Kentucky Retirement Systems

Certification of the June 30, 2020 Actuarial Valuation Results

P: 469.524.0000 | www.grsconsulting.com

December 3, 2020

Board of Trustees
Kentucky Retirement Systems
Perimeter Park West
1260 Louisville Road
Frankfort, KY 40601

Subject: Certification of the June 30, 2020 Actuarial Valuation Results

Dear Trustees of the Board:

Enclosed are the June 30, 2020 actuarial valuation reports for the Kentucky Employees Retirement System (KERS), the County Employees Retirement System (CERS), and the State Police Retirement System (SPRS). These reports provide the current actuarial and financial condition of the Kentucky Retirement Systems (KRS) and analyze fluctuations in the employer contribution rates since the prior actuarial valuation.

In 2019, the Board recommended the employer contribution rates for the KERS and SPRS Funds for the fiscal years beginning July 1, 2020 and ending June 30, 2022. However, during the 2020 legislative session, only contribution rates through June 30, 2021 were budgeted. Therefore, the Board must recommend the employer contribution rates for the KERS and SPRS Funds for the fiscal year beginning July 1, 2021 and ending June 30, 2022, as well as the employer contribution rates for the CERS Funds for the fiscal year beginning July 1, 2021 and ending June 30, 2022. The contribution rates determined by these actuarial valuations are intended to become effective twelve months after the valuation date and, as such, are intended to be used by the Board for recommending these required contribution rates effective July 1, 2021.

These contribution rates are calculated based on the membership data and plan assets as of June 30, 2020. These calculations are also based on the benefit provisions in effect as of June 30, 2020. If new legislation is enacted between the valuation date and the date the contribution rates become effective, the Board may adjust the calculated rates to reflect this new legislation. Such adjustments are based on information supplied by the actuary.

FINANCING OBJECTIVES AND FUNDING POLICY

KRS administers pension and health insurance funds to provide for monthly retirement income and retiree health insurance benefits. The total employer contribution rate is comprised of a contribution to each respective fund.

The employer contribution rate is determined in accordance with Section 61.565 of Kentucky Statute, which was last amended by SB249 (passed during the 2020 legislative session). As specified by the Statute, the employer contribution rate is comprised of a normal cost contribution and an actuarial accrued liability contribution. The actuarial accrued liability contribution is calculated by amortizing the unfunded accrued liability as of June 30, 2019 over a closed 30-year amortization period. Gains and losses incurring in future years (including those incurred in this June 30, 2020 valuation) are amortized as separate closed 20-year amortization bases. Prior to the passage of SB249, the unfunded liability was amortized as one amortization base over a closed 30-year period beginning July 1, 2013 (i.e. the amortization period would have been 23 years as of June 30, 2020).

PROGRESS TOWARDS REALIZATION OF FUNDING OBJECTIVES

One way to measure the progress towards achieving the intended funding objective is to measure the relationship between the actuarial value of assets and the actuarial accrued liabilities for each fund. This relationship is referred to as the funded ratio and should increase over time (absent of benefit improvements) with the goal of attaining 100%.

Table 1 shown below provides a comparison of the change in funded ratio from June 30, 2019 to June 30, 2020 for the retirement funds of each System. As the table shows, the funded ratios for both KERS funds and the SPRS fund have increased since the prior year. The funded ratios of the CERS funds have remained relatively stable with a small increase in the non-hazardous fund and a small decrease in the hazardous fund. The improvement in the financial health of these retirement systems is very dependent on the Retirement System and the Commonwealth maintaining a sound funding policy and the participating employers paying the actuarially determined contribution rates on the payroll of their employees. The lack of increase in the CERS funds is primarily due to the full actuarially determined contribution rates not being paid (due to the contribution phase-in provisions from House Bill 362 passed during the 2018 legislative session).

Table 1. Change in the Funded Ratio (AVA / AAL)
from June 30, 2019 to June 30, 2020 for the Retirement Funds

System	Funded Ratio – Retirement Funds	
	June 30, 2019	June 30, 2020
KERS Non-Hazardous	13.4%	14.2%
KERS Hazardous	54.8%	55.3%
CERS Non-Hazardous	49.1%	49.4%
CERS Hazardous	45.3%	45.1%
SPRS	27.0%	28.1%

Table 2 shown below provides a similar comparison of the change in funded ratio for the insurance funds. As the table shows, the funded ratio for all funds increased. This increase is primarily due to the accrued liability being lower than expected due the 2021 healthcare premium experience.

Table 2. Change in the Funded Ratio (AVA / AAL)
from June 30, 2019 to June 30, 2020 for the Insurance Funds

System	Funded Ratio – Insurance Funds	
	June 30, 2019	June 30, 2020
KERS Non-Hazardous	36.3%	42.7%
KERS Hazardous	123.1%	126.0%
CERS Non-Hazardous	70.7%	78.5%
CERS Hazardous	75.8%	78.2%
SPRS	71.3%	75.0%

SUMMARY OF CHANGE IN CONTRIBUTION RATES SINCE THE PRIOR VALUATION

The following tables provide a comparison of the actuarially determined contribution rates determined by the June 30, 2019 actuarial valuation, the certified contribution rates that are in effect for the fiscal year ending June 30, 2021 (which were based on the June 30, 2019 actuarial valuation), and the actuarially determined contribution rates determined by the June 30, 2020 actuarial valuation. The table also provides the recommended contribution rates for fiscal year ending June 30, 2022, based on the June 30, 2020 actuarial valuation.

Table 3. Comparison of the Contribution Rates (Retirement and Insurance)

System	2019 Valuation Calculated Rates[1]	Effective for FY2020-21	2020 Valuation Calculated Rates	Recommend for FY2021-22
KERS Non-Hazardous	84.43%	84.43%[2]	85.03%	85.03%
KERS Hazardous	36.00%	36.00%	33.43%	33.43%
CERS Non-Hazardous	29.24%	24.06%[3]	28.05%	26.95%[4]
CERS Hazardous	51.88%	39.58%[3]	51.96%	44.33%[4]
SPRS	143.48%	143.48%	146.06%	146.06%

[1] Reflect Senate Bill 249, which passed during the 2020 legislative session and updated the funding period (for amortization the unfunded liability) as of June 30, 2019 to 30 years (from 24 years).

[2] House Bill 352 passed during the 2020 legislative session and reduced the FY2020-21 employer contribution rate to 49.47% for Regional Mental Health/Mental Retardation Boards, Local and District Health Departments, State Universities, Community Colleges and any other agency eligible to voluntarily cease participating in the KERS non-hazardous system.

[3] Senate Bill 249 passed during the 2020 legislative session and froze CERS employer contribution rate for one year.

[4] House Bill 362 passed during the 2018 legislative session and limited the CERS employer contribution rate increases to 12% per year over the prior fiscal year for the period of July 1, 2018 to June 30, 2028.

The KERS Non-Hazardous retirement fund and SPRS employer contribution rates increased by 2.0% of pay and 4.2% of pay, respectively, primarily due to covered payroll decreasing in the past year. KERS Non-Hazardous covered pay decreased by 3.5% and SPRS covered pay decreased by 3.4% since the prior valuation (compared to the 0% payroll growth valuation assumption). The KERS Hazardous retirement fund employer contribution rate decreased by 2.6% of pay primarily due to covered payroll increasing by 13.5% since the prior valuation (compared to the 0% payroll growth valuation assumption).

The employer contribution rates for both CERS retirement funds were expected to increase this year due to the full actuarially determined employer contributions not being certified in FYE 2021 (due to the contribution phase-in provisions from House Bill 362 passed during the 2018 legislative session). The actuarially determined contribution rate for the CERS Non-Hazardous retirement fund remained relatively stable, as the expected increase was offset by liability gains. On the other hand, the CERS Hazardous retirement fund actuarially determined contribution rate increased by 1.2% of pay.

The insurance fund employer contributions decreased for all funds due to the 2021 healthcare premiums being lower than expected. When the contribution rates for the pension and insurance are combined, this results in a net increase in the employer contribution rates of 0.6% of pay for the KERS Non-Hazardous Fund, 0.1% of pay for the CERS Hazardous Fund, and 2.6% of pay for SPRS and a net decrease in the employer contribution rates of 2.6% of pay for the KERS Hazardous Fund and 1.2% of pay for the CERS Non-Hazardous Fund.

KERS NON-HAZARDOUS RETIREMENT FUND

For FYE 2020, the non-hazardous retirement fund distributed $1,023 million in benefit payments and administrative expenses, and received $1,045 million in employer and employee contributions. As of June 30, 2020, plan assets for this system were $2,308 million (excluding assets in the 401(h) account). To stabilize the financial condition of this system, it is imperative that contributions to the system continue to exceed the benefit payments.

For FYE 2019 through FYE 2021, certain quasi-governmental employers and universities have been allowed to contribute less than the actuarially determined contribution rate to the non-hazardous fund. The employer contribution rates documented in this letter (and subsequent valuation report) assume that all employers will pay the actuarially determined rate. If legislation is passed to allow these employers and universities to contribute less than the contribution rates documented in this report for FYE 2022, the required contribution rates for the remaining employers will need to be increased. Without this corresponding increase in contribution rate from other employers or other special appropriations, the System would be receiving less than the actuarially determined contribution, and the financial condition of this retirement system is expected to continue to deteriorate and there is a significant risk of the plan assets being exhausted.

As of June 30, 2020, these quasi-governmental employers and universities encompass approximately 21% of the covered payroll of the non-hazardous fund. If legislation were passed to continue to allow these employers and universities to contribute 49.47% of pay for FYE 2022, the actuarially determined contribution rate for the remaining employers would increase from 85.03% of pay to 94.50% of pay (84.44% of pay for the retirement fund and 10.06% of pay for the insurance fund).

Covered payroll decreased by 3.5% since the prior valuation for the KERS Non-Hazardous fund causing an increase in the employer contribution rate as a percentage of pay. The amortization cost (as a dollar amount), on the other hand, actually decreased since the prior valuation.

As contribution rates increase for this fund, there becomes increased incentive for participating employers to make business decisions to reduce their covered payroll to decrease their pension cost, thereby resulting in a continual pattern of additional increases in contribution rates. As a result, we recommend Kentucky Retirement Systems work with the legislators of the Commonwealth to change the method for collecting the amortization cost of the unfunded liability such that is no longer dependent on covered payroll.

ASSUMPTIONS AND METHODS

The Board of Trustees, in consultation with the actuary, sets the actuarial assumptions and methods used in the actuarial valuation. An experience study was conducted after the June 30, 2018 actuarial valuation and the Board adopted updated assumptions for first use in the June 30, 2019 actuarial valuation.

The assumed increase in future healthcare costs, or trend assumption, is reviewed on an annual basis and was updated since the June 30, 2019 valuation to better reflect the plan's anticipated long-term healthcare cost increases. There were no other changes in actuarial assumptions since the prior valuation.

The results of the actuarial valuations are dependent on the actuarial assumptions used. Actual results can, and almost certainly will, differ as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rate, and funding periods. The actuarial calculations are intended to provide information for rational decision making.

These valuations were prepared using our proprietary valuation model and related software which in our professional judgment has the capability to provide results that are consistent with the purposes of the valuation. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

BENEFIT PROVISIONS

The benefit provisions reflected in these valuations are those which were in effect on June 30, 2020. House Bill 1 passed during the 2019 special legislative session and allowed certain agencies in the KERS Non-Hazardous fund to elect to cease participating in the System as of June 30, 2020 under different provisions than were previously established. Senate Bill 249 passed during the 2020 legislative session and delayed the effective date of cessation for these provisions to June 30, 2021. Since we are unable to identify at this time which agencies will elect to cease participation, we have made no assumption regarding future employer elections and the results of this actuarial valuation reflect the membership as of June 30, 2020.

House Bill 271 passed during the 2020 legislative session and removed provisions that reduce the monthly payment to a surviving spouse of a member whose death was due to a duty-related injury upon remarriage of the spouse. It also increased benefits for a very small number of beneficiaries. There were no other material benefit provision changes since the prior valuation.

IMPACT DUE TO COVID-19

The actuarial valuations were performed as of June 30, 2020, which is approximately three months after the start of the COVID-19 pandemic in the United States. It is uncertain how the mortality and other demographic behavior (e.g. retirement and turnover) may change during the next couple years. However, if government budgets are constrained then we would expect lower than expected salary increases for individual members and a possible reduction in active membership until the Commonwealth's economy recovers. There may also be increased volatility and uncertainty in future investment returns.

DATA

Member data for retired, active and inactive members was supplied as of June 30, 2020, by the KRS staff. The staff also supplied asset information as of June 30, 2020. We did not audit this data, but we did apply a number of tests to the data, and we concluded that it was reasonable and consistent with the prior year's data. GRS is not responsible for the accuracy or completeness of the information provided to us by KRS.

CERTIFICATION

We certify that the information presented herein is accurate and fairly portrays the actuarial position of KRS as of June 30, 2020.

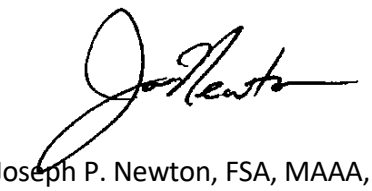
All of our work conforms with generally accepted actuarial principles and practices, and is in conformity with the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of Kentucky Code of Laws and, where

applicable, the Internal Revenue Code, ERISA, and the Statements of the Governmental Accounting Standards Board.

The undersigned are independent actuaries and consultants. Mr. Newton and Mr. White are Enrolled Actuaries. All three of the undersigned are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries. All of the undersigned are experienced in performing valuations for large public retirement systems.

Sincerely,

Gabriel, Roeder, Smith & Co.



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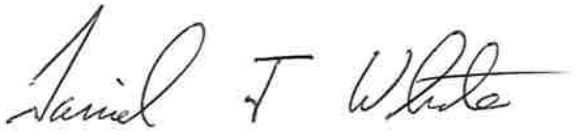
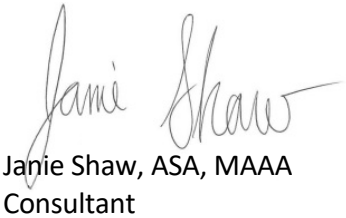
Pension Market Leader and Actuary



Daniel J. White, FSA, MAAA, EA
Senior Consultant



Janie Shaw, ASA, MAAA
Consultant

Summary of June 30, 2020 Actuarial Valuation Results

	KERS Non-Hazardous	KERS Hazardous	CERS Non-Hazardous	CERS Hazardous	SPRS
Actuarially Determined Contribution[1]:					
Pension Fund Contribution	75.32%	33.43%	23.88%	43.23%	127.99%
Insurance Fund Contribution	9.71%	0.00%	4.17%	8.73%	18.07%
Total Calculated Employer Contribution	85.03%	33.43%	28.05%	51.96%	146.06%
Certified Contribution Rate for Fiscal Year Ending 2022	85.03% [2]	33.43% [2]	26.95% [3]	44.33% [3]	146.06% [2]
Assets:					
Retirement					
• Actuarial value (AVAR)	$2,323,298,166	$709,586,801	$7,220,607,024	$2,447,885,345	$296,126,111
• Market value (MVAR)	$2,308,080,030	$690,349,952	$7,027,327,214	$2,379,703,906	$293,949,424
• Ratio of actuarial to market value of assets	100.7%	102.8%	102.8%	102.9%	100.7%
Insurance					
• Actuarial value (AVAI)	$1,095,958,769	$539,251,445	$2,661,350,936	$1,362,027,828	$207,017,723
• Market value (MVAI)	$1,060,648,531	$521,754,873	$2,581,612,912	$1,321,116,766	$201,340,037
• Ratio of actuarial to market value of assets	103.3%	103.4%	103.1%	103.1%	102.8%
Funded Status:					
Retirement					
• Actuarial accrued liability	$16,348,961,571	$1,283,769,521	$14,610,867,358	$5,431,298,482	$1,053,157,155
• Unfunded accrued liability on AVAR	$14,025,663,405	$574,182,720	$7,390,260,334	$2,983,413,137	$757,031,044
• Funded ratio on AVAR	14.2%	55.3%	49.4%	45.1%	28.1%
• Unfunded accrued liability on MVAR	$14,040,881,541	$593,419,569	$7,583,540,144	$3,051,594,576	$759,207,731
• Funded ratio on MVAR	14.1%	53.8%	48.1%	43.8%	27.9%
Insurance					
• Actuarial accrued liability	$2,564,787,757	$427,976,729	$3,392,085,755	$1,740,970,549	$276,143,386
• Unfunded accrued liability on AVAI	$1,468,828,988	($111,274,716)	$730,734,819	$378,942,721	$69,125,663
• Funded ratio on AVAI	42.7%	126.0%	78.5%	78.2%	75.0%
• Unfunded accrued liability on MVAI	$1,504,139,226	($93,778,144)	$810,472,843	$419,853,783	$74,803,349
• Funded ratio on MVAI	41.4%	121.9%	76.1%	75.9%	72.9%
Membership:					
• Number of					
- Active Members	31,703	4,094	81,250	9,419	798
- Retirees and Beneficiaries	47,333	4,628	65,414	10,452	1,669
- Inactive Members	53,499	6,941	95,692	3,590	589
- Total	132,535	15,663	242,356	23,461	3,056
• Projected payroll of active members	$1,387,760,907	$170,825,646	$2,565,390,935	$568,557,746	$46,144,943
• Average salary of active members	$43,774	$41,726	$31,574	$60,363	$57,826

[1] The Actuarially Determined Contribution rates assume that all employers will be required to contribute the amounts shown above. If certain employers are allowed to contribute less than the Actuarially Determined Contribution, a corresponding increase in the required contribution rate will be required for the other employers.

[2] The 2020 legislative session did not set the contribution rates for FYE 2022. Contribution rates for FYE 2022 will be based on the June 30, 2020 Valuation.

[3] Reflect the CERS Phase-In provisions, which limit the certified contribution rates to a 12% increase from the prior year.

Kentucky Employees Retirement System (KERS)

Actuarial Valuation Report
as of June 30, 2020

P: 469.524.0000 | www.grsconsulting.com

December 3, 2020

Board of Trustees
Kentucky Retirement Systems
Perimeter Park West
1260 Louisville Road
Frankfort, KY 40601

Subject: Actuarial Valuation as of June 30, 2020

Dear Trustees of the Board:

This report describes the current actuarial condition of the Kentucky Employees Retirement System (KERS) and provides the actuarially determined employer contribution rates for fiscal year ending June 30, 2022. In addition, the report analyzes changes in the System's financial condition and provides various summaries of the data.

Separate reports are issued with regard to valuation results determined in accordance with Governmental Accounting Standards Board (GASB) Statements 67, 68, 74 and 75. Results of this report should not be used for any other purpose without consultation with the undersigned. Valuations are prepared annually as of June 30, the first day of the plan year for KRS. This report was prepared at the request of the Board of Trustees of the Kentucky Retirement Systems (Board) and is intended for use by the KRS staff and those designated or approved by the Board.

FINANCING OBJECTIVES AND FUNDING POLICY

In 2019, the Board recommended the employer contribution rates for the fiscal years beginning July 1, 2020 and ending June 30, 2022. However, during the 2020 legislative session, only contribution rates through June 30, 2021 were budgeted. Therefore, the Board must recommend the employer contribution rates for the fiscal year beginning July 1, 2021 and ending June 30, 2022. The contribution rates determined by these actuarial valuations are intended to become effective twelve months after the valuation date and, as such, are intended to be used by the Board for recommending these required contribution rates effective July 1, 2021.

The employer contribution rate is determined in accordance with Section 61.565 of Kentucky Statute, which was last amended by SB249 (passed during the 2020 legislative session). As specified by the Statute, the employer contribution rate is comprised of a normal cost contribution and an actuarial accrued liability contribution.

The actuarial accrued liability contribution is calculated by amortizing the unfunded accrued liability as of June 30, 2019 over a closed 30-year amortization period. Gains and losses incurring in future years (including those incurred in this June 30, 2020 valuation) are amortized as separate closed 20-year amortization bases. Prior to the passage of SB249, the unfunded liability was amortized as one amortization base over a closed 30-year period beginning July 1, 2013 (i.e. the amortization period would have been 23 years as of June 30, 2020).

The number of active members in the KERS non-hazardous system decreased from 33,696 as of June 30, 2019 to 31,703 as of June 30, 2020 and the corresponding covered payroll decreased by 3.5% to $1,388 million. It is increasingly important for Kentucky Retirement Systems to work with the legislators of the Commonwealth to change the method for collecting the amortization cost of the unfunded liability so that the amortization cost is not collected on covered payroll (such as the allocation method in HB 171 that was introduced during the 2020 legislative session).

ASSUMPTIONS AND METHODS

The Board of Trustees, in consultation with the actuary, sets the actuarial assumptions and methods used in the actuarial valuation. An experience study was conducted after the June 30, 2018 actuarial valuation and the Board adopted updated assumptions for first use in the June 30, 2019 actuarial valuation.

The assumed increase in future healthcare costs, or trend assumption, is reviewed on an annual basis and was updated since the June 30, 2019 valuation to better reflect the plan's anticipated long-term healthcare cost increases. There were no other changes in actuarial assumptions since the prior valuation.

The results of the actuarial valuation are dependent on the actuarial assumptions used. Actual results can, and almost certainly will, differ as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rate, and funding periods. The actuarial calculations are intended to provide information for rational decision making.

This report was prepared using our proprietary valuation model and related software which in our professional judgment has the capability to provide results that are consistent with the purposes of the valuation. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

BENEFIT PROVISIONS

The benefit provisions reflected in these valuations are those which were in effect on June 30, 2020. House Bill 1 passed during the 2019 special legislative session and allowed certain agencies in the Non-Hazardous fund to elect to cease participating in the System as of June 30, 2020 under

different provisions than were previously established. Senate Bill 249 passed during the 2020 legislative session and delayed the effective date of cessation for these provisions to June 30, 2021. Since we are unable to identify at this time which agencies will elect to cease participation, we have made no assumption regarding future employer elections and the results of this actuarial valuation reflect the membership as of June 30, 2020.

House Bill 271 passed during the 2020 legislative session and removed provisions that reduce the monthly payment to a surviving spouse of a member whose death was due to a duty-related injury upon remarriage of the spouse. It also increased benefits for a very small number of beneficiaries. There were no other material benefit provision changes since the prior valuation.

IMPACT DUE TO COVID-19

This actuarial valuation is performed as of June 30, 2020, which is approximately three months after the start of the COVID-19 pandemic in the United States. It is uncertain how the mortality and other demographic behavior (e.g. retirement and turnover) may change during the next couple years. However, if government budgets are constrained then we would expect lower than expected salary increases for individual members and a possible reduction in active membership until the Commonwealth's economy recovers. There may also be increased volatility and uncertainty in future investment returns.

DATA

Member data for retired, active and inactive members was supplied as of June 30, 2020, by the KRS staff. The staff also supplied asset information as of June 30, 2020. We did not audit this data, but we did apply a number of tests to the data, and we concluded that it was reasonable and consistent with the prior year's data. GRS is not responsible for the accuracy or completeness of the information provided to us by KRS.

CERTIFICATION

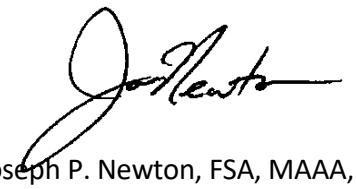
We certify that the information presented herein is accurate and fairly portrays the actuarial position of KERS as of June 30, 2020.

All of our work conforms with generally accepted actuarial principles and practices, and is in conformity with the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of Kentucky Code of Laws and, where applicable, the Internal Revenue Code, ERISA, and the Statements of the Governmental Accounting Standards Board.

The undersigned are independent actuaries and consultants. Mr. Newton and Mr. White are Enrolled Actuaries. All three of the undersigned are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries. All of the undersigned are experienced in performing valuations for large public retirement systems.

Sincerely,

Gabriel, Roeder, Smith & Co.



