/31/2006	787,237	2006 COLA
12/31/2006	7,794,903	Phase-in of COLA Assumption
12/31/2006	1,313,426	Chapter 159 Upgrade (Employer)
12/31/2006	2,025,864	Severance Load
12/31/2007	330,568	2007 COLA
12/31/2007	4,220,982	Phase-in of COLA Assumption
12/31/2007	223,538	Chapter 159 Upgrade (Employer)
12/31/2008	469,373	2008 COLA
12/31/2008	(839,918)	Miscellaneous Technical Change in Treatment of COLA Assumption
12/31/2008	193,614	Chapter 159 Upgrade (Employer)
12/31/2008	(122,243)	Retirement Eligibility Correction
12/31/2009	307,468	Chapter 159 Upgrade (Employer)
12/31/2009	10,706,101	Assumption and Methodology Change
12/31/2010	188,526	Chapter 159 Upgrade (Employer)
12/31/2010	(1,566,250)	No Ad-Hoc COLA this Year
12/31/2011	80,224	Chapter 159 Upgrade (Employer)
12/31/2012	(1,704,580)	No Ad-Hoc COLA this Year
12/31/2012	376,519	Chapter 159 Upgrade (Employer)
12/31/2012	(3,760,147)	Assumption and Methodology Change
12/31/2013	261,306	2013 COLA
12/31/2013	297,764	Chapter 159 Upgrade (Employer)
12/31/2014	293,410	2014 COLA
12/31/2014	373,599	Chapter 159 Upgrade (Employer)

Positive numbers indicate an increase in UAAL; negative numbers indicate a decrease in UAAL.

Schedule of Changes in Unfunded Actuarial Accrued Liability Other than Annual Gains (Losses) – concluded (Pension Only)

Schedule of Changes in Pension UAAL Other than Gains (Losses)

Date Established	Original Amount	Description
12/31/2015	\$ 498,682	Chapter 159 Upgrade (Employer)
12/31/2016	(1,979,746)	2016 COLA
12/31/2016	217,611	Chapter 159 Upgrade (Employer)
12/31/2017	(409,476)	2017 COLA
12/31/2017	203,132	Chapter 159 Upgrade (Employer)
12/31/2017	9,866,319	Assumption and Methodology Change

Unfunded Actuarial Accrued Liability (UAAL) Amortization Schedule and Projected Funded Status (Pension Only)

Fiscal Year	Employer Contribution Rates			Projected Active Member Payroll	Beginning of Year	
	Total Contribution	Employer Normal Cost	UAAL Payment		UAAL	Funded Status
2018*	23.05%	8.74%	14.31%	\$ 54,093,322	\$127,334,354	63.0%
2019	25.12%	9.17%	15.95%	55,580,888	127,779,280	62.7%
2020	25.12%	9.17%	15.95%	57,109,363	127,553,645	64.1%
2021	25.12%	9.17%	15.95%	58,679,870	127,060,036	65.6%
2022	25.12%	9.17%	15.95%	60,293,567	126,272,759	67.0%
2023	25.12%	9.17%	15.95%	61,951,640	125,164,133	68.4%
2024	25.12%	9.17%	15.95%	63,655,310	123,704,340	69.8%
2025	25.12%	9.17%	15.95%	65,405,831	121,861,276	71.2%
2026	25.12%	9.17%	15.95%	67,204,491	119,600,382	72.6%
2027	25.12%	9.17%	15.95%	69,052,615	116,884,469	74.0%
2028	25.12%	9.17%	15.95%	70,951,562	113,673,523	75.4%
2029	25.12%	9.17%	15.95%	72,902,730	109,924,508	76.8%
2030	25.12%	9.17%	15.95%	74,907,555	105,591,142	78.3%
2031	25.12%	9.17%	15.95%	76,967,512	100,623,668	79.9%
2032	25.12%	9.17%	15.95%	79,084,119	94,968,602	81.5%
2033	25.12%	9.17%	15.95%	81,258,932	88,568,467	83.2%
2034	25.12%	9.17%	15.95%	83,493,553	81,361,505	84.9%
2035	25.12%	9.17%	15.95%	85,789,626	73,281,369	86.8%
2036	25.12%	9.17%	15.95%	88,148,840	64,256,799	88.7%
2037	25.12%	9.17%	15.95%	90,572,933	54,211,267	90.7%
2038	25.12%	9.17%	15.95%	93,063,689	43,062,601	92.8%
2039	25.12%	9.17%	15.95%	95,622,940	30,722,583	95.0%
2040	25.12%	9.17%	15.95%	98,252,571	17,096,518	97.3%
2041	25.12%	9.17%	15.95%	100,954,517	2,082,771	99.7%
2042	25.12%	9.17%	15.95%	103,730,766	-	100.0%

* Represents a 6-month period from December 31, 2017 through June 30, 2018.

SECTION B

BENEFIT PROVISIONS AND VALUATION DATA

Summary of Benefit Provisions as of December 31, 2017

Eligibility

Amount

NORMAL RETIREMENT

Members are eligible to retire at age 60.

Straight life pension equals 2.0% of 3-year Final Average Earnings (FAE) times service on and after January 1, 1999 *plus* 1.5% of FAE times service before January 1, 1999.

