August 30, 2018

Ms. Bethany Rhodes, Director
Ohio Retirement Study Council
Rhodes State Office Tower
30 East Broad Street, 2nd Floor
Columbus, OH 43215

Dear Ms. Rhodes:

In accordance with Ohio Revised Code Section 5505.12(A), I am attaching the actuarial valuation of the Highway Patrol Retirement System at December 31, 2017.

If you have any questions, please contact me.

Sincerely,

Mark R. Atkeson
Executive Director
direct dial 614.430.3557
matkeson@ohprs.org

cc: The Honorable John Kasich, Governor
The Ohio Retirement Study Council
Director Timothy S. Keen, Office of Budget and Management
The Honorable Ryan Smith, Speaker of the House
The Honorable Larry Obhof, Senate President
The Honorable Kirk Schuring, Chair, Ohio Retirement Study Council
The Honorable Steven Arndt, Chair, House Aging & Long Term Care
The Honorable Joe Uecker, Chair, Senate Local Government, Public Safety & Veterans Affairs

Ohio State Highway Patrol Retirement System

Annual Actuarial Valuation Report

December 31, 2017

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GRS Retirement Consulting
800.521.0498 | P: 248.799.9000 | F: 248.799.9020 | www.grsconsulting.com

August 29, 2018

Retirement Board
Ohio State Highway Patrol Retirement System
Columbus, Ohio

Ladies and Gentlemen:

The results of the regular annual **actuarial valuation as of December 31, 2017** of the Ohio State Highway Patrol Retirement System (HPRS), as established by Chapter 5505 of the Revised Code, are presented in this report.

The purposes of the valuation are as follows:

- Measure the financial position of HPRS;
- Assist the Board in establishing employer and employee contribution rates necessary to fund the benefits provided by HPRS;
- Determine the number of years required to amortize the pension unfunded actuarial accrued liabilities based upon established contribution rates; and
- Provide actuarial reporting and disclosure information for the System's financial report, and analyze the experience of the System over the past year.

This report was prepared at the request of the Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety and only with the permission of the Board. GRS is not responsible for unauthorized use of this report.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as: plan experience differing from that anticipated by the economic and 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 the actuary's assignment, the actuary did not perform an analysis of the potential range of such future measurements.

Your Executive Director furnished the member statistical data required for the valuation, together with pertinent data on financial operations. We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the data.

One Towne Square | Suite 800 | Southfield, Michigan 48076-3723

Your attention is directed particularly to the summary of results, comments and recommendations on pages 3 through 5.

The actuarial calculations were performed in accordance with accepted actuarial procedures. The calculations were based upon provisions of the Retirement System described in Section A.

The financial assumptions used in making the valuations are shown in Section F of this report. Assumptions concerning future experience are needed for computing employer contribution rates. As time passes and actual experience develops, assumed and actual experiences are compared. From time to time one or more of the assumptions about the future are changed by the Board after consulting with the actuary. The assumptions used in performing the 2017 valuation were adopted by the Board in conjunction with a five-year experience investigation for the period ending December 31, 2014.

The cooperation of the Executive Director and staff in furnishing materials requested for this valuation, and the complete and excellent condition of the records, is acknowledged with appreciation.

The signing actuaries are independent of the plan sponsor.

Mita D. Drazilov and Brian B. Murphy are Members of the American Academy of Actuaries (MAAA), and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Respectfully submitted,

Mita Drazilov

Mita D. Drazilov, ASA, FCA, MAAA

Brian B Murphy

Brian B. Murphy, FSA, EA, FCA, MAAA

MDD/BBM:sc

December 31, 2017
Summary of Results, Comments and Recommendations

Ohio Revised Code Section 5505.15 provides in part as follows:

> (B) The state shall annually pay into the employer accumulation fund, in monthly or less frequent installments as the state highway patrol retirement board requires, the employer contribution. The employer contribution shall be an amount equal to twenty-six and one-half percent of the total salaries paid to contributing members.

With the enactment of Senate Bill 345, the Board has the discretion to set the member contribution rate and the Cost of Living Allowance (COLA) percentage to comply with the amortization requirement of Section 5505.121 of the Revised Code. The results presented in this report are based upon a member contribution rate of 12.5% and a COLA rate of 1.25% for all future calendar years. The purpose of this report is to provide information on the results of the December 31, 2017 actuarial valuation based upon these decisions.

The **total employer contribution rate** is 26.50% of payroll, as established by Statute. The breakdown between employer, employee, pension and health used for this valuation is shown below:

	Contribution Rates Expressed as a % of Active Payroll		
	Retirement, Survivor & Disability Allowances	**Post-Retirement Health Care**	**Totals**
Employer	26.50%	0.00%	26.50%
Employee	12.50%	0.00 %	12.50%
Totals	**39.00%**	**0.00%**	**39.00%**

December 31, 2017
Summary of Results, Comments and Recommendations
(Continued)

Items of significant importance for the December 31, 2017 actuarial valuation include:

1. House Bill 362 was signed into law February 8, 2018. A brief summary of the plan changes resulting from HB 362 is presented below:

    a. **Retirement Age** – Anyone hired after January 1, 2020 will not be able to retire or enter the DROP until the member is at least 52 years old with 20 years of service credit.
    b. **Survivor Benefits** – Survivor benefits will now be the same flat rate for all surviving spouses who retire or DROP on or after May 11, 2018. The flat amount for 2018 is $900, and will increase each year by the COLA percentage set by the Board.
    c. **Survivor Benefit and Marriage** – A survivor is only eligible for a survivor benefit if the survivor was married to the member when the member was active. This only applies to survivors if the member retired (or entered DROP) on or after May 11, 2018.
    d. **Joint Survivor Annuity** – If an active member is eligible to retire and has not entered the DROP and dies, the surviving spouse (in addition to survivor benefits) will receive a 50% JSA.
    e. **Off Duty Disability** – Eligible for benefits after 5 years of service. Benefits are calculated based on a minimum 12-year service benefit. Effective May 11, 2018.

2. The rate of market value investment return for calendar year 2017 was higher than the actuarial assumed investment return rate of 7.75% for that year. (The market value rate of return for calendar year 2017 was approximately 14.4%. This figure will generally differ from other reported return figures due to restated audited asset figures, approximate formulas and treatment of System expenses.) The funding value rate of return was below the assumed investment return rate. The funding value rate of return for calendar year 2017 was approximately 6.4%. The market value of assets currently exceeds the funding value of assets by approximately $13 million.

3. Experience during calendar year 2017 in the retiree health plan was favorable (i.e., actual employer paid claims were less than expected). The retiree health plan is expected to remain solvent until 2029, compared with 2028 last year.

This valuation indicates that a total employer contribution rate allocation to the pension program of 26.50% produces a 27-year amortization period for the pension program

December 31, 2017
Summary of Results, Comments and Recommendations (Concluded)

Comment on Post-Retirement Health Care: If all assumptions are met exactly and contribution rates and benefit provisions continue at their present levels, the retiree health program will run out of money and benefits will cease in 2029. At that time, the rate of benefit payout is projected to exceed 13.0% of payroll. This situation cannot continue indefinitely. **Further changes to the retiree health plan (i.e., in addition to those made recently) and/or further increases in employer contribution rates and/or member premiums will need to be a part of the future if the program is to continue. These changes/contribution increases are likely to be significant.**

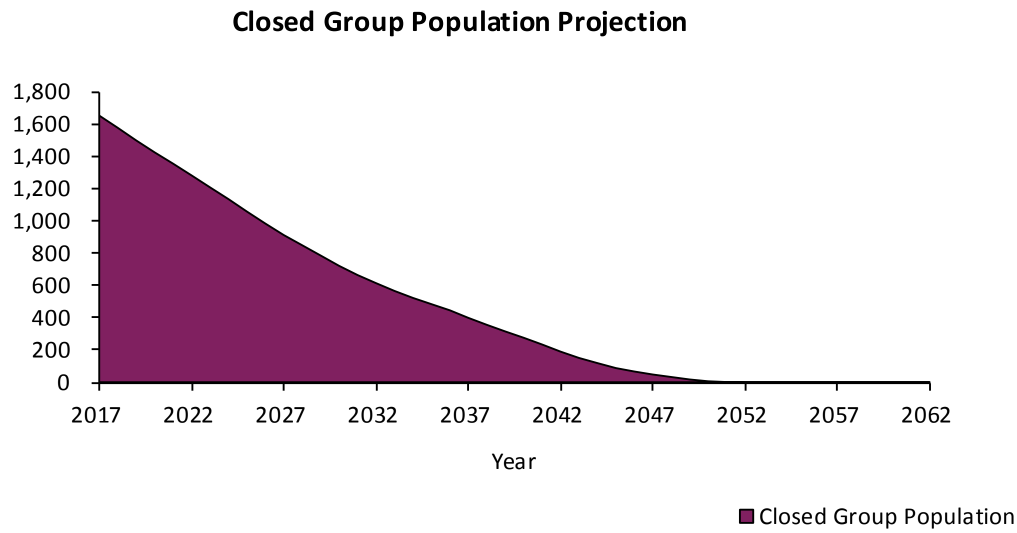
Recommendation: The following reserve transfers are recommended as of December 31, 2017:

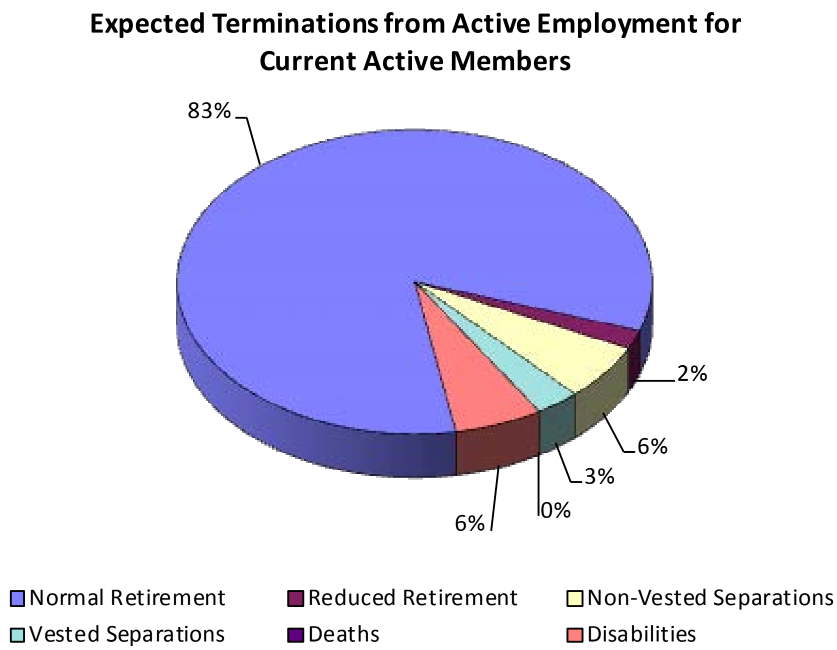
Transfer To (From)	Total Amount
Pension Reserve Fund:	$ 8,596,051
Survivor Benefit Fund:	39,086,735
Total	**$47,682,786**

The reserve funds from which the transfers are made are determined as follows: First, the accumulated contributions of members who retired or died with survivor benefits payable prior to January 1, 2018 should be transferred from the Employees' Savings Fund if this has not already been done. The remainder of the transfer should then be taken from the Income Fund or the Employer's Accumulation Fund, as the Board deems appropriate. The purpose of these transfers is to ensure that all pension benefits are fully funded by the appropriate reserve funds.

Conclusion: Based upon the results of the December 31, 2017 regular annual actuarial valuation, the unfunded actuarial accrued liabilities of the pension program are expected to be amortized over a 27-year period. With regard to the Retiree Health Plan, solvency to 2029 is an unfavorable result, since most people presently near retirement will live beyond that date. In addition, given the volatility of health care costs, the Plan may become insolvent sooner than 2029. A combination of contribution increases and continued cost containment measures including plan redesign will be important for the Retiree Health Plan. **These changes/contribution increases are likely to be significant.**

Expected Development of Present Population
December 31, 2017





The charts above show the expected future development of the present population in simplified terms. The Retirement System presently covers 1,650 active members. Eventually, 6% of the population is expected to terminate covered employment prior to retirement and forfeit eligibility for an employer provided benefit. 88% of the present population is expected to receive monthly retirement benefits either by retiring directly from active service, or by separating from service without withdrawing contributions. 6% of the present population is expected to become eligible for death-in-service or disability benefits. Within 13 years, over half of the covered membership is expected to consist of new hires.

Other Observations

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

Given the pension plan's contribution allocation procedure, if all actuarial assumptions are met (including the assumption of the plan earning 7.75% on the actuarial value of assets), it is expected that:

(1) Employer normal cost contributions will decrease as a percentage of payroll as more active members become covered under the post January 1, 2020 benefit provisions,
(2) The unfunded actuarial accrued liabilities will be fully amortized after 27 years, and
(3) The funded status of the plan will increase gradually towards a 100% funded ratio.

When selecting a contribution allocation procedure, the following three items should be considered, including the balance amongst the three items:

(1) Benefit security,
(2) Intergenerational equity, and
(3) Contribution stability and predictability

Generally, given the nature of public employee retirement systems (e.g., level contribution financing objective and perceived ongoing nature of the plan or plan sponsor), intergenerational equity and contribution stability and predictability have received more consideration than benefit security when contribution allocation procedures are selected. However, given the importance of benefit security to any retirement system, we suggest that contributions to the System in excess of those presented in this report be considered.

Limitations of Funded Status Measurements

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, in other words of transferring the obligation to an unrelated third party in a market value type transaction.
(2) The measurement is dependent upon the actuarial cost method which, in combination with the plan's amortization policy, affects the timing and amounts of future contributions. The amounts of future contributions will differ from those assumed in this report due to future actual experience differing from assumed experience based upon the actuarial assumptions. A funded status measurement in this report of 100% is not synonymous with no required future contributions. If the funded status were 100%, the plan would still require future normal cost contributions (i.e., contributions to cover the cost of the active membership accruing an additional year of service credit) and potential future losses could result in future unfunded liability 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.

SECTION A

RETIREMENT, SURVIVOR AND DISABILITY ALLOWANCES

Retirement, Survivor, and Disability Allowances
Benefits and Conditions Valued
December 31, 2017

Age & Service Pension: A member may retire at age 52 to age 60, provided he has 20 or more years of service (or also at age 48 with 25 or more years of contributing service for members hired before January 1, 2020). The member's pension equals the sum of 2-1/2% of final average salary [average of salaries during highest 5 years (3 years prior to January 1, 2015)] times years of service not in excess of 20, 2-1/4% of final average salary times years of service in excess of 20 but not in excess of 25 and 2% of final average salary times years of service in excess of 25. The maximum pension payable is 79.25% of the member's final average salary. A member must retire upon attainment of age 60 or completion of 20 years of service, whichever occurs later.

Reduced Retirement: A member who has acquired at least 20 but less than 25 years of service and is between the ages of 48 and 52 is eligible to receive a Pension computed in the same manner as an Age & Service pension but reduced as follows:

Age	Percent of Age & Service Pension
48	75%
49	80
50	86
51	93
52	100

Deferred Pension: A member who has acquired 20 years of service and retires is eligible to receive a pension computed in the same manner as an Age & Service Pension at the attainment of age 52. A reduced benefit is payable if the retirant elects to receive a benefit after age 48 and prior to age 52. The reduction is waived for members with 25 or more years of service. A member, who has acquired 15 years of service and who voluntarily resigns or is discharged, is eligible to receive a pension equal to 1-1/2% of final average salary multiplied by total service. The pension shall begin the first month after attainment of age 55, provided the member does not withdraw his accumulated contributions from the employees' savings fund.

Disability Pension:

A. **In-the-Line-of-Duty:** A member who is permanently disabled with a duty-related injury is eligible to receive a pension that is the larger of (i) 61.25% of average final salary, or (ii) the Age & Service Pension.

B. **Off-Duty:** A member who is permanently disabled with a non-duty related injury or illness, provided he/she has 5 or more years of service, is eligible to receive a pension that is the larger of (i) 30% of average annual salary, or (ii) the Age & Service Pension.

Retirement, Survivor, and Disability Allowances Benefits and Conditions Valued December 31, 2017 (Continued)

Survivor's Benefits: The surviving spouse of a deceased retirant (other than a deferred retirant) who retired or entered the DROP before 5/11/2018 is eligible to receive a pension of $900 a month, or 50% of the computed monthly pension the retirant was receiving, whichever is greater. The surviving spouse of an active member or of a deferred retirant who *was not* yet eligible for an immediate pension benefit is eligible to receive a pension of $900 per month.–The surviving spouse of a deceased retirant who retires on or after 5/11/2018 (does not include members who retired or entered the DROP before 5/11/2018) is eligible to receive a pension of $900 a month in 2018, increasing annually as determined by the COLA percentage set by the Board. The cost of living adjustments will begin in 2019, and all affected survivors will receive the same rate regardless of when they became survivors. The benefit terminates upon death. Each surviving child of a deceased member or retirant is eligible for a pension of $150 a month until attainment of age 18, marriage, or death. The benefit may be continued to age 23 if the child is a full-time student. Each surviving child regardless of age, who was totally dependent upon the deceased member or retirant at his death because of physical or mental disability is eligible to receive a pension of $150 per month until his death or recovery from the disability. If there is no spouse or surviving children, each dependent parent is eligible to receive a pension of $150 a month. Additionally, a $5,000 lump sum benefit is payable upon the death of the retirant.

The surviving spouse of a deceased active member who is eligible to retire and who has not entered the DROP will receive a 50% joint and survivor benefit payable immediately. The benefit is calculated as if the deceased member retired the day after death.

The spouse of a member who retired or entered the DROP before 5/11/2018 and who becomes married after retirement is eligible for survivor benefits. For members who retire on or after 5/11/2018, a survivor is only eligible for a survivor benefit if the survivor was married to the member when the member was active.

Minimum Benefit: All members who retired with an Age & Service Pension or Disability Benefit are eligible to receive a minimum benefit of $1,050 per month.

Members' Contributions to the Fund: Members contribute a certain percentage of the member's annual salary. The percentage shall not be less than 10.0% of salary but not more than 14.0%. The State Highway Patrol Retirement System shall establish and may adjust the rate as it considers necessary to meet the amortization period requirement. For the December 31, 2017 valuation, the assumed member contribution rate is 12.5%.

State Contributions: The State contributes the remaining amount necessary to finance the Retirement System on an actuarial basis. By statute, the State's contribution rate can be neither less than the member contribution rate, nor more than three times the member rate. The employer contribution shall be an amount equal to 26.50 percent of the total salaries paid to contributing members.

Retirement, Survivor, and Disability Allowances
Benefits and Conditions Valued
December 31, 2017
(Concluded)

Post-Retirement Increases: The basic benefit for all retirants is increased by 1.25 percent each year starting at age 60 (age 53 for members retired or entered the DROP prior to 1/7/2013). The retirant must have also been receiving monthly benefits for at least twelve months. Benefit recipients receiving survivor benefits prior to 1/7/2013 are eligible for the increase after receiving benefits for twelve months. Disability members retired prior to 1/7/2013 are eligible for the increase after receiving benefits for sixty months or age 53 whichever occurs first. The Board may adjust the cost of living adjustment annually. The Board's determination shall be based on the annual actuarial valuation. If the Board determines that an increase may be made, the increase shall not exceed 3 percent of the eligible member's basic benefit.

PLUS: A qualified member may elect a partial lump sum benefit of not less than 6 times the monthly amount payable to the member as a single lifetime pension and not more than 60 times that amount.

Deferred Retirement Option Program (DROP): Members are eligible for a one-time election to "DROP in" upon attainment of unreduced retirement eligibility. The primary features of the DROP include:

a) During participation in the DROP, members continue to make contributions based upon the member contribution rate. While participating in the DROP, 100% of members' contributions, up to 10% of payroll, are deposited to their DROP account.
b) 100% of the member's computed benefit (based upon service and salary at time of DROP), including any scheduled post-retirement increases is credited to the member's DROP account.
c) The DROP account is credited with interest annually based upon a rate of return earned on a selected group of fixed income type investments.
d) A member who "DROPs in" must stay in the DROP for a minimum period of time based on age at time of "DROPing in". A minimum participation period of 3 years for members who "DROP in" prior to age 52 and 2 years for members who "DROP in" on or after age 52. After a maximum of 8 years in the DROP program or attaining age 60, the member who entered the DROP program must retire.
e) If the member "DROPs in", the member's annual benefit when the member "DROPs out" (i.e., retires) is based upon the benefit calculations at time of the "DROP in", including any post-retirement increases that may have accrued during the DROP participation period.
f) If, during participation in the DROP, a member becomes disabled due to a duty related injury/illness, the member can choose to 1) have a disability pension benefit calculated based on the assumption that participation in the DROP did not occur, or 2) the member can elect to accept the age/service pension benefit achieved through DROP participation plus the accumulation in the DROP account. Duty disability benefit recipients will not suffer the loss of accumulated interest for early departure from the DROP.
g) Once a member elects to participate in the DROP, their contributions are committed for the minimum period (2 or 3 years). If the member voluntarily discontinues DROP participation prior to the minimum participation period, the member will not receive any interest accumulated in the DROP account but will receive all accumulated pension benefits and pension contributions deposited into the DROP account at the end of the minimum participation period.