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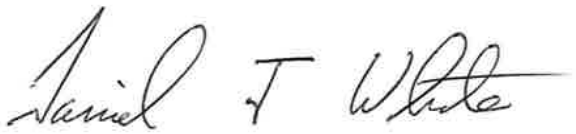

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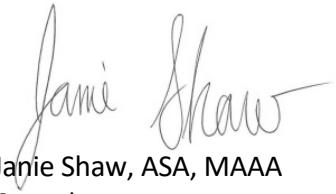


Janie Shaw, ASA, MAAA
Consultant

Table of Contents

SECTION 1

EXECUTIVE SUMMARY

Summary of Principal Results

(Dollar amounts expressed in thousands)

	Non-Hazardous		Hazardous		Total	
	June 30, 2020	June 30, 2019	June 30, 2020	June 30, 2019	June 30, 2020	June 30, 2019
Actuarially Determined Contribution[1]:						
Retirement	75.32%	73.28%	33.43%	36.00%		
Insurance	9.71%	11.15%	0.00%	0.00%		
Total	85.03%	84.43%	33.43%	36.00%	N/A	N/A
Contribution Rate for Next Fiscal Year[2]	85.03%	84.43%	33.43%	36.00%		
Assets:						
Retirement						
• Actuarial value (AVAR)	$2,323,298	$2,206,280	$709,587	$671,647	$3,032,885	$2,877,927
• Market value (MVAR)	$2,308,080	$2,233,672	$690,350	$680,932	$2,998,430	$2,914,604
• Ratio of actuarial to market value of assets	100.7%	98.8%	102.8%	98.6%	101.1%	98.7%
Insurance						
• Actuarial value (AVAI)	$1,095,959	$991,427	$539,251	$525,315	$1,635,210	$1,516,742
• Market value (MVAI)	$1,060,649	$995,089	$521,755	$534,053	$1,582,404	$1,529,142
• Ratio of actuarial to market value of assets	103.3%	99.6%	103.4%	98.4%	103.3%	99.2%
Funded Status:						
Retirement						
• Actuarial accrued liability	$16,348,961	$16,466,428	$1,283,769	$1,226,195	$17,632,730	$17,692,623
• Unfunded accrued liability on AVAR	$14,025,663	$14,260,148	$574,182	$554,548	$14,599,845	$14,814,696
• Funded ratio on AVAR	14.2%	13.4%	55.3%	54.8%	17.2%	16.3%
• Unfunded accrued liability on MVAR	$14,040,881	$14,232,756	$593,419	$545,263	$14,634,300	$14,778,019
• Funded ratio on MVAR	14.1%	13.6%	53.8%	55.5%	17.0%	16.5%
Insurance						
• Actuarial accrued liability	$2,564,788	$2,733,065	$427,977	$426,704	$2,992,765	$3,159,769
• Unfunded accrued liability on AVAI	$1,468,829	$1,741,638	($111,274)	($98,611)	$1,357,555	$1,643,027
• Funded ratio on AVAI	42.7%	36.3%	126.0%	123.1%	54.6%	48.0%
• Unfunded accrued liability on MVAI	$1,504,139	$1,737,976	($93,778)	($107,349)	$1,410,361	$1,630,627
• Funded ratio on MVAI	41.4%	36.4%	121.9%	125.2%	52.9%	48.4%
Membership:						
• Number of						
- Active Members	31,703	33,696	4,094	3,705	35,797	37,401
- Retirees and Beneficiaries	47,333	47,410	4,628	4,537	51,961	51,947
- Inactive Members	53,499	51,914	6,941	6,248	60,440	58,162
- Total	132,535	133,020	15,663	14,490	148,198	147,510
• Projected payroll of active members	$1,387,761	$1,437,647	$170,826	$150,446	$1,558,587	$1,588,093
• Average salary of active members	$43,774	$42,665	$41,726	$40,606	$43,540	$42,461

[1] Actuarially Determined Contributions calculated as of June 30, 2019 reflect SB249, which changed the amortization period to 30 years as of June 30, 2019.

[1] Further, the Actuarially Determined Contribution rates assume that all employers will be required to contribute the amounts shown above. If certain employers are allowed to contribute less than the Actuarially Determined Contribution, a corresponding increase in the required contribution rate will be required for the other employers.

[2] The 2020 legislative session did not set the contribution rates for FYE 2022. Contribution rates for FYE 2022 will be based on the June 30, 2020 Valuation.

Executive Summary (Continued)

Non-Hazardous Retirement Fund

The unfunded actuarial accrued liability of the non-hazardous retirement fund decreased by $234 million since the prior year's valuation to $14.026 billion. This decrease was approximately $102 million more than expected, primarily due to liability gains caused by the mortality experience in the past year.

For FYE 2020, the non-hazardous retirement fund distributed $1,023 million in benefit payments and administrative expenses, and received $1,045 million in employer and employee contributions. As of June 30, 2020, plan assets for this system were $2,308 million (excluding assets in the 401(h) account). To stabilize the financial condition of this system, it is imperative that contributions to the system continue to exceed the benefit payments.

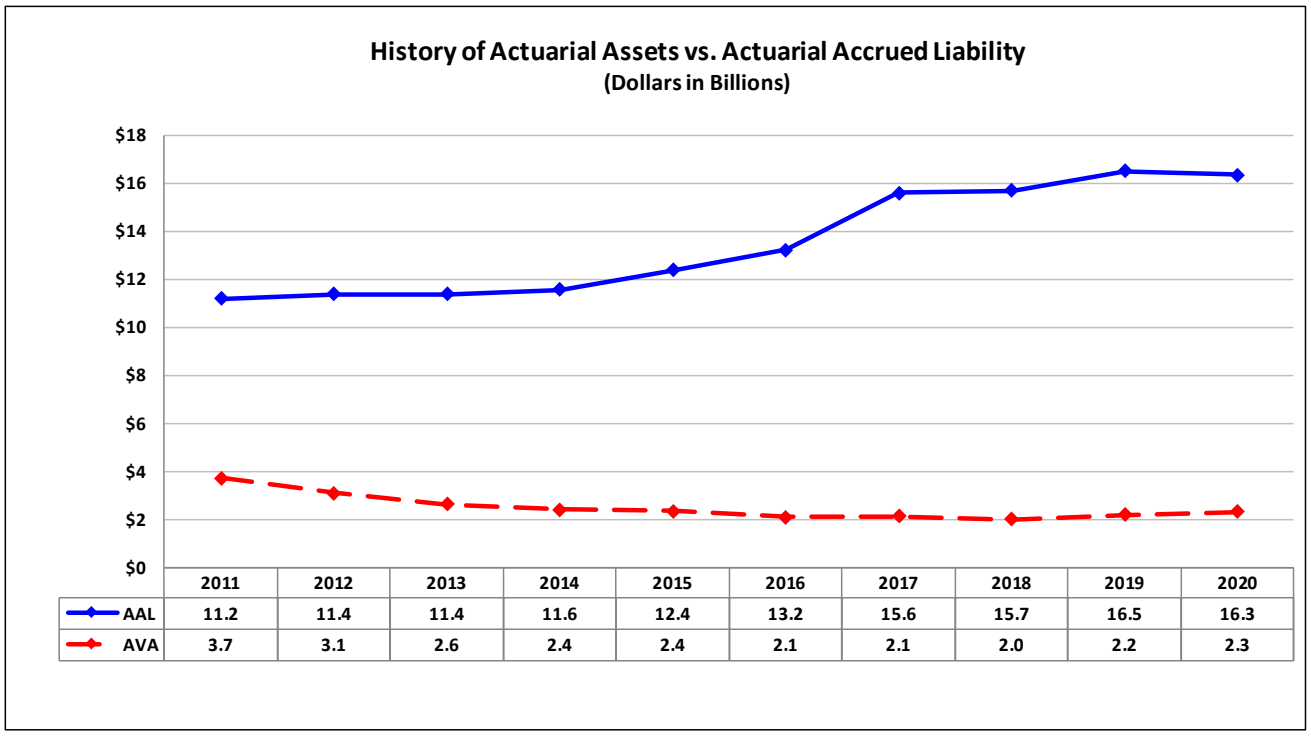
For FYE 2019 through FYE 2021, certain quasi-governmental employers and universities have been allowed to contribute less than the actuarially determined contribution rate to the non-hazardous fund. The employer contribution rates documented in this report assume that all employers will pay the actuarially determined rate. If legislation is passed to allow these employers and universities to contribute less than the contribution rates documented in this report for FYE 2022, the required contribution rates for the remaining employers will need to be increased. Without this corresponding increase in contribution rate from other employers or other special appropriations, the System would be receiving less than the actuarially determined contribution, and the financial condition of this retirement system is expected to continue to deteriorate and there is a significant risk of the plan assets being exhausted.

As of June 30, 2020, these quasi-governmental employers and universities encompass approximately 21% of the covered payroll of the non-hazardous fund. If legislation were passed to continue to allow these employers and universities to contribute 49.47% of pay for FYE 2022, the actuarially determined contribution rate for the remaining employers would increase from 85.03% of pay to 94.50% of pay (84.44% of pay for the retirement fund and 10.06% of pay for the insurance fund).

Executive Summary (Continued)

Non-Hazardous Retirement Fund (continued)

Below is a chart with the historical actuarial value of assets and actuarial accrued liability. The divergence in the assets and liability over the last ten years has generally been due to: (1) actual contributions being insufficient to finance the unfunded actuarial accrued liability, (2) decreases in the assumed rate of return between 2015 and 2017, and (3) actual investment experience being less than the investment return assumption.



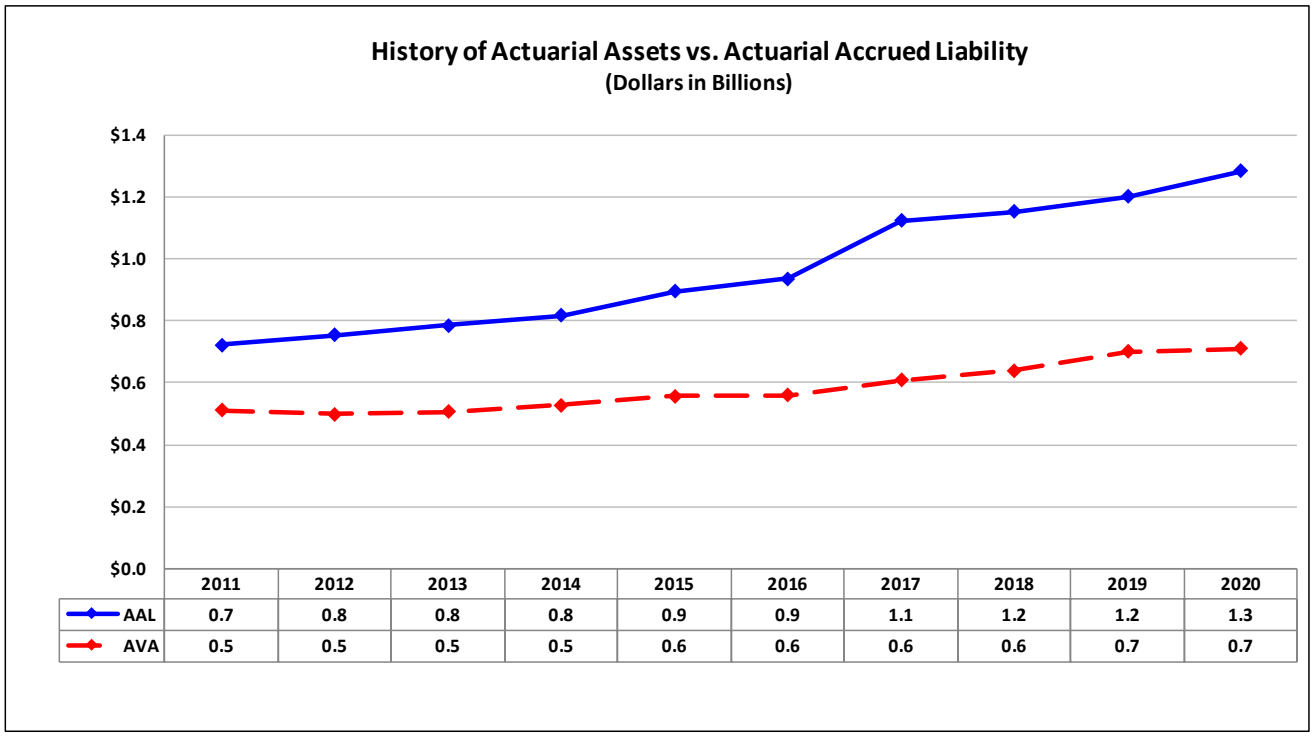
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AAL	11.2	11.4	11.4	11.6	12.4	13.2	15.6	15.7	16.5	16.3
AVA	3.7	3.1	2.6	2.4	2.4	2.1	2.1	2.0	2.2	2.3

Executive Summary (Continued)

Hazardous Retirement Fund

The unfunded actuarial accrued liability of the hazardous retirement fund increased by $20 million since the prior year's valuation to $574 million. This increase was primarily due to liability losses caused by the salary experience of active members and new active members with prior service.

Below is a chart with the historical actuarial value of assets and actuarial accrued liability. The divergence in the assets and liability over the last ten years has generally been due to: (1) actual contributions being insufficient to finance the unfunded actuarial accrued liability, (2) decreases in the assumed rate of return between 2015 and 2017, and (3) actual investment experience being less than the investment return assumption.



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AAL	0.7	0.8	0.8	0.8	0.9	0.9	1.1	1.2	1.2	1.3
AVA	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7

Executive Summary (Continued)

Summary of Change in Financial Condition of the Insurance Funds

Both the 2021 non-Medicare and Medicare premiums were lower than expected based on the prior year's actuarial assumptions, which resulted in lower than expected accrued liability for both of the insurance funds.

Specifically, the non-Medicare premiums were expected to increase by 6.25% from calendar year 2020 to calendar year 2021 (i.e. the medical trend assumption for non-Medicare premiums used in the prior year's actuarial valuation) and the actual premiums increased by approximately 3%. The Medicare premiums were expected to increase by 5.50% from calendar year 2020 to calendar year 2021 (i.e. the medical trend assumption for Medicare premiums used in the prior year's actuarial valuation) and the actual premiums decreased. The decrease to the Medicare premiums was primarily due to the repeal of the "Health Insurer Fee" in December 2019.

In conjunction with the review of the healthcare per capita claims cost, the assumed increase in future healthcare costs, or trend assumption, is reviewed on an annual basis. The trend assumption was updated since the June 30, 2019 valuation to better reflect the plan's anticipated long-term healthcare cost increases. In general, the updated assumption is assuming higher future increases in healthcare costs. Additionally, the assumed impact of the "Cadillac Tax" (previously, a 0.9% load on employer paid non-Medicare premiums for those who became participants prior to July 1, 2003) was removed to reflect its repeal since the prior valuation.

Non-Hazardous Insurance Fund

Since the prior year's valuation, the unfunded actuarial accrued liability of the non-hazardous insurance fund decreased by $273 million since the prior year's valuation to $1,469 million. The largest source of this decrease is due to a $228 million decrease in the liability due to the premium experience and corresponding healthcare trend assumption change. The corresponding funded ratio increased from 36.3% at June 30, 2019 to 42.7% at June 30, 2020.

Hazardous Insurance Fund

Since the prior year's valuation, the plan assets in excess of the actuarial accrued liability of the hazardous insurance fund increased by $13 million since the prior year's valuation to a $111 million surplus. The largest source of this increase is due to a $27 million decrease in the liability due to the premium experience and corresponding healthcare trend assumption change. The corresponding funded ratio increased from 123.1% at June 30, 2019 to 126.0% at June 30, 2020.

SECTION 2

DISCUSSION

Discussion

The Kentucky Employees Retirement System (KERS) is a defined benefit pension fund that provides pensions and health care coverage for employees of state government, non-teaching staff at regional state supported universities, local health departments, regional mental health/mental retardation agencies, and other quasi-state agencies. KERS includes both non-hazardous and hazardous duty benefits. This report presents the result of the June 30, 2020 actuarial funding valuation for both the Retirement Funds and Insurance Funds.

The primary purposes of the valuation report are to describe the current actuarial condition of the System and provide the actuarially determined employer contribution rates for fiscal year ending June 30, 2022. In addition, the report analyzes changes in the System's financial condition and provides various summaries of the data.

The actuarially determined contribution rates consist of two components: a normal cost rate and an amortization cost to finance the unfunded actuarial accrued liability. The normal cost rate is the theoretical amount which would be required to pay the members' benefits, based on the current plan provisions, if this amount had been contributed from each member's entry date and if the fund's experience exactly followed the actuarial assumptions. This is the amount that it should cost to provide the benefits for an average member. Since members contribute to the fund, only the excess of the normal rate over the member contribution rate is included in the employer contribution rate. The amortization cost is the amount, expressed as a percentage of payroll, necessary to amortize the unfunded actuarial accrued liability. The payroll growth rate and discount rate assumptions are selected by the Board. The funding period is specified in Section 61.565 of Kentucky Statute.

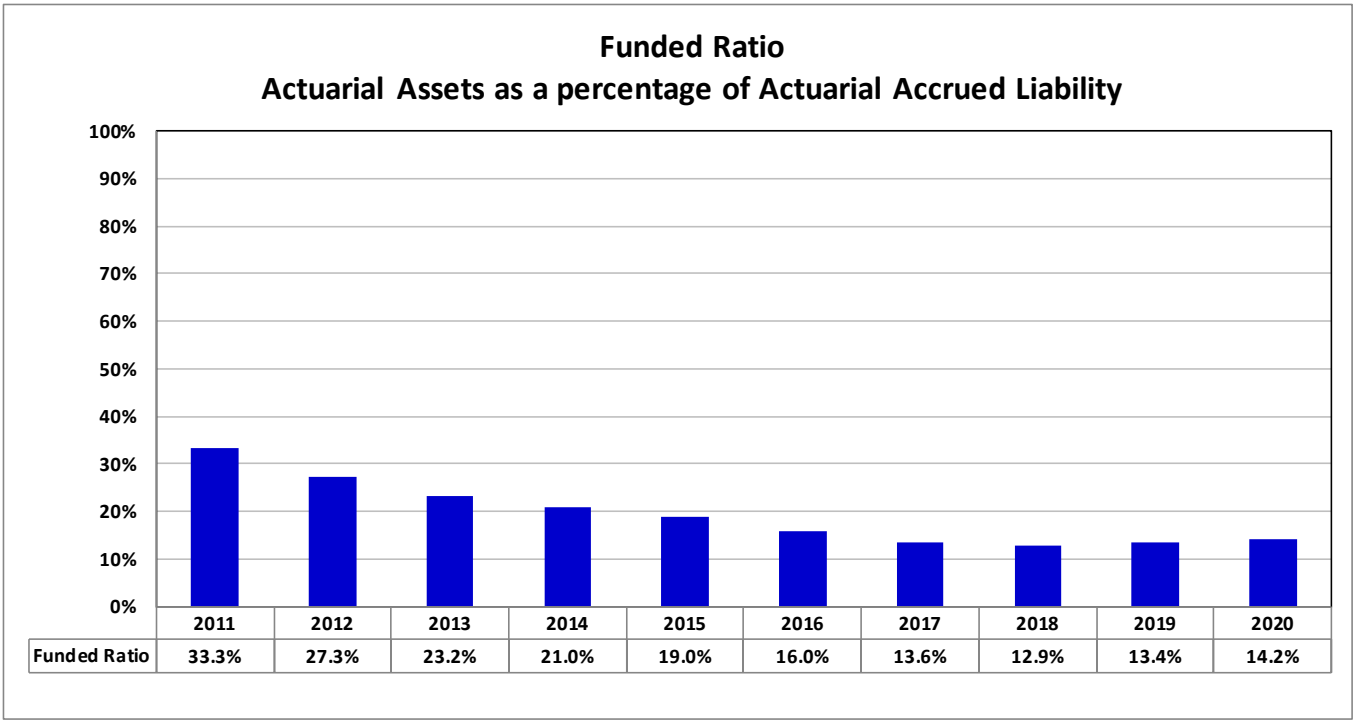
All of the actuarial and financial tables referenced by the other sections of this Report appear in Section 3. Section 4 provides additional details related to the calculation of the amortization of the unfunded actuarial accrued liability. This section was added to the report this year due to the change in the amortization methodology related to SB249 (passed during the 2020 legislative session). Section 5 provides member data and statistical information. Section 6 provides a discussion of various risk measures, which are intended to aid stakeholders in understanding the effects of future experience differing from the assumptions used in performing an actuarial valuation. Appendices A and B provide summaries of the principle actuarial assumptions and methods and plan provisions. Finally, Appendix C provides a glossary of technical terms that are used throughout this report.

Funding Progress

The following charts provide a ten-year history of the retirement funds' funded ratio (i.e. the Actuarial Value of Assets divided by the Actuarial Accrued Liability). The decline in the funded ratio over the last ten years has generally been due to: (1) actual contributions being insufficient to finance the unfunded actuarial accrued liability, (2) decreases in the assumed rate of return between 2015 and 2017, and (3) actual investment experience being less than the investment return assumption.

The funded ratio increased from 2019 to 2020 for both the non-hazardous and hazardous funds. Assuming the actuarially determined contributions are actually paid in future years and absent future unfavorable experience we expect the funded ratio to continue improving. Also, the dollar amount of the unfunded actuarial accrued liability, or the difference between the actuarial accrued liability and the actuarial value of assets, is expected to begin decreasing. Table 9, Schedule of Funding Progress, in the following section of the report provides additional detail regarding the funding progress of the Retirement Funds.

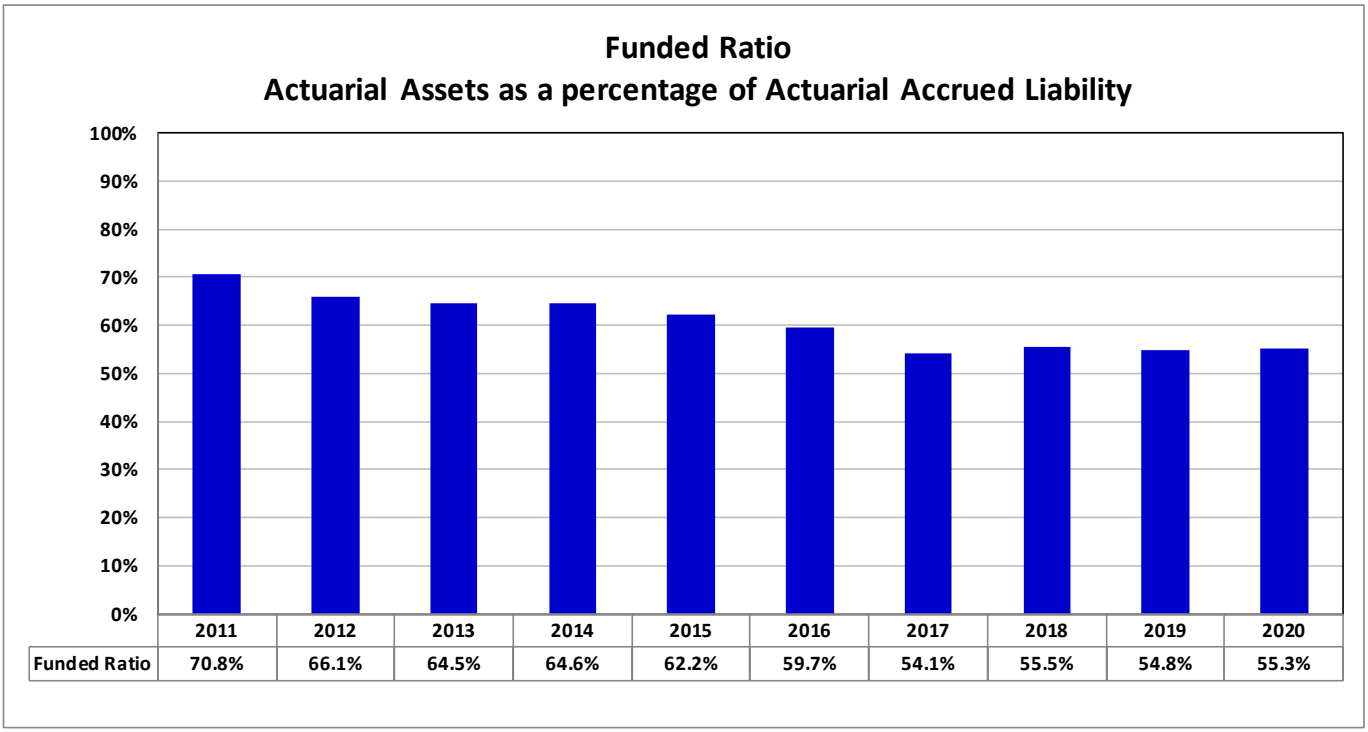
Non-Hazardous Retirement Fund



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Funded Ratio	33.3%	27.3%	23.2%	21.0%	19.0%	16.0%	13.6%	12.9%	13.4%	14.2%

Funding Progress (Continued)

Hazardous Retirement Fund



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Funded Ratio	70.8%	66.1%	64.5%	64.6%	62.2%	59.7%	54.1%	55.5%	54.8%	55.3%

Asset Gains/ (Losses)

The actuarial value of assets ("AVA") is based on a smoothed market value of assets, using a systematic approach to phase-in the difference between the actual and expected investment return on the market value of assets (adjusted for receipts and disbursements during the year). This is appropriate because it dampens the short-term volatility inherent in investment markets. The return is computed net of investment expenses.