Members with at least 20 years of service at retirement are eligible for a minimum benefit if employed on or before January 1, 1974.

Minimum benefit for eligible members is 50% of FAE.

EARLY RETIREMENT

Members are eligible to retire early if the sum of age and service is at least 80, or at age 55 with at least 20 years of service.

Computed as a normal retirement pension. If the early retirement occurs prior to the member attaining age 60, the benefit is reduced by 1/6 of 1% for each month that the early retirement precedes age 60.

DEFERRED RETIREMENT

Members are eligible to retire with a deferred benefit after attaining at least 5 years of service, provided they do not take a refund of member contributions.

Pension is computed as a normal retirement pension, based on service and FAE on date of termination. Commencement of benefits begins at age 60.

NON-DUTY DISABILITY

Members are eligible upon attainment of 15 years of service.

Pension is computed as a normal retirement pension based on service and FAE as of date of disability.

DUTY DISABILITY

No age or service requirement.

Pension is computed as a normal retirement pension based on service and FAE as of date of disability. Minimum duty disability benefit is 50% of FAE.

Summary of Benefit Provisions as of December 31, 2017

Eligibility

Amount

ORDINARY DEATH-IN-SERVICE

(1) Any age with less than 5 years of service.	Beneficiary receives member's contributions and accumulated interest, and an additional lump sum equal to one year's salary.
(2) Any age with 5 or more years of service.	Beneficiary receives the option of (1) the greater of (a) 50% of the accrued service retirement benefit (without any early retirement reduction); or (b) pension computed as normal or early retirement benefit (depending on eligibility), actuarially reduced as if the member had elected the 100% Joint & Survivor benefit; or (2) lump sum equal to 100% of base salary plus the member's accumulated contributions (including interest).

DUTY DEATH-IN-SERVICE

Death as a result of a work-related accident; not caused by willful neglect of the member.	The option of (1) the greater of (a) 50% of FAE, or (b) pension computed as an early retirement benefit actuarially reduced as if the member had elected the 100% Joint & Survivor benefit; or (2) a lump sum as described below; options payable to the spouse or child(ren) under age 18. If no spouse or child(ren) are alive at the time of the member's death, a lump sum is payable to the member's estate in the amount of 100% of base salary plus the member's accumulated contributions (including interest) plus accrued fringe benefits not paid at the time of death.
--	--

MEMBER CONTRIBUTIONS

3.75% of pay for service on and after January 1, 1999. 2.5% of pay for service prior to January 1, 1999. Contributions are credited with 5.0% interest per annum. Members may elect to contribute additional contributions which are accounted for separately. At retirement, the additional contribution balance is annuitized to provide an additional benefit within certain limits.

Summary of Benefit Provisions as of December 31, 2017

OPTIONAL FORMS OF PAYMENT

In lieu of the straight life benefit, a member may elect an actuarially reduced benefit in one of the following forms:

- 100% Joint & Survivor with pop-up
- 66 2/3 % Joint & Survivor with pop-up
- 50% Joint & Survivor with pop-up
- 10-year Certain & Life Option

The actuarial factors for optional forms of payment are based on the 1983 Group Annuity Mortality Table and 7.5% interest.

SERVICE UPGRADE

Members may elect to purchase an increase in their benefit multiplier for service rendered before 1999 under Chapter 159 (or Senate Bill 402). The cost to the member is ½ of the actuarially determined increase in System costs and results in a benefit based on 2% of FAE for the time purchased.

HEALTH SUBSIDY

Current and future retired members who are in receipt of an annuity benefit may elect to participate in a monthly health insurance subsidy. Spouses, dependents, and/or beneficiaries are not eligible for any subsidy. The full amount of the monthly health insurance subsidy is \$200 as of January 1, 2006 and increases by 4% annually beginning January 1, 2007. The full \$200 is prorated based on the member's service at retirement, as shown in the schedule below. Members who were already retired as of March 2006 are entitled to 50% of the subsidy available to members retired after March 2006. Active members must contribute 1.25% of pay. Member contributions for the health subsidy are non-refundable.

Service at Retirement	% of Full Subsidy Payable	
	Active on or after March 1, 2006	Terminated Vested or Retired on March 1, 2006
Less than 10 years	25.0%	12.5%
10 years or more, but less than 15 years	50.0%	25.0%
15 years or more, but less than 20 years	75.0%	37.5%
20 years or more	100.0%	50.0%

Retirees and Beneficiaries Comparative Statement

Year Ended December 31	Added to Rolls		Removed from Rolls		Rolls End of Year		Average Pension
	No.	Annual Pensions*	No.	Annual Pensions	No.	Annual Pensions	
2006	41	\$ 898,189	28	\$186,217	544	\$ 6,515,157	\$ 11,976
2007	49	1,109,288	24	297,006	569	7,327,439	12,878
2008	46	1,053,112	21	210,203	594	8,170,348	13,755
2009	47	511,404	16	221,371	625	8,460,381	13,537
2010	36	598,600	23	328,957	638	8,730,024	13,683
2011	63	914,086	29	92,673	672	9,551,437	14,213
2012	55	1,205,310	20	230,051	707	10,526,696	14,889
2013	51	1,416,661	29	331,168	729	11,612,189	15,929
2014	60	1,589,379	33	295,337	756	12,906,232	17,072
2015	89	2,910,593	24	323,204	821	15,493,622	18,872
2016	53	818,730	18	240,803	856	16,071,550	18,775
2017	55	1,372,546	29	410,260	882	17,033,836	19,313

* Includes adjustments due to COLA.