Sample Benefit Computation for Members

Assumed data in connection with this sample retirement is shown below:

	Data	Description
A.	$60,000	Final Average Compensation
B.	27	Years of Credited Service
C.	50	Age of Retirant
D.	50%	Percentage to continue to spouse after retirant's death (this is automatic)

Sample Computation Steps

E. Benefit Formula:	0.0250 x 20 x $60,000 =	$30,000
	0.0225 x 5 x $60,000 =	$ 6,750
	0.0200 x 2 x $60,000 =	$ 2,400
		$39,150

Benefit Payable to:

F. Retirant while spouse is alive (E)	$39,150
G. Spouse after retirant's death (D x E)	$19,575
H. Retirant after spouse's death (E)	$39,150

Projected Benefits to Member

Year of Retirement	Amount Payable*	
	COLA Beginning at Age 53	COLA Beginning at Age 60
First	$39,150	$39,150
Second	39,150	39,150
Third	39,150	39,150
Fourth	39,639	39,150
Fifth	40,129	39,150
Sixth	40,618	39,150
Seventh	41,108	39,150
Eighth	41,597	39,150
Ninth	42,086	39,150
Tenth	42,576	39,150
Eleventh	43,065	39,639

* *Cost of Living Adjustment (COLA) is subject to change annually. The basic benefit for all retirants is increased by 1.25% of the original amount each year starting at age 60 (age 53 for members retired or entered the DROP prior to 1/7/2013).*

Retirement Survivor & Disability Allowances
Computed Employer Contributions to Support Benefits

Contributions for	Contributions Expressed as Percents of Payroll	
Valuation Date - December 31	**2017**	**2016**
Normal Cost:		
Age & Service Benefits	14.09%	14.29%
Disability Benefits	1.97%	2.38%
Survivor Benefits	0.08%	0.10%
Separation Benefits	1.01%	1.01%
Administrative Expenses	1.20%	1.20%
Purchase of Military Service	0.75%	0.75%
Total Normal Cost	19.10%	19.73%
Less Member Contributions	12.50%	12.50%
Employer Normal Cost	6.60%	7.23%
Unfunded Actuarial Accrued Liabilities	19.90%	19.27%
Amortization Period	27	29
PENSION EMPLOYER CONTRIBUTION RATE	26.50%	26.50% *

** 22.50% employer pension contribution rate in 2017 (4.0% to retiree health) and 26.50% thereafter (0.0% to retiree health).*

The amortization period is computed and is the period of years over which the Board established pension employer contribution rate and the employee contribution rate will finance the unfunded liabilities. With the amortization periods shown above, the unfunded liability is expected to rise in dollar amount for several years before beginning to decline, although it is expected to decline steadily as a percentage of payroll (see page A-7).

Retirement, Survivor, & Disability Allowances
Method of Financing Future Benefits for
Present Active Members
December 31, 2017

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

(i) The annual normal costs 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

(ii) each annual normal cost is a constant percentage of the member's year-by-year projected covered pay.

Actuarial Accrued Liabilities, $1,153,619,256, less pension assets of $774,670,663 resulted in unfunded actuarial accrued liabilities of $378,948,593, which were amortized as a level percent of payroll over 27 years. The characteristics of this method are illustrated on the following page. Actuarial accrued liabilities represent the portion of present values not covered by future normal cost contributions.

Retirement, Survivor, and Disability Allowances
Financing Unfunded Actuarial Accrued Liabilities

Level % of Payroll Amortization:
Closed Amortization
($ Thousands)

Year	Unfunded Actuarial Accrued Liability	Annual UAL Contributions Dollars
1	$ 378,949	$ 23,247
2	384,187	24,096
3	388,950	24,975
4	393,169	25,887
5	396,768	26,832
6	399,666	27,811
7	401,772	28,826
8	402,987	29,878
9	403,204	30,969
10	402,306	32,099
11	400,165	33,270
12	396,642	34,485
13	391,586	35,743
14	384,831	37,048
15	376,199	38,400
16	365,494	39,802
17	352,504	41,254
18	337,000	42,760
19	318,731	44,321
20	297,426	45,939
21	272,791	47,616
22	244,506	49,354
23	212,225	51,155
24	175,572	53,022
25	134,140	54,957
26	87,489	56,963
27	35,140	36,476
28	0	0

Retirement, Survivor, and Disability Allowances
Actuarial Present Value of Future Benefits
Present Retired Lives and Vested Deferred Cases
December 31, 2017

Benefits Payable	Number	Monthly Amount	Actuarial Value
From Pension Reserve Fund:			
Regular Retirements	1,226	$4,682,662	$620,696,362
Disability Retirements	135	400,408	54,301,836
Total Benefits Payable from Pension Reserve Fund	1,361	5,083,070	674,998,198
From Survivor Benefit Fund:			
Surviving Spouses, Dependent Children & Dependent Parents	276	388,733	39,086,735
Total Benefits Payable from Survivor Benefit Fund	276	388,733	39,086,735
Total Retirement Benefits Payable	1,637	5,471,803	714,084,933
Total Vested Deferred Benefits Payable	11	29,801	3,536,350
Grand Total	**1,648**	**$5,501,604**	**$717,621,283**

Retirement, Survivor, and Disability Allowances
Development of Actuarial Accrued Liabilities
December 31, 2017

Actuarial Present Value, December 31, of	(1) Total Actuarial Present Value	(2) Portion Covered By Future Normal Cost Contributions	(3) Actuarial Accrued Liabilities (1) - (2)
Age & service allowances based on service rendered before and likely to be rendered after valuation date	$ 587,331,901	$ 155,692,139	$ 431,639,762
Disability allowances likely to be paid to present active members who become totally and permanently disabled	25,632,700	20,726,783	4,905,917
Survivor benefits likely to be paid to spouses and children of present active members who die before retiring	1,507,091	804,378	702,713
Separation benefits (refunds of contributions and deferred allowances likely to be paid on behalf of present active members)	9,371,983	10,622,402	(1,250,419)
Retirement benefits likely to be paid to current retirants and beneficiaries and to present inactive members	717,621,283	0	717,621,283
Total	$ 1,341,464,958	$ 187,845,702	$ 1,153,619,256
Member portion	250,833,796	130,879,803	119,953,993
Employer portion	$ 1,090,631,162	$ 56,965,899	$ 1,033,665,263

Retirement, Survivor, and Disability Allowances
Summary Statement of System Resources and Obligations
December 31, 2017

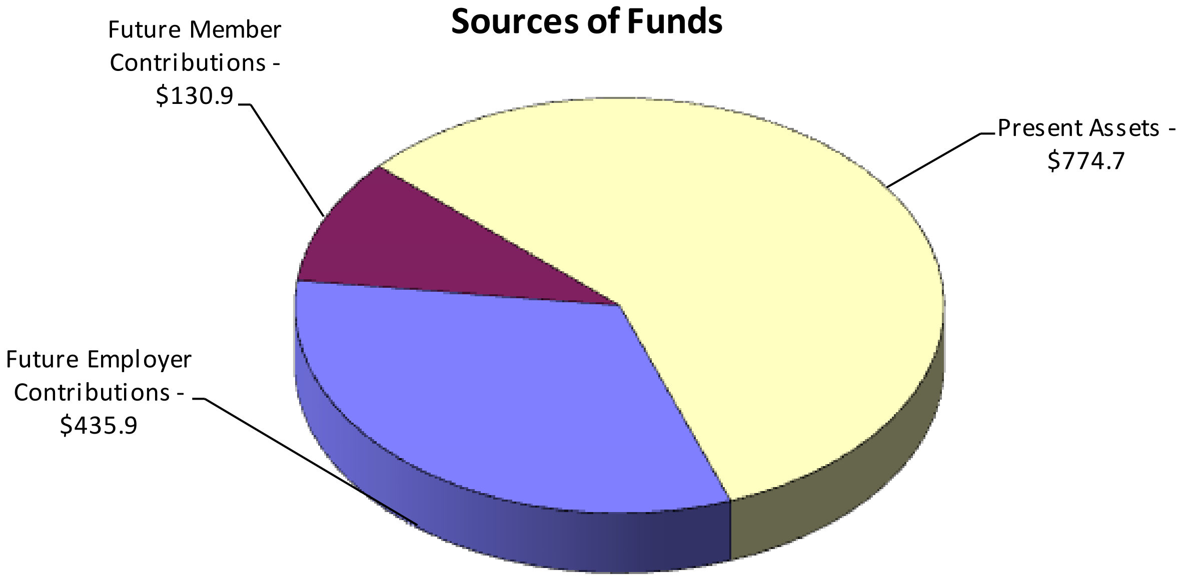
Present Resources and Expected Future Resources

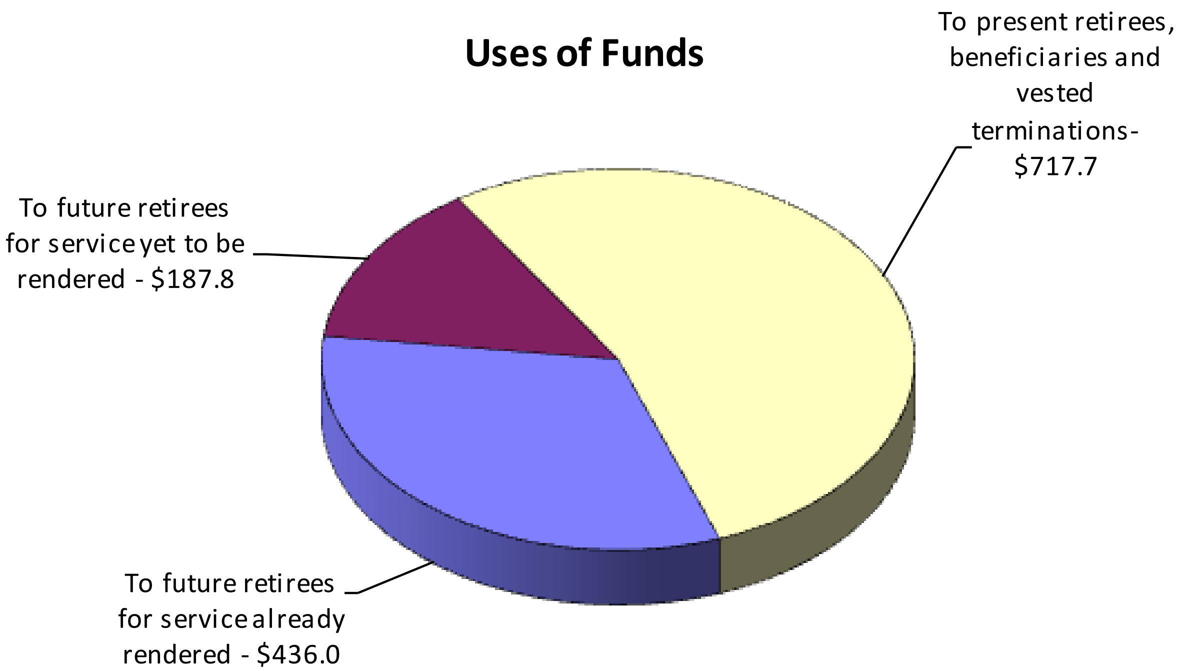
A. Present valuation assets		
1. Net assets from system financial statements	$ 898,154,960	
2. Market value adjustment	(13,346,839)	
3. Health assets	110,137,458	
4. Valuation assets: 1 + 2 - 3		$ 774,670,663
B. Actuarial present value of expected future employer contributions		
1. For normal costs	56,965,899	
2. For unfunded actuarial accrued liability	378,948,593	
3. Total		435,914,492
C. Actuarial present value of expected future member contributions		130,879,803
D. Total Present and Expected Future Resources		$ 1,341,464,958

Actuarial Present Value of Expected Future Benefit Payments

A. To retirants and beneficiaries	$ 714,084,933
B. To terminated members	3,536,350
C. To present active members	
1. Allocated to service rendered prior to valuation date (actuarial accrued liability)	435,997,973
2. Allocated to service likely to be rendered after valuation date	187,845,702
3. Total	623,843,675
D. Total Actuarial Present Value of Expected Future Benefit Payments	$ 1,341,464,958

Retirement, Survivor, and Disability Allowances
Financing $1,341.5 Million of Benefit Promises
December 31, 2017





Retirement, Survivor, and Disability Allowances
Comparative Statement

Valuation Date December 31	No.	Annual Payroll	Actuarial Accrued Liabilities Total	Funded	Unfunded	Unfunded/ Payroll	% Funded	Funding Years
1998	1,446	$ 65,153,864	$ 532,956,745	$ 509,859,924	$ 23,096,821	0.4	95.7%	10
1999 *	1,445	66,017,381	577,010,085	546,510,779	30,499,306	0.5	94.7%	20
2000 #	1,489	69,028,285	594,222,603	570,039,631	24,182,972	0.4	95.9%	8
2001	1,520	76,344,002	636,715,458	551,279,438	85,436,020	1.1	86.6%	31
2002 #	1,548	78,997,065	663,069,805	527,604,456	135,465,349	1.7	79.6%	32
2003	1,542	81,737,962	702,799,017	545,981,513	156,817,504	1.9	77.7%	32
2004 *	1,562	81,757,707	734,464,371	569,858,387	164,605,984	2.0	77.6%	34
2005 #	1,573	83,408,155	773,856,164	591,922,200	181,933,964	2.2	76.5%	35
2006 *	1,592	85,878,329	807,760,712	653,493,046	154,267,666	1.8	80.9%	28
2007	1,597	93,752,908	866,255,394	700,860,707	165,394,687	1.8	80.9%	27
2008	1,544	94,301,538	904,522,377	603,265,803	301,256,574	3.2	66.7%	N/A
2009	1,547	94,824,789	940,084,346	620,356,505	319,727,841	3.4	66.0%	N/A
2010 #	1,537	94,767,852	1,017,770,449	630,971,500	386,798,949	4.1	62.0%	N/A
2011	1,520	93,126,449	1,047,699,686	623,360,121	424,339,565	4.6	59.5%	N/A
2012 *	1,645	98,117,403	966,310,485	658,428,914	307,881,571	3.1	68.1%	30
2013 #	1,613	98,519,844	989,101,470	690,605,582	298,495,888	3.0	69.8%	30
2014	1,622	99,211,756	1,012,752,337	712,285,604	300,466,733	3.0	70.3%	29
2015 #	1,621	99,983,224	1,078,984,597	739,848,920	339,135,677	3.4	68.6%	30
2016	1,670	108,788,871	1,127,927,927	763,667,712	364,260,215	3.3	67.7%	29
2017	**1,650**	**112,705,188**	**1,157,798,442**	**774,670,663**	**383,127,779**	**3.4**	**66.9%**	**30**
2017 *	**1,650**	**112,705,188**	**1,153,619,256**	**774,670,663**	**378,948,593**	**3.4**	**67.2%**	**27**

* *Plan amended.*

\# *Revised actuarial assumptions or methods.*

While no one or two numeric indices can fully describe the financial condition of a retirement plan, ***the ratio of unfunded actuarial accrued liabilities to active member payroll ("Unfunded/Payroll" above) is significant***. Unfunded actuarial accrued liabilities represent a kind of debt, while active member payroll represents the Plan's capacity to collect contributions to pay toward debt --- thus ***the ratio is a relative index of condition***. ***The lower the ratio, the greater the financial strength, and vice-versa***.

Changes in Average Pay

Year	Number of Members	Total Payroll	Average Pay	% Change from Prior Year in Average Pay	N.A.E.+	CPI
2003	1,542	$81,737,962	$53,008	3.9%	2.4%	1.9%
2004	1,562	81,757,707	52,342	(1.3)%	4.6%	3.3%
2005	1,573	83,408,155	53,025	1.3%	3.7%	3.4%
2006	1,592	85,878,329	53,944	1.7%	4.6%	2.6%
2007	1,597	93,752,908	58,706	8.8%	4.5%	4.1%
2008	1,544	94,301,538	61,076	4.0%	2.3%	0.1%
2009	1,547	94,824,789	61,296	0.4%	(1.5)%	2.7%
2010	1,537	94,767,852	61,658	0.6%	2.4%	1.5%
2011	1,520	93,126,449	61,267	(0.6)%	3.1%	3.0%
2012	1,645	98,117,403	59,646	(2.6)%	3.1%	1.7%
2013	1,613	98,519,844	61,079	2.4%	1.3%	1.5%
2014	1,622	99,211,756	61,166	0.1%	3.5%	0.8%
2015	1,621	99,983,224	61,680	0.8%	3.5%	0.7%
2016	1,670	108,788,871	65,143	5.6%	1.1%	2.1%
2017	1,650	112,705,188	68,306	4.9%	N/A	2.1%
			10-Year Average	1.5%	2.1% *	1.6%

+ National Average Earnings published by the Social Security Administration.
** 9-year average.*

Over long periods of time, the change in average pay is an approximate measure of the impact of inflation and "Across the Board" pay increases on member pays. In years when the number of members decreases, the change in average pay may tend to be greater than actual pay increases experienced by members. In years when the number of members increases the change in average pay may tend to be less than actual pay increases experienced by members.

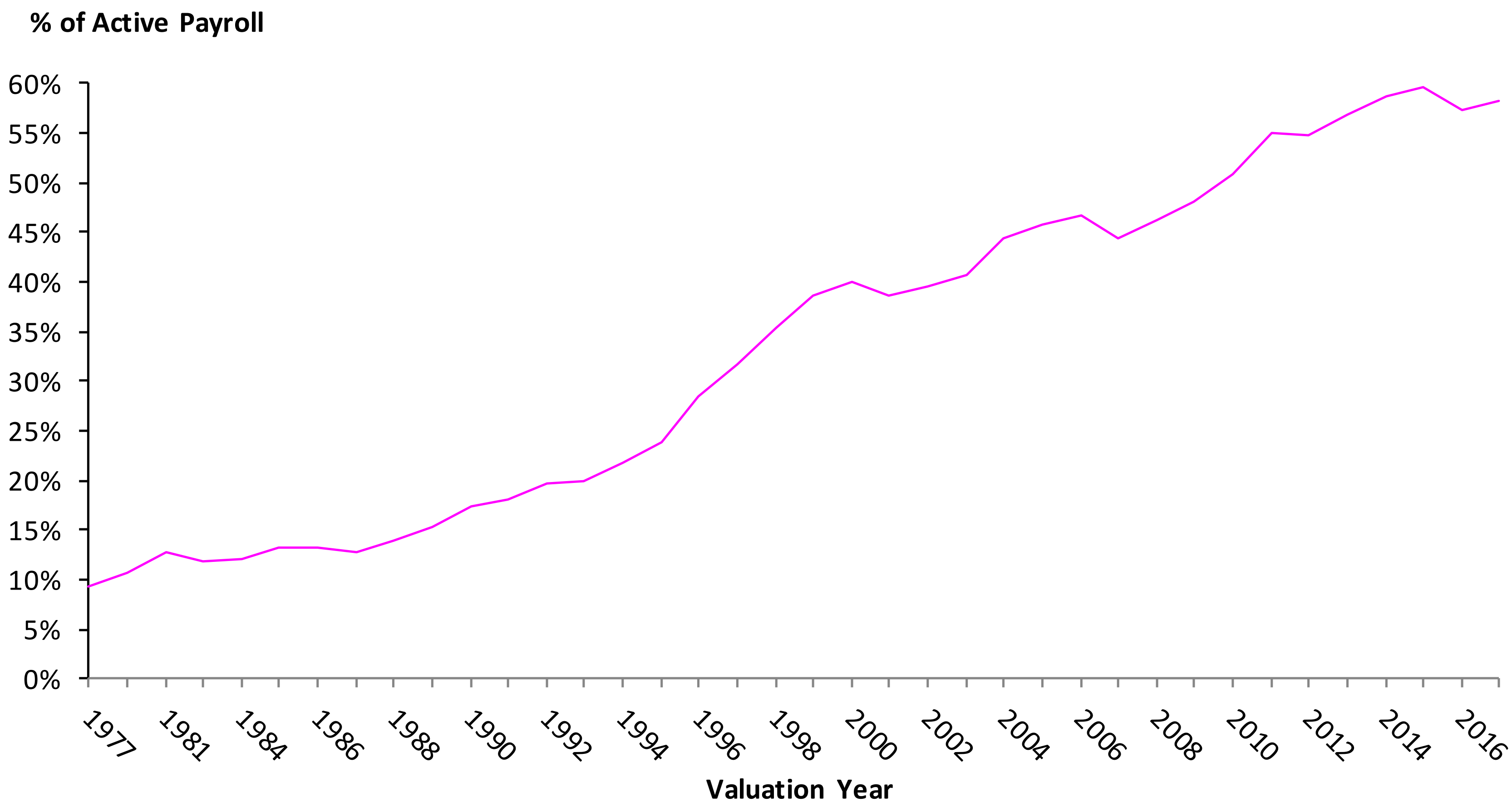
Retirement, Survivor, and Disability Benefits in Pay Status
Comparative Statement

Valuation Date December 31	Number of People	Monthly Pensions	Active Payroll	Average Amount	% of Active Member Pays
1998	1,060	$ 1,914,091	$ 65,153,864	$ 1,806	35.3%
1999 *	1,123	2,123,471	66,017,381	1,891	38.6%
2000 #	1,174	2,300,464	69,028,285	1,960	40.0%
2001	1,207	2,460,308	76,344,002	2,038	38.7%
2002	1,231	2,603,108	78,997,065	2,115	39.5%
2003	1,253	2,770,149	81,737,962	2,211	40.7%
2004	1,282	3,023,341	81,757,707	2,358	44.4%
2005 #	1,301	3,177,731	83,408,155	2,443	45.7%
2006 *	1,337	3,341,805	85,878,329	2,499	46.7%
2007	1,359	3,470,329	93,752,908	2,554	44.4%
2008	1,371	3,628,092	94,301,538	2,646	46.2%
2009	1,385	3,793,054	94,824,789	2,739	48.0%
2010 #	1,424	4,011,554	94,767,852	2,817	50.8%
2011	1,465	4,270,807	93,126,449	2,915	55.0%
2012 *	1,497	4,470,542	98,117,403	2,986	54.7%
2013 #	1,523	4,667,280	98,519,844	3,065	56.8%
2014	1,558	4,857,703	99,211,756	3,118	58.8%
2015 #	1,548	4,976,942	99,983,224	3,215	59.7%
2016	1,580	5,204,873	108,788,871	3,294	57.4%
2017 *	**1,637**	**5,471,803**	**112,705,188**	**3,343**	**58.3%**

* *Plan amended.*
\# *Revised actuarial assumptions or methods.*

Pensions expressed as a % of payroll exceed contribution income by a considerable margin. This is a normal and expected condition in a funded plan such as HPRS, but it does have implications for cash flow and investment planning.