Non-Hazardous Retirement Fund

The actuarial value of assets for the retirement fund increased from $2.206 billion to $2.323 billion since the prior valuation. The rate of return on the market value of assets on a dollar-weighted basis for the prior fiscal year was a 2.3% which is less than the 5.25% expected annual return. The return on an actuarial (smoothed) asset value was 4.3%, which resulted in a $21.3 million loss for the fiscal year. This difference in the estimated return on market value and actuarial value illustrates the smoothing effect of the asset valuation method. The market value of assets is $15 million less than the actuarial value of assets, which signifies that the retirement fund is in a position of deferred losses to be realized in future years.

Hazardous Retirement Fund

Likewise, the actuarial value of assets for the hazardous retirement fund increased from $672 million to $710 million since the prior valuation. The rate of return on the market value of assets on a dollar-weighted basis for the prior fiscal year was a 1.0% which is less than the 6.25% expected annual return. The return on an actuarial (smoothed) asset value was 5.2%, which resulted in a $6.8 million loss for the fiscal year. The market value of assets is $19 million less than the actuarial value of assets, which signifies that the retirement fund is in a position of deferred losses to be realized in future years.

Table 6 in the following section of this report provides asset information that was included in the annual financial statements of the System, as well as the estimated yield on a market value basis. Tables 7 and 8 provide the development of the actuarial value of assets and the estimated yield on an actuarial value basis.

Actuarial Gains/ (Losses)

The annual actuarial valuation is a snapshot analysis of the benefit liabilities, assets and funded position of the funds as of the first day of the plan year. In any one fiscal year, the experience can be better or worse from that which is assumed or expected. The actuarial assumptions do not necessarily attempt to model what the experience will be for any one given fiscal year, but instead try to model the overall experience over many years. Therefore, as long as the actual experience of a retirement system is reasonably close to the current assumptions, the long-term funding requirements of the system will remain relatively consistent.

Below are tables that separately show a reconciliation of the actuarial gains / (losses) since the prior actuarial valuation for the retirement and health insurance funds, which include the effect of asset and liability gains and losses, changes in assumptions, changes in plan provisions, etc.

Retirement Experience Gain or (Loss)
(Dollar amounts expressed in thousands)

	Non-Hazardous	Hazardous
A. Calculation of total actuarial gain or loss		
1. Unfunded actuarial accrued liability (UAAL), previous year	$ 14,260,148	$ 554,548
2. Normal cost and administrative expenses	186,750	25,892
3. Less: contributions for the year	(1,045,186)	(78,883)
4. Interest accrual	726,124	33,003
5. Expected UAAL (Sum of Items 1 - 4)	$ 14,127,836	$ 534,560
6. Actual UAAL as of June 30,2020	$ 14,025,663	$ 574,182
7. Total gain (loss) for the year (Item 5 - Item 6)	$ 102,173	$ (39,622)
B. Source of gains and losses		
8. Asset gain (loss) for the year	$ (21,295)	$ (6,801)
9. Liability experience gain (loss) for the year	123,468	(32,821)
10. Plan Change	—	—
11. Assumption change	—	—
12. Total	$ 102,173	$ (39,622)

Actuarial Gains/ (Losses) (Continued)

Insurance Experience Gain or (Loss)
(Dollar amounts expressed in thousands)

	Non-Hazardous	Hazardous
A. Calculation of total actuarial gain or loss		
1. Unfunded actuarial accrued liability (UAAL), previous year	$ 1,741,638	$ (98,611)
2. Normal cost and administrative expenses	39,628	7,517
3. Less: contributions for the year	(181,134)	(6,881)
4. Interest accrual	104,430	(6,143)
5. Expected UAAL (Sum of Items 1 - 4)	$ 1,704,562	$ (104,118)
6. Actual UAAL as of June 30,2020	$ 1,468,829	$ (111,274)
7. Total gain (loss) for the year (Item 5 - Item 6)	$ 235,733	$ 7,156
B. Source of gains and losses		
8. Asset gain (loss) for the year	$ (12,851)	$ (5,487)
9. Liability experience gain (loss) for the year	248,584	12,643
10. Plan Change	—	—
11. Assumption change	—	—
12. Total	$ 235,733	$ 7,156

The liability experience gains shown above include a $228 million gain for the non-hazardous fund and a $27 million gain for the hazardous fund due to the funds' favorable premium experience and corresponding healthcare trend assumption change. See the discussion in the Executive Summary for additional information.

Actuarial Assumptions and Methods

In determining costs and liabilities, actuaries use assumptions about the future, such as rates of salary increase, probabilities of retirement, termination, death and disability, and an annual investment return assumption. The Board of Trustees, in consultation with the actuary, sets the actuarial assumptions and methods used in the actuarial valuation. An experience study was conducted after the June 30, 2018 actuarial valuation and the Board adopted updated assumptions for first use in the June 30, 2019 actuarial valuation.

In conjunction with the review of the healthcare per capita claims cost, the assumed increase in future healthcare costs, or trend assumption, is reviewed on an annual basis. The trend assumption was updated since the June 30, 2019 valuation to better reflect the plan's anticipated long-term healthcare cost increases. There were no other changes in actuarial assumptions since the prior valuation.

It is our opinion that the assumptions are internally consistent, reasonable, and reflect anticipated future experience of the System. Appendix A includes a summary of the actuarial assumptions and methods used in this valuation.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. This report does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

Benefit Provisions

Appendix B of this report includes a summary of the major benefit provisions for System.

House Bill 1 passed during the 2019 special legislative session and allowed certain agencies in the Non-Hazardous fund to elect to cease participating in the System as of June 30, 2020 under different provisions than were previously established. Senate Bill 249 passed during the 2020 legislative session and delayed the effective date of cessation for these provisions to June 30, 2021. Since we are unable to identify at this time which agencies will elect to cease participation, we have made no assumption regarding future employer elections and the results of this actuarial valuation reflect the membership as of June 30, 2020.

House Bill 271 passed during the 2020 legislative session and removed provisions that reduce the monthly payment to a surviving spouse of a member whose death was due to a duty-related injury upon remarriage of the spouse. It also increased benefits for a very small number of beneficiaries.

There were no other material plan provision changes since the prior valuation.

SECTION 3

ACTUARIAL TABLES

Actuarial Tables

RETIREMENT BENEFITS

ACTUARIAL TABLES

Development of Unfunded Actuarial Accrued Liability
Retirement Benefits

(Dollar amounts expressed in thousands)

		June 30, 2020	
		Non-Hazardous (1)	Hazardous (2)
1.	Projected payroll of active members	$ 1,387,761	$ 170,826
2.	Present value of future pay	$ 10,855,851	$ 1,284,904
3.	Normal cost rate		
	a. Total normal cost rate	12.04%	16.15%
	b. Less: member contribution rate	-5.00%	-8.00%
	c. Employer normal cost rate	7.04%	8.15%
4.	Actuarial accrued liability for active members		
	a. Present value of future benefits	$ 5,127,148	$ 583,785
	b. Less: present value of future normal costs	(1,245,709)	(198,144)
	c. Actuarial accrued liability	$ 3,881,439	$ 385,641
5.	Total actuarial accrued liability		
	a. Retirees and beneficiaries	$ 11,810,296	$ 849,773
	b. Inactive members	657,226	48,355
	c. Active members (Item 4c)	3,881,439	385,641
	d. Total	$ 16,348,961	$ 1,283,769
6.	Actuarial value of assets	$ 2,323,298	$ 709,587
7.	Unfunded actuarial accrued liability (UAAL) (Item 5d - Item 6)	$ 14,025,663	$ 574,182
8.	Funded Ratio	14.2%	55.3%

Actuarial Present Value of Future Benefits
Retirement Benefits
(Dollar amounts expressed in thousands)

		June 30, 2020	
		Non-Hazardous (1)	Hazardous (2)
1.	Active members		
	a. Service retirement	$ 4,555,760	$ 520,118
	b. Deferred termination benefits and refunds	344,260	40,655
	c. Survivor benefits	71,155	5,440
	d. Disability benefits	155,973	17,572
	e. Total	$ 5,127,148	$ 583,785
2.	Retired members		
	a. Service retirement	$ 10,822,289	$ 782,340
	b. Disability retirement	269,769	17,266
	c. Beneficiaries	718,238	50,167
	d. Total	$ 11,810,296	$ 849,773
3.	Inactive members		
	a. Vested terminations	$ 615,384	$ 39,590
	b. Nonvested terminations	41,842	8,765
	c. Total	$ 657,226	$ 48,355
4.	Total actuarial present value of future benefits	$ 17,594,670	$ 1,481,913

Development of Actuarially Determined Contribution Rate
Retirement Benefits

		June 30, 2020	
		Non-Hazardous (1)	Hazardous (2)
1.	Total normal cost rate		
	a. Service retirement	8.26%	11.53%
	b. Deferred termination benefits and refunds	2.84%	3.62%
	c. Survivor benefits	0.34%	0.30%
	d. Disability benefits	0.60%	0.70%
	e. Total	12.04%	16.15%
2.	Less: member contribution rate	-5.00%	-8.00%
3.	Total employer normal cost rate	7.04%	8.15%
4.	Administrative expenses	0.86%	0.69%
5.	Net employer normal cost rate	7.90%	8.84%
6.	UAAL amortization contribution	67.42%	24.59%
7.	Total calculated employer contribution	75.32%	33.43%

Actuarial Balance Sheet

Non-Hazardous Members Retirement

(Dollar amounts expressed in thousands)

		June 30, 2020 (1)	June 30, 2019 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 2,323,298	$ 2,206,280
	b. Present value of future member contributions	$ 542,793	$ 565,380
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 702,916	$ 753,414
	ii. Unfunded accrued liability contributions	14,025,663	14,260,148
	iii. Total future employer contributions	$ 14,728,579	$ 15,013,562
	d. Total assets	$ 17,594,670	$ 17,785,222
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 1,245,709	$ 1,318,794
	ii. Accrued liability	3,881,439	3,953,197
	iii. Total present value of future benefits	$ 5,127,148	$ 5,271,991
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 11,810,296	$ 11,897,063
	c. Present value of benefits payable on account of current inactive members	$ 657,226	$ 616,168
	d. Total liabilities	$ 17,594,670	$ 17,785,222

Actuarial Balance Sheet

Hazardous Members Retirement

(Dollar amounts expressed in thousands)

		June 30, 2020 (1)	June 30, 2019 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 709,587	$ 671,647
	b. Present value of future member contributions	$ 102,792	$ 89,699
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 95,352	$ 87,238
	ii. Unfunded accrued liability contributions	574,182	554,548
	iii. Total future employer contributions	$ 669,534	$ 641,786
	d. Total assets	$ 1,481,913	$ 1,403,132
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 198,144	$ 176,937
	ii. Accrued liability	385,641	346,377
	iii. Total present value of future benefits	$ 583,785	$ 523,314
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 849,773	$ 834,633
	c. Present value of benefits payable on account of current inactive members	$ 48,355	$ 45,185
	d. Total liabilities	$ 1,481,913	$ 1,403,132

Reconciliation of Retirement Net Assets

(Dollar amounts expressed in thousands)[1]

	Year Ending June 30, 2020 (1) Non-Hazardous	Year Ending June 30, 2020 (2) Hazardous
1. Value of assets at beginning of year	$ 2,233,672	$ 680,932
2. Revenue for the year		
a. Contributions		
i. Member contributions	$ 96,594	$ 19,769
ii. Employer contributions	948,578	59,096
iii. Other contributions (less 401h)	14	19
iv. Total	$ 1,045,186	$ 78,883
b. Income		
i. Interest, dividends, and other income	$ 48,155	$ 16,182
ii. Investment expenses	(9,427)	(2,836)
iii. Net	$ 38,727	$ 13,346
c. Net realized and unrealized gains (losses)	13,773	(6,607)
d. Total revenue	$ 1,097,685	$ 85,622
3. Expenditures for the year		
a. Disbursements		
i. Refunds	$ 11,523	$ 3,168
ii. Regular annuity benefits	999,813	71,861
iii. Other benefit payments	0	0
iv. Transfers to other systems	0	0
v. Total	$ 1,011,336	$ 75,029
b. Administrative expenses and depreciation	11,941	1,176
c. Total expenditures	$ 1,023,277	$ 76,205
4. Increase in net assets (Item 2. - Item 3.)	$ 74,408	$ 9,418
5. Value of assets at end of year (Item 1. + Item 4.)	$ 2,308,080	$ 690,350
6. Net external cash flow		
a. Dollar amount	$ 21,909	$ 2,679
b. Percentage of market value	1.0%	0.4%
7. Estimated annual return on net assets	2.3%	1.0%

[1] Amounts may not add due to rounding

[1] Excludes 401h assets

Development of Actuarial Value of Assets

Non-Hazardous Members Retirement

(Dollar amounts expressed in thousands)*

	Year Ending	June 30, 2020
1.	Actuarial value of assets at beginning of year	$ 2,206,280
2.	Market value of assets at beginning of year	$ 2,233,672
3.	Net new investments	
	a. Contributions	$ 1,045,186
	b. Benefit payments	(1,011,336)
	c. Administrative expenses	(11,941)
	d. Subtotal	$ 21,909
4.	Market value of assets at end of year	$ 2,308,080
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$ 52,500
6.	Assumed investment return rate for fiscal year	5.25%
7.	Expected return for immediate recognition	$ 117,843
8.	Excess return for phased recognition	$ (65,343)
9.	Phased-in recognition, 20% of excess return on assets for prior years:	

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2020	$ (65,343)	$ (13,069)
b.	2019	4,070	814
c.	2018	42,022	8,404
d.	2017	89,028	17,806
e.	2016	(183,443)	(36,689)
f.	Total		$ (22,733)

10.	Actuarial value of assets as of June 30, 2020 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$ 2,323,298
11.	Ratio of actuarial value to market value	100.7%
12.	Estimated annual return on actuarial value of assets	4.3%

* Amounts may not add due to rounding

Development of Actuarial Value of Assets

Hazardous Members Retirement

(Dollar amounts expressed in thousands)*

	Year Ending	June 30, 2020
1.	Actuarial value of assets at beginning of year	$ 671,647
2.	Market value of assets at beginning of year	$ 680,932
3.	Net new investments	
	a. Contributions	$ 78,883
	b. Benefit payments	(75,029)
	c. Administrative expenses	(1,176)
	d. Subtotal	$ 2,679
4.	Market value of assets at end of year	$ 690,350
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$ 6,739
6.	Assumed investment return rate for fiscal year	6.25%
7.	Expected return for immediate recognition	$ 42,642
8.	Excess return for phased recognition	$ (35,903)
9.	Phased-in recognition, 20% of excess return on assets for prior years:	

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2020	$ (35,903)	$ (7,181)
b.	2019	(3,933)	(787)
c.	2018	14,102	2,820
d.	2017	31,023	6,205
e.	2016	(42,195)	(8,439)
f.	Total		$ (7,381)

10.	Actuarial value of assets as of June 30, 2020 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$ 709,587
11.	Ratio of actuarial value to market value	102.8%
12.	Estimated annual return on actuarial value of assets	5.2%

* Amounts may not add due to rounding

Schedule of Funding Progress
Retirement Benefits
(Dollar amounts expressed in thousands)

June 30,	Actuarial Value of Assets (AVA)	Actuarial Accrued Liability (AAL)	Unfunded Actuarial Accrued Liability (UAAL) (3) - (2)	Funded Ratio (2)/(3)	Annual Covered Payroll	UAAL as % of Payroll (4)/(6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Non-Hazardous Members				
2011	$ 3,726,986	$ 11,182,142	$ 7,455,156	33.3%	$ 1,731,633	430.5%
2012	3,101,317	11,361,048	8,259,731	27.3%	1,644,897	502.1%
2013	2,636,123	11,386,602	8,750,479	23.2%	1,644,409	532.1%
2014	2,423,957	11,550,110	9,126,154	21.0%	1,577,496	578.5%
2015	2,350,990	12,359,673	10,008,683	19.0%	1,544,234	648.1%
2016	2,112,286	13,224,698	11,112,412	16.0%	1,529,249	726.7%
2017	2,123,623	15,591,641	13,468,018	13.6%	1,531,535	879.4%
2018	2,019,278	15,675,232	13,655,954	12.9%	1,471,477	928.0%
2019	2,206,280	16,466,428	14,260,148	13.4%	1,437,647	991.9%
2020	2,323,298	16,348,961	14,025,663	14.2%	1,387,761	1010.7%
		Hazardous Members				
2011	$ 510,749	$ 721,293	$ 210,545	70.8%	$ 133,054	158.2%
2012	497,226	752,699	255,473	66.1%	131,977	193.6%
2013	505,657	783,981	278,324	64.5%	132,015	210.8%
2014	527,897	816,850	288,953	64.6%	129,076	223.9%
2015	556,688	895,433	338,746	62.2%	128,680	263.2%
2016	559,487	936,706	377,219	59.7%	147,563	255.6%
2017	607,159	1,121,420	514,261	54.1%	162,418	316.6%
2018	639,262	1,151,923	512,661	55.5%	158,213	324.0%
2019	671,647	1,226,195	554,548	54.8%	150,446	368.6%
2020	709,587	1,283,769	574,182	55.3%	170,826	336.1%
		Total KERS Members				
2011	$ 4,237,735	$ 11,903,435	$ 7,665,700	35.6%	$ 1,864,687	411.1%
2012	3,598,543	12,113,747	8,515,204	29.7%	1,776,874	479.2%
2013	3,141,780	12,170,583	9,028,803	25.8%	1,776,424	508.3%
2014	2,951,854	12,366,960	9,415,106	23.9%	1,706,572	551.7%
2015	2,907,678	13,255,106	10,347,428	21.9%	1,672,914	618.5%
2016	2,671,773	14,161,404	11,489,631	18.9%	1,676,812	685.2%
2017	2,730,782	16,713,061	13,982,279	16.3%	1,693,953	825.4%
2018	2,658,540	16,827,155	14,168,615	15.8%	1,629,690	869.4%
2019	2,877,927	17,692,623	14,814,696	16.3%	1,588,093	932.9%
2020	3,032,885	17,632,730	14,599,845	17.2%	1,558,587	936.7%

Summary of Principal Assumptions and Methods

Below is a summary of the principal economic assumptions, cost method, and the method for financing the unfunded actuarial accrued liability:

	Non-Hazardous	Hazardous
Valuation date:	June 30, 2020	June 30, 2020
Actuarial cost method:	Entry Age Normal	Entry Age Normal
Amortization method:	Level percentage of payroll (0% payroll growth assumed)	Level percentage of payroll (0% payroll growth assumed)
Amortization period for contribution rate:	30-year closed period at June 30, 2019 Gains/losses incurring after 2019 will be amortized over separate closed 20-year amortization bases	30-year closed period at June 30, 2019 Gains/losses incurring after 2019 will be amortized over separate closed 20-year amortization bases
Asset valuation method:	5-Year Smoothed Market	5-Year Smoothed Market
Actuarial assumptions:		
Investment rate of return	5.25%	6.25%
Projected salary increases	3.30% to 15.30% (varies by service)	3.55% to 20.05% (varies by service)
Inflation	2.30%	2.30%
Post-retirement benefit adjustments	0.00%	0.00%
Retiree Mortality	System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from MP-2014 mortality improvement scale using a base year of 2019.	System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from MP-2014 mortality improvement scale using a base year of 2019.

Solvency Test
Retirement Benefits
(Dollar amounts expressed in thousands)

June 30,	Actuarial Accrued Liability: Active Member Contributions	Actuarial Accrued Liability: Retired Members & Beneficiaries	Actuarial Accrued Liability: Active Members (Employer Financed)	Valuation Assets	Portion of Aggregate Accrued Liabilities Covered by Assets: Active	Portion of Aggregate Accrued Liabilities Covered by Assets: Retired	Portion of Aggregate Accrued Liabilities Covered by Assets: ER Financed
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Hazardous Members							
2011	$ 916,569	$ 8,482,714	$ 1,782,859	$ 3,726,986	100.0%	33.1%	0.0%
2012	885,137	8,708,536	1,767,375	3,101,317	100.0%	25.4%	0.0%
2013	922,928	8,709,324	1,754,351	2,636,123	100.0%	19.7%	0.0%
2014	928,558	8,870,693	1,750,860	2,423,957	100.0%	16.9%	0.0%
2015	925,934	9,437,468	1,996,271	2,350,990	100.0%	15.1%	0.0%
2016	920,120	10,010,168	2,294,410	2,112,286	100.0%	11.9%	0.0%
2017	934,559	11,608,346	3,048,736	2,123,623	100.0%	10.2%	0.0%
2018	892,033	11,929,019	2,854,180	2,019,278	100.0%	9.4%	0.0%
2019	881,020	12,513,231	3,072,177	2,206,280	100.0%	10.6%	0.0%
2020	869,196	12,467,522	3,012,243	2,323,298	100.0%	11.7%	0.0%
Hazardous Members							
2011	$ 86,614	$ 490,395	$ 144,284	$ 510,749	100.0%	86.5%	0.0%
2012	82,101	521,689	148,910	497,226	100.0%	79.6%	0.0%
2013	82,146	545,597	156,238	505,657	100.0%	77.6%	0.0%
2014	83,664	581,231	151,955	527,897	100.0%	76.4%	0.0%
2015	83,606	633,189	178,638	556,688	100.0%	74.7%	0.0%
2016	86,705	648,482	201,519	559,487	100.0%	72.9%	0.0%
2017	93,350	746,350	281,720	607,159	100.0%	68.8%	0.0%
2018	89,106	810,311	252,506	639,262	100.0%	67.9%	0.0%
2019	86,663	879,818	259,714	671,647	100.0%	66.5%	0.0%
2020	95,528	898,128	290,113	709,587	100.0%	68.4%	0.0%

INSURANCE BENEFITS

ACTUARIAL TABLES

Development of Unfunded Actuarial Accrued Liability
Insurance Benefits

(Dollar amounts expressed in thousands)

		June 30, 2020	
		Non-Hazardous (1)	Hazardous (2)
1.	Projected payroll of active members	$ 1,387,761	$ 170,826
2.	Present value of future pay	$ 10,094,435	$ 1,281,083
3.	Normal cost rate		
	a. Total normal cost rate	2.58%	4.63%
	b. Less: member contribution rate	-0.44%	-0.64%
	c. Employer normal cost rate	2.14%	3.99%
4.	Actuarial accrued liability for active members		
	a. Present value of future benefits	$ 1,211,047	$ 194,927
	b. Less: present value of future normal costs	(236,002)	(48,874)
	c. Actuarial accrued liability	$ 975,045	$ 146,053
5.	Total actuarial accrued liability		
	a. Retirees and beneficiaries	$ 1,445,401	$ 271,249
	b. Inactive members	144,342	10,675
	c. Active members (Item 4c)	975,045	146,053
	d. Total	$ 2,564,788	$ 427,977
6.	Actuarial value of assets	$ 1,095,959	$ 539,251
7.	Unfunded actuarial accrued liability (UAAL) (Item 5d - Item 6)	$ 1,468,829	$ (111,274)
8.	Funded Ratio	42.7%	126.0%

Development of Actuarially Determined Contribution Rate
Insurance Benefits

		June 30, 2020	
		Non-Hazardous (1)	Hazardous (2)
1.	Total normal cost rate	2.58%	4.63%
2.	Less: member contribution rate	-0.44%	-0.64%
3.	Total employer normal cost rate	2.14%	3.99%
4.	Administrative expenses	0.06%	0.07%
5.	Net employer normal cost rate	2.20%	4.06%
6.	UAAL amortization contribution	7.51%	-4.94%
7.	Total calculated employer contribution Max (0%, item 5. + item6.)	9.71%	0.00%

Actuarial Balance Sheet

Non-Hazardous Members Insurance

(Dollar amounts expressed in thousands)

		June 30, 2020 (1)	June 30, 2019 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 1,095,959	$ 991,427
	b. Present value of future member contributions	$ 53,935	$ 52,755
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 182,067	$ 207,718
	ii. Unfunded accrued liability contributions	1,468,829	1,741,638
	iii. Total future employer contributions	$ 1,650,896	$ 1,949,356
	d. Total assets	$ 2,800,790	$ 2,993,538
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 236,002	$ 260,473
	ii. Accrued liability	975,045	1,046,461
	iii. Total present value of future benefits	$ 1,211,047	$ 1,306,934
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 1,445,401	$ 1,546,457
	c. Present value of benefits payable on account of current inactive members	$ 144,342	$ 140,147
	d. Total liabilities	$ 2,800,790	$ 2,993,538

Actuarial Balance Sheet

Hazardous Members Insurance

(Dollar amounts expressed in thousands)

		June 30, 2020 (1)	June 30, 2019 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 539,251	$ 525,315
	b. Present value of future member contributions	$ 9,956	$ 8,240
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 38,918	$ 37,062
	ii. Unfunded accrued liability contributions	(111,274)	(98,611)
	iii. Total future employer contributions	$ (72,356)	$ (61,549)
	d. Total assets	$ 476,851	$ 472,006
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 48,874	$ 45,302
	ii. Accrued liability	146,053	144,635
	iii. Total present value of future benefits	$ 194,927	$ 189,937
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 271,249	$ 271,869
	c. Present value of benefits payable on account of current inactive members	$ 10,675	$ 10,200
	d. Total liabilities	$ 476,851	$ 472,006