Retirees and Beneficiaries December 31, 2017 Tabulated by Type of Pensions Being Paid

Type of Pensions Being Paid	Number	Annual Pensions
Age and Service Pensions		
Regular Pension - Benefit terminating at death of retiree	459	\$ 7,371,613
For life of member, but not less than 10 years	47	766,853
100% Joint & Survivor	162	3,421,488
66 2/3% Joint & Survivor	60	2,052,810
50% Joint & Survivor	60	1,748,097
Survivor Beneficiary	56	875,773
Total age and service pensions	844	\$ 16,236,634
Casualty Pensions		
Duty Disability	24	\$ 512,164
Non-Duty Disability	11	237,908
Duty Death - Survivor Benefits	0	0
Non-Duty Death - Survivor Benefits	3	47,130
Total casualty pensions	38	\$ 797,202
Total Pensions Being Paid	882	\$ 17,033,836

Each member is counted only once in the above table. Members who have purchased an additional annuity may elect a different payment option for the additional purchased benefits. All benefit payments are included in the table.

Retirees and Beneficiaries December 31, 2017 Pension Benefits Tabulated by Attained Ages

Attained Age	Age and Service		Casualty		Totals	
	Number	Annual Pensions	Number	Annual Pensions	Number	Annual Pensions
30-34	2	\$ 31,718			2	\$ 31,718
35-39	3	17,276			3	17,276
40-44	1	7,608			1	7,608
45-49			2	\$ 48,650	2	48,650
50-54	7	118,785	2	40,681	9	159,466
55-59	23	737,593	9	201,769	32	939,362
60-64	143	3,421,535	11	261,387	154	3,682,922
65-69	199	4,802,928	7	142,788	206	4,945,716
70-74	162	3,098,508	2	33,716	164	3,132,224
75-79	123	1,916,532	3	38,224	126	1,954,756
80-84	89	1,165,134	1	11,779	90	1,176,913
85-89	53	512,442			53	512,442
90-94	27	316,165	1	18,208	28	334,373
95-100	12	90,410			12	90,410
Totals	844	\$ 16,236,634	38	\$ 797,202	882	\$ 17,033,836

Retirees and Beneficiaries December 31, 2017 Health Subsidy Benefits Tabulated by Attained Ages

Attained Age	Health Subsidy	
	Number	Annual Amount
35-39	1	\$ 3,695
50-54	3	10,160
55-59	13	48,031
60-64	67	218,910
65-69	104	333,906
70-74	66	200,436
75-79	27	73,893
80-84	26	50,801
85-89	12	26,786
90-94	5	7,851
95+	1	1,386
Totals	325	\$975,855

Average Age at Retirement: 62.6 years

Average Age Now: 70.1 years

Retirees and Beneficiaries December 31, 2017 Tabulated by Year of Retirement

Year of Retirement	Number	Annual Pensions	
		Totals	Average
1980	1	\$ 459	\$ 459
1981	1	15,110	15,110
1982	2	17,832	8,916
1983	1	1,918	1,918
1984	3	23,770	7,923
1985	2	6,650	3,325
1986	2	27,834	13,917
1987	4	58,924	14,731
1988	5	55,028	11,006
1989	7	105,349	15,050
1990	7	69,781	9,969
1991	7	39,141	5,592
1992	10	149,709	14,971
1993	13	233,536	17,964
1994	21	210,746	10,036
1995	17	170,799	10,047
1996	20	317,867	15,893
1997	14	207,226	14,802
1998	11	140,796	12,800
1999	29	527,094	18,176
2000	22	338,340	15,379
2001	18	288,310	16,017
2002	30	323,659	10,789
2003	17	245,369	14,433
2004	24	189,307	7,888
2005	31	563,061	18,163
2006	35	736,726	21,049
2007	40	887,113	22,178
2008	39	942,759	24,173
2009	29	401,788	13,855
2010	34	595,302	17,509
2011	49	842,167	17,187
2012	50	1,115,555	22,311
2013	47	1,247,848	26,550
2014	53	1,384,543	26,123
2015	86	2,713,105	31,548
2016	54	772,207	14,300
2017	47	1,067,108	22,704
Totals	882	\$17,033,836	\$ 19,313

Average Age at Retirement: 61.9 years

Average Age Now: 72.0 years

Inactive Vested Members December 31, 2017 Tabulated by Attained Age

Attained Age	Number	Estimated Annual Pensions
30-34	2	\$ 12,532
35-39	11	50,198
40-44	4	32,390
45-49	18	178,447
50-54	20	168,583
55-59	39	315,763
60	2	9,567
Totals	96	\$767,480