Retirement, Survivor, and Disability Allowances Being Paid
Expressed as a % of Active Member Payroll
December 31, 2017



Short-Term Solvency Test

The HPRS financing objective is to pay for the benefits through contributions that remain approximately level from year-to-year as a percent of member payroll. If the contributions to the System are level in concept and soundly executed, the System will *pay all promised benefits when due – the ultimate test of financial soundness.*

Short-term solvency test is one means of checking a system's progress under its funding program. In a short-term solvency test, the plan's present assets (cash and investments) are compared with: 1) Active member contributions on deposit; 2) The liabilities for future benefits to present retired lives; 3) The liabilities for service already rendered by active members. In a system that has been following the discipline of level percent financing, the liabilities for active member contributions on deposit (1) and the liabilities for future benefits to present retired lives (2) will be fully covered by present assets (except in rare circumstances). In addition, the liabilities for service already rendered by active members (3) will be partially covered by the remainder of the present assets. Generally, if the system has been using level cost financing, the funded portion of Column 3 will increase over time.

Accrued Liabilities and Assets Allocated to Retirement, Survivor and Disability Allowances

Valuation Year	(1) Active Member Contributions	(2) Retirants, Beneficiaries & Vested Deferreds	(3) Active Members (Employer Financed Portion)	Valuation Assets	Portion of Accrued Liabilities Covered by Reported Assets		
					(1)	(2)	(3)
1998	$ 53,797,385	$ 291,066,407	$ 188,092,953	$ 509,859,924	100%	100%	88%
1999 *	55,558,145	333,340,728	188,111,212	546,510,779	100%	100%	84%
2000 #	59,455,707	358,422,165	176,344,731	570,039,631	100%	100%	86%
2001	63,969,216	374,228,361	198,517,881	551,279,438	100%	100%	57%
2002 #	68,794,904	391,098,788	203,176,113	527,604,456	100%	100%	33%
2003	73,358,075	412,818,959	216,621,983	545,981,513	100%	100%	28%
2004 *	77,100,466	445,084,791	212,279,114	569,858,387	100%	100%	22%
2005 #	77,779,569	463,476,318	232,600,277	591,922,200	100%	100%	22%
2006 *	82,720,940	482,998,754	242,041,018	653,493,046	100%	100%	36%
2007	89,279,853	509,179,659	267,795,882	700,860,707	100%	100%	38%
2008	94,749,356	511,626,943	298,146,078	603,265,803	100%	99%	0%
2009	101,131,517	528,087,050	310,865,779	620,356,505	100%	98%	0%
2010 #	104,503,065	583,714,389	329,552,995	630,971,500	100%	90%	0%
2011	104,701,161	618,984,073	324,014,452	623,360,121	100%	84%	0%
2012 *	108,311,937	586,311,106	271,687,442	658,428,914	100%	94%	0%
2013 #	113,334,067	601,342,081	274,425,322	690,605,582	100%	96%	0%
2014	117,441,639	622,719,141	272,591,557	712,285,604	100%	96%	0%
2015 #	122,286,821	662,562,480	294,135,296	739,848,920	100%	93%	0%
2016	127,311,764	688,936,795	311,679,368	763,667,712	100%	92%	0%
2017	**130,494,700**	**717,621,283**	**309,682,459**	**774,670,663**	**100%**	**90%**	**0%**
2017 *	**130,494,700**	**717,621,283**	**305,503,273**	**774,670,663**	**100%**	**90%**	**0%**

** Plan amendment.*

 # Assumption or method change.

Summary of Unfunded Actuarial Accrued Liabilities

Each time a new benefit is added which applies to service already rendered, an "unfunded actuarial accrued liability" is created. In addition, if actual financial experiences are less favorable than assumed financial experiences, the difference is added to unfunded actuarial accrued liabilities.

In an inflationary economy, the value of the dollar is decreasing. This environment results in employee pays increasing in dollar amounts resulting in unfunded actuarial accrued liabilities increasing in dollar amounts, all at a time when the actual substance of these items may be decreasing. Looking at just dollar amounts of unfunded actuarial accrued liabilities can be misleading. Unfunded actuarial accrued liabilities divided by active employee payroll provides an index, which aids understanding. The smaller ratio of unfunded liabilities to active member payroll, the stronger the system. Observation of this relative index over a period of years will give an indication of whether the system is becoming financially stronger or weaker.

Summary of Assets and Actuarial Accrued Liabilities for Retirement, Survivor, and Disability Allowances

Valuation Year	Actuarial Accrued Liability (AAL)	Valuation Assets	Unfunded Actuarial Accrued Liability (UAAL)	Ratio of Assets to AAL	Active Member Payroll	UAAL as a % of Active Member Payroll
1998	$ 532,956,745	$509,859,924	$ 23,096,821	95.7%	$65,153,864	35.4%
1999 *	577,010,085	546,510,779	30,499,306	94.7%	66,017,381	46.2%
2000 #	594,222,603	570,039,631	24,182,972	95.9%	69,028,285	35.0%
2001	636,715,458	551,279,438	85,436,020	86.6%	76,344,002	111.9%
2002 #	663,069,805	527,604,456	135,465,349	79.6%	78,997,065	171.5%
2003	702,799,017	545,981,513	156,817,504	77.7%	81,737,962	191.9%
2004 *	734,464,371	569,858,387	164,605,984	77.6%	81,757,707	201.3%
2005 #	773,856,164	591,922,200	181,933,964	76.5%	83,408,155	218.1%
2006 *	807,760,712	653,493,046	154,267,666	80.9%	85,878,329	179.6%
2007	866,255,394	700,860,707	165,394,687	80.9%	93,752,908	176.4%
2008	904,522,377	603,265,803	301,256,574	66.7%	94,301,538	319.5%
2009	940,084,346	620,356,505	319,727,841	66.0%	94,824,789	337.2%
2010 #	1,017,770,449	630,971,500	386,798,949	62.0%	94,767,852	408.2%
2011	1,047,699,686	623,360,121	424,339,565	59.5%	93,126,449	455.7%
2012 *	966,310,485	658,428,914	307,881,571	68.1%	98,117,403	313.8%
2013 #	989,101,470	690,605,582	298,495,888	69.8%	98,519,844	303.0%
2014	1,012,752,337	712,285,604	300,466,733	70.3%	99,211,756	302.9%
2015 #	1,078,984,597	739,848,920	339,135,677	68.6%	99,983,224	339.2%
2016	1,127,927,927	763,667,712	364,260,215	67.7%	108,788,871	334.8%
2017	**1,157,798,442**	**774,670,663**	**383,127,779**	**66.9%**	**112,705,188**	**339.9%**
2017 *	**1,153,619,256**	**774,670,663**	**378,948,593**	**67.2%**	**112,705,188**	**336.2%**

** Plan amendment.*
 # Assumption or method change.

The figures on this page do not include liabilities and assets related to post-retirement Health Care and Medicare reimbursement.

Schedule of Employer Contributions

Year Ended December 31	Actual Contributions	Percent of Required Contributed
2000	$13,210,189	100%
2001	13,901,313	100%
2002	14,923,893	100%
2003	16,361,339	100%
2004	17,205,610	100%
2005	18,467,789	100%
2006	19,263,941	98%
2007	19,956,700	92%
2008	20,302,216	96%
2009	20,453,914	102%
2010	21,211,944	93%
2011	22,966,338	85%
2012	23,766,361	78%
2013	22,908,182	65%
2014	22,325,421	75%
2015	22,895,242	100%
2016	25,383,684	100%
2017	**26,109,836**	**100%**

This information is presented in draft form for review by the System's auditor. Please let us know if there are any changes so that we may maintain consistency with the System's financial statements.

The amounts reported in this schedule do not include contributions for post-employment Health Care benefits.

Notes to Trend Data

The information presented in the required supplementary schedules was determined as part of the actuarial valuation at the dates indicated. Additional information as of the latest actuarial valuation follows:

Valuation Date	December 31, 2017
Actuarial Cost Method	Entry Age
Amortization Method	Level Percent Closed
Remaining Amortization Period	27 years for retirement allowances in determining the Annual Required Contribution
Asset Valuation Method	4-year smoothed market 20 % Corridor
Actuarial Assumptions:	
Investment Rate of Return	7.75%
Projected Salary Increases	3.8% - 13.5%
Includes Wage Inflation at	3.5%

Other Requested CAFR Information

As of December 31, 2017, the actuarial present value of credited projected benefits for current employees is shown below:

	Actuarial Present Value of Credited Projected Benefits
Current Employees	
Accumulated employee contributions	
including allocated investment income	$ 130,494,700
Employer - financed vested	215,427,117
Employer - financed non-vested	26,269,739

As of December 31, 2017, there were 773 vested active members and 877 non-vested active members.

Summary of Risk Measures

Valuation Date December 31,	Funded Ratio Based on AVA	Funded Ratio Based on MVA	UAAL Amortization Period	Total UAAL / Total Payroll	Total Actuarial Value of Assets / Total Payroll	Total AAL / Total Payroll	Standard Deviation of Investment Return / Total Payroll
2006 *	81 %	85 %	28	1.8	7.6	9.4	**
2007	81	83	27	1.8	7.5	9.2	**
2008	67	56	N/A	3.2	6.4	9.6	**
2009	66	63	N/A	3.4	6.5	9.9	**
2010 #	62	64	N/A	4.1	6.7	10.7	**
2011	60	58	N/A	4.6	6.7	11.3	**
2012 *	68	67	30	3.1	6.7	9.8	**
2013 #	70	74	30	3.0	7.0	10.0	**
2014	70	73	29	3.0	7.2	10.2	98 %
2015 #	69	65	30	3.4	7.4	10.8	92
2016	68	64	29	3.3	7.0	10.4	87
2017 *	67	68	27	3.4	6.9	10.2	92

* *Plan amendment.*
\# *Assumption or method change.*
** *Unavailable*

Funded ratio: The funded ratio is expected to trend toward 100% by December 31, 2045 based upon the current amortization period.

UAAL Amortization Period: The statutory amortization period is expected to decrease by one year each year.

UAAL / Total Payroll: The ratio of the unfunded actuarial accrued liability to payroll is expected to trend toward to 0% by December 31, 2045.

Funding Value of Assets / Total Payroll: As the funded ratio increases, this ratio is expected to converge to the ratio of Total AAL / Payroll.

Total AAL / Total Payroll: Total AAL / Total Payroll is expected to grow as the system matures.

Standard Deviation of Investment Return / Total Payroll: This measure illustrates the impact of a one standard deviation change in investment return as a percent of payroll. Investment return experience other than expected ultimately affects the employer contribution rates. The higher the ratio of this risk metric, the greater the expected volatility in employer contribution rates or computed amortization periods. Absent changes in investment policy, this metric is expected to increase as the assets grow to 100% of the AAL.

SECTION B

POST-RETIREMENT HEALTH CARE AND MEDICARE REIMBURSEMENT

Post-Retirement Health Care and Medicare Reimbursement Provisions Evaluated and/or Considered

Benefits Provided

Since July 1, 1974, the Retirement System has made Health Care available for every benefit recipient and eligible dependent under a hospitalization and health care policy administered by Aetna and Medical Mutual of Ohio. This Plan is secondary to Medicare or any other Health Care coverage. Depending on Medicare coverage, members are enrolled in either the fully-insured Medicare Advantage plan or the self-insured plan. Each year the Board establishes participant premium rates, any necessary co-payments for the retirant, spouse, or dependent children, and any other changes in plan design for the following calendar year. The member premiums for calendar year 2018 used for valuation purposes are as follows:

Premium Scale for Members or Spouses Ineligible for Medicare

	Monthly Premium		
Age	Retiree	Spouse	Surviving Spouse
60+	$135	$185	$ 135
56-59	$185	$235	$ 185
52-55	$345	$395	$ 345
<52	$594	$644	$ 594

Premium Scale for Members or Spouses Eligible for Medicare

Monthly Premium		
Retiree	Spouse	Surviving Spouse
$30	$170	$95

The dependent child premium is $130 per month for each child in calendar year 2018.

After calendar year 2018, member and spouse premiums presented above are assumed to increase by the health trend assumption shown on page B-9.

Post-Retirement Health Care and Medicare Reimbursement Provisions Evaluated and/or Considered (Concluded)

Benefits Provided (Continued)

Basic Plan coverage provides for a portion of payment of all reasonable and customary hospital expenses. All hospital admissions must be pre-certified prior to an elective admission. Emergency confinements require notification within 48 hours following admission. If a covered person is in a network area, he or she must use a preferred provider for the maximum benefit.

All other medical expenses are covered at the rate of 80% of reasonable and customary charges.

Designated surgical procedures require a second opinion. Designated outpatient procedures must be pre-certified. For in-network activity, the annual out-of-pocket maximum is $1,500 per individual or $3,000 per family (out of network amounts are $5,000 and $10,000, respectively) for Medical Mutual. Each covered person not eligible for Medicare must meet a $500 annual deductible ($1,000 for out of network). For in-network activity for members in the insured Medicare Advantage, the annual out-of-pocket maximum is $2,000 per individual. Members in the insured Medicare Advantage plan do not have a deductible requirement.

A mail-order prescription drug plan is also available. Each 90-day prescription submitted via mail order has a co-payment of $10.00 for generic and $30.00 for brands. Each 34-day prescription has a co-payment of $5.00 for generic and $15.00 for brands. Members will be responsible for the full cost of non-formulary drugs.

Administration: The medical program is administered by AETNA and Medical Mutual of Ohio for hospital-medical-surgical coverage and by ESI for retail/mail order prescription drug coverage.

Stop Loss Coverage: The non-Medicare population is fully self-insured and stop loss coverage is maintained.

Medicare Part B Reimbursements: None.

Dental/Vision: Premiums for benefit recipients are deducted from benefit payments. The Dental/Vision member premium amounts for calendar year 2018 are as follows:

Premium Scale for Dental/Vision

	Monthly Premium		
	Retiree	Spouse	Surviving Spouse
Dental	$5	$20	$5
Vision	$5	$ 5	$5

Dental and vision premiums are increased using a trend assumption of 3.50% for all years.

Post-Retirement Health Care and Medicare Reimbursement

		Amounts Paid to Vendors (Including Medicare Part B)												
Year	Covered Lives	Medical	Drugs	Medicare Part B	Dental	Vision	Wellness	Total	Retiree/Spouse Premiums and Other Adjustments	Retiree Drug Subsidy and Prescription Drug Rebates	Net Paid by OHPRS	Per Covered Life	Valuation Payroll	% of Payroll
1985	697	$ 427,361	$ 60,015	$ 28,272				$ 515,648			$ 515,648	$ 740	$ 32,500,428	1.6%
1986	715	787,245	80,911	30,457				898,613			898,613	1,257	34,757,277	2.6%
1987	731	559,832	115,544	38,037				713,413			713,413	976	39,938,912	1.8%
1988	761	522,747	145,847	57,461				726,055			726,056	954	40,674,634	1.8%
1989	810	1,043,650	186,795	77,869				1,308,314	$ 97,864		1,406,178	1,736	43,053,057	3.3%
1990	925	1,009,153	213,716	77,363				1,300,232	(94,251)		1,205,981	1,304	45,679,355	2.6%
1991	976	1,267,327	251,004	86,740				1,605,071	180,583		1,785,654	1,830	48,488,406	3.7%
1992	1,045	1,643,276	298,493	97,117				2,038,886	76,046		2,114,932	2,024	50,235,996	4.2%
1993	1,081	1,553,628	299,410	118,109				1,971,147	(90,525)		1,880,622	1,740	55,781,585	3.4%
1994	1,133	1,239,008	320,360	141,384				1,700,752	3,314		1,704,066	1,504	58,116,787	2.9%
1995	1,225	1,512,523	364,096	149,440				2,026,059	(66,834)		1,959,225	1,599	59,825,356	3.3%
1996	1,379	1,353,932	491,525	155,769				2,001,226	21,382		2,022,608	1,467	59,239,349	3.4%
1997	1,499	1,623,640	849,321	166,743				2,639,704	(140,526)		2,499,178	1,667	62,233,299	4.0%
1998	1,602	2,147,334	1,122,248	171,223				3,440,805	(311,917)		3,128,888	1,953	65,153,864	4.8%
1999	1,772	3,315,914	1,364,990	197,606				4,878,510	619,894		5,498,404	3,103	66,017,381	8.3%
2000	1,848	3,190,885	1,684,300	203,157				5,078,342	(358,082)		4,720,260	2,554	69,028,285	6.8%
2001	1,900	3,730,167	1,960,825	231,046				5,922,038	138,317		6,060,355	3,190	76,344,002	7.9%
2002	1,943	4,147,534	2,431,297	260,772	$194,893	$ 80,909		7,115,405	(200,021)		6,915,384	3,559	78,997,065	8.8%
2003	1,912	4,256,046	2,681,414	290,506	209,429	82,097		7,519,492	(507,642)		7,011,850	3,667	81,737,962	8.6%
2004	1,928	4,074,972	2,710,367	347,585	230,994	84,136		7,448,054	(641,707)		6,806,347	3,530	81,757,707	8.3%
2005	1,958	6,015,277	2,980,755	422,045	364,139	124,658		9,906,874	(552,570)		9,354,304	4,777	83,408,155	11.2%
2006	2,078	4,999,822	2,832,743	503,034	408,667	127,266		8,871,532	(198,141)		8,673,391	4,174	85,878,328	10.1%
2007	2,085	6,580,455	3,513,662	572,127	464,402	130,029		11,260,675	(980,539)		10,280,136	4,931	93,752,908	11.0%
2008	2,103	5,087,073	3,274,896	632,293	453,002	121,599	$ 79,679	9,648,542	(784,381)	$ (317,381)	8,546,780	4,064	94,301,538	9.1%
2009	2,095	4,983,739	3,430,089	673,450	495,272	133,296	86,007	9,801,853	(902,320)	(513,668)	8,385,865	4,003	94,824,789	8.8%
2010	2,166	6,380,294	3,709,855	713,317	453,276	133,141	57,747	11,447,630	(911,076)	(471,909)	10,064,645	4,647	94,767,852	10.6%
2011	2,269	6,755,757	4,053,343	770,183	528,824	157,600	95,210	12,360,917	(1,268,402)	(795,523)	10,296,992	4,538	93,126,449	11.1%
2012	2,310	6,393,584	4,301,087	839,451	594,292	149,962	24,604	12,302,980	(1,277,430)	(873,601)	10,151,949	4,395	98,117,403	10.3%
2013	2,359	7,872,163	4,110,260	896,970	612,575	158,197	53,440	13,703,605	(1,562,609)	(1,060,462)	11,080,534	4,697	98,519,844	11.2%
2014	2,356	7,624,000	4,722,043	874,164	619,286	167,660	48,728	14,055,881	(1,747,403)	(1,533,886)	10,774,592	4,573	99,211,756	10.9%
2015	2,400	7,087,732	5,245,815	601,860	593,016	162,417	68,263	13,759,103	(2,397,055)	(1,568,533)	9,793,515	4,081	99,983,224	9.8%
2016	2,399	7,331,598	6,115,492	311,820	621,659	182,959	31,455	14,594,983	(2,918,533)	(1,433,489)	10,242,961	4,270	108,788,871	9.4%
2017	**2,310**	**8,091,247**	**6,488,074**	**0**	**642,998**	**181,102**	**53,566**	**15,456,987**	**(3,885,594)**	**(2,137,648)**	**9,433,745**	**4,084**	**112,705,188**	**8.4%**

Separate information for dental and vision was not available for years prior to 2002. Retiree drug subsidy and prescription drug rebates are included beginning with calendar year 2008.