Reconciliation of Insurance Net Assets

(Dollar amounts expressed in thousands)[1]

		Year Ending June 30, 2020 (1) Non-Hazardous	Year Ending June 30, 2020 (2) Hazardous
1.	Value of assets at beginning of year	$ 995,089	$ 534,053
2.	Revenue for the year		
	a. Contributions		
	i. Member contributions	$ 6,128	$ 1,105
	ii. Employer contributions	170,480	4,482
	iii. Other contributions (less 401h)	4,527	1,294
	iv. Total	$ 181,134	$ 6,881
	b. Income		
	i. Interest, dividends, and other income	$ 22,969	$ 11,928
	ii. Investment expenses	(4,022)	(2,044)
	iii. Net	$ 18,946	$ 9,884
	c. Net realized and unrealized gains (losses)	(7,126)	(9,180)
	d. Total revenue	$ 192,955	$ 7,585
3.	Expenditures for the year		
	a. Disbursements		
	i. Refunds	$ 0	$ 0
	ii. Healthcare premium subsidies	125,006	19,630
	iii. Other benefit payments[2]	1,542	130
	iv. Transfers to other systems	0	0
	v. Total	$ 126,548	$ 19,760
	b. Administrative expenses and depreciation	847	123
	c. Total expenditures	$ 127,395	$ 19,883
4.	Increase in net assets (Item 2. - Item 3.)	$ 65,560	$ (12,298)
5.	Value of assets at end of year (Item 1. + Item 4.)	$ 1,060,649	$ 521,755
6.	Net external cash flow		
	a. Dollar amount	$ 53,739	$ (13,002)
	b. Percentage of market value	5.2%	-2.5%
7.	Estimated annual return on net assets	1.2%	0.1%

[1] Amounts may not add due to rounding and include 401h assets

[2] Benefit payments have been offset by Medicare Drug Reimbursements, Insurance Premiums, and Humana Gain Share Payments

Development of Actuarial Value of Assets

Non-Hazardous Members Insurance

(Dollar amounts expressed in thousands)*

	Year Ending	June 30, 2020
1.	Actuarial value of assets at beginning of year	$ 991,427
2.	Market value of assets at beginning of year	$ 995,089
3.	Net new investments	
	a. Contributions	$ 181,134
	b. Benefit payments	(126,548)
	c. Administrative expenses	(847)
	d. Subtotal	$ 53,739
4.	Market value of assets at end of year	$ 1,060,649
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$ 11,821
6.	Assumed investment return rate for fiscal year	6.25%
7.	Expected return for immediate recognition	$ 63,872
8.	Excess return for phased recognition	$ (52,052)
9.	Phased-in recognition, 20% of excess return on assets for prior years:	

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2020	$ (52,052)	$ (10,410)
b.	2019	(11,768)	(2,354)
c.	2018	12,636	2,527
d.	2017	41,687	8,337
e.	2016	(55,901)	(11,180)
f.	Total		$ (13,079)

10.	Actuarial value of assets as of June 30, 2020 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$ 1,095,959
11.	Ratio of actuarial value to market value	103.3%
12.	Estimated annual return on actuarial value of assets	5.0%

* Amounts may not add due to rounding

Development of Actuarial Value of Assets

Hazardous Members Insurance

(Dollar amounts expressed in thousands)*

	Year Ending	June 30, 2020
1.	Actuarial value of assets at beginning of year	$ 525,315
2.	Market value of assets at beginning of year	$ 534,053
3.	Net new investments	
	a. Contributions	$ 6,881
	b. Benefit payments	(19,760)
	c. Administrative expenses	(123)
	d. Subtotal	$ (13,002)
4.	Market value of assets at end of year	$ 521,755
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$ 704
6.	Assumed investment return rate for fiscal year	6.25%
7.	Expected return for immediate recognition	$ 32,972
8.	Excess return for phased recognition	$ (32,268)
9.	Phased-in recognition, 20% of excess return on assets for prior years:	

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2020	$ (32,268)	$ (6,454)
b.	2019	(3,651)	(730)
c.	2018	12,794	2,559
d.	2017	26,956	5,391
e.	2016	(33,995)	(6,799)
f.	Total		$ (6,033)

10.	Actuarial value of assets as of June 30, 2020 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$ 539,251
11.	Ratio of actuarial value to market value	103.4%
12.	Estimated annual return on actuarial value of assets	5.2%

* Amounts may not add due to rounding

Schedule of Funding Progress
Insurance Benefits
(Dollar amounts expressed in thousands)

June 30,	Actuarial Value of Assets (AVA)	Actuarial Accrued Liability (AAL)	Unfunded Actuarial Accrued Liability (UAAL) (3) - (2)	Funded Ratio (2)/(3)	Annual Covered Payroll	UAAL as % of Payroll (4)/(6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Non-Hazardous Members			
2011	$ 451,620	$ 4,280,090	$ 3,828,469	10.6%	$ 1,731,633	221.1%
2012	446,081	3,125,330	2,679,250	14.3%	1,644,897	162.9%
2013	497,584	2,128,754	1,631,170	23.4%	1,644,409	99.2%
2014	621,237	2,226,760	1,605,523	27.9%	1,577,496	101.8%
2015	695,018	2,413,705	1,718,687	28.8%	1,544,234	111.3%
2016	743,270	2,456,678	1,713,408	30.3%	1,529,249	112.0%
2017	823,918	2,683,496	1,859,578	30.7%	1,531,535	121.4%
2018	887,121	2,435,505	1,548,384	36.4%	1,471,477	105.2%
2019	991,427	2,733,065	1,741,638	36.3%	1,437,647	121.1%
2020	1,095,959	2,564,788	1,468,829	42.7%	1,387,761	105.8%
			Hazardous Members			
2011	$ 329,962	$ 507,059	$ 177,097	65.1%	$ 133,054	133.1%
2012	345,574	384,592	39,018	89.9%	131,977	29.6%
2013	370,774	385,518	14,743	96.2%	132,015	11.2%
2014	419,396	396,987	(22,409)	105.6%	129,076	-17.4%
2015	451,514	374,904	(76,610)	120.4%	128,680	-59.5%
2016	473,160	377,745	(95,415)	125.3%	147,563	-64.7%
2017	493,458	419,439	(74,019)	117.6%	162,418	-45.6%
2018	511,441	393,481	(117,960)	130.0%	158,213	-74.6%
2019	525,315	426,704	(98,611)	123.1%	150,446	-65.5%
2020	539,251	427,977	(111,274)	126.0%	170,826	-65.1%
			Total KERS Members			
2011	$ 781,582	$ 4,787,149	$ 4,005,567	16.3%	$ 1,864,687	214.8%
2012	791,655	3,509,922	2,718,267	22.6%	1,776,874	153.0%
2013	868,358	2,514,272	1,645,914	34.5%	1,776,424	92.7%
2014	1,040,633	2,623,747	1,583,114	39.7%	1,706,572	92.8%
2015	1,146,532	2,788,609	1,642,077	41.1%	1,672,914	98.2%
2016	1,216,430	2,834,423	1,617,993	42.9%	1,676,812	96.5%
2017	1,317,376	3,102,935	1,785,559	42.5%	1,693,953	105.4%
2018	1,398,562	2,828,986	1,430,424	49.4%	1,629,690	87.8%
2019	1,516,742	3,159,769	1,643,027	48.0%	1,588,093	103.5%
2020	1,635,210	2,992,765	1,357,555	54.6%	1,558,587	87.1%

Solvency Test
Insurance Benefits
(Dollar amounts expressed in thousands)

June 30,	Actuarial Accrued Liability: Active Member Contributions	Actuarial Accrued Liability: Retired Members & Beneficiaries	Actuarial Accrued Liability: Active Members (Employer Financed)	Valuation Assets	Portion of Aggregate Accrued Liabilities Covered by Assets: Active	Portion of Aggregate Accrued Liabilities Covered by Assets: Retired	Portion of Aggregate Accrued Liabilities Covered by Assets: ER Financed
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Hazardous Members							
2011	$ -	$ 2,568,003	$ 1,712,087	$ 451,620	100.0%	17.6%	0.0%
2012	-	1,924,069	1,201,262	446,081	100.0%	23.2%	0.0%
2013	-	1,338,773	789,981	497,584	100.0%	37.2%	0.0%
2014	-	1,425,605	801,155	621,237	100.0%	43.6%	0.0%
2015	-	1,428,350	985,355	695,018	100.0%	48.7%	0.0%
2016	-	1,483,636	973,042	743,270	100.0%	50.1%	0.0%
2017	-	1,575,294	1,108,202	823,918	100.0%	52.3%	0.0%
2018	-	1,475,953	959,552	887,121	100.0%	60.1%	0.0%
2019	-	1,686,604	1,046,461	991,427	100.0%	58.8%	0.0%
2020	-	1,589,743	975,045	1,095,959	100.0%	68.9%	0.0%
Hazardous Members							
2011	$ -	$ 285,540	$ 221,519	$ 329,962	100.0%	100.0%	20.1%
2012	-	196,579	188,013	345,574	100.0%	100.0%	79.2%
2013	-	202,032	183,486	370,774	100.0%	100.0%	92.0%
2014	-	206,477	190,509	419,396	100.0%	100.0%	100.0%
2015	-	221,115	153,789	451,514	100.0%	100.0%	100.0%
2016	-	228,361	149,384	473,160	100.0%	100.0%	100.0%
2017	-	243,816	175,623	493,458	100.0%	100.0%	100.0%
2018	-	248,775	144,706	511,441	100.0%	100.0%	100.0%
2019	-	282,069	144,635	525,315	100.0%	100.0%	100.0%
2020	-	281,924	146,053	539,251	100.0%	100.0%	100.0%

SECTION 4

AMORTIZATION BASES

Amortization of Unfunded Liability

Non-Hazardous Members Retirement

Valuation Year Base Established	Original Amortization Base	Remaining at June 30, 2020	Payments for FYE 2022	Funding Period at June 30, 2020
June 30, 2019	$ 14,260,148	$ 14,178,808	$ 938,364	29
June 30, 2020	(153,145)	(153,145)	(2,708)	20
Total		$ 14,025,663	$ 935,656	
Projected Payroll for FYE 2022			$ 1,387,761	
Amortization Payments as a Percentage of Payroll			67.42%	

Hazardous Members Retirement

Valuation Year Base Established	Original Amortization Base	Remaining at June 30, 2020	Payments for FYE 2022	Funding Period at June 30, 2020
June 30, 2019	$ 554,548	$ 550,159	$ 40,306	29
June 30, 2020	24,023	24,023	1,706	20
Total		$ 574,182	$ 42,012	
Projected Payroll for FYE 2022			$ 170,826	
Amortization Payments as a Percentage of Payroll			24.59%	

Note:
Budgeted contribution rates for FYE 2021 were known at the time of the June 30, 2020 Valuation. Amortization bases established at this valuation date was adjusted accordingly.

Amortization of Unfunded Liability

Non-Hazardous Members Insurance

Valuation Year Base Established	Original Amortization Base	Remaining at June 30, 2020	Payments for FYE 2022	Funding Period at June 30, 2020
June 30, 2019	$ 1,741,638	$ 1,715,719	$ 125,697	29
June 30, 2020	(246,890)	(246,890)	(22,305)	20
Total		$ 1,468,829	$ 103,392	

Projected Payroll for FYE 2022	$ 1,376,818
Amortization Payments as a Percentage of Payroll	7.51%

Hazardous Members Insurance

Valuation Year Base Established	Original Amortization Base	Remaining at June 30, 2020	Payments for FYE 2022	Funding Period at June 30, 2020
June 30, 2019	$ (98,611)	$ (101,766)	$ (7,456)	29
June 30, 2020	(9,508)	(9,508)	(946)	20
Total		$ (111,274)	$ (8,402)	

Projected Payroll for FYE 2022	$ 170,071
Amortization Payments as a Percentage of Payroll	-4.94%

Note:
Budgeted contribution rates for FYE 2021 were known at the time of the June 30, 2020 Valuation. Amortization bases established at this valuation date was adjusted accordingly.

SECTION 5

MEMBERSHIP INFORMATION

Membership Tables

Summary of Membership Data

(Total dollar amounts expressed in thousands)

		Non-Hazardous June 30, 2020 (1)	Hazardous June 30, 2020 (2)	Total June 30, 2020 (3)	Total June 30, 2019 (4)
1.	Active members				
a.	Males	12,145	2,848	14,993	15,420
b.	Females	19,558	1,246	20,804	21,981
c.	Total members	31,703	4,094	35,797	37,401
d.	Total annualized prior year salaries	$ 1,387,761	$ 170,826	$ 1,558,587	$ 1,588,093
e.	Average salary[2]	$ 43,774	$ 41,726	$ 43,540	$ 42,461
f.	Average age	45.7	39.8	45.0	44.9
g.	Average service	11.2	7.3	10.8	10.6
h.	Member contributions with interest	$ 869,196	$ 95,528	$ 964,724	$ 967,683
i.	Average contributions with interest[2]	$ 27,417	$ 23,334	$ 26,950	$ 25,873
2.	Vested inactive members[1]				
a.	Number	31,829	2,201	34,030	33,722
b.	Total annual deferred benefits	$ 86,534	$ 4,624	$ 91,158	$ 87,099
c.	Average annual deferred benefit[2]	$ 2,719	$ 2,101	$ 2,679	$ 2,583
d.	Average age at the valuation date	51.9	47.0	51.6	51.0
3.	Nonvested inactive members[1]				
a.	Number	21,670	4,740	26,410	24,440
b.	Total member contributions with interest	$ 40,220	$ 8,609	$ 48,829	$ 42,210
c.	Average contributions with interest[2]	$ 1,856	$ 1,816	$ 1,849	$ 1,727
4.	Service retirees				
a.	Number	40,551	3,981	44,532	44,432
b.	Total annual benefits	$ 869,412	$ 62,650	$ 932,062	$ 931,697
c.	Average annual benefit[2]	$ 21,440	$ 15,737	$ 20,930	$ 20,969
d.	Average age at the valuation date	69.6	65.0	69.2	69.0
5.	Disabled retirees				
a.	Number	1,837	152	1,989	2,111
b.	Total annual benefits	$ 24,316	$ 1,475	$ 25,791	$ 27,286
c.	Average annual benefit[2]	$ 13,237	$ 9,705	$ 12,967	$ 12,925
d.	Average age at the valuation date	66.0	60.4	65.6	65.3
6.	Beneficiaries				
a.	Number	4,945	495	5,440	5,404
b.	Total annual benefits	$ 74,236	$ 4,956	$ 79,192	$ 77,246
c.	Average annual benefit[2]	$ 15,012	$ 10,013	$ 14,557	$ 14,294
d.	Average age at the valuation date	70.4	66.5	70.1	70.2

[1] Vested inactive member section includes Tier 1 members eligible for a benefit equal to the actuarially equivalent of two times the member's contribution balance.

[2] Average dollar amounts shown are expresed to the dollar.

Summary of Historical Active Membership

	Active Members		Covered Payroll[1]		Average Annual Pay	
June 30,	Number	Percent Increase /(Decrease)	Amount in Thousands	Percent Increase /(Decrease)	Amount	Percent Increase /(Decrease)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Non-Hazardous Members			
2011	46,617		$ 1,731,633		$ 37,146	
2012	42,196	-9.5%	1,644,897	-5.0%	38,982	4.9%
2013	42,226	0.1%	1,644,409	0.0%	38,943	-0.1%
2014	40,365	-4.4%	1,577,496	-4.1%	39,081	0.4%
2015	39,056	-3.2%	1,544,234	-2.1%	39,539	1.2%
2016	37,779	-3.3%	1,529,249	-1.0%	40,479	2.4%
2017	37,234	-1.4%	1,531,535	0.1%	41,133	1.6%
2018	35,139	-5.6%	1,471,477	-3.9%	41,876	1.8%
2019	33,696	-4.1%	1,437,647	-2.3%	42,665	1.9%
2020	31,703	-5.9%	1,387,761	-3.5%	43,774	2.6%
			Hazardous Members			
2011	4,291		$ 133,054		$ 31,008	
2012	4,086	-4.8%	131,977	-0.8%	32,300	4.2%
2013	4,127	1.0%	132,015	0.0%	31,988	-1.0%
2014	4,024	-2.5%	129,076	-2.2%	32,077	0.3%
2015	3,886	-3.4%	128,680	-0.3%	33,114	3.2%
2016	3,959	1.9%	147,563	14.7%	37,273	12.6%
2017	4,047	2.2%	162,418	10.1%	40,133	7.7%
2018	3,929	-2.9%	158,213	-2.6%	40,268	0.3%
2019	3,705	-5.7%	150,446	-4.9%	40,606	0.8%
2020	4,094	10.5%	170,826	13.5%	41,726	2.8%

[1] Covered payroll is the annualized, projected compensation for the following year and does not include payroll attributable to working retirees.

Distribution of Active Members by Age and by Years of Service

Non-Hazardous Members

Attained Age	Years of Credited Service												
	0 Count & Avg. Comp.	1 Count & Avg. Comp.	2 Count & Avg. Comp.	3 Count & Avg. Comp.	4 Count & Avg. Comp.	5-9 Count & Avg. Comp.	10-14 Count & Avg. Comp.	15-19 Count & Avg. Comp.	20-24 Count & Avg. Comp.	25-29 Count & Avg. Comp.	30-34 Count & Avg. Comp.	35 & Over Count & Avg. Comp.	Total Count & Avg. Comp.
Under 20	16	1	0	0	0	0	0	0	0	0	0	0	17
	$19,561	$7,459	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$18,849
20-24	360	261	82	39	13	7	0	0	0	0	0	0	762
	$25,318	$31,726	$31,019	$31,531	$36,992	$35,506	$0	$0	$0	$0	$0	$0	$28,737
25-29	547	459	433	319	237	350	0	0	0	0	0	0	2,345
	$28,084	$33,144	$35,764	$37,235	$38,023	$37,980	$0	$0	$0	$0	$0	$0	$34,219
30-34	320	353	280	307	305	1,144	269	5	0	0	0	0	2,983
	$29,161	$34,942	$37,547	$37,872	$38,564	$41,324	$43,656	$41,898	$0	$0	$0	$0	$38,483
35-39	330	286	252	245	248	1,069	1,112	334	24	1	0	0	3,901
	$30,721	$36,225	$37,274	$39,109	$44,632	$43,071	$46,641	$46,922	$43,817	$51,709	$0	$0	$42,354
40-44	261	238	192	193	215	828	1,055	1,136	486	39	0	0	4,643
	$31,366	$38,343	$38,379	$40,938	$44,577	$42,809	$47,212	$49,654	$50,826	$58,697	$0	$0	$45,406
45-49	211	226	182	172	173	708	817	983	993	293	20	1	4,779
	$31,067	$38,107	$37,391	$38,084	$37,246	$42,211	$46,593	$50,395	$52,523	$57,206	$62,606	$97,473	$46,605
50-54	169	181	145	145	158	638	742	802	821	491	83	14	4,389
	$30,829	$39,165	$39,012	$39,622	$40,742	$42,020	$45,313	$49,140	$51,284	$56,154	$62,039	$67,609	$46,879
55-59	150	129	106	127	102	579	714	713	636	349	102	33	3,740
	$31,752	$36,823	$36,836	$38,429	$39,963	$41,051	$44,188	$46,834	$51,342	$56,223	$60,545	$74,328	$45,987
60-64	61	70	94	88	78	385	600	566	466	225	73	20	2,726
	$46,647	$41,036	$38,621	$38,004	$39,592	$40,070	$44,563	$44,735	$49,846	$51,623	$64,498	$68,330	$45,555
65 & Over	21	28	32	41	33	243	318	318	209	91	41	43	1,418
	$48,322	$39,479	$50,577	$40,221	$49,925	$43,248	$47,298	$48,566	$52,588	$55,564	$64,614	$71,812	$49,234
Total	2,446	2,232	1,798	1,676	1,562	5,951	5,627	4,857	3,635	1,489	319	111	31,703
	$29,777	$35,731	$37,219	$38,417	$40,717	$41,792	$45,928	$48,465	$51,413	$55,720	$62,490	$71,633	$43,774

Distribution of Active Members by Age and by Years of Service

Hazardous Members

Attained Age	Years of Credited Service												
	0 Count & Avg. Comp.	1 Count & Avg. Comp.	2 Count & Avg. Comp.	3 Count & Avg. Comp.	4 Count & Avg. Comp.	5-9 Count & Avg. Comp.	10-14 Count & Avg. Comp.	15-19 Count & Avg. Comp.	20-24 Count & Avg. Comp.	25-29 Count & Avg. Comp.	30-34 Count & Avg. Comp.	35 & Over Count & Avg. Comp.	Total Count & Avg. Comp.
Under 20	1	1	0	0	0	0	0	0	0	0	0	0	2
	$28,443	$35,721	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$32,082
20-24	168	90	25	14	0	0	0	0	0	0	0	0	297
	$27,235	$37,624	$37,734	$38,534	$0	$0	$0	$0	$0	$0	$0	$0	$31,799
25-29	178	119	102	87	67	88	0	0	0	0	0	0	641
	$27,892	$37,160	$38,483	$42,438	$44,885	$46,691	$0	$0	$0	$0	$0	$0	$37,629
30-34	113	82	65	54	53	240	39	0	0	0	0	0	646
	$28,691	$39,371	$39,413	$41,846	$44,221	$43,805	$47,321	$0	$0	$0	$0	$0	$40,239
35-39	50	32	33	30	36	161	168	41	0	0	0	0	551
	$27,183	$36,557	$39,877	$40,187	$42,779	$44,692	$47,703	$48,944	$0	$0	$0	$0	$43,206
40-44	47	31	32	27	17	92	118	127	29	0	0	0	520
	$29,705	$36,812	$40,747	$39,363	$46,281	$44,173	$47,704	$49,822	$52,844	$0	$0	$0	$44,699
45-49	41	33	22	22	31	98	97	125	44	5	0	0	518
	$34,165	$39,299	$40,214	$42,739	$39,812	$41,925	$49,848	$48,485	$54,818	$61,505	$0	$0	$45,330
50-54	35	17	14	24	25	76	87	95	26	6	0	0	405
	$30,960	$39,044	$39,685	$43,911	$41,762	$44,512	$44,261	$48,500	$52,959	$58,525	$0	$0	$44,370
55-59	22	24	17	13	19	66	64	59	20	5	4	0	313
	$30,972	$40,290	$39,980	$40,032	$37,821	$41,163	$45,481	$48,470	$49,119	$59,852	$65,416	$0	$43,443
60-64	3	9	1	3	8	33	36	42	10	2	0	1	148
	$33,657	$38,798	$26,946	$54,972	$44,199	$42,094	$44,391	$46,773	$48,206	$70,358	$0	$122,365	$45,219
65 & Over	1	0	3	3	1	12	14	14	2	3	0	0	53
	$18,287	$0	$40,481	$49,786	$52,804	$45,774	$43,100	$45,000	$42,283	$67,310	$0	$0	$45,492
Total	659	438	314	277	257	866	623	503	131	21	4	1	4,094
	$28,605	$38,037	$39,232	$41,836	$43,117	$43,912	$47,009	$48,621	$52,446	$61,932	$65,416	$122,365	$41,726

Distribution of Annuitant Monthly Benefit by Status and Age
Non-Hazardous Retirees and Beneficiaries
(Dollar amounts expressed in thousands)

	Retirement		Disability		Survivors & Beneficiaries		Total	
Current Age	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Under 50	462	$ 10,830	85	$ 1,142	495	$ 5,816	1,042	$ 17,787
50 - 54	1,570	41,348	166	2,589	192	2,434	1,928	46,371
55 - 59	3,513	87,490	235	3,262	297	3,915	4,045	94,667
60 - 64	6,527	153,949	355	4,925	485	7,105	7,367	165,979
65 - 69	9,566	204,276	376	4,904	693	11,548	10,635	220,728
70 - 74	8,883	189,910	302	3,772	724	12,388	9,909	206,071
75 - 79	4,987	98,312	157	1,845	705	11,738	5,849	111,895
80 - 84	2,855	51,584	109	1,323	593	9,535	3,557	62,441
85 - 89	1,421	21,770	43	495	453	6,399	1,917	28,664
90 And Over	767	9,943	9	59	308	3,359	1,084	13,361
Total	**40,551**	**$ 869,412**	**1,837**	**$ 24,316**	**4,945**	**$ 74,236**	**47,333**	**$ 967,963**

*Amounts may not add due to rounding

Distribution of Annuitant Monthly Benefit by Status and Age
Hazardous Retirees and Beneficiaries
(Dollar amounts expressed in thousands)