Average Age at Termination: 45.0 years

Average Age Now: 51.1 years

Active Members Added to and Removed From Rolls

Valuation Date	Number Added During Year		Terminations During Year										Active Members End of Year
			Retirement		Disability		Died-in-Service		Withdrawals				
	Vested	Other							Totals				
	A	E	A	E	A	E	A	A	A	E			
2008	128	130	35	53.9	1	1.1	0	2.1	9	85	94	65.3	1,323
2009	91	114	27	62.3	1	1.1	1	2.1	13	72	85	64.4	1,300
2010	87	102	25	45.7	2	1.0	0	2.5	9	66	75	77.7	1,285
2011	57	114	34	48.8	2	1.0	3	2.6	7	68	75	72.5	1,228
2012	76	104	41	54.0	2	0.4	3	2.7	16	42	58	60.6	1,200
2013	96	102	41	49.8	1	0.6	1	2.5	11	48	59	56.5	1,194
2014	113	107	44	53.9	0	0.6	0	2.6	15	48	63	58.5	1,200
2015	145	150	75	56.3	1	0.6	4	2.6	19	51	70	65.3	1,195
2016	109	124	44	51.4	0	0.6	1	2.3	12	67	79	75.3	1,180
2017	129	133	40	51.5	0	0.6	0	2.4	12	81	93	71.8	1,176
5-Year Totals	592	616	244	263	2	3	6	12	69	295	364	327	
10-Year Totals	1031	1180	406	528	10	8	13	24	123	628	751	668	
Since Last Exp. Study (1 years)	129	133	40	52	0	1	0	2	12	81	93	72	

A = Actual
E = Expected

30 retirees/beneficiaries and \$415,806 in benefits were expected to come off the rolls for the December 31, 2017 valuation; 29 retirees/beneficiaries and \$317,844 in benefits were actually removed from the rolls.

Active Members December 31, 2017 by Attained Age and Years of Service

Attained Age	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	Number	Valuation Payroll
20-24	44							44	\$ 1,302,380
25-29	78	5						83	2,627,238
30-34	48	17	10					75	2,964,977
35-39	36	20	20	5				81	3,442,785
40-44	44	18	26	19	1			108	4,822,086
45-49	42	20	26	19	19	7		133	6,627,666
50-54	40	34	40	42	17	12	12	197	9,702,778
55-59	36	19	49	57	24	12	33	230	11,101,029
60-64	14	15	21	34	26	13	23	146	7,311,126
65-69	7	7	10	14	6	5	8	57	2,694,224
70-74	4	3	2	3	3			15	455,879
75 & over	1	1	1	2			2	7	312,368
Totals	394	159	205	195	96	49	78	1,176	\$53,364,536

While not used in the financial computations, the following group averages are computed and shown because of their general interest.

Age: 48.7 years
Service: 11.9 years
Annual Pay: \$45,378

SECTION C

VALUATION METHODS AND ASSUMPTIONS

Actuarial Cost Method

Normal cost and the allocation of benefit values between service rendered before and after the valuation date was determined using the *individual entry-age actuarial cost method* having the following characteristics:

- the annual normal cost for each individual active member, payable from the date of employment to the date of retirement, are sufficient to accumulate the value of the member's benefit at the time of retirement; and
- each annual normal cost is a constant percentage of the member's year-by-year projected covered pay.

MECRS currently has a tiered benefit structure with the ultimate tier being more costly than the initial tier. The normal cost is computed based on this tiered structure. As a result, the normal cost rate is expected to increase as the members affected by the initial tier are replaced by new members, or when members upgrade their prior service.

Financing of Unfunded Actuarial Accrued Liabilities. Unfunded Actuarial Accrued Liabilities were amortized by level (principal and interest combined) percent-of-payroll contributions over 22 future years for pension benefits, and over 22 future years for health subsidy benefits. The amortization period is closed for both pension benefits and health subsidy benefits.

Asset Valuation Method. Last year's valuation assets are increased by contributions and reduced by refunds, benefit payments and expenses. An amount equal to the assumed investment return for the year is then added. Differences between actual return on a market value basis and an assumed return are phased-in over a five-year period.

Actuarial Assumptions Used for the Valuation

The contribution requirements and benefit values of the System are calculated by applying actuarial assumptions to the benefit provisions and member information furnished, using the actuarial cost method described on the previous page.

The principal areas of financial risk which require assumptions about future experience are:

- long-term rates of investment return to be generated by the assets of the System,
- patterns of pay increases to members,
- rates of mortality among members, retirees and beneficiaries,
- rates of withdrawal of active members,
- rates of disability among members, and
- the age patterns of actual retirement.

In a valuation, the monetary effect of each assumption is calculated for as long as a present covered person survives - - - a period of time which can be as long as a century.

Actual experience of the System will not coincide exactly with assumed experience, regardless of the accuracy of the assumptions, or the skill of the actuary and the precision of the many calculations made. Each valuation provides a complete recalculation of assumed future experience and takes into account all past differences between assumed and actual experience. The result is a continual series of adjustments (usually small) to the computed contribution rate.

From time to time it becomes appropriate to modify one or more of the assumptions, to reflect experience trends (but not random year-to-year fluctuations). The Board has established a policy of performing an Experience Study every 3-5 years to evaluate/modify valuation assumptions. Assumptions used in this report are based on the January 1, 2012 – December 31, 2016 experience study of the MECRS and were adopted by the Board. These assumptions were first used in the December 31, 2017 actuarial valuation. We believe the assumptions are reasonable individually and in the aggregate.