Post-Retirement Health Care and Medicare Reimbursement

Assumptions for Health Care Coverages
December 31, 2017

Development of Health Care Rates: Based on the 2017 retired life data, the HPRS portion of the total health care rates was developed as follows:

		HPRS Monthly Rates [Age 59 Central Age]	
		This Year Gross Rate	**Prior Year Gross Rate**
A.	One-person without Medicare	$ 851.50	$ 793.43
B.	One-person with Medicare*	227.88	252.24
C.	Two-persons without Medicare	1,703.00	1,586.86
D.	Two-persons with Medicare*	455.76	504.48
E.	Child	330.26	344.52

* *Includes a reduction to the premium due retiree drug subsidies and prescription drug rebates.*

The above rates are estimates that are suitable for the purpose of this valuation. Use of the above rates for any other purpose would require review. Pre-Medicare rates are lower than would be expected when compared with other retired groups. This may be attributable to a higher than average amount of coordination of benefit claims for younger HPRS retirees. Many younger retirees likely have other employment. Please see page B-6 for age specific rates used for valuation purposes. Employment related primary coverages for recipients and dependents have been reflected in the age based specific premium rates.

James E. Pranschke is a Member of the American Academy of Actuaries (MAAA) and meets the Qualification Standards of the American Academy of Actuaries to certify the per capita retiree health care rates shown above and on page B-6 as well as the trend rates presented on page B-9.

James E. Pranschke

James E. Pranschke, FSA, MAAA

Assumptions for Health Care Coverages
Age Specific HPRS Monthly Gross Rates

	Gross Rate			Gross Rate			Gross Rate	
Age	Male	Female	Age	Male	Female	Age	Male	Female
16	$ 235.04	$ 236.85	51	$ 556.94	$ 670.87	86	$ 370.84	$ 377.95
17	233.39	247.74	52	588.79	692.88	87	369.33	378.95
18	226.13	254.83	53	621.92	714.29	88	367.85	379.71
19	214.64	259.27	54	656.51	735.30	89	366.50	380.24
20	201.32	263.44	55	692.64	756.26	90	365.32	380.37
21	188.64	270.10	56	730.29	777.74	91	364.29	379.84
22	178.45	281.40	57	769.42	800.39	92	363.35	378.34
23	171.87	298.43	58	809.85	824.81	93	362.42	375.56
24	169.28	321.12	59	851.50	851.50	94	361.41	371.22
25	170.44	348.44	60	894.58	880.85	95	360.25	365.11
26	174.74	378.70	61	939.50	913.08	96	358.90	357.04
27	181.38	409.94	62	986.58	948.23	97	357.30	346.91
28	189.63	440.19	63	1,036.01	986.12	98	355.47	334.68
29	198.89	467.71	64	1,087.83	1,026.62	99	355.47	334.68
30	208.70	491.11	65	300.85	283.77	100	355.47	334.68
31	218.72	509.50	66	305.91	290.74	101	355.47	334.68
32	228.75	522.53	67	311.12	297.59	102	355.47	334.68
33	238.83	530.45	68	316.49	304.31	103	355.47	334.68
34	249.18	533.98	69	322.04	310.85	104	355.47	334.68
35	260.03	534.27	70	327.74	317.14	105	355.47	334.68
36	271.61	532.56	71	333.39	323.13	106	355.47	334.68
37	284.00	530.10	72	338.73	328.80	107	355.47	334.68
38	297.10	527.99	73	343.59	334.10	108	355.47	334.68
39	310.72	527.03	74	347.99	338.99	109	355.47	334.68
40	324.72	527.64	75	352.00	343.47	110	355.47	334.68
41	339.07	529.94	76	355.77	347.60	111	355.47	334.68
42	353.95	533.92	77	359.45	351.54	112	355.47	334.68
43	369.59	539.72	78	363.08	355.42	113	355.47	334.68
44	386.24	547.60	79	366.52	359.28	114	355.47	334.68
45	404.24	557.90	80	369.53	363.07	115	355.47	334.68
46	424.01	570.95	81	371.83	366.59	116	355.47	334.68
47	445.98	586.86	82	373.22	369.72	117	355.47	334.68
48	470.44	605.49	83	373.65	372.46	118	355.47	334.68
49	497.35	626.31	84	373.23	374.78	119	355.47	334.68
50	526.36	648.43	85	372.22	376.60	120	355.47	334.68

Assumptions for Health Care Coverages
December 31, 2017

Eligibility for Medicare Coverage: All benefit recipients were assumed to be eligible for Medicare on attainment of age 65.

Health Care Inflation: If the price for any product or service were to increase faster than wages for an indefinite period, eventually that product or service would be priced out of the market and either the product or service would not be offered or substituted with an affordable product or service. For this reason, health care inflation was assumed to equal wage inflation in the long term. The assumed point in time when health care inflation reduces to wage growth inflation is uncertain. Our assumptions are based on an approximate 5 to 10-year horizon. Short-term assumptions are described on page B-9.

Retiree health valuations require an assumption about how the health costs that the System is absorbing will change over the years. This assumption includes more than just "health inflation." It includes the impact of:

- The introduction of new procedures and medications and how they are priced.
- The utilization of services and products by covered retirees and their dependents and how that utilization changes over the years.

Retiree health valuations use a health cost trend assumption that changes over the years. The near term rates reflect the fact that currently employers are seeing sharp increases in the cost of health goods and services. If this trend is projected to continue for years to come, it implies that years from now virtually all our expenditures will be for health care. The seemingly more reasonable alternative is that in the not too distant future inflation in medical expenses will decrease to a level at or near wage inflation. It is on this basis that we project premium rates will continue to exceed wage inflation for the next 5 - 10 years, but by less each year until leveling off at an ultimate rate, assumed to be 3.5% in this valuation.

The trend assumption is established by reviewing the System's historical trends and evaluating its relationship with national trends. Comparative trends obtained from a variety of resources including trend surveys from major insurers and benefit consulting groups. This information is added to information we have collected from analysis done in conjunction with many retiree health valuations we have completed for other clients.

This analysis is done separately for the prescription drug program and the remainder of the medical benefits since the trends and forces driving the trends are quite different in these two segments. Review of the System's recent experience indicates trends typical of our comparative trends for both prescription drug and medical. The trends used in this valuation are found on page B-9.

Post-Retirement Health Premium and Medicare Reimbursement Selection of Assumptions December 31, 2017

In order to prepare actuarial studies of the coverages, it is necessary to make assumptions regarding future events such as:

1. When people will retire and how long people will live after retirement.
2. Whether or not people will quit employment prior to eligibility for a benefit.
3. Whether or not people will die in service or become disabled.
4. Rates of Investment Return and pay increases.
5. The proportion of retirees electing coverage for a spouse after retirement.
6. Rates of increase in health care premium.
7. Effect of managed care program on future claims.

Regarding items 1 through 4, the assumptions from the regular December 31, 2017 valuations were used. For current retirees, actual health care coverage elections were used. For future retirees, it was assumed that 90% of males and 50% of females who retire and elect healthcare coverage would also elect coverage for a spouse at retirement, and that coverage would be available to surviving spouses of deceased retirees and active members.

For purposes of the solvency projections, an investment return assumption of 7.75% was chosen by default to be the same rate used in the Pension Plan valuations. It is uncertain how much longer retiree health fund assets can be invested in the same manner as pension assets given the current solvency period of the retiree health fund.

Post-Retirement Health Premium and Medicare Reimbursement Selection of Assumptions December 31, 2017 (Concluded)

Three alternate assumptions for near term health care cost increases were considered and are shown below. A brief description of each of the alternate assumptions follows:

Alternate A (Optimistic): The Alternate A assumption assumes that the employer share of per capita costs would increase at 6.00% next year, 5.50% the second year, 5.25% the third year, 5.00% the fourth year, 4.75% the fifth year, 4.50% the sixth year, 4.25% the seventh year, 4.00% the eighth year, 3.75% the ninth year and no faster than 3.50% per year thereafter.

Alternate B (Intermediate): In the middle of the range of probable conditions is the view that short-term health care trends will rise somewhat over the next few years before declining to the level of overall GDP growth. This is the assumption set upon which Governmental Accounting Standards Board (GASB) Statements No. 74 and No. 75 information is based.

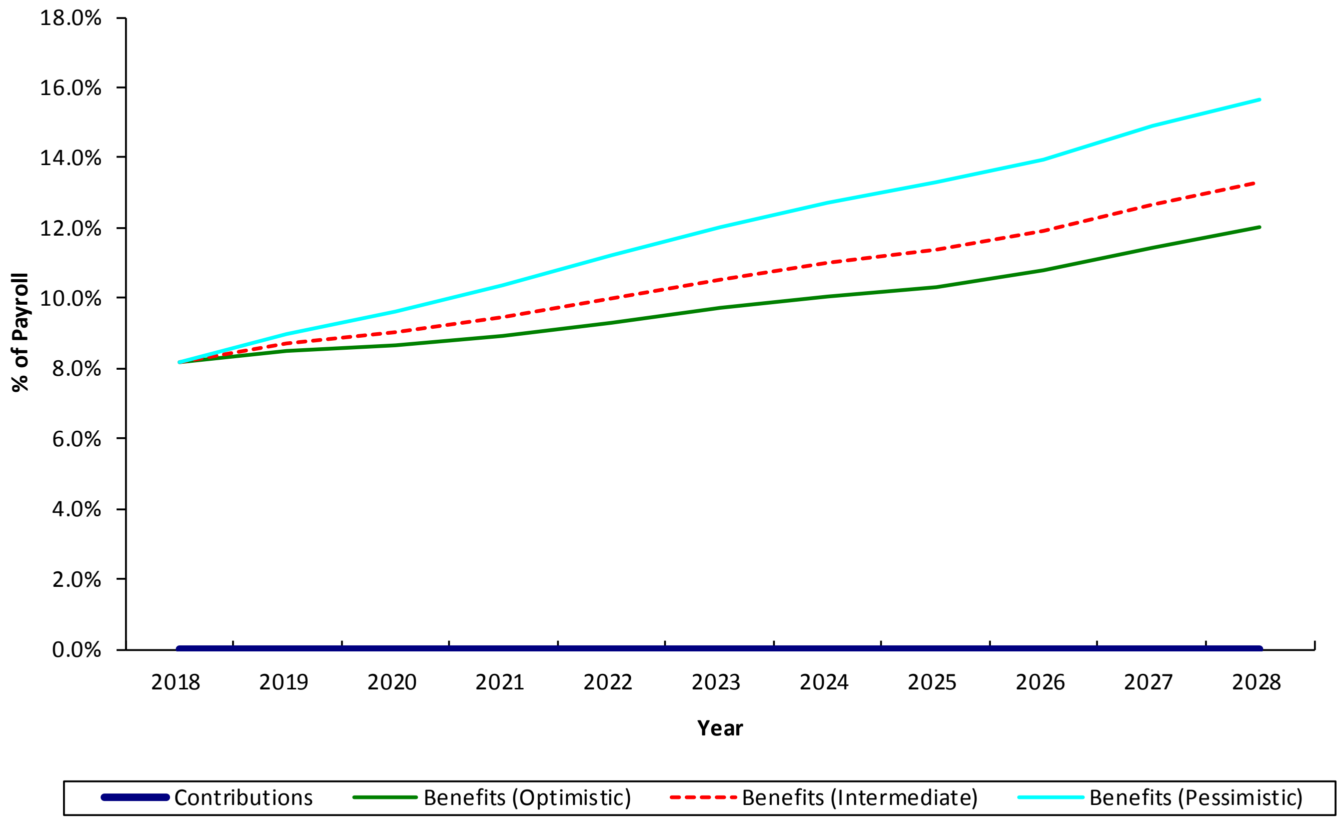
Alternate C (Pessimistic): This scenario envisions poorer experience than the other two.

	Health Trend Assumption		
	Medical and Prescription Drug		
Year	Alt. A Optimistic	Alt. B Intermediate	Alt. C Pessimistic
2018			
2019	6.00%	8.25%	12.00%
2020	5.50%	7.50%	11.00%
2021	5.25%	7.00%	10.00%
2022	5.00%	6.50%	9.00%
2023	4.75%	6.00%	8.00%
2024	4.50%	5.50%	7.00%
2025	4.25%	5.00%	6.00%
2026	4.00%	4.50%	5.00%
2027	3.75%	4.00%	4.25%
2028	3.50%	3.50%	3.50%
2029	3.50%	3.50%	3.50%
2030	3.50%	3.50%	3.50%
2031	3.50%	3.50%	3.50%
2032 & Later	3.50%	3.50%	3.50%

Post-Retirement Health Care and Medicare Reimbursement
Projected Benefits
December 31, 2017

Year Ended 12/31	Projected Benefits as a % of Payroll		
	Alt. A Optimistic	Alt. B Intermediate	Alt. C Pessimistic
2018	8.2%	8.2%	8.2%
2019	8.5%	8.7%	9.0%
2020	8.7%	9.0%	9.6%
2021	8.9%	9.5%	10.4%
2022	9.3%	10.0%	11.2%
2023	9.7%	10.5%	12.0%
2024	10.0%	11.0%	12.7%
2025	10.3%	11.4%	13.3%
2026	10.8%	11.9%	14.0%
2027	11.4%	12.7%	14.9%
2032	14.2%	15.7%	18.5%
2037	14.5%	16.1%	18.9%
2042	13.3%	14.8%	17.3%
2047	13.2%	14.6%	17.1%
2052	14.5%	16.1%	18.9%
2057	15.8%	17.5%	20.6%
2062	16.2%	18.0%	21.1%
2067	16.1%	17.9%	21.0%
2072	15.7%	17.4%	20.4%
2077	15.6%	17.3%	20.3%

Contributions vs. Benefit Payouts



The above chart assumes that there will be assets sufficient to pay the benefits. Under the intermediate assumptions, unless significant investment gains and/or contribution increases arise, the retiree health fund is expected to run out of money in 2029. At that point, the retiree health plan would become "pay as you go." Benefits would have to be reduced well below the present levels, because benefits paid out could not exceed contribution income. Given the assumed contribution level, benefits would actually have to be completely eliminated.

Post-Retirement Health Care and Medicare Reimbursement
Alternative B: Intermediate Health Trend

Determination of the Actuarially Determined Employer Contribution for the Period July 1, 2018 to June 30, 2019	Contributions Expressed as Percents of Payroll
Normal Cost	5.37%
UAL Payment (30-year amortization)	6.91%
Total (Annual Required Contribution)	**12.28%**

Accrued Health and Medicare Reimbursement Liabilities, $248,087,741 were more than applicable assets of $110,137,458.

The calculations above show the employer's Actuarially Determined Employer Contribution (ADEC) for the year ended June 30, 2019. The System's ADEC for the year ended December 31, 2018 will be ½ of 25.83% and ½ of the 12.28% shown above.

Notes to Trend Data

The information presented in the required supplementary schedules was determined as part of the actuarial valuation at the dates indicated. Additional information as of the latest actuarial valuation follows:

Valuation Date	December 31, 2017
Actuarial Cost Method	Entry Age
Amortization Method	Level Percent Open
Remaining Amortization Period	30 years for retiree health benefits in determining the Actuarially Determined Employer Contribution
Asset Valuation Method	4-year smoothed market 20 % Corridor
Actuarial Assumptions:	
Investment Rate of Return	7.75%
Projected Salary Increases	3.8% - 13.5%
Includes Wage Inflation at	3.5%
Health Trend	Intermediate Trend (See Page B-9)

Experience Gain / (Loss)

Gains/(Losses) During the Year Ended December 31, 2017
Resulting from Differences Between Assumed and Actual Experience

A. Derivation of Actuarial Gain/(Loss):

1.	Unfunded Actuarial Accrued Liability (UAAL) - Previous Valuation	$ 295,420,882
2.	Total Normal Cost for Year Ending 12/31/2017	16,523,896
3.	Total Contributions (employer) for Year Ending 12/31/2017	4,640,177
4.	Interest on:	
	a. UAAL: Discount Rate* x (1)	14,771,044
	b. Normal Cost and Contributions: Discount Rate / 2 x [(2) - (3)]	297,093
	c. Net Total: (a) + (b)	15,068,137
5.	Change in UAAL due to Benefit Changes	221,502
6.	Change in UAAL due to Assumptions (Trend/Discount Rate)	(130,883,355)
7.	Expected UAAL Current Year:	
	(1) + (2) - (3) + (4c) + (5) + (6)	191,710,885
8.	Actual UAAL Current Year	137,950,283
9.	**Experience Gain/(Loss): (7) - (8)**	**$ 53,760,602**

B. Approximate Portion of Gain/(Loss) due to Investments	$ (1,345,114)
C. Approximate Portion of Gain/(Loss) due to Liabilities: (A.9) - (B)	$ 55,105,716

** Discount rate is 5.0%*

Type of Activity

	Gain/(Loss)
1. **Premiums.** Gains and losses resulting from actual premiums in valuation year versus that assumed from prior valuation.	$33,659,428
2. **Investment Income.** If there is greater investment income than assumed, there is a gain. If less income, a loss.	(1,345,114)
3. **All Other Sources.** Gains and losses resulting from demographic experience, data adjustments, timing of financial transactions, etc.	21,446,288
4. **Composite Gain/(Loss) During Year.**	**$53,760,602**

Short-Term Healthcare Solvency Test

The HPRS financing objective is to pay for the benefits through contributions that remain approximately level from year-to-year as a percent of member payroll. If the contributions to the System are level in concept and soundly executed, the System will *pay all promised benefits when due – the ultimate test of financial soundness.*

Short-term solvency test is one means of checking a system's progress under its funding program. In a short-term solvency test, the plan's present assets (cash and investments) are compared with; 1) The liabilities for future benefits to present retired lives; 2) The liabilities for service already rendered by active members. In a system that has been following the discipline of level percent financing, the liabilities for future benefits to present retired lives (1) will be fully covered by present assets (except in rare circumstances). In addition, the liabilities for service already rendered by active members (2) will be partially covered by the remainder of the present assets. Generally, if the system has been using level cost financing, the funded portion of Column 2 will increase over time.

Accrued Liabilities and Assets Allocated to Retirement, Survivor and Disability Healthcare

Valuation Year	(1) Retirants, Beneficiaries & Vested Deferreds	(2) Active Members (Employer Financed Portion)	Healthcare Valuation Assets	Portion of Accrued Liabilities Covered by Reported Assets	
				(1)	(2)
2012	$ 253,784,322	$ 157,683,503	$ 99,817,173	39%	0%
2013	246,744,210	191,817,484	102,083,923	41%	0%
2014 #	177,574,474	199,108,639	103,812,807	58%	0%
2015	195,195,607	217,156,476	106,550,139	55%	0%
2016	187,123,383	216,579,635	108,282,136	58%	0%
2017	**166,409,636**	**200,169,820**	**110,137,458**	**66%**	**0%**
2017 *#	**125,764,087**	**122,323,654**	**110,137,458**	**88%**	**0%**

* *Plan amendment.*
\# *Assumption or method change.*

.

Post-Retirement Health and Medicare Reimbursement
Results with Alternate Health Inflation Assumptions
December 31, 2017

Optimistic, Intermediate and Pessimistic assumption sets were described on page B-9. For each assumption set, four questions are asked.

Question 1. How long will the Health Care fund remain solvent if the present employer contribution rate allocation, "Funding Level 1", is not changed?
Question 2. What is the lowest employer contribution rate, "Funding Level 2", that would maintain the solvency of the fund for 20 years?
Question 3. What is the lowest employer contribution rate, "Funding Level 3", that would maintain the solvency of the fund for 30 years?
Question 4. What is the lowest employer contribution rate, "Funding Level 4", that would maintain the solvency of the fund indefinitely?

The answers to these questions are summarized below. In reviewing the answers, it is important to keep in mind that the alternates are intended to be helpful in understanding the range of potential outcomes. They are not predictions.