	Retirement		Disability		Survivors & Beneficiaries		Total	
Current Age	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Under 50	273	$ 5,416	23	$ 335	66	$ 620	362	$ 6,371
50 - 54	393	7,768	19	193	22	316	434	8,278
55 - 59	508	9,164	35	344	44	526	587	10,034
60 - 64	709	12,233	29	253	55	532	793	13,018
65 - 69	827	12,182	23	190	85	1,045	935	13,416
70 - 74	755	10,407	13	111	72	717	840	11,235
75 - 79	323	3,821	4	26	73	600	400	4,448
80 - 84	139	1,277	4	17	42	337	185	1,631
85 - 89	37	239	2	6	25	125	64	371
90 And Over	17	142	0	0	11	139	28	280
Total	**3,981**	**$ 62,650**	**152**	**$ 1,475**	**495**	**$ 4,956**	**4,628**	**$ 69,081**

*Amounts may not add due to rounding

Non-Hazardous Retired Lives Summary

Form of Payment	Male Lives Number	Male Lives Monthly Benefit Amount	Female Lives Number	Female Lives Monthly Benefit Amount	Total Number	Total Monthly Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Basic	4,516	$ 7,949,923	13,233	$ 19,071,487	17,749	$ 27,021,411
Joint & Survivor:						
100% to Beneficiary	2,823	5,058,599	1,538	1,945,626	4,361	7,004,225
66 2/3% to Beneficiary	823	2,289,340	611	1,162,297	1,434	3,451,637
50% to Beneficiary	1,113	2,801,673	1,565	3,068,067	2,678	5,869,740
Pop-up Option	4,112	9,904,426	3,940	7,585,789	8,052	17,490,215
Social Security Option:						
Age 62 Basic	383	791,011	925	1,526,747	1,308	2,317,758
Age 62 Survivorship	745	1,480,522	586	936,369	1,331	2,416,891
Partial Deferred (Old Plan)	0	0	0	0	0	0
Widows Age 60	0	0	0	0	0	0
5 Years Certain	0	0	0	0	0	0
10 Years Certain	0	0	0	0	0	0
10 Years Certain & Life	969	1,696,752	2,304	3,495,956	3,273	5,192,708
15 Years Certain & Life	443	717,207	665	993,929	1,108	1,711,136
20 Years Certain & Life	438	960,963	656	1,040,626	1,094	2,001,589
Total:	16,365	$ 33,650,417	26,023	$ 40,826,893	42,388	$ 74,477,310

Hazardous Retired Lives Summary

Form of Payment	Male Lives Number	Male Lives Monthly Benefit Amount	Female Lives Number	Female Lives Monthly Benefit Amount	Total Number	Total Monthly Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Basic	732	$ 814,204	596	$ 647,895	1,328	$ 1,462,099
Joint & Survivor:						
100% to Beneficiary	463	569,848	79	90,639	542	660,487
66 2/3% to Beneficiary	124	162,308	31	38,225	155	200,533
50% to Beneficiary	178	286,848	77	115,697	255	402,546
Pop-up Option	966	1,504,703	209	290,313	1,175	1,795,016
Social Security Option:						
Age 62 Basic	56	62,400	34	29,986	90	92,386
Age 62 Survivorship	135	165,359	20	15,681	155	181,040
Partial Deferred (Old Plan)	0	0	0	0	0	0
Widows Age 60	0	0	0	0	0	0
5 Years Certain	0	0	0	0	0	0
10 Years Certain	51	81,263	14	19,593	65	100,856
10 Years Certain & Life	113	142,486	76	68,243	189	210,729
15 Years Certain & Life	54	68,723	26	25,415	80	94,137
20 Years Certain & Life	66	97,926	33	45,996	99	143,923
Total:	2,938	$ 3,956,068	1,195	$ 1,387,683	4,133	$ 5,343,751

Non-Hazardous Beneficiary Lives Summary

Form of Payment	Male Lives Number	Male Lives Monthly Benefit Amount	Female Lives Number	Female Lives Monthly Benefit Amount	Total Number	Total Monthly Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Basic	28	$ 19,241	48	$ 68,759	76	$ 88,000
Joint & Survivor:						
100% to Beneficiary	361	312,797	1,590	1,833,582	1,951	2,146,379
66 2/3% to Beneficiary	66	73,551	289	373,995	355	447,546
50% to Beneficiary	160	131,934	459	391,702	619	523,636
Pop-up Option	227	358,004	822	1,431,129	1,049	1,789,134
Social Security Option:						
Age 62 Basic	1	1,293	11	12,803	12	14,096
Age 62 Survivorship	71	103,338	327	570,800	398	674,137
Partial Deferred (Old Plan)	0	0	0	0	0	0
Widows Age 60	0	0	2	611	2	611
5 Years Certain	35	37,523	50	43,566	85	81,089
10 Years Certain	82	70,841	90	61,159	172	132,000
10 Years Certain & Life	36	37,416	46	44,050	82	81,466
15 Years Certain & Life	19	21,843	46	45,770	65	67,612
20 Years Certain & Life	21	38,965	58	101,623	79	140,587
Total:	1,107	$ 1,206,746	3,838	$ 4,979,548	4,945	$ 6,186,294

Hazardous Beneficiary Lives Summary

Form of Payment	Male Lives Number	Male Lives Monthly Benefit Amount	Female Lives Number	Female Lives Monthly Benefit Amount	Total Number	Total Monthly Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Basic	2	$ 1,052	12	$ 9,554	14	$ 10,606
Joint & Survivor:						
100% to Beneficiary	18	12,310	173	127,539	191	139,849
66 2/3% to Beneficiary	1	481	21	11,872	22	12,353
50% to Beneficiary	4	2,769	35	13,720	39	16,490
Pop-up Option	13	13,838	127	137,038	140	150,876
Social Security Option:						
Age 62 Basic	0	0	1	18	1	18
Age 62 Survivorship	0	0	43	44,632	43	44,632
Partial Deferred (Old Plan)	0	0	0	0	0	0
Widows Age 60	0	0	0	0	0	0
5 Years Certain	0	0	7	5,688	7	5,688
10 Years Certain	4	3,728	12	11,067	16	14,796
10 Years Certain & Life	3	967	5	3,181	8	4,148
15 Years Certain & Life	2	819	3	1,548	5	2,366
20 Years Certain & Life	2	4,048	7	7,161	9	11,209
Total:	49	$ 40,013	446	$ 373,019	495	$ 413,032

Schedule of Retirants Added to And Removed from Rolls

(Dollar amounts except average allowance expressed in thousands)

Year Ended	Added to Rolls	Removed from Rolls	Rolls End of the Year		% Increase in Annual Benefit	Average Annual Benefit
	Number	Number	Number	Annual Benefits		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non-Hazardous						
2011	1,592	940	38,597	$ 821,197		$ 21,276
2012	1,707	1,078	39,226	844,881	2.9%	21,539
2013	1,982	1,014	40,194	872,140	3.2%	21,698
2014	2,067	1,038	41,223	866,047	-0.7%	21,009
2015	2,140	1,094	42,269	883,578	2.0%	20,904
2016	2,441	706	44,004	934,930	5.8%	21,246
2017	2,181	1,269	44,916	921,302	-1.5%	20,512
2018	2,853	1,243	46,526	952,951	3.4%	20,482
2019	2,226	1,342	47,410	968,706	1.7%	20,433
2020	1,806	1,883	47,333	967,963	-0.1%	20,450
Hazardous						
2011	288	59	3,064	$ 45,609		14,885
2012	243	54	3,253	49,231	7.9%	15,134
2013	229	52	3,430	51,122	3.8%	14,904
2014	256	66	3,620	54,272	6.2%	14,992
2015	203	65	3,758	56,431	4.0%	15,016
2016	237	29	3,966	59,001	4.6%	14,877
2017	206	79	4,093	59,162	0.3%	14,454
2018	321	44	4,370	64,050	8.3%	14,657
2019	227	60	4,537	67,523	5.4%	14,883
2020	214	123	4,628	69,081	2.3%	14,927

SECTION 6

ASSESSMENT AND DISCLOSURE OF RISK

Risks Associated with Measuring the Accrued Liability And Actuarially Determined Contribution

(As Required by ASOP No. 51)

The determination of KERS's accrued liability and actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. The risk measures illustrated in this section are intended to aid stakeholders in understanding the effects of future experience differing from the assumptions used in performing an actuarial valuation. These risk measures may also help with illustrating the potential volatility in the funded status and actuarially determined contributions that result from differences between actual experience and the expected experience based on the actuarial assumptions.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience (economic and demographic) differing from the assumptions, changes in assumptions due to changing conditions, changes in contribution requirements due to modifications to the funding policy, and changes in the liability and cost due to changes in plan provisions or applicable law. The scope of this actuarial valuation does not include any analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the System's future financial condition include:

- Investment risk – actual investment returns may differ from expected returns;
- Longevity risk – members may live longer or shorter than expected and receive pensions for a time period different than assumed;
- Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future contributions differing from expected;
- Salary and payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liabilities or contributions differing from expected;
- Asset/Liability mismatch – changes in assets may be inconsistent with changes in liabilities, thereby altering the relative difference between the assets and liabilities which may alter the funded status and contribution requirements;
- Contribution risk – actual contributions may differ from expected future contributions (for example, actual contributions not being paid in accordance with the System's funding policy, withdrawal liability assessments or other anticipated payments to the plan are not being paid, or material changes occurring in the anticipated number of covered employees, covered payroll, or another relevant contribution base).

Effects of certain experience can generally be anticipated. For example, if investment returns since the most recent actuarial valuation is less (or more) than the assumed rate of return, then the funded status of the plan can be expected to decrease (or increase) more than anticipated.

The contribution rate in this report was established in accordance with applicable Statutes and assumptions adopted by the Board. However, stakeholders should be aware that the scheduled contribution rates specified in State Code do not necessarily guarantee that the contribution requirements will not increase in a future year.

Employer Risk with Contribution Rates

Currently KRS collects contributions from participating employers based on the employer's total payroll of employees who are earning benefits in KERS (i.e. covered payroll). The actuarially determined contribution rate is comprised of two components - the normal cost rate (to pay for the benefits accruing in the next year) and the unfunded amortization (to pay for the benefits accrued by members in previous years). The unfunded amortization is calculated by first determining the dollar amount necessary to pay for the unfunded liability based on KRS's funding policy, and then by dividing that dollar amount by expected covered payroll to convert that contribution requirement to a percentage of payroll (i.e. a contribution rate).

As the contribution requirement, as a percentage of payroll, increases then there is increased incentive for participating employers to make deliberate business action to reduce their payroll reported to the System in order to reduce their pension cost.

Plan Specific Risk Measures

Risks faced by a pension plan evolve over time. A relatively new plan with virtually no assets and paying few benefits will experience lower investment risk than a mature plan with a significant amount of assets and large number of members receiving benefits. There are a few measures that can assist stakeholders in understanding and comparing the maturity of a plan to other systems, which include:

- Ratio of market value of assets to payroll: The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. If assets are approximately the same as covered payroll, an investment return that is 5% different than assumed would equal 5% of payroll. In another example, if the assets are approximately twice as large as covered payroll, an investment return that is 5% different than assumed would equal 10% of payroll. A ratio that increases over time generally indicates the potential of an increasing volatility in employer contribution rates as a percentage of payroll.
- Ratio of actuarial accrued liability to payroll: The ratio of actuarial accrued liability to payroll can be used as a measure to indicate the potential volatility of contributions due to volatility in the liability experience. For instance, if the actuarial accrued liability is 5 times the size of the covered payroll, then a change in the liability that is 2% different than expected would be a change in magnitude that is 10% of payroll. A ratio that increases over time generally indicates the potential of an increasing volatility in employer contribution rates as a percentage of payroll.
- Percentage of Expected Contributions Actually Received: This measure identifies the percentage difference between the contributions the fund expects to receive during the fiscal year to and actual contributions received by the fund during the fiscal year. A percentage that is less than 100% means that actual contributions the fund received were less than the expected contributions determined by a prior actuarial valuation. On the other hand, a percentage that is greater than 100% means that actual contributions the fund received were more than the expected contributions.

- Ratio of active to retired members: A relatively mature open plan is likely to have close to the same number of actives to retirees resulting in a ratio that is around 1.0. On the other hand, a super-mature plan, or a plan that is closed to new entrants will have more retirees than active members resulting in a ratio below 1.0. As this ratio declines, a larger portion of the total actuarial accrued liability in the System is attributable to retirees. This metric also typically moves in tandem with the liability to payroll metric, which provides an indication of potential contribution volatility.

The following tables provide a summary of these measures for KERS Non-Hazardous and Hazardous Funds for the current year and the prior four years so stakeholders can identify how these measures are trending. While ASOP No. 51 requires this disclosure with respect to only the retirement funds, we have included this information for the insurance funds for completeness.

KERS Non-Hazardous

	Retirement Fund					Insurance Fund				
	June 30,					June 30,				
	2020	2019	2018	2017	2016	2020	2019	2018	2017	2016
Ratio of the market value of assets to total payroll	1.66	1.55	1.36	1.34	1.28	0.76	0.69	0.61	0.53	0.45
Ratio of actuarial accrued liability to payroll	11.78	11.45	10.65	10.18	8.65	1.85	1.90	1.66	1.75	1.61
Ratio of net cash flow to market value of assets	0.9%	5.2%	-9.8%	-5.5%	-17.0%	5.1%	5.8%	1.1%	3.3%	1.6%
Percentage of Expected Contribution Actually Received	89% [1]	91%	93%	104%	95%	111% [1]	95%	99%	100%	106%
Ratio of actives to retirees and beneficiaries	0.67	0.71	0.76	0.83	0.86					

[1] Expected contribution for FYE2020 based on the actuarially determined contribution rate of 85.19% from the June 30, 2018 valuation and expected compensation based on census data from the June 30, 2019 valuation

KERS Hazardous

	Retirement Fund					Insurance Fund				
	June 30,					June 30,				
	2020	2019	2018	2017	2016	2020	2019	2018	2017	2016
Ratio of the market value of assets to total payroll	4.04	4.53	4.08	3.70	3.56	3.05	3.55	3.28	3.01	2.99
Ratio of actuarial accrued liability to payroll	7.52	8.15	7.28	6.90	6.35	2.51	2.84	2.49	2.58	2.56
Ratio of net cash flow to market value of assets	0.4%	-0.1%	-1.2%	1.0%	-4.5%	-2.5%	-2.5%	-2.4%	-2.3%	0.0%
Percentage of Expected Contribution Actually Received	114% [1]	102%	95%	116%	103%	N/A [1]	96%	190%	111%	166%
Ratio of actives to retirees and beneficiaries	0.88	0.82	0.90	0.99	1.00					

[1] Expected contribution for FYE2020 based on the actuarially determined contribution rate of 34.42% from the June 30, 2018 valuation and expected compensation based on census data from the June 30, 2019 valuation. As of the June 30, 2018 valuation, the actuarially determined employer contribution rate was 0% of pay for the insurance fund.

APPENDIX A

ACTUARIAL ASSUMPTIONS AND METHODS

Summary of Actuarial Methods and Assumptions

The following presents a summary of the actuarial assumptions and methods used in the valuation of the Kentucky Employees Retirement System.

In general, the assumptions and methods used in the valuation are based on the actuarial experience study for the five-year period ending June 30, 2018 and adopted by the Board in April 2019.

Investment return rate:

Assumed annual rate of 5.25% net of investment expenses for the non-hazardous retirement fund
Assumed annual rate of 6.25% net of investment expenses for the hazardous retirement fund, non-hazardous insurance fund, and hazardous insurance fund

Price Inflation:

Assumed annual rate of 2.30%

Payroll Growth Assumption (used for amortization of unfunded accrued liabilities):

Assumed annual rate of 0.00%

Rates of Annual Salary Increase:

Assumed rates of annual salary increases are shown below.

Service Years	Annual Rates of Salary					
	Merit & Seniority		Price Inflation & Productivity		Total Increase	
	Non-Hazardous	Hazardous	Non-Hazardous	Hazardous	Non-Hazardous	Hazardous
0	12.00%	16.50%	3.30%	3.55%	15.30%	20.05%
1	3.50%	4.00%	3.30%	3.55%	6.80%	7.55%
2	2.75%	3.00%	3.30%	3.55%	6.05%	6.55%
3	2.50%	3.00%	3.30%	3.55%	5.80%	6.55%
4	2.00%	2.00%	3.30%	3.55%	5.30%	5.55%
5	1.50%	1.50%	3.30%	3.55%	4.80%	5.05%
6	1.25%	1.00%	3.30%	3.55%	4.55%	4.55%
7	1.00%	0.50%	3.30%	3.55%	4.30%	4.05%
8	0.75%	0.50%	3.30%	3.55%	4.05%	4.05%
9	0.50%	0.00%	3.30%	3.55%	3.80%	3.55%
10	0.50%	0.00%	3.30%	3.55%	3.80%	3.55%
11 & Over	0.00%	0.00%	3.30%	3.55%	3.30%	3.55%

Retirement rates:

Assumed annual rates of retirement are shown below. Rates are only applicable for members who are eligible for a service retirement.

	Non-Hazardous					Hazardous			
	Normal Retirement		Early Retirement[1]			Members participating before 9/1/2008[2]		Members participating between 9/1/2008 and 1/1/2014[3]	Members participating after 1/1/2014[3]
Age	Male	Female	Male	Female	Service	Age 55-61	Age 62+		
Under 45	20.0%	33.0%			5	10.0%	35.0%		
45	21.0%	33.0%			6	10.0%	35.0%		
46	22.0%	33.0%			7	10.0%	35.0%		
47	23.0%	33.0%			8	10.0%	35.0%		
48	24.0%	33.0%			9	10.0%	35.0%		
49	25.0%	33.0%			10	10.0%	35.0%		
50	26.0%	33.0%			11	10.0%	35.0%		
51	27.0%	33.0%			12	10.0%	35.0%		
52	28.0%	33.0%			13	10.0%	35.0%		
53	29.0%	33.0%			14	10.0%	35.0%		
54	30.0%	33.0%			15	10.0%	35.0%		
55	30.0%	33.0%	5.0%	5.0%	16	10.0%	35.0%		
56	30.0%	33.0%	5.0%	5.0%	17	10.0%	35.0%		
57	30.0%	33.0%	5.0%	5.0%	18	10.0%	35.0%		
58	30.0%	33.0%	5.0%	5.0%	19	10.0%	35.0%		
59	30.0%	33.0%	5.0%	5.0%	20	50.0%	50.0%		
60	30.0%	33.0%	5.0%	8.0%	21	32.0%	32.0%		
61	30.0%	33.0%	8.0%	9.0%	22	32.0%	32.0%		
62	35.0%	35.0%	15.0%	20.0%	23	32.0%	32.0%		
63	30.0%	33.0%	15.0%	18.0%	24	32.0%	32.0%		
64	30.0%	33.0%	15.0%	16.0%	25	32.0%	32.0%	25.6%	16.0%
65	30.0%	33.0%			26	32.0%	32.0%	25.6%	16.0%
66	30.0%	33.0%			27	32.0%	32.0%	25.6%	16.0%
67	30.0%	33.0%			28	32.0%	32.0%	25.6%	16.0%
68	30.0%	33.0%			29	32.0%	32.0%	25.6%	16.0%
69	30.0%	33.0%			30+	32.0%	32.0%	25.6%	100.0%
70	30.0%	33.0%							
71	30.0%	33.0%							
72	30.0%	33.0%							
73	30.0%	33.0%							
74	30.0%	33.0%							
75	100.0%	100.0%							

[1] *The annual rate of retirement is 12% for male members and 14% for female members with 25-26 years of service.*

[2] *The annual rate of retirement is 100% at age 65.*

[3] *The annual rate of retirement is 100% at age 60.*

Non-Hazardous System: For members hired after 7/1/2003, the rates shown above are multiplied by 80% if the member is under age 65 to reflect the different retiree health insurance benefit.

Hazardous System: For members hired after 7/1/2003 and prior to 9/1/2008, the rates shown above are multiplied by 80% if the member is under age 65 to reflect the different retiree health insurance benefit.

Disability rates:

An abbreviated table with assumed rates of disability is shown below.

Age	Non-Hazardous		Hazardous	
	Male	Female	Male	Female
20	0.03%	0.03%	0.05%	0.05%
30	0.06%	0.06%	0.08%	0.08%
40	0.12%	0.12%	0.18%	0.18%
50	0.34%	0.34%	0.50%	0.50%
60	0.88%	0.88%	1.32%	1.32%

Withdrawal rates (for causes other than disability and retirement):

Assumed annual rates of withdrawal are shown below and include pre-retirement mortality rates as described on the next page.

Service Years	Annual Rates of Withdrawal	
	Non-Hazardous	Hazardous
1	20.00%	25.00%
2	16.45%	19.68%
3	13.39%	15.12%
4	11.61%	12.45%
5	10.34%	10.56%
6	9.35%	9.09%
7	8.55%	7.89%
8	7.87%	6.87%
9	7.28%	5.99%
10	6.76%	5.22%
11	6.30%	4.53%
12	5.88%	3.90%
13	5.49%	3.33%
14	5.14%	2.80%
15	4.81%	2.31%
16	4.51%	1.86%
17	4.22%	1.43%
18	3.96%	1.03%
19	3.70%	0.66%
20	3.47%	0.30%
21	3.24%	0.00%
22	3.02%	0.00%
23	2.82%	0.00%
24	2.62%	0.00%
25	2.43%	0.00%
26 & Over	0.00%	0.00%

Mortality Assumption:

Pre-retirement mortality: PUB-2010 General Mortality table, for the Non-Hazardous System, and the PUB-2010 Public Safety Mortality table for the Hazardous System, projected with the ultimate rates from the MP-2014 mortality improvement scale using a base year of 2010.

Post-retirement mortality (non-disabled): System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from MP-2014 mortality improvement scale using a base year of 2019.

The following table provides the life expectancy for a non-disabled retiree in future years based on the assumption with full generational projection:

Life Expectancy for an Age 65 Retiree in Years					
Gender	**Year of Retirement**				
	2020	**2025**	**2030**	**2035**	**2040**
Male	21.0	21.4	21.8	22.2	22.6
Female	24.0	24.4	24.8	25.2	25.6

Post-retirement mortality (disabled): PUB-2010 Disabled Mortality table, with a 4-year set-forward for both male and female rates, projected with the ultimate rates from the MP-2014 mortality improvement scale using a base year of 2010.

Marital status:

100% of employees are assumed to be married, with the female spouse 3 years younger than the male spouse.

Line of Duty Disability

Non-Hazardous: 2% of disabilities are assumed to occur in the line of duty

Hazardous: 10% of disabilities are assumed to occur in the line of duty

Line of Duty Death

25% of deaths are assumed to occur in the line of duty

Dependent Children:

For members in the Hazardous Plan who receive a duty-related death or disability benefit, the member is assumed to be survived by two dependent children, each age 6 with payments for 15 years.

Form of Payment:

Members are assumed to elect a life-only annuity at retirement.

Actuarial Cost Method:

Entry Age Normal, Level Percentage of Pay. The Entry Age Normal actuarial cost method allocates the System's actuarial present value of future benefits to various periods based upon service. The portion of the present value of future benefits allocated to years of service prior to the valuation date is the actuarial accrued liability, and the portion allocated to years following the valuation date is the present value of future normal costs. The normal cost is determined for each active member as the level percent of pay necessary to fully fund the expected benefits to be earned over the career of each individual active member. The normal cost is partially funded with active member contributions with the remainder funded by employer contributions.

Health Care Age Related Morbidity/Claims Utilization:

To model the impact of aging on the underlying health care costs for Medicare retirees, the valuation relied on the Society of Actuaries' 2013 Study "Health Care Costs – From Birth to Death". Table 4 (Development of Plan Specific Medicare Age Curve) was used to model the impact of aging for ages 65 and over.

Health Care Cost Trend Rates:

Year	Non-Medicare Plans[1]	Medicare Plans[1]	Dollar Contribution[2]
2022	6.40%	2.90%[3]	1.50%
2023	6.30%	6.30%	1.50%
2024	6.20%	6.20%	1.50%
2025	6.10%	6.10%	1.50%
2026	6.00%	6.00%	1.50%
2027	5.80%	5.80%	1.50%
2028	5.60%	5.60%	1.50%
2029	5.40%	5.40%	1.50%
2030	5.20%	5.20%	1.50%
2031	5.00%	5.00%	1.50%
2032	4.80%	4.80%	1.50%
2033	4.60%	4.60%	1.50%
2034	4.40%	4.40%	1.50%
2035	4.20%	4.20%	1.50%
2036 & Beyond	4.05%	4.05%	1.50%

[1]All increases are assumed to occur on January 1. The 2021 premiums were known at the time of the valuation and were incorporated into the liability measurement
[2]Applies to members participating on or after July 1, 2003. All increases are assumed to occur on July 1.
[3] Humana provided "Not to Exceed" 2022 Medicare premiums, which were incorporated into the liability measurement and resulted in an assumed 2.90% increase in Medicare premiums at January 1, 2022.