Valuation Assumptions

The rate of investment return was 7.00% per year, compounded annually (net of investment expenses). This assumption is used to make money payable at one point in time equal in value to a different amount of money payable at another point in time. The assumed real rate of return (the net return in excess of the wage inflation rate) is 4.25%. Experience over the last 5 years has been as follows:

	Year Ended December 31					5-Year Average
	2017	2016	2015	2014	2013	
1) Nominal rate of return#	7.4 %	6.3 %	4.8 %	7.4 %	9.3 %	7.0 %
2) Increase in CPI	2.1 %	2.1 %	0.7 %	0.8 %	1.5 %	1.4 %
3) Average Salary Increase (ASI)	1.2 %	1.1 %	(2.0)%	1.3 %	3.3 %	1.0 %
4) Real Return						
- Total: CPI (1) - (2)						5.6 %
- Total: ASI (1) - (3)						6.1 %
- Assumption	4.25 %	4.25 %	4.25 %	4.25 %	4.25 %	4.3 %

The nominal rate of return was computed using the approximate formula: $i = I$ divided by $\frac{1}{2}(A+B-I)$, where I is realized investment income net of expenses, A is the beginning of year asset funding value and B is the end of year funding asset value.

The rate of assumed price inflation was 2.25% per year. This results in a real rate of return over price inflation of 4.75%.

These economic assumptions were updated for the December 31, 2017 valuation.

Valuation Assumptions

The rates of salary increase used for individual members are in accordance with the following table. This assumption is used to project a member's current salary to the salaries upon which benefit amounts will be based.

Service	Salary Increase Assumptions for an Individual Member		
	Merit & Seniority	Base (Economic)	Increase Next Year
1	3.71%	2.75%	6.46%
2	4.68%	2.75%	7.43%
3	4.47%	2.75%	7.22%
4	3.95%	2.75%	6.70%
5	3.63%	2.75%	6.38%
6	3.18%	2.75%	5.93%
7	2.80%	2.75%	5.55%
8	2.51%	2.75%	5.26%
9	2.31%	2.75%	5.06%
10	2.10%	2.75%	4.85%
15	1.33%	2.75%	4.08%
20	1.02%	2.75%	3.77%
25	1.00%	2.75%	3.75%
30	1.00%	2.75%	3.75%
35	1.00%	2.75%	3.75%
40	1.00%	2.75%	3.75%
Ref:	733		

If the number of active members remains constant, then the total active member payroll will increase 2.75% annually, the base portion of the individual salary increase assumptions. This increasing payroll was recognized in amortizing unfunded actuarial accrued liabilities.

Rates of salary increase were updated for the December 31, 2017 valuation.

Valuation Assumptions (Continued)

The rates of retirement used to measure the probability of eligible members retiring during the next year were updated for the December 31, 2017 valuation and are as follows:

Active Members Retiring Next Year Under Normal Retirement			Active Members Retiring Next Year Under Early Retirement			
Ages	% Retiring		Ages	% Retiring		
	Men	Women		Age and Service		Rule of 80
				Men	Women	
60	10%	10%	50			10%
61	13%	15%	51			4%
62	25%	25%	52			7%
63	15%	12%	53			5%
64	16%	12%	54			5%
65	22%	20%	55	5%	10%	5%
66	30%	25%	56	5%	15%	4%
67	18%	27%	57	5%	8%	8%
68	20%	13%	58	5%	7%	8%
69	20%	20%	59	5%	7%	10%
70	20%	22%				
71	60%	23%				
72	50%	23%				
73	50%	23%				
74	50%	23%				
75	100%	23%				
76	100%	23%				
77	100%	23%				
78	100%	23%				
79	100%	23%				
80	100%	100%				
Ref.	2757	2756		2357	2754	2755

A member was assumed to be eligible for normal retirement after attaining age 60 regardless of service. A member was assumed to be eligible for early retirement after attaining age 55 with at least 20 years of service or if the sum of age and service is at least 80.

Valuation Assumptions

The post-retirement healthy mortality table was the RP-2014 Mortality Table projected to 2026 using projection scale MP-2017.

Sample Attained Ages	Single Life Retirement Values					
	Present Value of \$1 Monthly for Life		Percent Dying Next Year		Future Life Expectancy (years)	
	Men	Women	Men	Women	Men	Women
50	\$152.48	\$156.61	0.3826%	0.2596%	35.07	37.62
55	145.39	150.10	0.5366%	0.3600%	30.31	32.68
60	136.49	141.81	0.7607%	0.5462%	25.72	27.88
65	125.58	131.52	1.1113%	0.8176%	21.33	23.29
70	112.43	118.88	1.6572%	1.2451%	17.20	18.93
75	97.02	103.77	2.6043%	2.0005%	13.39	14.86
80	79.85	86.49	4.3403%	3.4148%	9.98	11.18
Ref:	2135 x 1.00 sb 0	2136 x 1.00 sb 0				

This assumption is used to measure the probabilities of members dying after retirement. The projection to 2026 is the margin for mortality improvement.

Post-retirement disabled mortality table is the RP-2014 Disabled Retiree Annuitant Table projected to 2026 using projection scale MP-2017.