	Funding Level 1			Funding Level 2			Funding Level 3			Funding Level 4		
	Employer Rate Allocation			Lowest Employer Rate to Maintain Solvency of Fund for 20 Years			Lowest Employer Rate to Maintain Solvency of Fund for 30 Years			Lowest Employer Rate to Maintain Solvency of Fund Indefinitely		
Assumption Set	**%**	**Fund Solvent Until**	**Prior Valuation %**	**%**	**Fund Solvent Until**	**Prior Valuation %**	**%**	**Fund Solvent Until**	**Prior Valuation %**	**%**	**Fund Solvent Until**	**Prior Valuation %**
A (Optimistic)	0.00%	2030	0.00%	4.10%	2038	4.90%	6.10%	2048	7.10%	8.90%	Indefinitely	10.50%
B (Intermediate)	0.00%	2029	0.00%	5.10%	2038	6.30%	7.20%	2048	8.50%	10.10%	Indefinitely	12.40%
C (Pessimistic)	0.00%	2028	0.00%	6.90%	2038	8.30%	9.20%	2048	10.70%	12.40%	Indefinitely	14.90%

** The employer contribution rate is 4.0% for the first year and 0.0% thereafter.*

The above results show that:

- Under the optimistic assumptions, the employer rate will need to be raised prior to 2030 in order to maintain the solvency of the fund. The ultimate rate needed to support the plan would be 8.90% of payroll if the increase were made today.
- Under the intermediate assumptions, the employer rate will need to be raised prior to 2029 in order to maintain the solvency of the fund. The ultimate rate needed to support the plan would be 10.10% of payroll if the increase were made today.
- Under the pessimistic assumptions, the employer rate will need to be raised prior to 2028 in order to maintain the solvency of the fund. The ultimate rate needed to support the plan would be 12.40% of payroll if the increase were made today.

The following pages show projected fund activity based upon Alternate Assumptions A, B and C, and Funding Levels 1, 2, 3 and 4.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Optimistic Assumptions: A
Funding Level 1
($ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return $	Fund Balance EOY		% of Payroll	
							Nominal $	Real $	Contrib.	Benefits
2018	$110,137	$0	$ 9,551	$ (9,551)	7.75%	$8,170	$108,756	$108,756	0.00%	8.19%
2019	108,756	0	10,235	(10,235)	7.75%	8,037	106,558	102,955	0.00%	8.50%
2020	106,558	0	10,773	(10,773)	7.75%	7,846	103,631	96,741	0.00%	8.67%
2021	103,631	0	11,478	(11,478)	7.75%	7,592	99,745	89,964	0.00%	8.95%
2022	99,745	0	12,330	(12,330)	7.75%	7,258	94,673	82,502	0.00%	9.32%
2023	94,673	0	13,236	(13,236)	7.75%	6,831	88,268	74,319	0.00%	9.71%
2024	88,268	0	14,124	(14,124)	7.75%	6,300	80,444	65,441	0.00%	10.05%
2025	80,444	0	14,969	(14,969)	7.75%	5,662	71,137	55,913	0.00%	10.33%
2026	71,137	0	16,097	(16,097)	7.75%	4,897	59,937	45,517	0.00%	10.77%
2027	59,937	0	17,629	(17,629)	7.75%	3,970	46,278	33,956	0.00%	11.43%
2028	46,278	0	19,133	(19,133)	7.75%	2,854	29,999	21,267	0.00%	12.00%
2029	29,999	0	20,712	(20,712)	7.75%	1,532	10,819	7,410	0.00%	12.56%
2030	10,819	0	22,460	(22,460)	7.75%	(21)	(11,662)	(7,718)	0.00%	13.18%

Funding Level 1 is the present contribution rate for post-retirement Health Care and Medicare reimbursement. The fund remains solvent until 2030 in this projection.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Optimistic Assumptions: A
Funding Level 2
($ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return $	Fund Balance EOY Nominal $	Fund Balance EOY Real $	% of Payroll Contrib.	% of Payroll Benefits
2018	$ 110,137	$ 4,780	$ 9,551	$ (4,771)	7.75%	$ 8,353	$ 113,719	$113,719	4.10%	8.19%
2019	113,719	4,936	10,235	(5,299)	7.75%	8,610	117,030	111,457	4.10%	8.50%
2020	117,030	5,094	10,773	(5,679)	7.75%	8,853	120,204	109,029	4.10%	8.67%
2021	120,204	5,261	11,478	(6,217)	7.75%	9,078	123,065	106,308	4.10%	8.95%
2022	123,065	5,425	12,330	(6,905)	7.75%	9,273	125,433	103,194	4.10%	9.32%
2023	125,433	5,589	13,236	(7,647)	7.75%	9,428	127,214	99,675	4.10%	9.71%
2024	127,214	5,762	14,124	(8,362)	7.75%	9,539	128,391	95,807	4.10%	10.05%
2025	128,391	5,942	14,969	(9,027)	7.75%	9,605	128,969	91,656	4.10%	10.33%
2026	128,969	6,127	16,097	(9,970)	7.75%	9,614	128,613	87,050	4.10%	10.77%
2027	128,613	6,324	17,629	(11,305)	7.75%	9,535	126,843	81,764	4.10%	11.43%
2028	126,843	6,536	19,133	(12,597)	7.75%	9,348	123,594	75,876	4.10%	12.00%
2029	123,594	6,760	20,712	(13,952)	7.75%	9,045	118,687	69,394	4.10%	12.56%
2030	118,687	6,989	22,460	(15,471)	7.75%	8,606	111,822	62,267	4.10%	13.18%
2031	111,822	7,231	24,221	(16,990)	7.75%	8,016	102,848	54,542	4.10%	13.73%
2032	102,848	7,492	25,935	(18,443)	7.75%	7,265	91,670	46,300	4.10%	14.19%
2033	91,670	7,767	27,503	(19,736)	7.75%	6,349	78,283	37,655	4.10%	14.52%
2034	78,283	8,055	29,014	(20,959)	7.75%	5,265	62,589	28,673	4.10%	14.77%
2035	62,589	8,359	30,287	(21,928)	7.75%	4,012	44,673	19,491	4.10%	14.86%
2036	44,673	8,677	31,141	(22,464)	7.75%	2,603	24,812	10,310	4.10%	14.72%
2037	24,812	9,000	31,893	(22,893)	7.75%	1,047	2,966	1,174	4.10%	14.53%
2038	2,966	9,333	32,756	(23,423)	7.75%	(666)	(21,123)	(7,961)	4.10%	14.39%

Funding Level 2 is the lowest funding level that will keep the fund solvent for 20 years.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Optimistic Assumptions: A
Funding Level 3
($ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return $	Fund Balance EOY		% of Payroll	
							Nominal $	Real $	Contrib.	Benefits
2018	$ 110,137	$ 7,111	$ 9,551	$ (2,440)	7.75%	$ 8,442	$ 116,139	$116,139	6.10%	8.19%
2019	116,139	7,343	10,235	(2,892)	7.75%	8,890	122,137	118,007	6.10%	8.50%
2020	122,137	7,579	10,773	(3,194)	7.75%	9,343	128,286	119,756	6.10%	8.67%
2021	128,286	7,827	11,478	(3,651)	7.75%	9,802	134,437	121,254	6.10%	8.95%
2022	134,437	8,072	12,330	(4,258)	7.75%	10,256	140,435	122,381	6.10%	9.32%
2023	140,435	8,316	13,236	(4,920)	7.75%	10,695	146,210	123,105	6.10%	9.71%
2024	146,210	8,573	14,124	(5,551)	7.75%	11,119	151,778	123,472	6.10%	10.05%
2025	151,778	8,840	14,969	(6,129)	7.75%	11,528	157,177	123,540	6.10%	10.33%
2026	157,177	9,116	16,097	(6,981)	7.75%	11,914	162,110	123,108	6.10%	10.77%
2027	162,110	9,409	17,629	(8,220)	7.75%	12,249	166,139	121,901	6.10%	11.43%
2032	171,410	11,147	25,935	(14,788)	7.75%	12,718	169,340	104,615	6.10%	14.19%
2037	148,119	13,390	31,893	(18,503)	7.75%	10,771	140,387	73,023	6.10%	14.53%
2042	101,378	16,133	35,219	(19,086)	7.75%	7,126	89,418	39,161	6.10%	13.32%
2047	26,233	19,500	42,101	(22,601)	7.75%	1,168	4,800	1,770	6.10%	13.17%
2048	4,800	20,233	44,405	(24,172)	7.75%	(553)	(19,925)	(7,099)	6.10%	13.39%

Funding Level 3 is the lowest funding level that will keep the fund solvent for 30 years.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Optimistic Assumptions: A
Funding Level 4
($ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return $	Fund Balance EOY Nominal $	Fund Balance EOY Real $	% of Payroll Contrib.	% of Payroll Benefits
2018	$ 110,137	$ 10,375	$ 9,551	$824	7.75%	$ 8,567	$ 119,528	$119,528	8.90%	8.19%
2019	119,528	10,714	10,235	479	7.75%	9,282	129,289	124,917	8.90%	8.50%
2020	129,289	11,059	10,773	286	7.75%	10,031	139,606	130,324	8.90%	8.67%
2021	139,606	11,420	11,478	(58)	7.75%	10,817	150,365	135,621	8.90%	8.95%
2022	150,365	11,777	12,330	(553)	7.75%	11,632	161,444	140,689	8.90%	9.32%
2023	161,444	12,133	13,236	(1,103)	7.75%	12,470	172,811	145,502	8.90%	9.71%
2024	172,811	12,508	14,124	(1,616)	7.75%	13,331	184,526	150,112	8.90%	10.05%
2025	184,526	12,898	14,969	(2,071)	7.75%	14,222	196,677	154,586	8.90%	10.33%
2026	196,677	13,300	16,097	(2,797)	7.75%	15,135	209,015	158,728	8.90%	10.77%
2027	209,015	13,727	17,629	(3,902)	7.75%	16,049	221,162	162,273	8.90%	11.43%
2032	267,408	16,264	25,935	(9,671)	7.75%	20,354	278,091	171,800	8.90%	14.19%
2037	320,769	19,537	31,893	(12,356)	7.75%	24,387	332,800	173,108	8.90%	14.53%
2042	392,081	23,539	35,219	(11,680)	7.75%	29,939	410,340	179,711	8.90%	13.32%
2047	496,681	28,451	42,101	(13,650)	7.75%	37,970	521,001	192,118	8.90%	13.17%
2052	622,943	34,054	55,479	(21,425)	7.75%	47,458	648,976	201,492	8.90%	14.50%
2057	753,129	40,383	71,580	(31,197)	7.75%	57,174	779,106	203,668	8.90%	15.78%
2062	886,060	47,901	87,250	(39,349)	7.75%	67,164	913,875	201,146	8.90%	16.21%
2067	1,031,950	56,971	103,361	(46,390)	7.75%	78,201	1,063,761	197,136	8.90%	16.15%
2077	1,421,593	80,464	141,094	(60,630)	7.75%	107,853	1,468,816	192,969	8.90%	15.61%
2087	1,927,786	113,399	205,587	(92,188)	7.75%	145,876	1,981,474	184,546	8.90%	16.14%
2097	2,468,116	159,926	292,289	(132,363)	7.75%	186,214	2,521,967	166,514	8.90%	16.27%
2107	3,001,503	225,756	402,562	(176,806)	7.75%	225,850	3,050,547	142,786	8.90%	15.87%
2117	3,302,206	318,325	572,182	(253,857)	7.75%	246,206	3,294,555	109,321	8.90%	16.00%

Funding Level 4 is the lowest funding level that will keep the fund solvent indefinitely, i.e., throughout the entire 100-year projection period assuming all assumptions are realized.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Intermediate Assumptions: B
Funding Level 1
($ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return $	Fund Balance EOY		% of Payroll	
							Nominal $	Real $	Contrib.	Benefits
2018	$110,137	$0	$ 9,551	$ (9,551)	7.75%	$8,170	$108,756	$108,756	0.00%	8.19%
2019	108,756	0	10,453	(10,453)	7.75%	8,029	106,332	102,736	0.00%	8.68%
2020	106,332	0	11,211	(11,211)	7.75%	7,812	102,933	96,089	0.00%	9.02%
2021	102,933	0	12,141	(12,141)	7.75%	7,513	98,305	88,665	0.00%	9.46%
2022	98,305	0	13,224	(13,224)	7.75%	7,113	92,194	80,342	0.00%	9.99%
2023	92,194	0	14,361	(14,361)	7.75%	6,595	84,428	71,086	0.00%	10.53%
2024	84,428	0	15,466	(15,466)	7.75%	5,951	74,913	60,942	0.00%	11.00%
2025	74,913	0	16,484	(16,484)	7.75%	5,175	63,604	49,992	0.00%	11.37%
2026	63,604	0	17,786	(17,786)	7.75%	4,249	50,067	38,021	0.00%	11.90%
2027	50,067	0	19,524	(19,524)	7.75%	3,133	33,676	24,709	0.00%	12.66%
2028	33,676	0	21,196	(21,196)	7.75%	1,799	14,279	10,123	0.00%	13.30%
2029	14,279	0	22,948	(22,948)	7.75%	228	(8,441)	(5,782)	0.00%	13.92%

Funding Level 1 is the present contribution rate for post-retirement Health Care and Medicare reimbursement. The fund remains solvent until 2029 in this projection.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Intermediate Assumptions: B
Funding Level 2
($ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return $	Fund Balance EOY		% of Payroll	
							Nominal $	Real $	Contrib.	Benefits
2018	$ 110,137	$ 5,945	$ 9,551	$(3,606)	7.75%	$ 8,398	$ 114,929	$114,929	5.10%	8.19%
2019	114,929	6,139	10,453	(4,314)	7.75%	8,742	119,357	115,321	5.10%	8.68%
2020	119,357	6,337	11,211	(4,874)	7.75%	9,064	123,547	115,332	5.10%	9.02%
2021	123,547	6,544	12,141	(5,597)	7.75%	9,361	127,311	114,827	5.10%	9.46%
2022	127,311	6,749	13,224	(6,475)	7.75%	9,619	130,455	113,684	5.10%	9.99%
2023	130,455	6,952	14,361	(7,409)	7.75%	9,827	132,873	111,876	5.10%	10.53%
2024	132,873	7,168	15,466	(8,298)	7.75%	9,980	134,555	109,461	5.10%	11.00%
2025	134,555	7,391	16,484	(9,093)	7.75%	10,080	135,542	106,535	5.10%	11.37%
2026	135,542	7,621	17,786	(10,165)	7.75%	10,116	135,493	102,895	5.10%	11.90%
2027	135,493	7,866	19,524	(11,658)	7.75%	10,055	133,890	98,239	5.10%	12.66%
2028	133,890	8,131	21,196	(13,065)	7.75%	9,877	130,702	92,657	5.10%	13.30%
2029	130,702	8,409	22,948	(14,539)	7.75%	9,573	125,736	86,122	5.10%	13.92%
2030	125,736	8,694	24,887	(16,193)	7.75%	9,125	118,668	78,533	5.10%	14.60%
2031	118,668	8,995	26,841	(17,846)	7.75%	8,514	109,336	69,910	5.10%	15.22%
2032	109,336	9,320	28,743	(19,423)	7.75%	7,730	97,643	60,322	5.10%	15.73%
2033	97,643	9,662	30,482	(20,820)	7.75%	6,771	83,594	49,896	5.10%	16.09%
2034	83,594	10,020	32,159	(22,139)	7.75%	5,631	67,086	38,689	5.10%	16.37%
2035	67,086	10,398	33,570	(23,172)	7.75%	4,312	48,226	26,872	5.10%	16.47%
2036	48,226	10,793	34,516	(23,723)	7.75%	2,830	27,333	14,715	5.10%	16.31%
2037	27,333	11,195	35,347	(24,152)	7.75%	1,194	4,375	2,276	5.10%	16.10%
2038	4,375	11,610	36,302	(24,692)	7.75%	(606)	(20,923)	(10,515)	5.10%	15.95%

Funding Level 2 is the lowest funding level that will keep the fund solvent for 20 years.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Intermediate Assumptions: B
Funding Level 3
($ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return $	Fund Balance EOY Nominal $	Fund Balance EOY Real $	% of Payroll Contrib.	% of Payroll Benefits
2018	$ 110,137	$ 8,394	$ 9,551	$(1,157)	7.75%	$ 8,491	$ 117,471	$117,471	7.20%	8.19%
2019	117,471	8,667	10,453	(1,786)	7.75%	9,036	124,721	120,503	7.20%	8.68%
2020	124,721	8,946	11,211	(2,265)	7.75%	9,579	132,035	123,256	7.20%	9.02%
2021	132,035	9,238	12,141	(2,903)	7.75%	10,122	139,254	125,599	7.20%	9.46%
2022	139,254	9,528	13,224	(3,696)	7.75%	10,651	146,209	127,413	7.20%	9.99%
2023	146,209	9,815	14,361	(4,546)	7.75%	11,157	152,820	128,670	7.20%	10.53%
2024	152,820	10,119	15,466	(5,347)	7.75%	11,639	159,112	129,438	7.20%	11.00%
2025	159,112	10,434	16,484	(6,050)	7.75%	12,100	165,162	129,816	7.20%	11.37%
2026	165,162	10,759	17,786	(7,027)	7.75%	12,531	170,666	129,606	7.20%	11.90%
2027	170,666	11,105	19,524	(8,419)	7.75%	12,904	175,151	128,514	7.20%	12.66%
2032	181,323	13,157	28,743	(15,586)	7.75%	13,456	179,193	110,702	7.20%	15.73%
2037	156,800	15,805	35,347	(19,542)	7.75%	11,404	148,662	77,327	7.20%	16.10%
2042	107,963	19,043	39,020	(19,977)	7.75%	7,603	95,589	41,864	7.20%	14.75%
2047	30,375	23,017	46,639	(23,622)	7.75%	1,450	8,203	3,025	7.20%	14.59%
2048	8,203	23,882	49,193	(25,311)	7.75%	(333)	(17,441)	(6,214)	7.20%	14.83%

Funding Level 3 is the lowest funding level that will keep the fund solvent for 30 years.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Intermediate Assumptions: B
Funding Level 4
($ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return $	Fund Balance EOY		% of Payroll	
							Nominal $	Real $	Contrib.	Benefits
2018	$ 110,137	$ 11,774	$ 9,551	$ 2,223	7.75%	$ 8,621	$ 120,981	$120,981	10.10%	8.19%
2019	120,981	12,159	10,453	1,706	7.75%	9,441	132,128	127,660	10.10%	8.68%
2020	132,128	12,550	11,211	1,339	7.75%	10,291	143,758	134,200	10.10%	9.02%
2021	143,758	12,959	12,141	818	7.75%	11,173	155,749	140,477	10.10%	9.46%
2022	155,749	13,365	13,224	141	7.75%	12,076	167,966	146,373	10.10%	9.99%
2023	167,966	13,769	14,361	(592)	7.75%	12,995	180,369	151,866	10.10%	10.53%
2024	180,369	14,195	15,466	(1,271)	7.75%	13,930	193,028	157,028	10.10%	11.00%
2025	193,028	14,637	16,484	(1,847)	7.75%	14,889	206,070	161,969	10.10%	11.37%
2026	206,070	15,093	17,786	(2,693)	7.75%	15,867	219,244	166,496	10.10%	11.90%
2027	219,244	15,578	19,524	(3,946)	7.75%	16,840	232,138	170,327	10.10%	12.66%
2032	280,749	18,457	28,743	(10,286)	7.75%	21,364	291,827	180,285	10.10%	15.73%
2037	335,614	22,171	35,347	(13,176)	7.75%	25,506	347,944	180,985	10.10%	16.10%
2042	409,042	26,713	39,020	(12,307)	7.75%	31,230	427,965	187,430	10.10%	14.75%
2047	517,613	32,287	46,639	(14,352)	7.75%	39,566	542,827	200,166	10.10%	14.59%
2052	647,701	38,646	61,473	(22,827)	7.75%	49,323	674,197	209,322	10.10%	16.07%
2057	778,576	45,828	79,324	(33,496)	7.75%	59,058	804,138	210,212	10.10%	17.48%
2062	907,498	54,359	96,685	(42,326)	7.75%	68,711	933,883	205,550	10.10%	17.96%
2067	1,043,801	64,652	114,531	(49,879)	7.75%	78,986	1,072,908	198,832	10.10%	17.89%
2077	1,391,209	91,313	156,315	(65,002)	7.75%	105,331	1,431,538	188,071	10.10%	17.29%
2087	1,785,105	128,688	227,775	(99,087)	7.75%	134,554	1,820,572	169,560	10.10%	17.88%
2097	2,046,623	181,490	323,845	(142,355)	7.75%	153,166	2,057,434	135,843	10.10%	18.02%
2107	1,947,809	256,195	446,007	(189,812)	7.75%	143,691	1,901,688	89,012	10.10%	17.58%
2117	856,203	361,245	633,947	(272,702)	7.75%	55,920	639,421	21,217	10.10%	17.72%