Health care trend assumptions are based on the model issued by the Society of Actuaries "Getzen model of Long-Run Medical Cost Trends for the SOA; Thomas E. Getzen, iHEA and Temple University 2014 © Society of Actuaries.

The underlying assumptions used to develop the health care trend rates include:

- A short run period-this is a period for which anticipated health care trend rates are manually set based on local information as well as plan-specific and carrier information.
- Long term real GDP growth – 1.75%
- Long term rate of inflation – 2.30%
- Long term nominal GDP growth – 4.05%
- Year that excess rate converges to 0 – 2036

Health care trend rates are thus the manually set rates for the short run period and rates which decline to an ultimate trend rate which equals the assumed nominal long term GDP growth rate.

Health Care Participation Assumptions:

- Active members are assumed to elect health coverage at retirement at the following participation rates.

Service at Retirement	Members participating before 7/1/2003*	Members participating after 7/1/2003
Under 10	50%	100%
10-14	75%	100%
15-19	90%	100%
Over 20	100%	100%

* 100% of members with a duty disability or a duty death (in service) benefit are assumed to elect coverage at retirement.

- Future retirees are assumed to have a similar distribution by plan type as the current retirees.

Medical Plan	Participation Percentage
Medical Only[1]	6%
Essential Plan	8%
Premium Plan	86%

[1] Includes Medicare Advantage Mirror Plans

Non-Medicare Plan	Participation Percentage
LivingWell Limited	4%
LivingWell Basic	2%
LivingWell CDHP	33%
LivingWell PPO	61%

- 50% of deferred vested members participating before July 1, 2003 are assumed to elect health coverage at retirement. 100% of deferred vested members participating after July 1, 2003 are assumed to elect health coverage at retirement.

- Deferred vested members receiving insurance benefits from the non-hazardous fund are assumed to begin health coverage at age 55 for members participating before September 1, 2008, at age 60 for members participating on or after September 1, 2008 but before January 1, 2014, and at age 65 for members participating on or after January 1, 2014.

- Deferred vested members receiving insurance benefits from the hazardous fund are assumed to begin health coverage at age 50 for members participating before January 1, 2014 and at age 60 for members participating on or after January 1, 2014.

- 50% of future retirees, with hazardous service, are assumed to elect spouse health care coverage. No dependent coverage is assumed for members who only have non-hazardous service. 100% of spouses with health care coverage are assumed to continue coverage after the member's death.

Other Assumptions

1. Valuation payroll (used for determining the amortization contribution rate): Current fiscal year payroll.

2. Individual salaries used to project benefits: For salary amounts prior to the valuation date, the salary from the last fiscal year is projected backward with the valuation salary scale assumption. For future salaries, the salary from the last fiscal year is projected forward with one year's salary scale.

3. Pay increase timing: Beginning of (fiscal) year. This is equivalent to assuming that reported salaries represent amounts paid to members during the year ending on the valuation date.

4. Current active members that terminated employment (for reasons other than retirement, disability, or death) are assumed to commence their retirement benefits at first unreduced retirement eligibility. Members are assumed to elect a refund of member contributions if the value of their account balance exceeds the present value of the deferred benefit. Members participating in the Cash Balance plan are assumed to elect to receive a lump sum of their cash balance account if their account balance exceeds the present value of the deferred benefit and the member is not eligible for insurance benefits at termination.

5. The beneficiaries of current active members that die while active are assumed to commence their survivor benefits at the member's first unreduced retirement eligibility. Beneficiaries are assumed to elect a refund of member contributions if the value of the member's account balance exceeds the present value of the survivor benefit. Beneficiaries of active members that die while in the line of duty are assumed to commence their survivor benefits immediately at the death of the member.

6. There will be no recoveries once disabled.

7. Cash Balance Provisions: The cash balance interest crediting rate while a member is an active employee is assumed to equal 4.9375% (based upon the 5.25% assumed investment return) for the Non-Hazardous Fund and 5.6875% (based upon the 6.25% assumed investment return) for the Hazardous Fund. The interest crediting rate after a member terminates employment is 4% for all plans.

8. Decrement timing: Decrements of all types are assumed to occur mid-year. Decrement rates are used as described in this report, without adjustment for multiple decrement table effects.

9. Service: All members are assumed to accrue 1 year of benefit and eligibility service each year.

10. 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.

11. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.

12. Current Inactive Population (Retirement Funds): All non-vested members are assumed to take an immediate refund of member contributions. Vested members are assumed to elect an immediate refund of member contributions at the valuation date if the value of their account balance exceeds the present value of their deferred benefit. Non-hazardous members are assumed to retire at age 65. Hazardous members hired prior to September 1, 2008 are assumed to retire at age 55 and hazardous members hired on or after September 1, 2008 are assumed to retire at age 60.

Participant Data

Participant data was supplied in electronic text files. There were separate files for (i) active and inactive members, and (ii) members and beneficiaries receiving benefits.

The data for active and terminated members included date of birth, gender, date of participation, benefit tier indicator, service with the current system, total vesting service, salary, employee contribution account balances, and employer pay credits for members participating in the cash balance plan. For retired members and beneficiaries, the data included date of birth, gender, spouse's date of birth (where applicable), amount of monthly benefit, date of retirement, and form of payment code.

Assumptions were made to correct for missing, bad, or inconsistent data. These had no material impact on the results presented.

Changes in assumptions since the prior valuation:

- The assumed increase in future health care costs, or trend assumption, is reviewed on an annual basis and was updated to better reflect the plan's anticipated long-term healthcare cost increases.
- The assumed impact of the Cadillac Tax (previously a 0.9% load on employer paid non-Medicare premiums for those who became participants prior to July 1, 2003) was removed to reflect its repeal since the prior valuation.

Development of Baseline Claims Cost

For non-Medicare retirees, the initial per capita costs were based on the plan premiums effective January 1, 2021, and are used for both current and future retirees. An inherent assumption in this methodology is that the projected future retirees will have a similar distribution by plan type as the current retirees. The spouse/dependent premium of $903.52 for non-Medicare retirees is based on a blending of Family and Couple premiums for the current retirees that have over 4 years of hazardous service. The fully-insured premiums KRS pays the Kentucky Employees' Health Plan (KEHP) are blended rates based on the combined experience of active and retired members. Because the average cost of providing health care benefits to retirees under age 65 is higher than the average cost of providing health care benefits to active employees, there is an implicit rate subsidy for the non-Medicare eligible retirees. Actuarial Standard of Practice No. 6 (ASOP No. 6) requires aging subsidies (or implicit rate subsidies) to be recognized. However, the KRS health insurance trusts are only used to reimburse KEHP for the employer's portion of the blended premiums. Said another way, the trusts are not used to fund the difference between the underlying retiree claims and the blended KEHP premiums. As a result, the retiree health care liabilities developed in this report for the non-Medicare retirees are based solely on the premiums charged by KEHP, without any age-adjustment. GASB Statements No. 74 and No. 75 prohibit such a deviation from ASOP No. 6. The liabilities developed in this report are solely for the purpose of funding the benefits paid by the health insurance funds and are not appropriate for financial statement disclosures required by GASB. GRS provides separate GASB reports to KRS which include the liabilities associated with the implicit rate subsidy.

For those not eligible for Medicare		
Age	Member	Spouse/Dependents
<65	$738.54	$903.52

For Medicare retirees, the initial per capita costs were estimated based on the plan premiums effective January 1, 2021, and are used for both current and future retirees. An inherent assumption in this methodology is that the projected future retirees will have a similar distribution by plan type as the current retirees. Age graded and sex distinct premiums are utilized for retirees over the age of 65. These costs are appropriate for the unique age and sex distribution currently existing. Over the future years covered by this valuation, the age and sex distribution will most likely change. Therefore, our process "distributes" the average premium over all age/sex combinations and assigns a unique premium for each combination. The age/sex specific costs more accurately reflect the health care utilization and cost at that age.

For those eligible for Medicare		
Age	Male	Female
65	$184.81	$174.31
75	216.22	210.98
85	228.64	231.33

Appendix B of the report provides a full schedule of premiums.

Mehdi Riazi is a Member of the American Academy of Actuaries (MAAA) and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Mehdi Riazi, FSA, EA, FCA, MAAA

APPENDIX B

BENEFIT PROVISIONS

Summary of Benefit Provisions for Kentucky Employees Retirement System (KERS)

KERS Non-Hazardous Employees

Retirement: Tier 1, Participation before 9/1/2008

Normal Retirement Eligibility	Age 65 with at least 1 month of service credit; or Any age with at least 27 years of service
Benefit Amount	If a member has at least 48 months of service, the monthly benefit is 2.00% times final average compensation times years of service. For members who did not have 13 months of service credit for 1/1/1998-1/1/1999, the monthly benefit is 1.97% times final average compensation times years of service. If a member has less than 48 months of service, the monthly benefit is the actuarial equivalent of two times the member's contributions with interest. Final average compensation is based on the member's highest 5 years of compensation.
Early Retirement Eligibility	Any age (prior to age 65) with at least 25 years of service; or Age 55 with at least 5 years of service
Early Retirement Reduction	Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement eligibility precedes the member's normal retirement date.

KERS Non-Hazardous Employees (continued)

Retirement: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014

Normal Retirement Eligibility	Age 65 with at least 5 years of service; or Rule of 87 (Age 57 or older if age plus service equals 87)
Benefit Amount	The monthly benefit is equal to the applicable benefit multiplier times final average compensation times years of service.

Years of Service	Benefit Multiplier
10 or less	1.10%
10-20	1.30%
20-26	1.50%
26-30	1.75%
Greater than 30*	2.00%

* The 2.00% benefit multiplier only applies to service credit in excess of 30 years. If a member has greater than 30 years of service at retirement, service prior to 30 years will be multiplied by the 1.75% benefit multiplier.

Final compensation is based on the member's last 5 years of compensation.

Early Retirement Eligibility	Age 60 with at least 10 years of service
Early Retirement Reduction	Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement date precedes the member's normal retirement eligibility.

Retirement: Tier 3, Participation on or after 1/1/2014

Normal Retirement Eligibility	Age 65 with at least 5 years of service; or Rule of 87 (Age 57 or older if age plus service equals 87)
Benefit Amount	Each year that the member is active, a 4.00% employer pay credit and the employee's 5.00% contribution will be credited to each member's hypothetical cash balance account. The hypothetical account will earn interest at a minimum rate of 4%, annually. If the System's geometric average net investment return for the previous five years exceeds 4%, then the hypothetical account will be credited with an additional amount of interest in that year equal to 75% of the amount of the return which exceeds 4%. All interest credits will be applied to the hypothetical account balance on June 30 based on the account balance as of June 30 of the previous year. At retirement, the member's hypothetical account balance may be converted into an annuity based on an actuarial factor.
Early Retirement Eligibility	N/A

KERS Non-Hazardous Employees (continued)

Deferred Vested Benefit: Tier 1, Participation before 9/1/2008

Eligibility	At least 1 month of service credit
Benefit Amount	Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age

Deferred Vested Benefit: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014

Eligibility	5 years of service
Benefit Amount	Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age

Deferred Vested Benefit Tier 3, Participation on or after 1/1/2014

Eligibility	5 years of service
Benefit Amount	At termination of employment, members may choose to leave their account balance with the System and retire once they are eligible. The hypothetical account balance will earn 4% annual interest after termination. Members may also choose to withdrawal their entire accumulated balance. If a member does not have 5 years of service at termination, the member is eligible to receive a partial refund of their account balance. This refund includes the member's contributions with interest.

Disability Retirement: Participation before 8/1/2004

Eligibility	60 months of service (requirement is waived if line of duty disability)
Disability Benefit	Disability benefits are calculated in the same manner as the normal retirement benefit with years of service and final compensation being determined as of the date of disability, except that service credit shall be added to the person's total service beginning with the last date of paid employment and continuing to the member's 65th birthday, with total service not exceeding 25 years. Total service credit added shall not be greater than the member's actual service at disability. For members with at least 25 years of service on the last day of paid employment but less than 27 years of service, total service shall be 27 years. For members with 27 or more years of service credit, actual service will be used.

KERS Non-Hazardous Employees (continued)

Disability Retirement: Participation on or after 8/1/2004 but before 1/1/2014

Eligibility	60 months of service (requirement is waived if line of duty disability)
Disability Benefit	The higher of 20% of the member's final monthly rate of pay or the member's normal retirement benefit (without reduction for early retirement) with years and final compensation being determined as of the date of disability.

Disability Retirement: Participation on or after 1/1/2014

Eligibility	60 months of service (requirement is waived if line of duty disability)
Disability Benefit	The higher of 20% of the member's final monthly rate of pay or the member's retirement benefit calculated at the member's normal retirement date.

Line of Duty Disability Benefit

Disability Benefit	If the disability is a direct result of an act in the line of duty, the benefit shall not be less than 25% of the member's final monthly rate of pay. Additionally, each eligible dependent child will receive 10% of the member's monthly final rate of pay up to a maximum of 40%.

Pre-Retirement Death Benefit

Eligibility	Eligible for early or normal retirement; or Under age 65 with at least 60 months of service and actively working at the time of death; or At least 144 months of service, if no longer actively working
Spouse Benefit	The member's retirement benefit calculated in the same manner as if the member had retired on the day of the member's death and elected a 100% joint and survivor benefit. The benefit is actuarially reduced if the member dies prior to their normal retirement age.

Pre-Retirement Death Benefit (Death in the Line of Duty)

Eligibility	One month of service credit
Spouse Benefit	A $10,000 lump sum payment plus a monthly payment of 75% of the deceased member's final monthly average pay. Each dependent child will receive 10% of the final monthly average pay (not to exceed a total child benefit of 25% while the spouse is alive). A spouse may also elect the non-line of duty death benefit.
Child Benefit	In the event there is no surviving spouse, the benefit is 50% of final monthly average pay for one child, 65% of final monthly average pay for two children, or 75% of final monthly average pay for three or more eligible children.

KERS Non-Hazardous Employees (continued)

Post-Retirement Death Benefit

Eligibility	48 months of service, and in receipt of retirement benefits
Death Benefit	A $5,000 lump sum payment

Member Contributions

Tier 1, Participation before 9/1/2008	5% of creditable compensation. Members who do not receive a retirement benefit are entitled to a full refund of contributions with interest. The annual interest rate is set by the KRS board, not less than 2.0%.
Tier 2, Participation on or after 9/1/2008 but before 1/1/2014	5% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest. The annual interest rate is 2.5%.
Tier 3, Participation after 1/1/2014	5% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest.

Changes since the Prior Valuation

- House Bill 1 passed during the 2019 special legislative session and allowed certain agencies in the Non-Hazardous fund to elect to cease participating in the System as of June 30, 2020 under different provisions than were previously established. Senate Bill 249 passed during the 2020 legislative session and delayed the effective date of cessation for these provisions to June 30, 2021.
- House Bill 271 passed during the 2020 legislative session and removed provisions that reduce the monthly payment to a surviving spouse of a member whose death was due to a duty-related injury upon remarriage of the spouse. It also increased benefits for a very small number of beneficiaries.

KERS Hazardous Employees

Retirement: Tier 1, Participation before 9/1/2008

Normal Retirement Eligibility	Age 55 with at least 1 month of service credit; or Any age with at least 20 years of service
Benefit Amount	If a member has at least 60 months of service, the monthly benefit is 2.49% times final average compensation times years of service. If a member has less than 60 months of service, the monthly benefit is the actuarial equivalent of two times the member's contributions with interest. Final average compensation is based on the member's highest 3 years of compensation.
Early Retirement Eligibility	Age 50 with at least 15 years of service
Early Retirement Reduction	Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement date precedes the member's normal retirement eligibility.

KERS Hazardous Employees (continued)

Retirement: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014

Normal Retirement Eligibility	Age 60 with at least 5 years of service; or Any age with at least 25 years of service
Benefit Amount	The monthly benefit is equal to the applicable benefit multiplier times final average compensation times years of service.

Years of Service	Benefit Multiplier
10 or less	1.30%
10-20	1.50%
20-25	2.25%
Greater than 25	2.50%

Final average compensation is based on the member's highest 3 years of compensation.

Early Retirement Eligibility	Age 50 with at least 15 years of service
Early Retirement Reduction	Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement date precedes the member's normal retirement eligibility.

Retirement: Tier 3, Participation on or after 1/1/2014

Normal Retirement Eligibility	Age 60 with at least 5 years of service; or Any age with at least 25 years of service
Benefit Amount	Each year that the member is active, a 7.50% employer pay credit and the employee's 8.00% contribution will be credited to each member's hypothetical cash balance account. The hypothetical account will earn interest at a minimum rate of 4%, annually. If the System's geometric average net investment return for the previous five years exceeds 4%, then the hypothetical account will be credited with an additional amount of interest in that year equal to 75% of the amount of the return which exceeds 4%. All interest credits will be applied to the hypothetical account balance on June 30 based on the account balance as of June 30 of the previous year. At retirement, the member's hypothetical account balance may be converted into an annuity based on an actuarial factor.
Early Retirement Eligibility	N/A

KERS Hazardous Employees (continued)

Deferred Vested Benefit: Tier 1, Participation before 9/1/2008

Eligibility	At least 1 month of service credit
Benefit Amount	Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age

Deferred Vested Benefit: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014

Eligibility	5 years of service
Benefit Amount	Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age

Deferred Vested Benefit Tier 3, Participation on or after 1/1/2014

Eligibility	5 years of service
Benefit Amount	At termination of employment, members may choose to leave their account balance with the System and retire once they are eligible. The hypothetical account balance will earn 4% annual interest after termination. Members may also choose to withdrawal their entire accumulated balance. If a member does not have 5 years of service at termination, the member is eligible to receive a partial refund of their account balance. This refund includes the member's contributions with interest.

Disability Retirement: Participation before 8/1/2004

Eligibility	60 months of service (requirement is waived if line of duty disability)
Disability Benefit	Disability benefits are calculated in the same manner as the normal retirement benefit with years of service and final compensation being determined as of the date of disability, except that if the member has less than 20 years of service at disability, service credit shall be added to the person's total service beginning with the last date of paid employment and continuing to the member's 55th birthday, with total service not exceeding 20 years. Total service credit added shall not be greater than the member's actual service at disability.

KERS Hazardous Employees (continued)

Disability Retirement: Participation on or after 8/1/2004 but before 1/1/2014

Eligibility	60 months of service (requirement is waived if line of duty disability)
Disability Benefit	The higher of 25% of the member's final monthly rate of pay or the member's normal retirement benefit (without reduction for early retirement) with years and final compensation being determined as of the date of disability.

Disability Retirement: Participation on or after 1/1/2014

Eligibility	60 months of service (requirement is waived if line of duty disability)
Disability Benefit	The higher of 25% of the member's final monthly rate of pay or the member's retirement benefit calculated at the member's normal retirement date.

Line of Duty Disability Benefit

Disability Benefit	If the disability is a direct result of an act in the line of duty, the benefit shall not be less than 25% of the member's final monthly rate of pay. Additionally, each eligible dependent child will receive 10% of the member's monthly final rate of pay up to a maximum of 40%.

Pre-Retirement Death Benefit

Eligibility	Eligible for early or normal retirement; or Under age 55 with at least 60 months of service and actively working at the time of death; or At least 144 months of service, if no longer actively working
Spouse Benefit	The member's retirement benefit calculated in the same manner as if the member had retired on the day of the member's death and elected a 100% joint and survivor benefit. The benefit is actuarially reduced if the member dies prior to their normal retirement age.

Pre-Retirement Death Benefit (Death in the Line of Duty)

Eligibility	One month of service credit
Spouse Benefit	A $10,000 lump sum payment plus a monthly payment of 75% of the deceased member's final monthly average pay. Each dependent child will receive 10% of the final monthly average pay (not to exceed a total child benefit of 25% while the spouse is alive). A spouse may also elect the non-line of duty death benefit.
Non-Spouse Benefit	If the beneficiary is only one person who is a dependent receiving at least 50% of his or her support from the member, the beneficiary may elect a lump-sum payment of $10,000.
Child Benefit	In the event there is no surviving spouse, the benefit is 50% of final monthly average pay for one child, 65% of final average pay for two children, or 75% of final average pay for three or more eligible children.

KERS Hazardous Employees (continued)

Post-Retirement Death Benefit

Eligibility	48 months of service, and in receipt of retirement benefits
Death Benefit	A $5,000 lump sum payment

Member Contributions

Tier 1, Participation before 9/1/2008	8% of creditable compensation. Members who do not receive a retirement benefit are entitled to a full refund of contributions with interest. The annual interest rate is set by the KRS board, not less than 2.0%.
Tier 2, Participation on or after 9/1/2008 but before 1/1/2014	8% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest. The annual interest rate is 2.5%.
Tier 3, Participation after 1/1/2014	8% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest.

Changes since the Prior Valuation

- House Bill 271 passed during the 2020 legislative session and removed provisions that reduce the monthly payment to a surviving spouse of a member whose death was due to a duty-related injury upon remarriage of the spouse. It also increased benefits for a very small number of beneficiaries.

Summary of Main Retiree Insurance Benefit Provisions

Insurance Tier 1: Participation began before 7/1/2003

Benefit Eligibility Recipient of a retirement allowance

Benefit Amount

Non-Hazardous Service	Percentage of Member Premium Paid by Retirement System	Hazardous Service	Percentage of Member & Dependent Premium Paid by Retirement System
Less than 4 years	0%	Less than 4 years	0%
4 – 9 years	25%	4 – 9 years	25%
10 – 14 years	50%	10 – 14 years	50%
15 – 19 years	75%	15 – 19 years	75%
20 or more years	100%	20 or more years	100%

The percentage paid by the retirement system is applied to the 'contribution' plan selected by the KRS Board.

Duty Disability Retirement If disability was a result of injuries sustained while in the line of duty, the member receives 100% of the maximum contribution for the member and dependents. This benefit is provided to members in the Non-hazardous and Hazardous plans alike.

Duty Death in Service If an active employee's death was a result of injuries sustained while in the line of duty, the member's spouse and children receive a fully subsidized health insurance benefit. This benefit is provided to members in the Non-hazardous and Hazardous plans alike.

Non-Duty Death in Service If the surviving spouses is in receipt of a pension allowance, he or she is eligible for continued health coverage. The percentage of the premium paid for by the retirement system is based on the member's years of hazardous service at the time of death.

Surviving Spouse of a Retiree A surviving spouse of a retiree, who is in receipt of a pension allowance, will receive a premium subsidy based on the member's years of hazardous service.

Hazardous employees who retired prior to August 1, 1998 System's contribution for spouse and dependents is based on total service.

Insurance Tier 2: Participation began on or after 7/1/2003, but before 9/1/2008

Benefit Eligibility	Recipient of a retirement allowance with at least 120 months of service at retirement
Non-Hazardous Subsidy	Monthly contribution of $10 for each year of earned non-hazardous service. The monthly contribution is increased by 1.5% each July 1. As of July 1, 2020, the Non-Hazardous monthly contribution was $13.78/year of service. Upon the retiree's death, the surviving spouse may continue coverage (if in receipt of a retirement allowance) but will be 100% responsible for the premiums.
Hazardous Subsidy	Monthly contribution of $15 for each year of earned hazardous service. The monthly contribution is increased by 1.5% each July 1. As of July 1, 2020, the Hazardous monthly contribution was $20.68/year of service. Upon the retiree's death, the surviving spouse of a hazardous duty member will receive a monthly contribution of $10 ($13.78 as of July 1, 2020) for each year of hazardous service.
Duty Disability Retirement	If disability was a result of injuries sustained while in the line of duty, the member receives a benefit equal to at least 20 times the Non-Hazardous monthly contribution. This benefit is provided to members in the Non-Hazardous and Hazardous plans alike.
Duty Death in Service	If an active employee's death was a result of injuries sustained while in the line of duty, the member's spouse and children receive a fully subsidized health insurance benefit. This benefit is provided to members in the Non-Hazardous and Hazardous plans alike.
Non-Duty Death in Service	If the surviving spouse is in receipt of a pension allowance, he or she is eligible for continued health coverage. The percentage of the premium paid for by the retirement system is based on the member's years of hazardous service at the time of death.

Insurance Tier 3: Participation began on or after 9/1/2008

Tier 3 insurance benefits are identical to Tier 2, except Tier 3 members are required to have at least 180 months of service in order to be eligible.