Pre-retirement mortality is modeled using the RP-2014 Employee Mortality Table projected to 2026 using projection scale MP-2017 and multiplied by a factor of 80%.

These tables were updated for the December 31, 2017 valuation in accordance with an experience study for the System of the 5-year period ended December 31, 2016.

Valuation Assumptions (Continued)

Rates of separation from active membership are shown below (rates do not apply to members eligible to retire and do not include separation on account of death or disability). This assumption measures the probabilities of members remaining in employment. These rates were updated for the December 31, 2017 valuation.

Sample Ages	Service	% of Active Members Separating within Next Year	
		Men	Women
	0-1	22.00%	32.00%
	1-2	17.00%	20.00%
	2-3	12.00%	15.00%
	3-4	8.00%	12.00%
	4-5	8.00%	11.00%
	5-6	n/a	9.00%
30	5 & Up (Men)		
35	6 & Up (Women)	4.88%	5.57%
40		3.61%	4.67%
45		2.85%	4.04%
50		2.45%	3.57%
		2.28%	3.10%
Ref.		1106 77 x 0.4275	1105 37 x 1.05

Rates of disability are divided two-thirds toward duty and one-third toward non-duty disability and are as follows:

Sample Ages	% of Active Members Becoming Disabled within Next Year	
	Male	Female
20	0.002%	0.002%
25	0.002%	0.002%
30	0.002%	0.002%
35	0.011%	0.011%
40	0.043%	0.043%
45	0.088%	0.088%
50	0.144%	0.144%
55	0.214%	0.214%
60	0.318%	0.318%
Ref.	37 x 0.30	37 x 0.30

Miscellaneous and Technical Assumptions

December 31, 2017

Marriage Assumption:	75% of males and 75% of females are assumed to be married for purposes of death-in-service benefits. Male spouses are assumed to be three years older than female spouses.
Pay Increase Timing:	Beginning of the year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.
Decrement Timing:	Decrements of all types are assumed to occur mid-year.
Eligibility Testing:	Eligibility for benefits is determined based upon the age nearest birthday and exact fractional service on the date the decrement is assumed to occur.
Decrement Relativity:	Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.
Decrement Operation:	Disability and withdrawal decrements do not operate after member reaches retirement eligibility.
Administrative Expense Load:	1.00% of payroll.
Normal Form of Benefit:	The assumed normal form of benefit is the straight life form.
Benefit Service:	Exact fractional service as of the valuation date is used to determine the amount of benefit payable.
Incidence of Contributions:	For Manchester School District and enterprise funds of the City (Airport, Water Works, and the MECRS), contributions are assumed to be received continuously throughout the year based upon the actual payroll payable at the time contributions are made. For the remaining City group, contributions are assumed to be received on a semiannual basis in December and July.
COLA Assumption:	1.00% compounded annually.
Adjustments:	Normal and Early retirement costs were increased by 10% to reflect lump sums that are payable at retirement but not available in the active data. Retiree liabilities were increased 1% to account for pop-up retiree benefits.
Post-Retirement Subsidy:	55% of current actives and 25% of current terminated vested members were assumed to elect to receive the post-retirement health subsidy upon retirement.

SECTION D

OPERATION OF THE RETIREMENT SYSTEM

Basic Financial Objective and Operation of the Retirement System

Benefit Promises Made Which Must Be Paid For. A retirement system is an orderly means of handing out, keeping track of, and financing contingent pension promises to a group of employees. As each member of the retirement system acquires a unit of service credit they are, in effect, handed an “IOU” which reads: “The Employees Retirement System promises to pay you one unit of retirement benefits, payments in cash commencing when you retire.”

The principal related financial question is: **When shall the money required to cover the “IOU” be contributed?** This year, when the benefit of the member’s service is received? Or, some future year when the “IOU” becomes a cash demand?

This Retirement System meets the requirement of funding future benefits during the year by having the following **Financial Objective: To establish and receive contributions, expressed as percents of active member payroll, which will remain approximately level from year to year** and will not have to be increased for future generations of taxpayers.

Translated into actuarial terminology, a level percent-of-payroll contribution objective means that the contribution rate must be at least:

Normal Cost (the current value of benefits likely to be paid on account of members’ service being rendered in the current year)

... plus ...

Interest on the Unfunded Actuarial Accrued Liability (the difference between the actuarial accrued liability and current system assets).

If contributions to the Retirement System are less than the preceding amount, the difference, plus investment earnings not realized thereon, will have to be contributed at some later time, or, benefits will have to be reduced, to satisfy the fundamental fiscal equation under which all retirement systems must operate; that is:

$$B = C + I - E$$

Benefit payments to any group of members and their beneficiaries cannot exceed the sum of:

Contributions received on behalf of the group

... plus ...