Funding Level 4 is the lowest funding level that will keep the fund solvent indefinitely, i.e., throughout the entire 100-year projection period assuming all assumptions are realized.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Pessimistic Assumptions: C
Funding Level 1
($ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return $	Fund Balance EOY Nominal $	Fund Balance EOY Real $	% of Payroll Contrib.	% of Payroll Benefits
2018	$110,137	$0	$ 9,551	$ (9,552)	7.75%	$8,170	$108,755	$108,755	0.00%	8.19%
2019	108,755	0	10,806	(10,806)	7.75%	8,015	105,964	102,381	0.00%	8.98%
2020	105,964	0	11,955	(11,955)	7.75%	7,755	101,764	94,998	0.00%	9.62%
2021	101,764	0	13,302	(13,302)	7.75%	7,378	95,840	86,442	0.00%	10.37%
2022	95,840	0	14,823	(14,823)	7.75%	6,860	87,877	76,580	0.00%	11.20%
2023	87,877	0	16,398	(16,398)	7.75%	6,183	77,662	65,389	0.00%	12.03%
2024	77,662	0	17,901	(17,901)	7.75%	5,334	65,095	52,955	0.00%	12.74%
2025	65,095	0	19,247	(19,247)	7.75%	4,308	50,156	39,422	0.00%	13.28%
2026	50,156	0	20,862	(20,862)	7.75%	3,089	32,383	24,592	0.00%	13.96%
2027	32,383	0	22,957	(22,957)	7.75%	1,631	11,057	8,113	0.00%	14.88%
2028	11,057	0	24,935	(24,935)	7.75%	(97)	(13,975)	(9,907)	0.00%	15.64%

Funding Level 1 is the present contribution rate for post-retirement Health Care and Medicare reimbursement. The fund remains solvent until 2028 in this projection.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Pessimistic Assumptions: C
Funding Level 2
($ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return $	Fund Balance EOY		% of Payroll	
							Nominal $	Real $	Contrib.	Benefits
2018	$110,137	$ 8,044	$ 9,551	$ (1,508)	7.75%	$ 8,478	$117,107	$117,107	6.90%	8.19%
2019	117,107	8,306	10,806	(2,500)	7.75%	8,980	123,587	119,408	6.90%	8.98%
2020	123,587	8,574	11,955	(3,381)	7.75%	9,449	129,655	121,034	6.90%	9.62%
2021	129,655	8,853	13,302	(4,449)	7.75%	9,878	135,084	121,838	6.90%	10.37%
2022	135,084	9,131	14,823	(5,692)	7.75%	10,251	139,643	121,691	6.90%	11.20%
2023	139,643	9,406	16,398	(6,992)	7.75%	10,555	143,206	120,576	6.90%	12.03%
2024	143,206	9,697	17,901	(8,204)	7.75%	10,785	145,787	118,598	6.90%	12.74%
2025	145,787	9,999	19,247	(9,248)	7.75%	10,945	147,484	115,921	6.90%	13.28%
2026	147,484	10,311	20,862	(10,551)	7.75%	11,026	147,959	112,362	6.90%	13.96%
2027	147,959	10,643	22,957	(12,314)	7.75%	10,996	146,641	107,595	6.90%	14.88%
2028	146,641	11,000	24,935	(13,935)	7.75%	10,831	143,537	101,756	6.90%	15.64%
2029	143,537	11,377	27,001	(15,624)	7.75%	10,526	138,439	94,823	6.90%	16.38%
2030	138,439	11,762	29,287	(17,525)	7.75%	10,058	130,972	86,675	6.90%	17.18%
2031	130,972	12,169	31,590	(19,421)	7.75%	9,407	120,958	77,341	6.90%	17.91%
2032	120,958	12,609	33,827	(21,218)	7.75%	8,562	108,302	66,907	6.90%	18.51%
2033	108,302	13,072	35,872	(22,800)	7.75%	7,521	93,023	55,525	6.90%	18.93%
2034	93,023	13,556	37,843	(24,287)	7.75%	6,280	75,016	43,262	6.90%	19.26%
2035	75,016	14,068	39,501	(25,433)	7.75%	4,840	54,423	30,325	6.90%	19.37%
2036	54,423	14,602	40,605	(26,003)	7.75%	3,223	31,643	17,035	6.90%	19.19%
2037	31,643	15,146	41,578	(26,432)	7.75%	1,441	6,652	3,460	6.90%	18.94%
2038	6,652	15,708	42,697	(26,989)	7.75%	(517)	(20,854)	(10,481)	6.90%	18.76%

Funding Level 2 is the lowest funding level that will keep the fund solvent for 20 years.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Pessimistic Assumptions: C
Funding Level 3
($ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return $	Fund Balance EOY Nominal $	Fund Balance EOY Real $	% of Payroll Contrib.	% of Payroll Benefits
2018	$110,137	$10,725	$9,551	$ 1,173	7.75%	$ 8,581	$119,891	$119,891	9.20%	8.19%
2019	119,891	11,075	10,806	269	7.75%	9,302	129,462	125,084	9.20%	8.98%
2020	129,462	11,431	11,955	(524)	7.75%	10,013	138,951	129,712	9.20%	9.62%
2021	138,951	11,805	13,302	(1,497)	7.75%	10,711	148,165	133,636	9.20%	10.37%
2022	148,165	12,174	14,823	(2,649)	7.75%	11,381	156,897	136,727	9.20%	11.20%
2023	156,897	12,542	16,398	(3,856)	7.75%	12,012	165,053	138,970	9.20%	12.03%
2024	165,053	12,930	17,901	(4,971)	7.75%	12,601	172,683	140,478	9.20%	12.74%
2025	172,683	13,333	19,247	(5,914)	7.75%	13,157	179,926	141,420	9.20%	13.28%
2026	179,926	13,748	20,862	(7,114)	7.75%	13,672	186,484	141,618	9.20%	13.96%
2027	186,484	14,190	22,957	(8,767)	7.75%	14,117	191,834	140,755	9.20%	14.88%
2032	199,808	16,812	33,827	(17,015)	7.75%	14,834	197,627	122,090	9.20%	18.51%
2037	173,454	20,195	41,578	(21,383)	7.75%	12,624	164,695	85,667	9.20%	18.94%
2042	121,530	24,332	45,867	(21,535)	7.75%	8,594	108,589	47,557	9.20%	17.34%
2047	40,619	29,410	54,812	(25,402)	7.75%	2,176	17,393	6,414	9.20%	17.15%
2048	17,393	30,516	57,817	(27,301)	7.75%	303	(9,605)	(3,422)	9.20%	17.43%

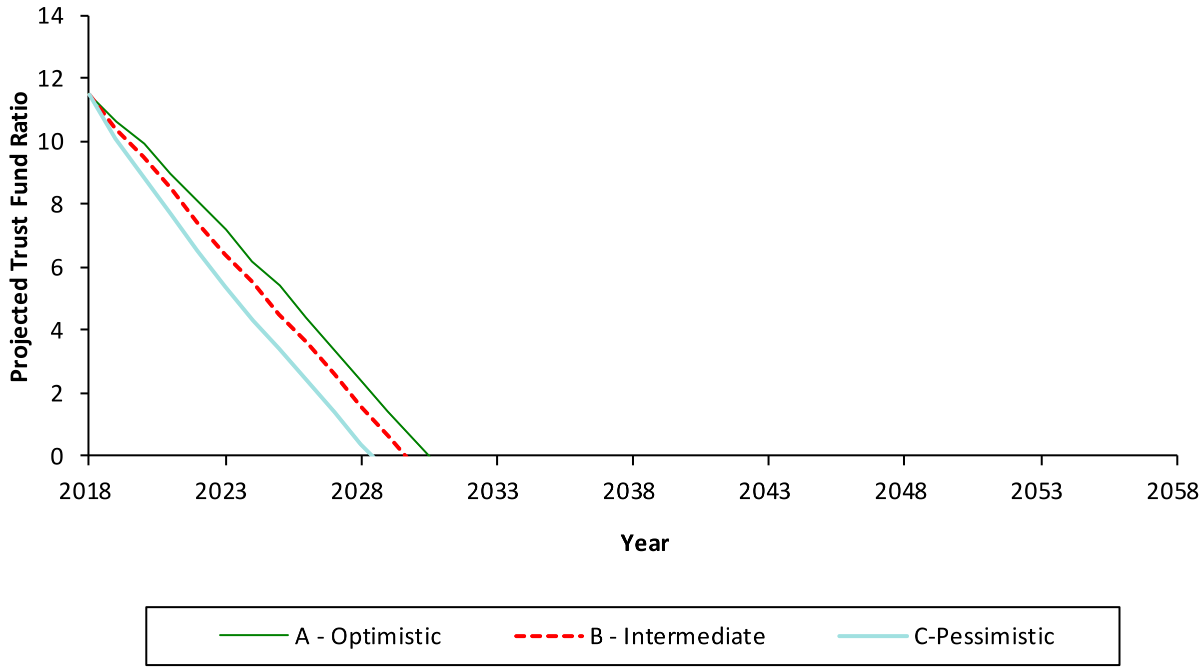
Funding Level 3 is the lowest funding level that will keep the fund solvent for 30 years.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Pessimistic Assumptions: C
Funding Level 4
($ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return $	Fund Balance EOY		% of Payroll	
							Nominal $	Real $	Contrib.	Benefits
2018	$ 110,137	$ 14,456	$ 9,551	$ 4,904	7.75%	$ 8,723	$ 123,764	$ 123,764	12.40%	8.19%
2019	123,764	14,927	10,806	4,121	7.75%	9,749	137,634	132,980	12.40%	8.98%
2020	137,634	15,407	11,955	3,452	7.75%	10,799	151,885	141,786	12.40%	9.62%
2021	151,885	15,911	13,302	2,609	7.75%	11,871	166,365	150,052	12.40%	10.37%
2022	166,365	16,409	14,823	1,586	7.75%	12,954	180,905	157,648	12.40%	11.20%
2023	180,905	16,904	16,398	506	7.75%	14,040	195,451	164,564	12.40%	12.03%
2024	195,451	17,427	17,901	(474)	7.75%	15,129	210,106	170,921	12.40%	12.74%
2025	210,106	17,970	19,247	(1,277)	7.75%	16,234	225,063	176,897	12.40%	13.28%
2026	225,063	18,530	20,862	(2,332)	7.75%	17,353	240,084	182,323	12.40%	13.96%
2027	240,084	19,126	22,957	(3,831)	7.75%	18,460	254,713	186,891	12.40%	14.88%
2032	309,515	22,660	33,827	(11,167)	7.75%	23,560	321,908	198,869	12.40%	18.51%
2037	370,758	27,220	41,578	(14,358)	7.75%	28,184	384,584	200,044	12.40%	18.94%
2042	453,748	32,796	45,867	(13,071)	7.75%	34,665	475,342	208,179	12.40%	17.34%
2047	578,251	39,640	54,812	(15,172)	7.75%	44,234	607,313	223,946	12.40%	17.15%
2052	728,493	47,446	72,265	(24,819)	7.75%	55,508	759,182	235,708	12.40%	18.89%
2057	880,461	56,264	93,258	(36,994)	7.75%	66,820	910,287	237,960	12.40%	20.55%
2062	1,031,695	66,738	113,654	(46,916)	7.75%	78,161	1,062,940	233,956	12.40%	21.12%
2067	1,194,458	79,375	134,611	(55,236)	7.75%	90,457	1,229,679	227,884	12.40%	21.03%
2077	1,625,153	112,107	183,665	(71,558)	7.75%	123,211	1,676,806	220,294	12.40%	20.31%
2087	2,159,604	157,994	267,643	(109,649)	7.75%	163,173	2,213,128	206,121	12.40%	21.01%
2097	2,651,373	222,819	380,545	(157,726)	7.75%	199,446	2,693,093	177,813	12.40%	21.18%
2107	2,971,976	314,537	524,067	(209,530)	7.75%	222,310	2,984,756	139,707	12.40%	20.66%
2117	2,677,801	443,509	744,921	(301,412)	7.75%	195,995	2,572,384	85,357	12.40%	20.83%

Funding Level 4 is the lowest funding level that will keep the fund solvent indefinitely, i.e., throughout the entire 100-year projection period assuming all assumptions are realized.

Post-Retirement Health Care & Medicare Reimbursement
Projected Trust Fund Ratios Based on
0.00% Employer Contribution Rate
December 31, 2017



The ***trust fund ratio*** is the ratio of the fund balance at the beginning of the year to the projected benefit payout during the year. It is one measure of the Plan's ability to pay benefits. A trust fund ratio on the order of about 15 to 25 is expected in a plan that is funding health care payouts as a level percentage of payroll. Given the experience of the last several years, very few, if any plans, are likely to be able to report such a trust fund ratio.

Approximate IRC Section 401(h) Computation

($ in Thousands)

Year	(1) Covered Pay	(2) Pension EANC %	(3) Pension PUCNC %	(4) Pension PUCNC $	(5) Health Contribution	(6) (4) + (5)	(7) Sum of (5)	(8) Sum of (6)	(9) IRC Ratio (7) / (8)
1990	$45,640	22.75%	23.66%	$ 10,798.4	$1,835.5	$12,633.9	$ 8,761.7	$ 63,353.5	13.8%
1991	48,586	22.15%	23.04%	11,194.2	2,165.1	13,359.3	10,926.8	76,712.8	14.2%
1992	50,255	22.15%	23.04%	11,578.8	2,542.7	14,121.5	13,469.5	90,834.3	14.8%
1993	54,715	22.36%	23.25%	12,721.2	2,563.5	15,284.7	16,033.0	106,119.0	15.1%
1994	58,341	22.36%	23.25%	13,564.3	3,053.4	16,617.7	19,086.4	122,736.7	15.6%
1995	56,833	23.79%	24.74%	14,060.5	3,122.0	17,182.5	22,208.4	139,919.2	15.9%
1996	60,909	23.79%	24.74%	15,068.9	2,860.8	17,929.7	25,069.2	157,848.9	15.9%
1997	61,714	24.47%	25.45%	15,706.2	2,548.8	18,255.0	27,618.0	176,103.9	15.7%
1998	65,848	24.45%	25.55%	16,824.2	2,719.5	19,543.7	30,337.5	195,647.6	15.5%
1999	69,030	24.96%	26.08%	18,003.0	3,278.9	21,281.9	33,616.4	216,929.5	15.5%
2000	68,505	24.96%	26.08%	17,866.1	3,254.0	21,120.1	36,870.4	238,049.6	15.5%
2001	74,140	23.10%	23.63%	17,519.3	3,521.7	21,041.0	40,392.1	259,090.6	15.6%
2002	79,594	23.14%	23.71%	18,871.7	3,780.7	22,652.4	44,172.8	281,743.0	15.7%
2003	80,641	21.88%	22.72%	18,321.6	3,395.7	21,717.3	47,568.5	303,460.3	15.7%
2004	81,931	21.91%	22.83%	18,704.8	2,867.6	21,572.4	50,436.1	325,032.7	15.5%
2005	85,828	21.68%	22.59%	19,388.5	3,006.4	22,394.9	53,442.5	347,427.6	15.4%
2006	87,563	20.99%	21.83%	19,115.0	3,384.8	22,499.8	56,827.3	369,927.4	15.4%
2007	95,032	20.78%	21.92%	20,831.0	4,575.1	25,406.1	61,402.4	395,333.5	15.5%
2008	93,029	20.81%	21.89%	20,364.0	4,668.0	25,032.0	66,070.4	420,365.5	15.7%
2009	93,339	21.21%	22.92%	21,393.3	4,794.7	26,188.0	70,865.1	446,553.5	15.9%
2010	92,226	21.23%	23.25%	21,445.7	3,699.8	25,145.5	74,564.9	471,699.0	15.8%
2011	92,790	21.72%	24.03%	22,297.8	2,418.4	24,716.2	76,983.3	496,415.2	15.5%
2012	96,022	21.80%	24.19%	23,227.8	2,553.0	25,780.8	79,536.3	522,196.0	15.2%
2013	100,250	18.23%	20.37%	20,418.9	4,718.7	25,137.6	84,255.0	547,333.6	15.4%
2014	100,569	18.13%	21.00%	21,117.3	5,859.3	26,976.6	90,114.3	574,310.2	15.7%
2015	101,751	18.13%	21.01%	21,375.1	5,637.4	27,012.5	95,751.7	601,322.7	15.9%
2016	112,811	19.70%	21.55%	24,305.2	5,944.6	30,249.8	101,696.3	631,572.5	16.1%
2017	**116,038**	**19.73%**	**21.18%**	**24,574.0**	**6,777.8**	**31,351.8**	**108,474.1**	**662,924.3**	**16.4%**

The approximate computations above indicate compliance with IRC Section 401(h) because the ratio in Column 9 is below 25%. The ratio in Column 9 would appear lower if the computations were extended farther into the past.

SECTION C

PENSION GAIN/LOSS ANALYSIS

Gain (Loss) Analysis

Purpose of Gain/Loss Analysis. Regular actuarial valuations provide information about the composite change in unfunded actuarial accrued liabilities -- whether or not the liabilities are increasing or decreasing, and by how much.

However, valuations do not show the portion of the change attributable to each risk area within the Retirement System: the rate of investment income on plan assets; the rates of withdrawal of active members who leave covered employment; the rates of mortality; the rates of disability; the rates of salary increases; the assumed ages at actual retirement. In an actuarial valuation, assumptions are made as to what these rates will be for the next year and for decades in the future.

The objective of a gain and loss analysis is to determine the portion of the change in unfunded actuarial accrued liabilities attributable to each risk area.

The fact that actual experience differs from assumed experience is to be expected. The future cannot be predicted with precision. Changes in the valuation assumption for a risk area should be made when the differences between assumed and actual experience have been observed to be sizable and persistent. One year's gain and loss analysis may or may not be indicative of ***long-term trends, which are the basis of financial assumptions***.

Development of Total Gain (Loss)
January 1, 2017 to December 31, 2017

Unfunded Accrued Liabilities (UAL), January 1	$364,260,215
Normal Cost	21,901,786
Contributions	41,093,303
Interest	27,486,495
Expected UAL Before Any Changes	372,555,193
Effect of Changes in Assumptions and Benefits	(4,179,186)
Expected UAL After All Changes	368,376,007
Actual UAL	378,948,593
Gain (Loss) for Year from Experience	**$ (10,572,587)**

This page measures the actual gain or loss for the year after adjusting for the effect of benefit and assumption changes.

Analysis of Financial Experience
for the Year Ended December 31, 2017 and 2016

Gains and Losses in Pension Accrued Liabilities Resulting from Differences Between Assumed Experience and Actual Experience

Type of Activity	Gain or (Loss) for Year Ended 12/31 2017	2016
Age & Service Retirements. If members retire at older ages or with lower final average pay than assumed, there is a gain. If younger ages or higher average pays, a loss.	**$ (57,648)**	$ 244,658
Disability Retirements. If disability claims are less than assumed, there is a gain. If more claims, a loss.	**721,566**	76,712
Death-in-Service Benefits. If more liabilities are released by death-in-service claims than assumed, there is a gain. If smaller releases, a loss.	**(92,407)**	402,882
Withdrawal From Employment. If more liabilities are released by withdrawals than assumed, there is a gain. If smaller releases, a loss.	**493,727**	1,912,187
Pay Increases. If there are smaller pay increases than assumed, there is a gain. If greater increases, a loss.	**(2,883,793)**	(11,313,936)
Investment Income. If there is greater investment return on pension assets than assumed, there is a gain. If less return, a loss.	**(9,943,102)**	(4,839,839)
Other. Miscellaneous gains and losses resulting from data adjustments, timing of financial transactions, valuation methods, DROP account interest crediting, etc.	**1,189,070**	(5,778,914)
Gain (or Loss) During Year from Experience	**$ (10,572,587)**	$ (19,296,250)
Non-Recurring Items (Effect of Benefit/Assumption Changes)	**4,179,186**	0
Composite Gain (or Loss) During Year	**$ (6,393,401)**	$ (19,296,250)

Investment Gain (Loss)
Development of Portion Attributable to Retirement, Survivor and Disability Allowances
January 1, 2017 to December 31, 2017

Assets, Beginning of Year	$763,667,712
Net Cash Flow	(36,811,740)
Assumed Investment Return	57,757,793
Expected Assets End of Year	$784,613,765
Actual Assets End of Year	774,670,663
Gain (Loss) for Year	**$(9,943,102)**

The total investment gain (loss) was ($11,288,216), including the gain (loss) on health assets.