Monthly Health Plan Premiums – Effective January 1, 2021

Non-Medicare Plan Options					
Plan Option	Single	Parent Plus	Couple	Family	Family X-Ref
LivingWell PPO[1]	$753.76	$1,075.44	$1,653.10	$1,841.08	$907.84
LivingWell CDHP	732.26	1,011.78	1,383.08	1,545.50	846.00
LivingWell Basic	704.08	970.78	1,501.56	1,673.40	825.88
Living Well Limited	626.48	892.76	1,374.22	1,530.02	753.62

Medicare Plan Options	
Medical Only Plan	$184.30
Medicare Advantage Mirror Essential Plan	215.41
Medicare Advantage Mirror Premium Plan	310.04
Kentucky Retirement Systems – Essential Plan[2]	46.16
Kentucky Retirement Systems – Premium Plan[3]	222.74

[1] Contribution plan selected by the KRS Board was the LivingWell PPO plan option for non-Medicare retirees.
[2] Contribution rate for retirees selected by the KRS board remains at $75.56.
[3] Contribution rate for retirees selected by the KRS board remains at $252.51.

Dollar Contribution Amount for Insurance Tier 2 and Tier 3

Monthly contribution amounts per year of service as of July 1, 2020.

Non-Hazardous Service	Hazardous Service
$13.78	$20.68

Changes since the Prior Valuation

There have been no changes to benefit provisions since the prior valuation.

APPENDIX C

GLOSSARY

Glossary

Actuarial Accrued Liability (AAL): That portion, as determined by a particular Actuarial Cost Method, of the Actuarial Present Value of Future Plan Benefits which is not provided for by future Normal Costs. It is equal to the Actuarial Present Value of Future Plan Benefits minus the actuarial present value of future Normal Costs.

Actuarial Assumptions: Assumptions as to future experience under the Fund. These include assumptions about the occurrence of future events affecting costs or liabilities, such as:

- mortality, withdrawal, disablement, and retirement;
- future increases in salary;
- future rates of investment earnings and future investment and administrative expenses;
- characteristics of members not specified in the data, such as marital status;
- characteristics of future members;
- future elections made by members; and
- other relevant items.

Actuarial Cost Method or ***Funding Method:*** A procedure for allocating the Actuarial Present Value of Future Benefits to various time periods; a method used to determine the Normal Cost and the Actuarial Accrued Liability. These items are used to determine the ADC.

Actuarial Gain or ***Actuarial Loss:*** A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two Actuarial Valuation dates. Through the actuarial assumptions, rates of decrements, rates of salary increases, and rates of fund earnings have been forecasted. To the extent that actual experience differs from that assumed, Actuarial Accrued Liabilities emerge which may be the same as forecasted, or may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., the fund's assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, actuarial losses are the result of unfavorable experience, i.e., actual results that produce actuarial liabilities which are larger than projected. Actuarial gains will shorten the time required for funding of the actuarial balance sheet deficiency while actuarial losses will lengthen the funding period.

Actuarially Equivalent: Of equal actuarial present value, determined as of a given date and based on a given set of Actuarial Assumptions.

Actuarial Present Value (APV): The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions. For purposes of this standard, each such amount or series of amounts is:

a. adjusted for the probable financial effect of certain intervening events (such as changes in compensation levels, marital status, etc.)

b. multiplied by the probability of the occurrence of an event (such as survival, death, disability, termination of employment, etc.) on which the payment is conditioned, and

c. discounted according to an assumed rate (or rates) of return to reflect the time value of money.

Actuarial Present Value of Future Plan Benefits: The Actuarial Present Value of those benefit amounts which are expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and past and anticipated future compensation and service credits. The Actuarial Present Value of Future Plan Benefits includes the liabilities for active members, retired members, beneficiaries receiving benefits, and inactive, non-retired members either entitled to a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.

Actuarial Valuation: The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan. An Actuarial valuation for a governmental retirement system typically also includes calculations that provide the financial information of the plan, such as the funded ratio, unfunded actuarial accrued liability and the ADC.

Actuarial Value of Assets or ***Valuation Assets:*** The value of the Fund's assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets, but commonly actuaries use a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the ADC.

Actuarially Determined: Values which have been determined utilizing the principles of actuarial science. An actuarially determined value is derived by application of the appropriate actuarial assumptions to specified values determined by provisions of the law.

Actuarially Determined Contribution (ADC): The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation. The ADC consists of the Employer Normal Cost and the Amortization Payment.

Amortization Method: A method for determining the Amortization Payment. The most common methods used are level dollar and level percentage of payroll. Under the Level Dollar method, the Amortization Payment is one of a stream of payments, all equal, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the Amortization payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the stream of payments increases at the assumed rate at which total covered payroll of all active members will increase.

Amortization Payment: The portion of the pension plan contribution or ADC which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

Closed Amortization Period: A specific number of years that is counted down by one each year, and therefore declines to zero with the passage of time. For example if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc. See Funding Period and Open Amortization Period.

Decrements: Those causes/events due to which a member's status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or termination.

Defined Benefit Plan: A retirement plan that is not a Defined Contribution Plan. Typically a defined benefit plan is one in which benefits are defined by a formula applied to the member's compensation and/or years of service.

Defined Contribution Plan: A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, and the plan's earnings are allocated to each account, and each member's benefits are a direct function of the account balance.

Employer Normal Cost: The portion of the Normal Cost to be paid by the employers. This is equal to the Normal Cost less expected member contributions.

Experience Study: A periodic review and analysis of the actual experience of the Fund which may lead to a revision of one or more actuarial assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified as deemed appropriate by the Actuary.

Funded Ratio: The ratio of the actuarial value of assets (AVA) to the actuarial accrued liability (AAL). Plans sometimes calculate a market funded ratio, using the market value of assets (MVA), rather than the AVA.

Funding Period or ***Amortization Period:*** The term "Funding Period" is used two ways. In the first sense, it is the period used in calculating the Amortization Payment as a component of the ADC. This funding period is specified in State statute. In the second sense, it is a calculated item: the number of years in the future that will theoretically be required to amortize (i.e., pay off or eliminate) the Unfunded Actuarial Accrued Liability, based on a statutory employer contribution rate, and assuming no future actuarial gains or losses.

GASB: Governmental Accounting Standards Board.

GASB 67 and ***GASB 68***: Governmental Accounting Standards Board Statements No. 67 and No. 68. These are the governmental accounting standards that set the accounting and reporting rules for public retirement systems and the employers that sponsor, participate in, or contribute to them. Statement No. 67 sets the accounting rules for the financial reporting of the retirement systems, while Statement No. 68 sets the rules for the employers that sponsor, participate in, or contribute to public retirement systems.

Normal Cost: That portion of the Actuarial Present Value of pension plan benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method. Any payment in respect of an Unfunded

Actuarial Accrued Liability is not part of Normal Cost (see Amortization Payment). For pension plan benefits which are provided in part by employee contributions, Normal Cost refers to the total of employee contributions and employer Normal Cost unless otherwise specifically stated. Under the entry age normal cost method, the Normal Cost is intended to be the level cost (when expressed as a percentage of pay) needed to fund the benefits of a member from hire until ultimate termination, death, disability or retirement.

Open Amortization Period: An open amortization period is one which is used to determine the Amortization Payment but may not decrease by exactly one year in the subsequent year's actuarial valuation. For instance, if the initial period is set as 30 years, the same 30-year period is used in determining the Amortization Period each year.

Unfunded Actuarial Accrued Liability: The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. This value may be negative in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus.

Valuation Date or Actuarial Valuation Date: The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Plan Benefits is determined. The expected benefits to be paid in the future are discounted to this date.

County Employees Retirement System (CERS)

Actuarial Valuation Report
as of June 30, 2020

P: 469.524.0000 | www.grsconsulting.com

December 3, 2020

Board of Trustees
Kentucky Retirement Systems
Perimeter Park West
1260 Louisville Road
Frankfort, KY 40601

Subject: Actuarial Valuation as of June 30, 2020

Dear Trustees of the Board:

This report describes the current actuarial condition of the County Employees Retirement System (CERS) and provides the actuarially determined employer contribution rates for fiscal year ending June 30, 2022. In addition, the report analyzes changes in the System's financial condition and provides various summaries of the data.

Separate reports are issued with regard to valuation results determined in accordance with Governmental Accounting Standards Board (GASB) Statements 67, 68, 74 and 75. Results of this report should not be used for any other purpose without consultation with the undersigned. Valuations are prepared annually as of June 30, the first day of the plan year for KRS. This report was prepared at the request of the Board of Trustees of the Kentucky Retirement Systems (Board) and is intended for use by the KRS staff and those designated or approved by the Board.

FINANCING OBJECTIVES AND FUNDING POLICY

The contribution rates determined by this actuarial valuation become effective twelve months after the valuation date. In other words, the contribution rates determined by this June 30, 2020 actuarial valuation will be used by the Board to recommend the participating employers' contribution rates for the fiscal year beginning July 1, 2021 and ending June 30, 2022. If new legislation is enacted between the valuation date and the date the contribution rates become effective, the Board may adjust the calculated rates before certifying them, in order to reflect this new legislation. Such adjustments are based on information supplied by the actuary.

The employer contribution rate is determined in accordance with Section 61.565 of Kentucky Statute, which was last amended by SB249 (passed during the 2020 legislative session). As specified by the Statute, the employer contribution rate is comprised of a normal cost contribution and an actuarial accrued liability contribution.

The actuarial accrued liability contribution is calculated by amortizing the unfunded accrued liability as of June 30, 2019 over a closed 30-year amortization period. Gains and losses incurring in future years (including those incurred in this June 30, 2020 valuation) are amortized as separate closed 20-year amortization bases. Prior to the passage of SB249, the unfunded liability was amortized as one amortization base over a closed 30-year period beginning July 1, 2013 (i.e. the amortization period would have been 23 years as of June 30, 2020).

ASSUMPTIONS AND METHODS

The Board of Trustees, in consultation with the actuary, sets the actuarial assumptions and methods used in the actuarial valuation. An experience study was conducted after the June 30, 2018 actuarial valuation and the Board adopted updated assumptions for first use in the June 30, 2019 actuarial valuation.

The assumed increase in future healthcare costs, or trend assumption, is reviewed on an annual basis and was updated since the June 30, 2019 valuation to better reflect the plan's anticipated long-term healthcare cost increases. There were no other changes in actuarial assumptions since the prior valuation.

The results of the actuarial valuation are dependent on the actuarial assumptions used. Actual results can, and almost certainly will, differ as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rate, and funding periods. The actuarial calculations are intended to provide information for rational decision making.

This report was prepared using our proprietary valuation model and related software which in our professional judgment has the capability to provide results that are consistent with the purposes of the valuation. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

BENEFIT PROVISIONS

The benefit provisions reflected in these valuations are those which were in effect on June 30, 2020. House Bill 271 passed during the 2020 legislative session and removed provisions that reduce the monthly payment to a surviving spouse of a member whose death was due to a duty-related injury upon remarriage of the spouse. It also increased benefits for a very small number of beneficiaries. There were no other material benefit provision changes since the prior valuation.

IMPACT DUE TO COVID-19

This actuarial valuation is performed as of June 30, 2020, which is approximately three months after the start of the COVID-19 pandemic in the United States. It is uncertain how the mortality and other demographic behavior (e.g. retirement and turnover) may change during the next couple years. However, if government budgets are constrained then we would expect lower than expected salary increases for individual members and a possible reduction in active membership until the Commonwealth's economy recovers. There may also be increased volatility and uncertainty in future investment returns.

DATA

Member data for retired, active and inactive members was supplied as of June 30, 2020, by the KRS staff. The staff also supplied asset information as of June 30, 2020. We did not audit this data, but we did apply a number of tests to the data, and we concluded that it was reasonable and consistent with the prior year's data. GRS is not responsible for the accuracy or completeness of the information provided to us by KRS.

CERTIFICATION

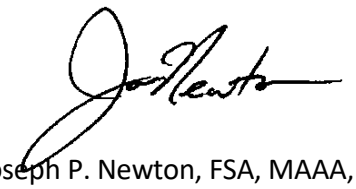
We certify that the information presented herein is accurate and fairly portrays the actuarial position of CERS as of June 30, 2020.

All of our work conforms with generally accepted actuarial principles and practices, and is in conformity with the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of Kentucky Code of Laws and, where applicable, the Internal Revenue Code, ERISA, and the Statements of the Governmental Accounting Standards Board.

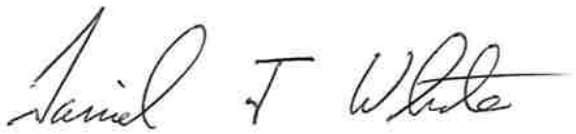
The undersigned are independent actuaries and consultants. Mr. Newton and Mr. White are Enrolled Actuaries. All three of the undersigned are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries. All of the undersigned are experienced in performing valuations for large public retirement systems.

Sincerely,

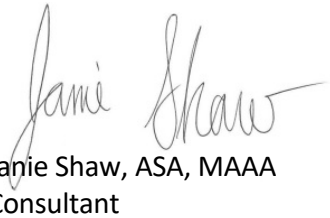
Gabriel, Roeder, Smith & Co.



Joseph P. Newton, FSA, MAAA, EA
Pension Market Leader and Actuary



Daniel J. White, FSA, MAAA, EA
Senior Consultant



Janie Shaw, ASA, MAAA
Consultant

Table of Contents

SECTION 1

EXECUTIVE SUMMARY

Summary of Principal Results

(Dollar amounts expressed in thousands)

	Non-Hazardous		Hazardous		Total	
	June 30, 2020	June 30, 2019	June 30, 2020	June 30, 2019	June 30, 2020	June 30, 2019
Actuarially Determined Contribution[1]:						
Retirement	23.88%	23.81%	43.23%	42.02%		
Insurance	4.17%	5.43%	8.73%	9.86%		
Total	28.05%	29.24%	51.96%	51.88%	N/A	N/A
Contribution Rate for Next Fiscal Year[2]	26.95%	24.06%	44.33%	39.58%		
Assets:						
Retirement						
• Actuarial value (AVAR)	$7,220,607	$7,049,527	$2,447,885	$2,375,106	$9,668,492	$9,424,633
• Market value (MVAR)	$7,027,327	$7,159,921	$2,379,704	$2,413,708	$9,407,031	$9,573,629
• Ratio of actuarial to market value of assets	102.8%	98.5%	102.9%	98.4%	102.8%	98.4%
Insurance						
• Actuarial value (AVAI)	$2,661,351	$2,523,249	$1,362,028	$1,313,659	$4,023,379	$3,836,908
• Market value (MVAI)	$2,581,613	$2,569,511	$1,321,117	$1,340,714	$3,902,730	$3,910,225
• Ratio of actuarial to market value of assets	103.1%	98.2%	103.1%	98.0%	103.1%	98.1%
Funded Status:						
Retirement						
• Actuarial accrued liability	$14,610,868	$14,356,113	$5,431,299	$5,245,365	$20,042,167	$19,601,478
• Unfunded accrued liability on AVAR	$7,390,261	$7,306,586	$2,983,414	$2,870,259	$10,373,675	$10,176,845
• Funded ratio on AVAR	49.4%	49.1%	45.1%	45.3%	48.2%	48.1%
• Unfunded accrued liability on MVAR	$7,583,541	$7,196,192	$3,051,595	$2,831,657	$10,635,136	$10,027,849
• Funded ratio on MVAR	48.1%	49.9%	43.8%	46.0%	46.9%	48.8%
Insurance						
• Actuarial accrued liability	$3,392,085	$3,567,947	$1,740,971	$1,732,879	$5,133,056	$5,300,826
• Unfunded accrued liability on AVAI	$730,734	$1,044,698	$378,943	$419,220	$1,109,677	$1,463,918
• Funded ratio on AVAI	78.5%	70.7%	78.2%	75.8%	78.4%	72.4%
• Unfunded accrued liability on MVAI	$810,472	$998,436	$419,854	$392,165	$1,230,326	$1,390,601
• Funded ratio on MVAI	76.1%	72.0%	75.9%	77.4%	76.0%	73.8%
Membership:						
• Number of						
- Active Members	81,250	81,506	9,419	9,474	90,669	90,980
- Retirees and Beneficiaries	65,414	64,539	10,452	10,023	75,866	74,562
- Inactive Members	95,692	91,543	3,590	3,422	99,282	94,965
- Total	242,356	237,588	23,461	22,919	265,817	260,507
• Projected payroll of active members	$2,565,391	$2,521,860	$568,558	$559,353	$3,133,949	$3,081,213
• Average salary of active members	$31,574	$30,941	$60,363	$59,041	$34,565	$33,867

[1] Actuarially Determined Contributions calculated as of June 30, 2019 reflect SB249, which changed the amortization period to 30 years as of June 30, 2019.

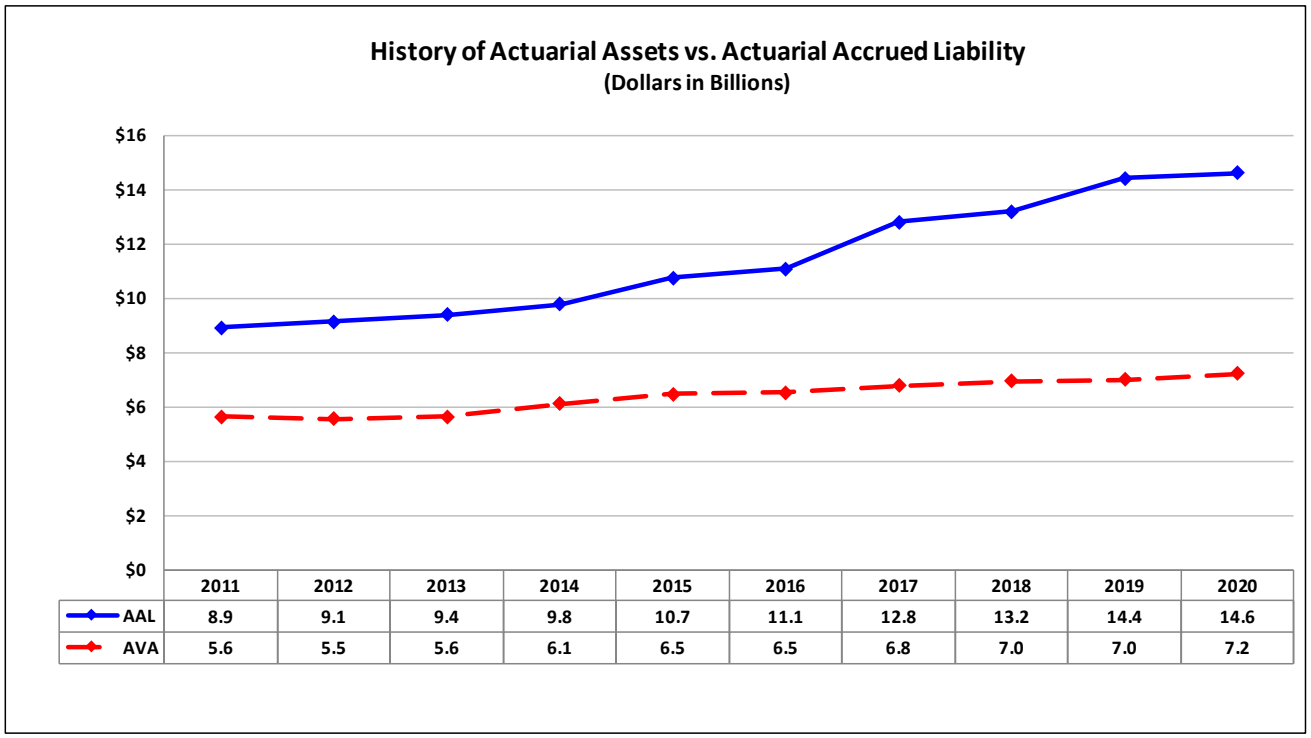
[2] Contribution rates for FYE 2021 (June 30, 2019 Valuation) reflect SB249 (2020 legislative session), which kept the CERS contribution rates level for one year. Contribution rates for FYE 2022 (June 30, 2020 Valuation) reflect the CERS Phase-In provisions, which limit the certified contribution rates to a 12% increase from the prior year

Executive Summary (Continued)

Non-Hazardous Retirement Fund

The unfunded actuarial accrued liability of the non-hazardous retirement fund increased by $84 million since the prior year's valuation to $7.390 billion. This increase was primarily due to the fund receiving less than the actuarially determined contribution rate due to the CERS contribution rate phase-in provisions. This increase was partially offset by liability gains caused by the mortality experience in the past year.

Below is a chart with the historical actuarial value of assets and actuarial accrued liability. The divergence in the assets and liability over the last ten years has generally been due to: (1) actual contributions being insufficient to finance the unfunded actuarial accrued liability, (2) decreases in the assumed rate of return between 2015 and 2017, and (3) actual investment experience being less than the investment return assumption.



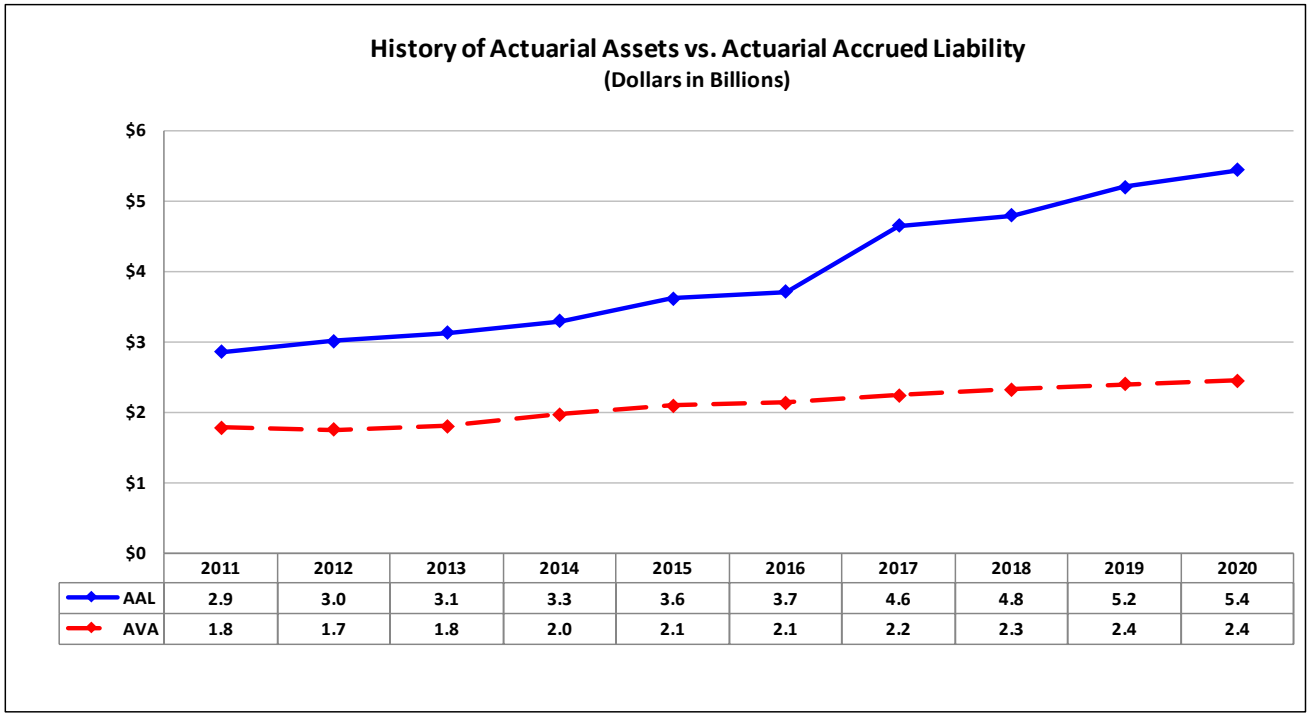
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AAL	8.9	9.1	9.4	9.8	10.7	11.1	12.8	13.2	14.4	14.6
AVA	5.6	5.5	5.6	6.1	6.5	6.5	6.8	7.0	7.0	7.2

Executive Summary (Continued)

Hazardous Retirement Fund

The unfunded actuarial accrued liability of the hazardous retirement fund increased by $113 million since the prior year's valuation to $2.983 billion. This increase was primarily due to the fund receiving less than the actuarially determined contribution rate due to the CERS contribution rate phase-in provisions.

Below is a chart with the historical actuarial value of assets and actuarial accrued liability. The divergence in the assets and liability over the last ten years has generally been due to: (1) actual contributions being insufficient to finance the unfunded actuarial accrued liability, (2) decreases in the assumed rate of return between 2015 and 2017, and (3) actual investment experience being less than the investment return assumption.



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AAL	2.9	3.0	3.1	3.3	3.6	3.7	4.6	4.8	5.2	5.4
AVA	1.8	1.7	1.8	2.0	2.1	2.1	2.2	2.3	2.4	2.4

Executive Summary (Continued)

Summary of Change in Financial Condition of the Insurance Funds

Both the 2021 non-Medicare and Medicare premiums were lower than expected based on the prior year's actuarial assumptions, which resulted in lower than expected accrued liability for both of the insurance funds.