Interest earnings on contributions received

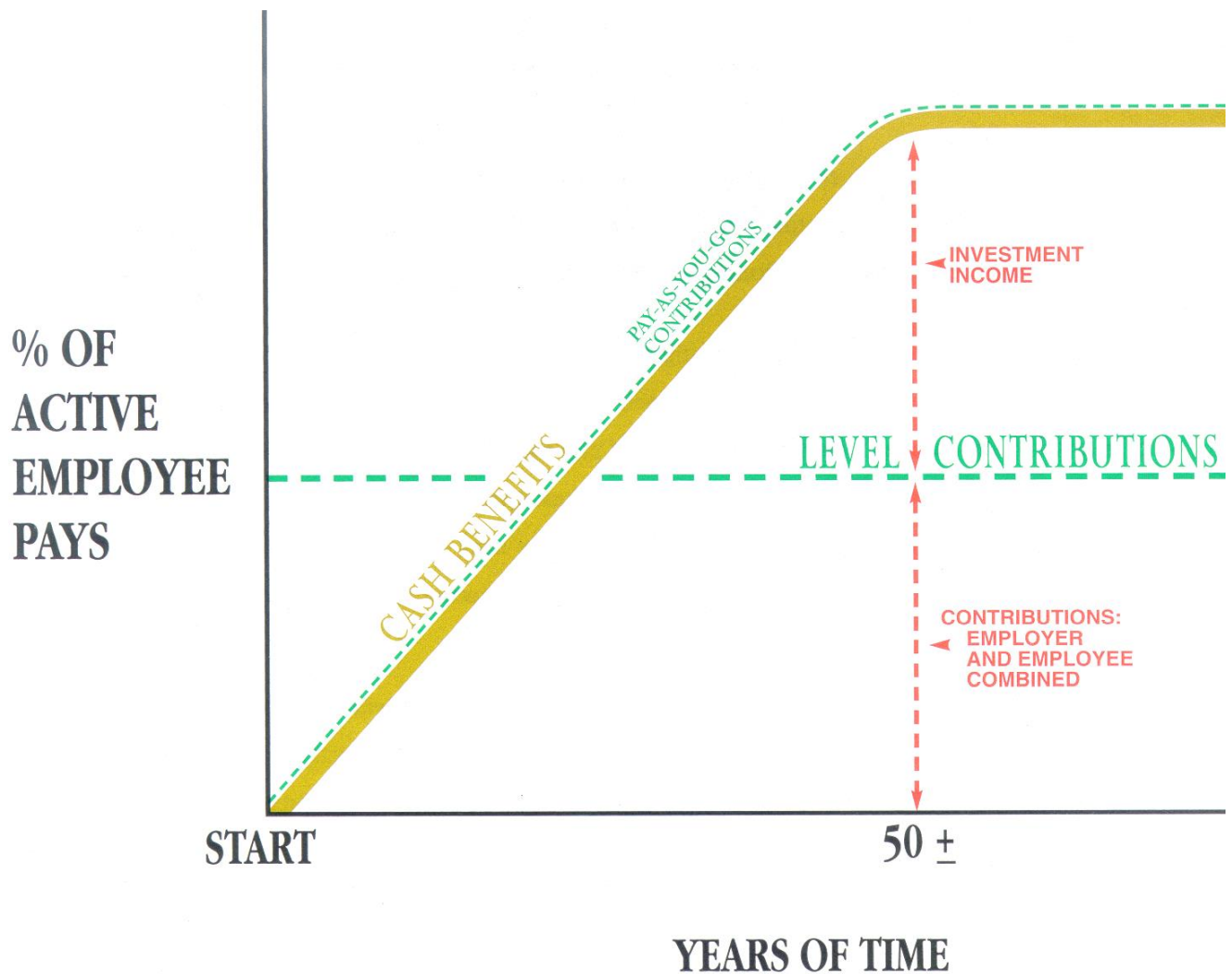
... minus ...

Expenses incurred in the operation of the system.

There are retirement systems designed to defer the bulk of contributions far into the future. They are lured by artificially low present contributions, but the inevitable consequence is a relentlessly increasing contribution rate to a level greatly in excess of the level percent-of-payroll rate.

A by-product of the level percent-of-payroll contribution objective is the accumulation of invested assets for varying periods of time. Investment income becomes a major contributor to the Retirement System and the amount is directly related to the amount of contributions and investment performance.

Computed Contribution Rate Needed to Finance Benefits. From a given schedule of benefits and from the data furnished, the contribution rate is calculated ***by means of an actuarial valuation*** - the technique of assigning monetary values to the risks assumed in operating a retirement system.



CASH BENEFITS LINE. This relentlessly increasing line is the fundamental reality of retirement plan financing. It happens each time a new benefit is added for future retirements (and happens regardless of the design for contributing for benefits).

LEVEL CONTRIBUTION LINE. Determining the level contribution line requires detailed assumptions concerning a variety of experiences in future decades, including:

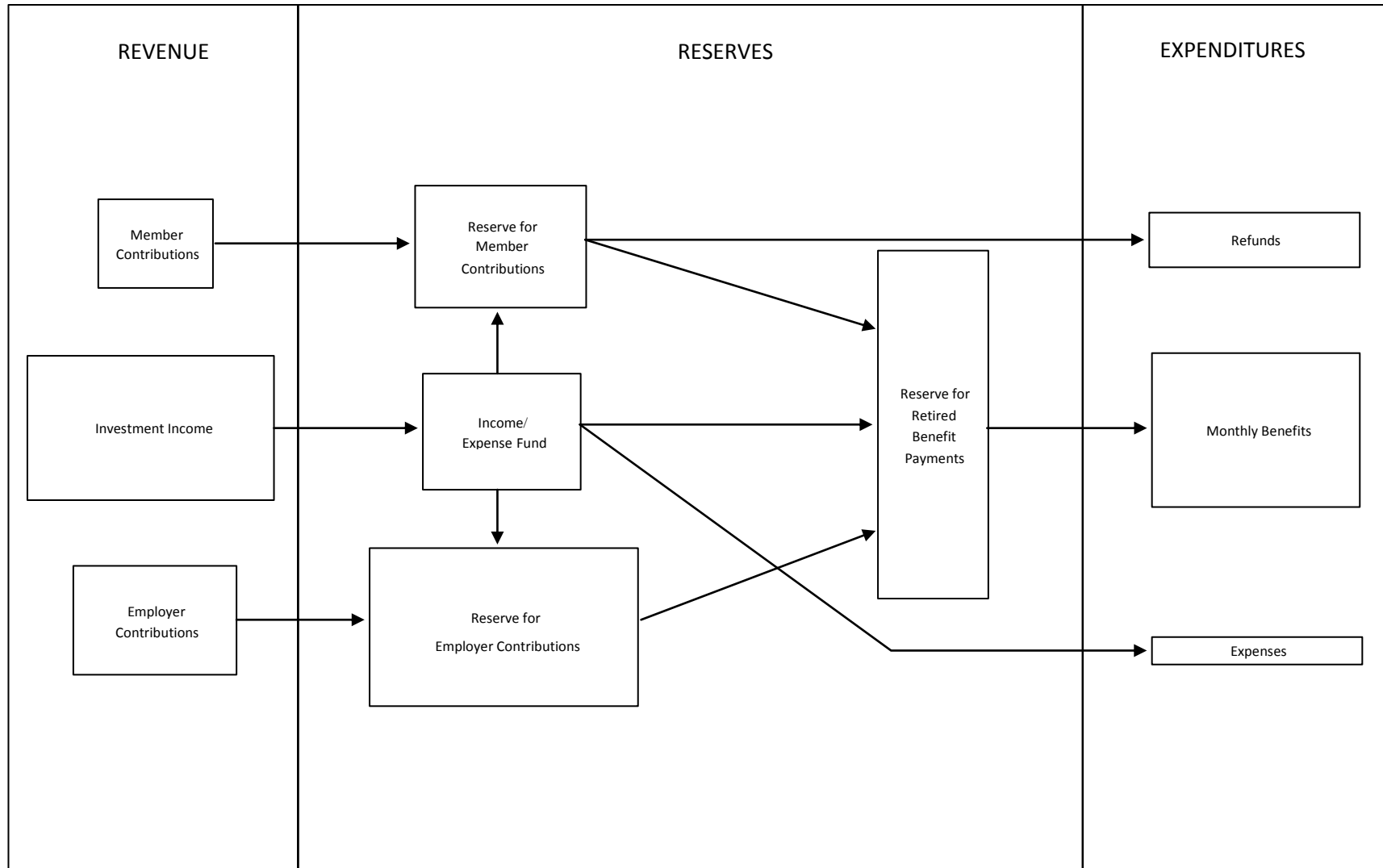
Economic Risk Areas

- Rates of investment return
- Rates of pay increase
- Changes in active member group size

Non-Economic Risk Areas

- Ages at actual retirement
- Rates of mortality
- Rates of withdrawal of active members (turnover)
- Rates of disability

Flow of Money Through the Retirement System



Glossary

Actuarial Accrued Liability. The difference between (i) the actuarial present value of future plan benefits, and (ii) the actuarial present value of future normal cost. Sometimes referred to as “accrued liability” or “past service liability.”

Accrued Service. The service credited under the plan which was rendered before the date of the actuarial valuation.

Actuarial Assumptions. Estimates of future plan experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.

Actuarial Cost Method. A mathematical budgeting procedure for allocating the dollar amount of the “actuarial present value of future plan benefits” between the actuarial present value of future normal cost and the actuarial accrued liability. Sometimes referred to as the “actuarial funding method.”

Actuarial Equivalent. A single amount or series of amounts of equal value to another single amount or series of amounts, computed on the basis of the rate(s) of interest and mortality tables used by the plan.

Actuarial Present Value. The amount of funds presently required to provide a payment or series of payments in the future. It is determined by discounting the future payments at a predetermined rate of interest, taking into account the probability of payment.

Amortization. Paying off an interest-bearing liability by means of periodic payments of interest and principal, as opposed to paying it off with a lump sum payment.

Experience Gain (Loss). A measure of the difference between actual experience and that expected based upon a set of actuarial assumptions during the period between two actuarial valuation dates, in accordance with the actuarial cost method being used.

Normal Cost. The annual cost assigned, under the actuarial funding method, to current and subsequent plan years. Sometimes referred to as “current service cost.” Any payment toward the unfunded actuarial accrued liability is not part of the normal cost.

Reserve Account. An account used to indicate that funds have been set aside for a specific purpose and are not generally available for other uses.

Unfunded Actuarial Accrued Liabilities. The difference between the actuarial accrued liability and valuation assets. Sometimes referred to as “unfunded accrued liability.”

Valuation Assets. The value of current plan assets recognized for valuation purposes.