Active Member Population Reconciliation
January 1, 2017 to December 31, 2017

	Actual	Expected
Active Members Beginning of Year	1,670	
Plus New Hires	87	
Minus Retirements	62	48.8
Minus Deaths	0	0.6
Minus Disabilities	6	7.2
Minus Other Terminations*	43	28.8
Returned to Active Status	4	
Plus or Minus Data Correction	0	
Active Members End of Year	**1,650**	

** Includes 1 LOA member.*

SECTION D

FINANCIAL INFORMATION

Current Asset Information Furnished for the Valuation December 31, 2017

Balance Sheet

Current Assets (Market Value)*		Fund Balance	
Cash & Short-Term Investments	$ 14,497,957	Employees' Savings Fund	$ 119,953,993
Fixed Income	160,098,289	Employer Accumulation Fund	111,798,820
Stocks	489,715,453	Pension Reserve Fund	666,402,147
Real Estate	34,303,989	Survivors Benefit Fund	0
Alternatives	196,344,239	Health Care Fund	111,798,820
Other Short-Term	68,763	Income Fund	(111,798,820)
Deferred Outflows - Pension	419,899		
Accruals & Receivables	(18,857,238)		
Total Current Assets	**$ 876,591,351**	**Total Fund Balance**	**$ 898,154,960**

** Does not include $21,563,609 for DROP Account Balances.*

Revenues and Expenditures

	Year Ended December 31, 2017	2016
Net Assets Held in Trust for Pension and Postemployment Health Care Benefits	$ 798,818,976	$ 782,167,640
DROP Liabilities	25,196,087	23,477,120
Total	$ 824,015,063	$ 805,644,760
Revenues**		
Employee contributions		
For non-DROP members	13,437,937	13,016,853
For DROP members	1,066,982	1,084,318
Employer contributions (net)	31,228,561	30,251,338
Investment income (net)		
Non-DROP investment income	115,952,501	54,678,109
DROP investment income	(3,098)	(1,420,223)
Miscellaneous	0	0
Total	161,682,883	97,610,395
Expenditures		
Benefit payments		
Retirees and Beneficiaries	64,344,739	59,842,451
From DROP account	10,948,064	5,792,987
Health insurance	9,433,745	10,242,961
Refund of member contributions	1,074,973	1,730,725
Administrative expenses	1,641,465	1,545,968
Death benefit	100,000	85,000
Total	87,542,986	79,240,092
Net Addition to Assets	74,139,897	18,370,303
Net Assets Held in Trust for Pension and Postemployment Health Care Benefits	$ 876,591,351	$ 798,818,976
DROP Liabilities	21,563,609	25,196,087
Total	**$ 898,154,960**	**$ 824,015,063**

*** Revenues include transfers to and from systems.*

CAFR Asset Information Furnished for the Valuation
December 31, 2017
Additions by Source

	Pension Benefits					Other Postemployment Benefits		
	Contributions		Net Investment	Transfers from		Employer Contributions & Retiree Drug Subsidy and Prescription Drug	Net Investment	
Year	Member*	Employer	Income	Other Systems	Total	Rebates	Income	Total
2008	$9,666,665	$20,302,216	$(207,368,115)	$ 632,894	$ (176,766,340)	$4,667,972	$ (30,809,552)	$ (26,141,580)
2009	9,503,526	20,453,914	109,523,583	1,009,422	140,490,445	4,794,710	21,030,418	25,825,128
2010	9,221,920	21,211,944	72,158,093	329,335	102,921,292	3,699,814	17,734,416	21,434,230
2011	9,278,533	22,966,338	(16,039,272)	608,366	16,813,965	2,418,411	(2,746,073)	(327,662)
2012	9,641,772	23,766,361	63,783,964	557,316	97,749,413	2,553,023	10,199,419	12,752,442
2013	10,037,246	22,908,182	115,874,530	1,353,520	150,173,478	4,718,651	17,893,377	22,612,028
2014	11,577,268	22,325,421	45,104,959	586,929	79,594,577	5,859,320	6,799,267	12,658,587
2015	13,686,292	22,895,242	(5,649,718)	947,265	31,879,081	5,637,420	(647,032)	4,990,388
2016	14,101,171	25,383,684	46,423,126	773,206	86,681,187	5,944,616	6,834,760	12,779,376
2017	**14,504,919**	**26,109,836**	**101,482,224**	**619,110**	**142,716,089**	**6,777,825**	**14,467,179**	**21,245,004**

** Does not include service purchases.*

Deductions by Type

	Pension Benefits					Other Postemployment Benefits		
Year	Benefits#	Refunds	Transfers to Other Systems	Administrative	Total	Benefits	Administrative	Total
2008	$43,455,149	$ 570,827	$ 282,987	$ 613,447	$ 44,922,410	$ 8,864,161	$ 98,082	$ 8,962,243
2009	46,009,029	1,076,685	406,147	758,818	48,250,679	8,899,533	123,210	9,022,743
2010	49,106,165	476,936	566,615	637,943	50,787,659	10,536,554	106,450	10,643,004
2011	57,288,210	451,682	1,797,986	948,319	60,486,197	11,092,515	159,271	11,251,786
2012	57,110,650	179,614	377,994	859,477	58,527,735	11,025,550	137,943	11,163,493
2013	61,528,826	943,433	467,462	909,929	63,849,650	12,140,996	140,676	12,281,672
2014	64,525,978	2,177,476	165,945	1,031,473	67,900,872	12,308,478	156,176	12,464,654
2015	66,213,253	857,626	160,888	1,084,161	68,315,928	11,362,048	157,150	11,519,198
2016	65,720,438	1,730,725	416,679	1,352,722	69,220,564	11,676,450	193,246	11,869,696
2017	**75,392,803**	**1,074,973**	**140,562**	**1,437,267**	**78,045,605**	**11,571,393**	**204,198**	**11,775,591**

 # Includes death benefits.

Development of Funding Value of Retirement System Assets
December 31, 2017

		2015	2016	2017	2018	2019	2020
A.	Funding Value From Prior Year	$ 816,098,411	$ 846,399,059	**$ 871,949,848**			
B.	Market Value End of Year	805,644,760	824,015,063	**898,154,960**			
C.	Market Value Beginning of Year	848,610,417	805,644,760	**824,015,063**			
D.	Non-Investment Net Cash Flow	(35,427,596)	(33,341,615)	**(41,809,506)**			
E.	Investment Return:						
	E1. Market Total: B - C - D	(7,538,061)	51,711,918	**115,949,403**			
	E2. Assumed Rate	8.00%	7.75%	**7.75%**			
	E3. For Immediate Recognition	63,870,769	64,303,939	**65,955,995**			
	E4. Amount for Phased-In Recognition E1-E3	(71,408,830)	(12,592,021)	**49,993,408**			
F.	Phased-In Recognition of Investment Return:						
	F1. Current Year: 25% x E4	(17,852,208)	(3,148,005)	**12,498,352**			
	F2. First Prior Year	(2,786,357)	(17,852,208)	**(3,148,005)**	**$ 12,498,352**		
	F3. Second Prior Year	18,375,035	(2,786,357)	**(17,852,208)**	**(3,148,005)**	**$ 12,498,352**	
	F4. Third Prior Year	4,121,005	18,375,035	**(2,786,355)**	**(17,852,206)**	**(3,148,006)**	**$ 12,498,352**
	F5. Total Recognized Phased-In	$ 1,857,475	$ (5,411,535)	**$ (11,288,216)**	**$ (8,501,859)**	**$ 9,350,346**	**$ 12,498,352**
G.	Funding Value End of Year:						
	G1. Preliminary Funding Value End of Year: A + D + E3 + F5	$ 846,399,059	$ 871,949,848	**$ 884,808,121**			
	G2. Corridor Percent	20%	20%	**20%**			
	G3. Upper Corridor Limit: (100% + G2) x B	966,773,712	988,818,076	**1,077,785,952**			
	G4. Lower Corridor Limit: (100% - G2) x B	644,515,808	659,212,050	**718,523,968**			
	G5. Funding Value End of Year	$ 846,399,059	$ 871,949,848	**$ 884,808,121**			
H.	Difference between Market Value and Funding Value	$ (40,754,299)	$ (47,934,785)	**$ 13,346,839**	$ 21,848,698	$ 12,498,352	$ -
I.	Funding Value Rate of Return	8.2 %	7.1 %	**6.4 %**			
J.	Market Value Rate of Return	(0.9)%	6.6 %	**14.4 %**			

The asset valuation method recognizes assumed investment income (line E2) fully each year. Differences between actual and expected investment income (line E3) are phased-in over a closed 4-year period. When investment markets are performing well, Funding Value will tend to lag market value. When investment markets are performing poorly, Funding Value will tend to exceed market value. From a Funding standpoint, the asset valuation method is *neutral*.

Separation of Assets between Pension and Health
December 31, 2017

	Pension	Health	Total
A. Market Value Beginning of Year	$721,685,656	$ 102,329,407	$824,015,063
B. Member Contributions			
B1. Pension Contributions	13,437,937		13,437,937
B2. DROP Contributions	1,066,982		1,066,982
B3. Retiree Health Contributions		3,885,594	3,885,594
C. Other Contributions			
C1. Employer Contributions	26,109,836	4,640,177	30,750,013
C2. Transfers	478,548		478,548
C3. Retiree Drug Subsidy and Prescription Drug Rebates		2,137,648	2,137,648
D. Benefits Paid			
D1. Pension Benefits	64,344,739		64,344,739
D2. Benefit Payments from DROP Account	10,948,064		10,948,064
D3. HPRS Paid Retiree Health Benefits		11,571,393	11,571,393
D4. HPRS Paid Medicare Part B Benefits		0	0
D5. Member Paid Retiree Health Benefits		3,885,594	3,885,594
E. Refunds of Member Contributions	1,074,973	0	1,074,973
F. Death Benefits	100,000	0	100,000
G. Administrative Expenses	1,437,267	204,198	1,641,465
H. Net External Cash Flow (B + C - D - E - F - G)	(36,811,740)	(4,997,766)	(41,809,506)
I. Other Changes in Market Value	101,482,224	14,467,179	115,949,403
J. Market Value End of Year (A + H + I)	786,356,140	111,798,820	898,154,960
K. Funding Value Adjustment	(11,685,477)	(1,661,362)	(13,346,839)
L. Funding Value End of Year (J + K)	**$774,670,663**	**$110,137,458**	**$884,808,121**

Line J is allocated in proportion to Line I.

SECTION E

SUMMARY OF MEMBER DATA

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

Attained	Years of Service to Valuation Date							Totals	
Age	0-4	5-9	10-14	15-19	20-24	25-29	30 Up	No.	Payroll
20-24	116							116	$ 5,361,428
25-29	188	72						260	14,052,194
30-34	68	117	26					211	12,727,275
35-39	21	44	126	61	1			253	17,773,430
40		8	18	38	6			70	5,195,790
41		2	9	37	6			54	4,019,988
42		2	10	36	9			57	4,247,220
43	1	1	13	29	31			75	5,757,414
44		1	9	26	29	1		66	5,077,564
45		1	6	20	27	9		63	4,761,573
46			7	16	28	17		68	5,337,450
47			3	21	28	16		68	5,243,473
48			5	18	22	26		71	5,488,970
49			2	8	20	21	1	52	4,042,360
50				7	11	22	3	43	3,577,254
51		1		5	8	19	5	38	3,112,161
52				1	5	10	2	18	1,543,487
53				5	6	7	5	23	1,749,940
54				1	5	8	6	20	1,708,177
55				1	2	2	2	7	569,160
56					1	7	4	12	1,032,982
57					1	1	1	3	189,118
58							1	1	68,429
59									
60							1	1	68,351
Totals	**394**	**249**	**234**	**330**	**246**	**166**	**31**	**1,650**	**$ 112,705,188**

** Includes 126 DROP members.*

While not used in the valuations, the following group averages are computed and shown for their general interest.

Age: 38.3 years

Service: 13.4 years

Annual Pay: $68,306

Active Members
by Ages of Entry into Service
December 31, 2017

Entry Age Nearest Birthday	Number	Cumulative Number	Percent	Cumulative Percent
Less than 18	0	0	0.00%	0.00%
18	16	16	0.97%	0.97%
19	46	62	2.79%	3.76%
20	96	158	5.82%	9.58%
21	187	345	11.33%	20.91%
22	240	585	14.54%	35.45%
23	215	800	13.03%	48.48%
24	190	990	11.52%	60.00%
25	159	1,149	9.64%	69.64%
26	106	1,255	6.42%	76.06%
27	88	1,343	5.33%	81.39%
28	70	1,413	4.25%	85.64%
29	54	1,467	3.27%	88.91%
30	44	1,511	2.67%	91.58%
31	31	1,542	1.87%	93.45%
32	48	1,590	2.91%	96.36%
33	30	1,620	1.82%	98.18%
34	22	1,642	1.34%	99.52%
35	1	1,643	0.06%	99.58%
36	0	1,643	0.00%	99.58%
37	4	1,647	0.24%	99.82%
38	1	1,648	0.06%	99.88%
39	0	1,648	0.00%	99.88%
40 & Up	2	1,650	0.12%	100.00%
Total	**1,650**			

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

Attained Ages	DROP			
	No.	Annual Benefit	Annual Pay	DROP Account Balance
48	13	$ 651,543	$ 1,100,486	$ 352,504
49	19	880,064	1,555,793	1,213,421
50	14	718,689	1,240,294	1,787,407
51	13	589,625	1,065,310	1,739,820
52	19	880,984	1,627,490	2,132,940
53	17	739,938	1,401,120	2,665,284
54	14	660,265	1,226,525	2,856,382
55	8	313,800	600,747	1,559,165
56	6	279,854	568,611	1,642,500
57	2	77,300	121,171	475,388
59	1	48,400	68,351	193,339
Totals	**126**	**$ 5,840,461**	**$ 10,575,897**	**$ 16,618,149**

Average Age: 52.1 yrs.
Average Age at DROP: 49.8 yrs.

Average Service: 27.9 yrs.
Average Service at DROP: 24.5 yrs.

Average Annual Pay: $83,936

Age and Service Pensions Being Paid December 31, 2017
by Attained Ages

Attained Ages	Number	Monthly Pensions	Number Married	Average Age of Spouse
48 & Under	9	$ 34,317	4	48
49	13	47,388	7	48
50	18	60,212	6	50
51	15	54,594	8	49
52	25	99,351	19	53
53	28	100,927	18	51
54	32	117,299	19	51
55	32	116,179	19	53
56	36	143,900	27	55
57	41	159,916	33	56
58	53	216,263	43	55
59	48	187,871	38	57
60	37	148,761	32	57
61	36	148,083	33	60
62	49	198,358	44	59
63	33	141,677	28	62
64	23	105,003	22	62
65	36	160,138	33	61
66	44	176,537	38	63
67	44	177,115	38	64
68	37	153,585	32	66
69	50	193,659	44	67
70	67	260,036	55	67
71	45	182,507	38	70
72	37	149,178	33	69
73	50	192,644	48	70
74	34	123,974	31	72
75	47	164,663	40	71
76	33	121,152	29	72
77	22	79,842	20	74
78	22	87,435	18	76
79	22	68,362	21	76
80	20	70,955	19	76
81	12	38,556	9	78
82	11	33,640	10	80
83	8	25,453	6	79
84	7	18,604	4	79
85 & Over	50	124,528	35	80
Totals	**1,226**	**$ 4,682,662**	**1,001**	

Disability Pensions Being Paid December 31, 2017
by Attained Age

Attained Ages	Number	Monthly Pensions	Number Married	Average Age of Spouse
30	1	$ 1,924		
31	1	2,298		N/A
32	1	2,338	1	35
35	1	2,023		N/A
37	3	7,881	2	37
38	1	3,444		N/A
39	4	10,929	2	39
40	1	1,928		N/A
42	2	5,403		N/A
43	3	7,708	2	41
44	2	6,138	2	44
45	6	17,517	4	46
46	7	19,279	5	36
47	6	18,296	4	46
48	3	9,679	3	43
49	6	17,351	1	48
50	5	13,972	3	45
51	5	13,322	3	51
52	4	11,843	3	57
53	6	20,003	2	51
54	4	12,344	4	51
55	5	18,418	3	49
56	3	12,692	3	57
57	6	18,226	5	56
58	5	15,724	4	53
59	6	17,654	4	58
60	6	20,126	3	60
61	3	10,033	2	62
62	2	7,132	2	64
64	3	9,394	3	62
65	3	8,526	2	64
66	3	9,924	3	64
67	1	1,996	1	62
68	2	6,038	2	66
69	6	14,491	6	63
70	1	2,715	1	70
71	2	5,892	1	60
73	2	6,035	1	75
74	2	4,458	2	73
80	1	3,378	0	N/A
88	1	1,936	1	84
Totals	**135**	**$400,408**	**90**	

Dependents Being Paid as of December 31, 2017
Tabulated by Attained Age

Attained Ages	Number	Monthly Pensions
14 & Under	5	$ 750
16	1	189
17	2	362
18	3	537
19	2	377
20	2	402
21	1	212
22	3	515
30	1	1,889
31	1	1,109
37	1	150
38	1	1,136
40	3	3,071
44	1	1,303
45	1	1,371
47	2	2,641
49	1	1,448
51	2	3,205
52	1	1,347
53	4	4,325
55	4	5,575
56	1	2,551
57	2	3,213
58	2	2,194
59	1	1,215
60	3	4,768
61	1	1,093
62	6	9,560
63	3	3,926
64	2	3,387
65	4	8,304
66	7	10,664
67	4	6,524
68	8	15,956
69	6	10,086
70-79	76	125,283
80-89	83	114,312
90 & Over	25	33,783
Totals	**276**	**$388,733**

Active Member Valuation Data, 2008 to 2017

Actuarial Valuation as of December 31	Number of Active Members	Annual Payroll	Average Annual Salary	% Increase in Average Pay
2008	1,544	$ 94,301,538	$61,076	4.0 %
2009	1,547	94,824,789	61,296	0.4
2010	1,537	94,767,852	61,658	0.6
2011	1,520	93,126,449	61,267	(0.6)
2012	1,645	98,117,403	59,646	(2.6)
2013	1,613	98,519,844	61,079	2.4
2014	1,622	99,211,756	61,166	0.1
2015	1,621	99,983,224	61,680	0.8
2016	1,670	108,788,871	65,143	5.6
2017	**1,650**	**112,705,188**	**68,306**	**4.9**

Retirants and Beneficiaries Valuation Data, 2008 to 2017

Actuarial Valuation as of December 31	Added to Rolls		Removed from Rolls		Number of People	Total Monthly Benefits	Average Benefit
	No.	Monthly Benefits	No.	Monthly Benefits			
2008	45	$ 211,061	33	$53,298	1,371	$ 3,628,092	$2,646
2009	45	207,598	31	42,636	1,385	3,793,054	2,739
2010	64	259,964	25	41,464	1,424	4,011,554	2,817
2011	73	327,709	32	68,456	1,465	4,270,807	2,915
2012	79	281,692	47	81,957	1,497	4,470,542	2,986
2013	61	267,055	35	70,317	1,523	4,667,280	3,065
2014	66	250,714	31	60,291	1,558	4,857,703	3,118
2015	73	258,562	83 *	139,323	1,548	4,976,942	3,215
2016	69	298,031	37	70,100	1,580	5,204,873	3,294
2017	**83**	**323,187**	**26**	**56,257**	**1,637**	**5,471,803**	**3,343**

* *Includes Alternate Payee records, which were combined with Participant records beginning with the December 31, 2015 valuation.*

Of the 1,637 retirants and beneficiaries as of December 31, 2017, 1,226 are service retirees, 135 are disability retirees and 276 are survivor beneficiaries. The average monthly benefits are $3,819 for service retirees, $2,966 for disability retirees and $1,408 for survivor beneficiaries.

Number of Retired Lives Covered by
Medical Mutual, AETNA & Medicare Advantage
Comparative Schedule

	Census Date											
	12/17	12/16	**12/15**	**12/14**	**12/13**	**12/12**	**12/11**	**12/10**	**12/09**	**12/08**	**12/07**	**12/06**
Recipients:												
w/o Medicare A	**606**	654	685	645	672	702	NA	732	692	762	751	779
Medicare A	**841**	821	780	753	717	669	NA	596	580	398	503	522
Spouses:												
w/o Medicare A	**253**	287	302	325	330	355	NA	365	368	518	372	420
Medicare A	**402**	386	372	360	338	305	NA	257	267	232	242	156
Dependent Children	**208**	251	261	273	302	279	NA	216	165	167	154	168
Orphans	**0**	0	0	0	0	0	NA	0	23	26	63	33
Totals	**2,310**	2,399	2,400	2,356	2,359	2,310	2,269	2,166	2,095	2,103	2,085	2,078

A summary of recipients and dependents covered by AETNA, Medicare Advantage and Medical Mutual of Ohio follows:

	AETNA		Medicare Advantage		Medical Mutual		
	Network	Non-Network	Network	Non-Network	Network	Non-Network	Totals
2008	1,262	2			818	21	2,103
2009	1,260	0			835	0	2,095
2010	190	0	819	0	1,157	0	2,166
2011	197	0	891	0	1,181	0	2,269
2012	183	0	975	0	1,152	0	2,310
2013	162	0	1,056	0	1,141	0	2,359
2014	0	0	1,114	0	1,242	0	2,356
2015	0	0	1,152	0	1,248	0	2,400
2016	0	0	1,207	0	1,192	0	2,399
2017	**0**	**0**	**1,244**	**0**	**1,066**	**0**	**2,310**

Number of Retired Lives Covered by
Medical Mutual, AETNA & Medicare Advantage
Added and Removed from Rolls*

Actuarial Valuation as of December 31	Added to Rolls No.	Removed from Rolls No.	Retirees with Healthcare, Dental or Vision Coverage
2016			1,395
2017	**78**	**87**	**1,386**

* *The number of lives was compiled from data files provided by HPRS Staff. This is the number of retired members covered and will differ from the number of actual lives covered based on the type of coverage elected, as shown in the schedules above.*

Deferred Pensions as of December 31, 2017
Tabulated by Attained Age

Attained Ages	Number	Annual Pensions
41	1	$ 16,723
42	1	39,759
46	1	$33,580
47	4	124,632
48	1	30,592
49	2	79,614
50	1	32,711
Totals	**11**	**$357,611**

A ***deferred retirant*** is a member who has left active service with at least 15 (and in most cases 20) years of service credit, and has not withdrawn his accumulated contributions. Such members are entitled to a pension upon attaining eligibility age.

SECTION F

ASSUMPTIONS USED IN THE VALUATION

Summary of Valuation Method and Assumptions
December 31, 2017

The actuarial assumptions used in the valuation are shown in this section of the report. The assumptions were established for the December 31, 2015 actuarial valuation, following a 5-year experience study covering the period January 1, 2010 through December 31, 2014. They were adopted by the Board after obtaining the advice of the Actuary and other professionals. The assumptions represent estimates of future experience.

Economic Assumptions

The investment return rate used in making the valuations was 7.75% per year, compounded annually (net after investment expenses). The real rate of return is defined to be the portion of total investment return, which is more than the wage inflation rate. Considering other financial assumptions, the 7.75% investment return rate translates to an assumed real rate of return of 4.25% over the wage inflation rate of 3.50%. In order to assume a 4.25% real return over wage inflation, it would be necessary to realize about a 5.0% real return over the assumed price inflation of 2.75%, after accounting for investment expenses and the difference between wage increases and price increases.

Pay increase assumptions for individual active members are shown for sample ages on page F-5. Part of the assumed increase at each age is for merit and/or seniority, and the other 3.50% recognizes changes in wage levels due to broad economic effects, including inflation and real wage growth.

The active member payroll is assumed to increase 3.50% annually, which is the portion of the individual pay increase assumptions attributable to broad economic effects.

The number of active members is assumed to continue at the present number.

Non-Economic Assumptions

The healthy retiree mortality tables, for post-retirement mortality, used in evaluating allowances to be paid were the RP-2014 Healthy Annuitant Mortality Table for males and females, adjusted for mortality improvement back to the observation period base year of 2006. The base year for females was then established to be 2012. Mortality rates for a particular calendar year are determined by applying the MP-2015 mortality improvement scale to the above described tables. This assumption was last reviewed and updated as part of the 5-year experience study for the period January 1, 2010 through December 31, 2014.

The disabled retiree mortality tables, for post-retirement mortality, used in evaluating allowances to be paid were the RP-2014 Disabled Mortality Table for males and females, adjusted for mortality improvement back to the observation period base year of 2006. The base year for females was then established to be 2012. Mortality rates for a particular calendar year are determined by applying the MP-2015 mortality improvement scale to the above described tables. This assumption was last reviewed and updated as part of the 5-year experience study for the period January 1, 2010 through December 31, 2014.

The probabilities of age and service retirement are shown on page F-5.

The probabilities of withdrawal from service, disability and death-in-service are shown for sample ages on page F-5. The pre-retirement mortality tables used were the RP-2014 employees mortality table for males and females, adjusted for mortality improvement back to the observation period base year of 2006. The base year for females was then established to be 2012. Mortality rates for a particular calendar year are determined by applying the MP-2015 mortality improvement scale to the above described tables. Fifty percent of disability retirements are assumed to be non-duty related and fifty percent are assumed to be duty related. This assumption was last reviewed and updated as part of the 5-year experience study for the period January 1, 2010 through December 31, 2014.

The entry age normal actuarial cost method of valuation was used in determining liabilities and normal cost. For GASB Statement Nos. 67 and 68 purposes, the DROP entry date is assumed to be the date of retirement for normal cost purposes.

> Differences in the past between assumed experience and actual experience ("actuarial gains and losses") become part of actuarial accrued liabilities.
>
> Unfunded actuarial accrued liabilities are amortized to produce payments (principal & interest), which are level percent of payroll contributions.

Employer contributions were assumed to be ***paid in equal installments*** throughout the employer fiscal year.

Non-Economic Assumptions (Concluded)

Present assets (cash & investments) were used with a market value adjustment that spreads differences between actual and assumed return over a closed four-year period for funding valuation purposes. Funding value is not permitted to deviate from market value by more than 20%. Details of the method may be found in the body of the funding valuation report on page D-3. Assets may be used in the valuation prior to the final audit. For GASB Statement Nos. 67 and 68 purposes, the market value of assets is used.

The data about persons now covered and about present assets were furnished by the System's administrative staff. Although examined for general reasonableness, the data was not audited by the Actuary.

The actuarial valuation computations were made by or under the supervision of a Member of the American Academy of Actuaries (MAAA) who has experience performing public plan valuations.

Single Life Retirement Values*
(7.75% Interest)

Sample Attained Ages	Present Value of $1 Monthly for Life		Future Life Expectancy (years)	
	Men	Women	Men	Women
50	$141.52	$144.11	35.12	36.82
55	135.51	138.40	30.32	31.87
60	128.05	130.97	25.74	27.08
65	118.57	121.64	21.35	22.51
70	106.65	110.08	17.17	18.21
75	92.44	96.26	13.32	14.23
80	76.57	80.55	9.92	10.69

** Applicable to calendar year 2017. Values for future years are determined using the MP-2015 projection scale.*

The present values shown above are for illustrative purposes only and do not include the value of future post-retirement increases.

Separations from Active Employment & Salary Scale

Sample Ages	Percent of Active Members Separating Within Next Year					Salary Increase Assumptions for an Individual Member			
		Death*							
	Disability	Men	Women	Service	Other	Service	Merit & Seniority	Base (Economic)	Increase Next Year
20	0.08%	0.0327%	0.0168%	1	10.00%	1-2	10.00%	3.50%	13.50%
25	0.08%	0.0406%	0.0163%	2-5	4.00%	3-5	3.00%	3.50%	6.50%
30	0.23%	0.0401%	0.0206%	6-15	1.00%	6-10	1.00%	3.50%	4.50%
35	0.42%	0.0481%	0.0305%	16-20	0.75%	11 & Up	0.30%	3.50%	3.80%
40	0.70%	0.0568%	0.0447%	21 & up	0.50%				
45	0.85%	0.0865%	0.0678%						
50	1.13%	0.1550%	0.1066%						
55	1.32%	0.2678%	0.1713%						

* *Applicable to calendar year 2017. Rates in future years are determined by the above rates and the MP-2015 projection scale.*

Probabilities of Age & Service Retirement		
Retirement Ages	Percents of Eligible Members Retiring Within Next Year with an Unreduced Benefit	Percents of Eligible Members Retiring Within Next Year with a Reduced Benefit
48	30%	3.0%
49	15%	2.0%
50	15%	2.0%
51	15%	2.0%
52	15%	
53	15%	
54	10%	
55	30%	
56	25%	
57	30%	
58	30%	
59	40%	
60 & Over	100%	

In addition, it was assumed that 100% of eligible members age 55 and older would retire upon attaining 34 years of service. A member was assumed eligible for unreduced retirement at age 48 or greater with 25 or more years of service or age 52 or greater with 20 or more years of service. A member was assumed eligible for reduced retirement at age 48 or greater with 20 or more years of service.

It was assumed that members eligible to DROP would either retire or “DROP in” at first eligibility for unreduced retirement. 100% of members still working 8 years after first reaching retirement eligibility are assumed to retire.

Additions to and Removals from Active Membership
Actual and Expected Numbers

Year Ended December 31	Number Added During Year		Retirement		Disability Retirement		Death-in-Service		Other Terminations		Active Members
	A	E	A	E	A	E	A	E	A	E	
2008	9	71.8	27	44.8	4	6.9	0	0.8	31	19.3	1,544
2009	49	74.5	21	50.0	10	7.0	0	0.9	15	16.6	1,547
2010	51	79.7	39	54.5	4	7.1	1	0.9	17	17.2	1,537
2011	74	61.4	50	36.8	5	7.2	1	1.0	35	16.4	1,520
2012	204	63.9	37	38.8	10	7.2	1	1.0	31	16.9	1,645
2013	54	67.1	34	36.5	7	7.2	0	0.9	45	22.5	1,613
2014	84	62.3	40	36.2	3	7.4	1	0.8	31	17.9	1,622
2015	92	62.8	44	36.4	4	7.4	1	0.8	44	18.2	1,621
2016	152	74.5	39	40.3	6	7.4	3	0.6	55	26.2	1,670
2017	**91**	**85.4**	**62**	**48.8**	**6**	**7.2**	**0**	**0.6**	**43**	**28.8**	**1,650**
Total	**860**	**703.4**	**393**	**423.1**	**59**	**72.0**	**8**	**8.3**	**347**	**200.0**	

A: Actual
E: Expected

The following pages summarize the removals from active membership by age group and years of accrued service.

Age and Service Retirements
During Calendar Year 2017

Age Group	Years of Accrued Service 15-19	20-24	25-29	30 Plus	Total
Under 20					
20-24					
25-29					
30-34					
35-39					
40-44					
45					
46					
47					
48			11		11
49		1	8		9
50		1	3		4
51			5		5
52		2	4		6
53			4		4
54			7		7
55		2	3		5
56			6		6
57		1			1
58			1	1	2
59			1		1
60 & Over			1		1
Totals		**7**	**54**	**1**	**62**

Disability Retirements
During Calendar Year 2017

Age Group	Years of Accrued Service 0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	Total
Under 20								
20-24								
25-29								
30-34								
35-39				1				1
40-44			1		1			2
45-49				2		1		3
50 & Over								
Totals			**1**	**3**	**1**	**1**		**6**

Death-in-Service Terminations During Calendar Year 2017

Age Group	Years of Accrued Service							
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	Total
Under 20								
20-24								
25-29								
30-34								
35-39								
40-44								
45-49								
50 & Over								
Totals								**0**

Withdrew and Eligible for Deferred Benefit Terminations During Calendar Year 2017

Age Group	Years of Accrued Service							
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	Total
Under 20								
20-24								
25-29								
30-34								
35-39								
40-44				1	1			2
45-49					1	1		2
50 & Over								
Totals				**1**	**2**	**1**		**4**

Withdrew and Pending Contributions Termination
During Calendar Year 2017

Age Group	Years of Accrued Service							
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	Total
Under 20								
20-24								
25-29								
30-34								
35-39								
40-44								
45-49								
50 & Over								
Totals								**0**

Withdrew and Refunded Terminations
During Calendar Year 2017

Age Group	Years of Accrued Service							
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	Total
Under 20								
20-24	6	1						7
25-29	7	9						16
30-34	7	2						9
35-39	2							2
40-44			1	1				2
45-49					1			1
50 & Over				1				1
Totals	**22**	**12**	**1**	**2**	**1**			**38**

Miscellaneous and Technical Assumptions

Administrative Expenses:	For administrative expenses, a 1.20% of payroll load is added to the normal cost.
Marriage Assumption:	85% of active participants are assumed to be married for purposes of death-in-service benefits and for purposes of retiring with the automatic joint and survivor benefit.
Pay Increase Timing:	Beginning of 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 service nearest whole year on the date the decrement is assumed to occur.
Benefit Service:	Exact fractional service is used to determine the amount of benefit payable.
Decrement Relativity:	Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.
Other:	Disability and turnover decrements do not operate during retirement eligibility. For death-in-service, two children are assumed to receive benefits for a 10-year period. To estimate the effect on the computed amortization period resulting from a lower expected normal cost for members hired on or after January 1, 2020, it was assumed that amortization payments would increase each year by 3.65%.
Miscellaneous Loading Factors:	A load of 0.75% of payroll is used to measure the effect of military service purchases.

SECTION G

FINANCIAL PRINCIPLES AND OPERATIONAL TECHNIQUES

Financial Principles and Operational Techniques of the Retirement System

Promises Made, and To Be Paid For. As each year is completed, the Retirement System in effect hands an "IOU" to each member then acquiring a year of service credit -- the "IOU" says: "The Ohio State Highway Patrol Retirement System owes you one year's worth of retirement benefits, payments in cash commencing when you qualify for retirement."

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?

The objective of level percent-of-payroll financing is that this year's taxpayers contribute the money to cover the IOUs being handed out this year. By following this objective, ***the employer contribution rate will remain approximately level from year-to-year*** --- and will not have to be increased for future generations of taxpayers.

(There are systems which have a design for deferring contributions to future taxpayers, lured by a lower contribution rate now and putting aside the consequence that the contribution rate must then relentlessly grow much greater over decades of time.)

An inevitable by-product of the level-cost design is the accumulation of reserve assets, for decades, and the income produced when the assets are invested. ***Invested assets are a by-product and not the objective***. Investment income becomes the third contributor for benefits to employees, and is interlocked with the contribution amounts required from employees and employer.

Translated to actuarial terminology, this level-cost objective means that the contribution rates must total at least the following:

> ***Normal Cost*** (the value assigned to service being rendered this year)
> . . . plus . . .
> ***Interest on Unfunded Actuarial Accrued Liabilities*** (the difference between liabilities for service already rendered and the accrued assets of the Retirement System).

Computing Contributions To Support System Benefits From a given schedule of benefits and from the employee data and asset data furnished by the system, the actuary determines the contribution rates to support the benefits, by means of ***an actuarial valuation***.

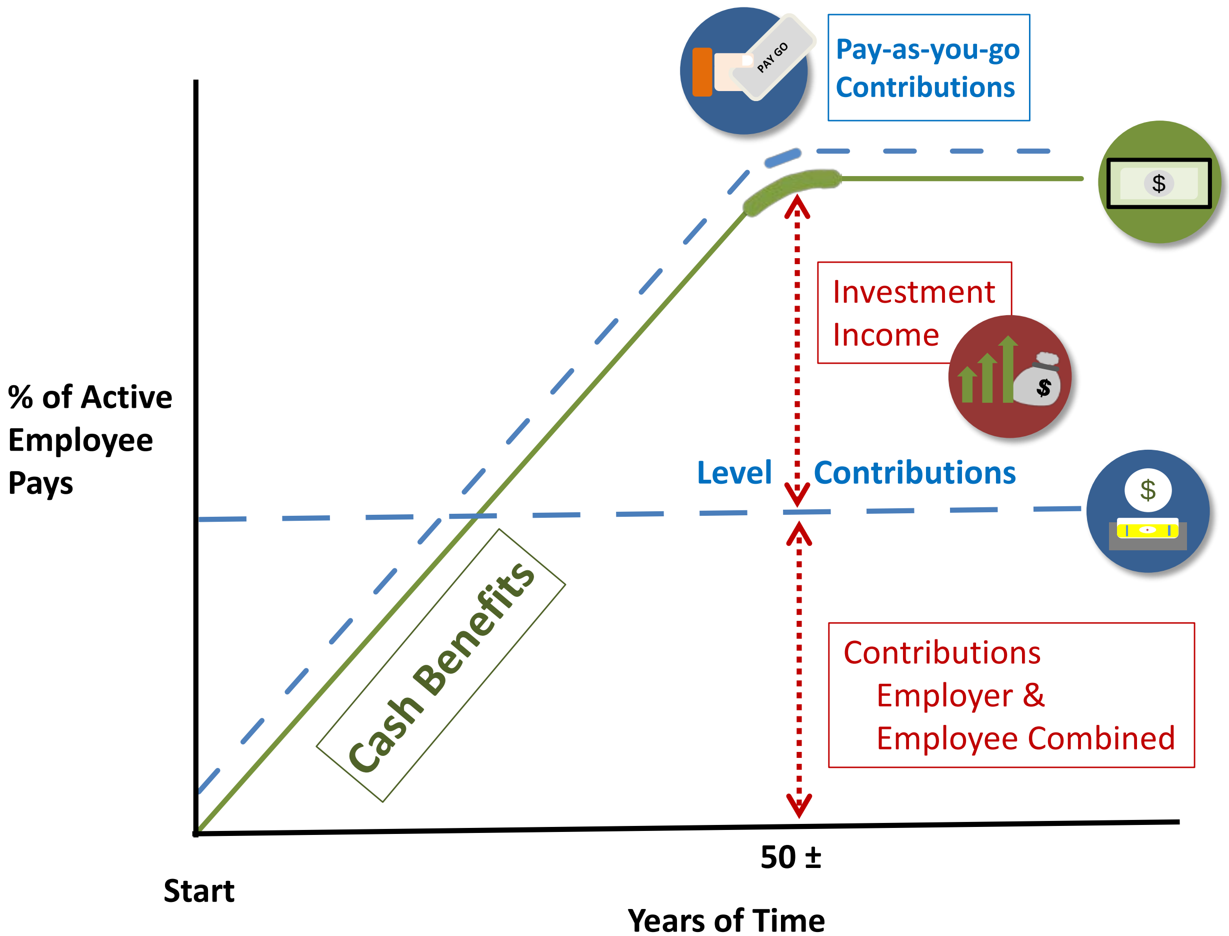
An actuarial valuation has a number of ingredients such as: the rate of investment return which plan assets will earn; the rates of withdrawal of active members who leave covered employment; the rates of mortality; the rates of disability; the rates of pay increases and the assumed age or ages at actual retirement.

In an actuarial valuation the actuary must assume what the above rates will be, for the next year and for decades in the future. Only the subsequent actual experience of the plan can indicate the degree of accuracy of the assumptions.

(Concluded on Next Page)

Financial Principles and Operational Techniques of the Retirement System (Concluded)

Reconciling Differences Between Assumed Experience and Actual Experience Once actual experience has occurred and has been observed, it will not coincide exactly with assumed experience, regardless of the skill of the actuary and the many calculations made. Most retirement systems cope with such differences by having annual actuarial valuations. Each actuarial valuation is a complete recalculation of assumed future experience, taking into account all past differences between assumed and actual experience. The result is ***continuing adjustments to the financial position***.



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

Actuarial Valuation Process

The ***actuarial valuation*** is the mathematical process by which the contribution rate is determined, and the flow of activity constituting the valuation may be summarized as follows:

A. ***Covered people data*** furnished by plan administrator, including:
   Retired lives now receiving benefits
   Former employees with vested benefits not yet payable
   Active employees

B. + ***Asset data*** (cash & investments), furnished by the plan administrator

C. + ***Benefit provisions*** which specify eligibility and amounts of pensions

D. + ***Assumptions concerning future experience in various risk areas***, which are established by the Retirement Board after consulting with the actuary

E. + ***The funding method*** for employer contributions (the long-term, planned pattern for employer contributions)

F. + ***Mathematically combining the assumptions, the funding method, and the data***

G. = Determination of:
   Plan Financial Position and/or
   New Employer Contribution Rate

Meaning of "Unfunded Actuarial Accrued Liabilities"

"Actuarial accrued liabilities" are ***the portion of the present value of plan promises to pay benefits in the future that are not covered by future normal cost contributions***. A liability has been established ("accrued") because the service has been rendered but the resulting monthly cash benefit may not be payable until years in the future. Actuarial accrued liabilities are the result of complex mathematical calculations, which are made by the plan's actuary.

If "actuarial accrued liabilities" exceed the plan's accrued assets (cash & investments), the difference is ***"unfunded actuarial accrued liabilities."*** This is the usual condition. If the plan's assets equaled the plan's "actuarial accrued liabilities," then the plan would be termed "fully funded." This is an unusual condition.

Each time a plan adds a new benefit, which applies to service already rendered, an "actuarial accrued liability" is created, which is also an "unfunded actuarial accrued liability" because the plan can't print instant cash to cover the value of the new benefit promises. Payment for such unfunded actuarial accrued liabilities is spread over a period of years, commonly in the 15-30 year range.

Unfunded actuarial accrued liabilities can occur in another way: if actual plan experience is less favorable than assumed plan experience, the difference is added to unfunded actuarial accrued liabilities. In plans where benefits are directly related to an employee's pay near time of retirement, unfunded actuarial accrued liabilities rose dramatically during the 1970's. Unexpected rates of pay increase created additional actuarial accrued liabilities, which could not be matched by reasonable investment results. More recent experience has generally been more favorable with some reductions in unfunded actuarial accrued liabilities.

The existence of unfunded actuarial accrued liabilities is not bad, but the changes from year to year in the amount of unfunded actuarial accrued liabilities are important, --- "bad" or "good" or somewhere in between.

Even though unfunded actuarial accrued liabilities don't constitute a bill payable immediately, it is important that policy-makers prevent the amount from becoming unreasonably high and ***it is vital for plans to have a sound method for making payments toward them*** so that they are controlled.

GRS Retirement Consulting

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August 29, 2018

Mr. Mark R. Atkeson, Executive Director
Ohio State Highway Patrol Retirement System
Mettler Toledo Building
1900 Polaris Parkway, Suite 201
Columbus, OH 43240

Dear Mark:

Enclosed are four bound copies of the December 31, 2017 actuarial valuation of the Ohio State Highway Patrol Retirement System.

Sincerely,

Mita Drazilov

Mita D. Drazilov, ASA, FCA, MAAA

MDD:dks:sc
Enclosures

cc: Schneider Downs
Attn: Mr. Matt McNeal (+1 report copy)

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