Specifically, the non-Medicare premiums were expected to increase by 6.25% from calendar year 2020 to calendar year 2021 (i.e. the medical trend assumption for non-Medicare premiums used in the prior year's actuarial valuation) and the actual premiums increased by approximately 3%. The Medicare premiums were expected to increase by 5.50% from calendar year 2020 to calendar year 2021 (i.e. the medical trend assumption for Medicare premiums used in the prior year's actuarial valuation) and the actual premiums decreased. The decrease to the Medicare premiums was primarily due to the repeal of the "Health Insurer Fee" in December 2019.

In conjunction with the review of the healthcare per capita claims cost, the assumed increase in future healthcare costs, or trend assumption, is reviewed on an annual basis. The trend assumption was updated since the June 30, 2019 valuation to better reflect the plan's anticipated long-term healthcare cost increases. In general, the updated assumption is assuming higher future increases in healthcare costs. Additionally, the assumed impact of the "Cadillac Tax" (previously, a 0.9% load on employer paid non-Medicare premiums for those who became participants prior to July 1, 2003) was removed to reflect its repeal since the prior valuation.

<u>Non-Hazardous Insurance Fund</u>

Since the prior year's valuation, the unfunded actuarial accrued liability of the non-hazardous insurance fund decreased by $314 million since the prior year's valuation to $731 million. The largest source of this decrease is due to a $296 million decrease in the liability due to the premium experience and corresponding healthcare trend assumption change. The corresponding funded ratio increased from 70.7% at June 30, 2019 to 78.5% at June 30, 2020.

<u>Hazardous Insurance Fund</u>

Since the prior year's valuation, the unfunded actuarial accrued liability of the hazardous insurance fund decreased by $40 million since the prior year's valuation to $379 million. The largest source of this decrease is due to a $98 million decrease in the liability due to the premium experience and corresponding healthcare trend assumption change. The corresponding funded ratio increased from 75.8% at June 30, 2019 to 78.2% at June 30, 2020.

SECTION 2

DISCUSSION

Discussion

The County Employees Retirement System (CERS) is a cost-sharing, multiple-employer defined benefit pension fund that provides pensions and health care coverage for regular full-time members employed by positions of each participating county, city, and school board, and any additional eligible local agencies electing to participate in CERS. CERS includes both non-hazardous and hazardous duty benefits. This report presents the result of the June 30, 2020 actuarial funding valuation for both the Retirement Funds and Insurance Funds.

The primary purposes of the valuation report are to describe the current actuarial condition of the System and provide the actuarially determined employer contribution rates for fiscal year ending June 30, 2022. In addition, the report analyzes changes in the System's financial condition and provides various summaries of the data.

The actuarially determined contribution rates consist of two components: a normal cost rate and an amortization cost to finance the unfunded actuarial accrued liability. The normal cost rate is the theoretical amount which would be required to pay the members' benefits, based on the current plan provisions, if this amount had been contributed from each member's entry date and if the fund's experience exactly followed the actuarial assumptions. This is the amount that it should cost to provide the benefits for an average member. Since members contribute to the fund, only the excess of the normal rate over the member contribution rate is included in the employer contribution rate. The amortization cost is the amount, expressed as a percentage of payroll, necessary to amortize the unfunded actuarial accrued liability. The payroll growth rate and discount rate assumptions are selected by the Board. The funding period is specified in Section 61.565 of Kentucky Statute.

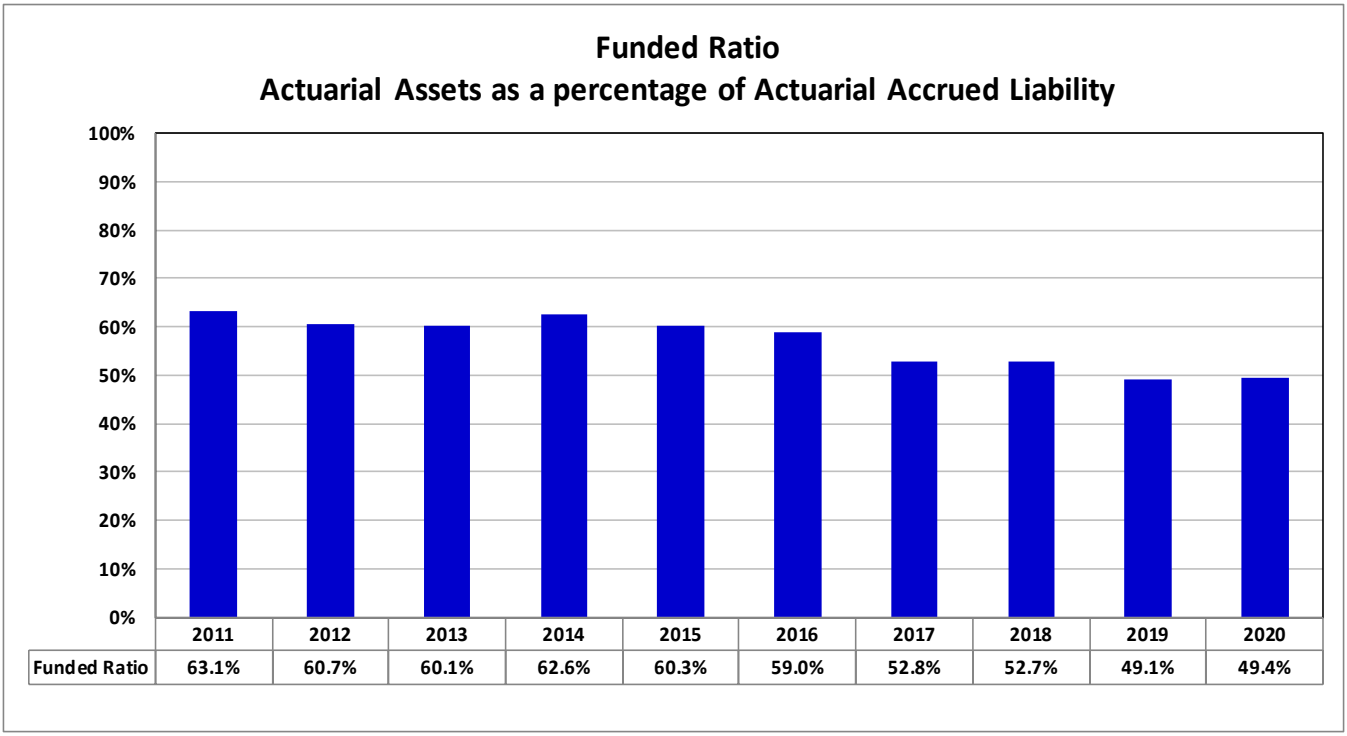
All of the actuarial and financial tables referenced by the other sections of this Report appear in Section 3. Section 4 provides additional details related to the calculation of the amortization of the unfunded actuarial accrued liability. This section was added to the report this year due to the change in the amortization methodology related to SB249 (passed during the 2020 legislative session). Section 5 provides member data and statistical information. Section 6 provides a discussion of various risk measures, which are intended to aid stakeholders in understanding the effects of future experience differing from the assumptions used in performing an actuarial valuation. Appendices A and B provide summaries of the principle actuarial assumptions and methods and plan provisions. Finally, Appendix C provides a glossary of technical terms that are used throughout this report.

Funding Progress

The following charts provide a ten-year history of the retirement funds' funded ratio (i.e. the Actuarial Value of Assets divided by the Actuarial Accrued Liability). The decline in the funded ratio over the last ten years has generally been due to: (1) actual contributions being insufficient to finance the unfunded actuarial accrued liability, (2) decreases in the assumed rate of return between 2015 and 2017, and (3) actual investment experience being less than the investment return assumption.

The funded ratio increased slightly from 2019 to 2020 for the non-hazardous fund and decreased slightly from 2019 to 2020 for the hazardous fund. Once the actuarially determined contribution rates have been fully phased in and assuming they are actually paid in future years, and absent future unfavorable experience, we expect the funded ratio to begin improving. Also, the dollar amount of the unfunded actuarial accrued liability, or the difference between the actuarial accrued liability and the actuarial value of assets, is, then, expected to begin decreasing. Table 9, Schedule of Funding Progress, in the following section of the report provides additional detail regarding the funding progress of the Retirement Funds.

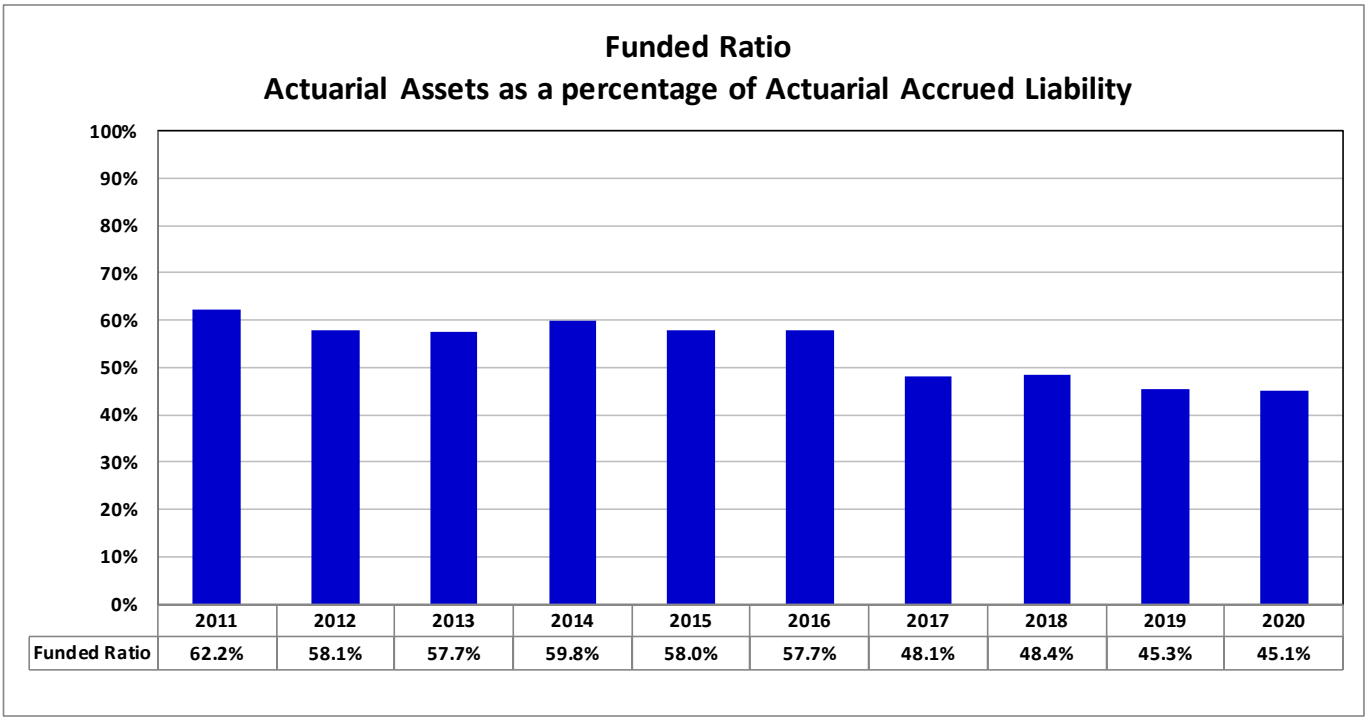
Non-Hazardous Retirement Fund



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Funded Ratio	63.1%	60.7%	60.1%	62.6%	60.3%	59.0%	52.8%	52.7%	49.1%	49.4%

Funding Progress (Continued)

Hazardous Retirement Fund



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Funded Ratio	62.2%	58.1%	57.7%	59.8%	58.0%	57.7%	48.1%	48.4%	45.3%	45.1%

Asset Gains/ (Losses)

The actuarial value of assets ("AVA") is based on a smoothed market value of assets, using a systematic approach to phase-in the difference between the actual and expected investment return on the market value of assets (adjusted for receipts and disbursements during the year). This is appropriate because it dampens the short-term volatility inherent in investment markets. The return is computed net of investment expenses.

Non-Hazardous Retirement Fund

The actuarial value of assets for the non-hazardous retirement fund increased from $7.050 billion to $7.221 billion since the prior valuation. The rate of return on the market value of assets on a dollar-weighted basis for the prior fiscal year was a 0.8% which is less than the 6.25% expected annual return. The return on an actuarial (smoothed) asset value was 5.2%, which resulted in a $74.8 million loss for the fiscal year. This difference in the estimated return on market value and actuarial value illustrates the smoothing effect of the asset valuation method. The market value of assets is $193 million less than the actuarial value of assets, which signifies that the retirement fund is in a position of deferred losses to be realized in future years.

Hazardous Retirement Fund

Likewise, the actuarial value of assets for the hazardous retirement fund increased from $2.375 billion to $2.448 billion since the prior valuation. The rate of return on the market value of assets on a dollar-weighted basis for the prior fiscal year was a 0.7% which is less than the 6.25% expected annual return. The return on an actuarial (smoothed) asset value was 5.2%, which resulted in a $24.2 million loss for the fiscal year. The market value of assets is $68 million less than the actuarial value of assets, which signifies that the retirement fund is in a position of deferred losses to be realized in future years.

Table 6 in the following section of this report provides asset information that was included in the annual financial statements of the System, as well as the estimated yield on a market value basis. Tables 7 and 8 provide the development of the actuarial value of assets and the estimated yield on an actuarial value basis.

Actuarial Gains/ (Losses)

The annual actuarial valuation is a snapshot analysis of the benefit liabilities, assets and funded position of the funds as of the first day of the plan year. In any one fiscal year, the experience can be better or worse from that which is assumed or expected. The actuarial assumptions do not necessarily attempt to model what the experience will be for any one given fiscal year, but instead try to model the overall experience over many years. Therefore, as long as the actual experience of a retirement system is reasonably close to the current assumptions, the long-term funding requirements of the system will remain relatively consistent.

Below are tables that separately show a reconciliation of the actuarial gains / (losses) since the prior actuarial valuation for the retirement and health insurance funds, which include the effect of asset and liability gains and losses, changes in assumptions, changes in plan provisions, etc.

Retirement Experience Gain or (Loss)
(Dollar amounts expressed in thousands)

	Non-Hazardous	Hazardous
A. Calculation of total actuarial gain or loss		
1. Unfunded actuarial accrued liability (UAAL), previous year	$ 7,306,586	$ 2,870,259
2. Normal cost and administrative expenses	293,292	108,291
3. Less: contributions for the year	(644,411)	(231,679)
4. Interest accrual	445,689	175,535
5. Expected UAAL (Sum of Items 1 - 4)	$ 7,401,156	$ 2,922,406
6. Actual UAAL as of June 30,2020	$ 7,390,261	$ 2,983,414
7. Total gain (loss) for the year (Item 5 - Item 6)	$ 10,895	$ (61,008)
B. Source of gains and losses		
8. Asset gain (loss) for the year	$ (74,844)	$ (24,187)
9. Liability experience gain (loss) for the year	85,739	(36,821)
10. Plan Change	—	—
11. Assumption change	—	—
12. Total	$ 10,895	$ (61,008)

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Actuarial Gains/ (Losses) (Continued)

Insurance Experience Gain or (Loss)
(Dollar amounts expressed in thousands)

	Non-Hazardous	Hazardous
A. Calculation of total actuarial gain or loss		
1. Unfunded actuarial accrued liability (UAAL), previous year	$ 1,044,698	$ 419,220
2. Normal cost and administrative expenses	85,942	33,102
3. Less: contributions for the year	(142,231)	(60,659)
4. Interest accrual	63,535	25,340
5. Expected UAAL (Sum of Items 1 - 4)	$ 1,051,944	$ 417,003
6. Actual UAAL as of June 30,2020	$ 730,734	$ 378,943
7. Total gain (loss) for the year (Item 5 - Item 6)	$ 321,210	$ 38,060
B. Source of gains and losses		
8. Asset gain (loss) for the year	$ (22,635)	$ (11,137)
9. Liability experience gain (loss) for the year	343,845	49,197
10. Plan Change	—	—
11. Assumption change	—	—
12. Total	$ 321,210	$ 38,060

The liability experience gains shown above include a $296 million gain for the non-hazardous fund and a $98 million gain for the hazardous fund due to the funds' favorable premium experience and corresponding healthcare trend assumption change. See the discussion in the Executive Summary for additional information.

Actuarial Assumptions and Methods

In determining costs and liabilities, actuaries use assumptions about the future, such as rates of salary increase, probabilities of retirement, termination, death and disability, and an annual investment return assumption. The Board of Trustees, in consultation with the actuary, sets the actuarial assumptions and methods used in the actuarial valuation. An experience study was conducted after the June 30, 2018 actuarial valuation and the Board adopted updated assumptions for first use in the June 30, 2019 actuarial valuation.

In conjunction with the review of the healthcare per capita claims cost, the assumed increase in future healthcare costs, or trend assumption, is reviewed on an annual basis. The trend assumption was updated since the June 30, 2019 valuation to better reflect the plan's anticipated long-term healthcare cost increases. There were no other changes in actuarial assumptions since the prior valuation.

It is our opinion that the assumptions are internally consistent, reasonable, and reflect anticipated future experience of the System. Appendix A includes a summary of the actuarial assumptions and methods used in this valuation.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. This report does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

Benefit Provisions

Appendix B of this report includes a summary of the major benefit provisions for System.

House Bill 271 passed during the 2020 legislative session and removed provisions that reduce the monthly payment to a surviving spouse of a member whose death was due to a duty-related injury upon remarriage of the spouse. It also increased benefits for a very small number of beneficiaries.

There were no other material plan provision changes since the prior valuation.

SECTION 3

ACTUARIAL TABLES

Actuarial Tables

RETIREMENT BENEFITS

ACTUARIAL TABLES

Development of Unfunded Actuarial Accrued Liability
Retirement Benefits

(Dollar amounts expressed in thousands)

		June 30, 2020	
		Non-Hazardous (1)	Hazardous (2)
1.	Projected payroll of active members	$ 2,565,391	$ 568,558
2.	Present value of future pay	$ 19,776,259	$ 4,919,883
3.	Normal cost rate		
	a. Total normal cost rate	10.59%	18.65%
	b. Less: member contribution rate	-5.00%	-8.00%
	c. Employer normal cost rate	5.59%	10.65%
4.	Actuarial accrued liability for active members		
	a. Present value of future benefits	$ 7,491,570	$ 2,679,974
	b. Less: present value of future normal costs	(1,968,939)	(854,766)
	c. Actuarial accrued liability	$ 5,522,631	$ 1,825,208
5.	Total actuarial accrued liability		
	a. Retirees and beneficiaries	$ 8,501,757	$ 3,537,224
	b. Inactive members	586,480	68,867
	c. Active members (Item 4c)	5,522,631	1,825,208
	d. Total	$ 14,610,868	$ 5,431,299
6.	Actuarial value of assets	$ 7,220,607	$ 2,447,885
7.	Unfunded actuarial accrued liability (UAAL) (Item 5d - Item 6)	$ 7,390,261	$ 2,983,414
8.	Funded Ratio	49.4%	45.1%

Actuarial Present Value of Future Benefits
Retirement Benefits
(Dollar amounts expressed in thousands)

		June 30, 2020	
		Non-Hazardous (1)	Hazardous (2)
1.	Active members		
	a. Service retirement	$ 6,616,570	$ 2,441,225
	b. Deferred termination benefits and refunds	440,168	102,105
	c. Survivor benefits	128,282	22,365
	d. Disability benefits	306,550	114,279
	e. Total	$ 7,491,570	$ 2,679,974
2.	Retired members		
	a. Service retirement	$ 7,524,849	$ 3,218,062
	b. Disability retirement	474,454	113,833
	c. Beneficiaries	502,454	205,329
	d. Total	$ 8,501,757	$ 3,537,224
3.	Inactive members		
	a. Vested terminations	$ 527,626	$ 61,864
	b. Nonvested terminations	58,854	7,003
	c. Total	$ 586,480	$ 68,867
4.	Total actuarial present value of future benefits	$ 16,579,807	$ 6,286,065

Development of Actuarially Determined Contribution Rate
Retirement Benefits

		June 30, 2020	
		Non-Hazardous (1)	Hazardous (2)
1.	Total normal cost rate		
	a. Service retirement	7.32%	14.86%
	b. Deferred termination benefits and refunds	2.20%	2.21%
	c. Survivor benefits	0.37%	0.29%
	d. Disability benefits	0.70%	1.29%
	e. Total	10.59%	18.65%
2.	Less: member contribution rate	-5.00%	-8.00%
3.	Total employer normal cost rate	5.59%	10.65%
4.	Administrative expenses	0.87%	0.35%
5.	Net employer normal cost rate	6.46%	11.00%
6.	UAAL amortization contribution	17.42%	32.23%
7.	Total calculated employer contribution	23.88%	43.23%

Actuarial Balance Sheet

Non-Hazardous Members Retirement

(Dollar amounts expressed in thousands)

		June 30, 2020 (1)	June 30, 2019 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 7,220,607	$ 7,049,527
	b. Present value of future member contributions	$ 988,813	$ 972,742
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 980,126	$ 1,006,165
	ii. Unfunded accrued liability contributions	7,390,261	7,306,586
	iii. Total future employer contributions	$ 8,370,387	$ 8,312,751
	d. Total assets	$ 16,579,807	$ 16,335,020
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 1,968,939	$ 1,978,907
	ii. Accrued liability	5,522,631	5,450,569
	iii. Total present value of future benefits	$ 7,491,570	$ 7,429,476
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 8,501,757	$ 8,350,811
	c. Present value of benefits payable on account of current inactive members	$ 586,480	$ 554,733
	d. Total liabilities	$ 16,579,807	$ 16,335,020

Actuarial Balance Sheet

Hazardous Members Retirement

(Dollar amounts expressed in thousands)

		June 30, 2020 (1)	June 30, 2019 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 2,447,885	$ 2,375,106
	b. Present value of future member contributions	$ 393,591	$ 376,964
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 461,175	$ 462,955
	ii. Unfunded accrued liability contributions	2,983,414	2,870,259
	iii. Total future employer contributions	$ 3,444,589	$ 3,333,214
	d. Total assets	$ 6,286,065	$ 6,085,284
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 854,766	$ 839,919
	ii. Accrued liability	1,825,208	1,845,411
	iii. Total present value of future benefits	$ 2,679,974	$ 2,685,330
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 3,537,224	$ 3,334,535
	c. Present value of benefits payable on account of current inactive members	$ 68,867	$ 65,419
	d. Total liabilities	$ 6,286,065	$ 6,085,284

Reconciliation of Retirement Net Assets

(Dollar amounts expressed in thousands)[1]

	Year Ending June 30, 2020 (1) Non-Hazardous	Year Ending June 30, 2020 (2) Hazardous
1. Value of assets at beginning of year	$ 7,159,921	$ 2,413,708
2. Revenue for the year		
a. Contributions		
i. Member contributions	$ 168,994	$ 63,236
ii. Employer contributions	475,311	168,201
iii. Other contributions (less 401h)	105	242
iv. Total	$ 644,411	$ 231,679
b. Income		
i. Interest, dividends, and other income	$ 164,244	$ 55,520
ii. Investment expenses	(30,369)	(9,169)
iii. Net	$ 133,875	$ 46,351
c. Net realized and unrealized gains (losses)	(77,697)	(30,437)
d. Total revenue	$ 700,589	$ 247,593
3. Expenditures for the year		
a. Disbursements		
i. Refunds	$ 14,919	$ 3,814
ii. Regular annuity benefits	795,960	275,802
iii. Other benefit payments	0	0
iv. Transfers to other systems	0	0
v. Total	$ 810,878	$ 279,616
b. Administrative expenses and depreciation	22,305	1,981
c. Total expenditures	$ 833,183	$ 281,597
4. Increase in net assets (Item 2. - Item 3.)	$ (132,594)	$ (34,004)
5. Value of assets at end of year (Item 1. + Item 4.)	$ 7,027,327	$ 2,379,704
6. Net external cash flow		
a. Dollar amount	$ (188,772)	$ (49,918)
b. Percentage of market value	-2.7%	-2.1%
7. Estimated annual return on net assets	0.8%	0.7%

[1] Amounts may not add due to rounding

[1] Excludes 401h assets

Development of Actuarial Value of Assets

Non-Hazardous Members Retirement

(Dollar amounts expressed in thousands)*

	Year Ending	June 30, 2020
1.	Actuarial value of assets at beginning of year	$ 7,049,527
2.	Market value of assets at beginning of year	$ 7,159,921
3.	Net new investments	
	a. Contributions	$ 644,411
	b. Benefit payments	(810,878)
	c. Administrative expenses	(22,305)
	d. Subtotal	$ (188,772)
4.	Market value of assets at end of year	$ 7,027,327
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$ 56,178
6.	Assumed investment return rate for fiscal year	6.25%
7.	Expected return for immediate recognition	$ 441,596
8.	Excess return for phased recognition	$ (385,418)

9. Phased-in recognition, 20% of excess return on assets for prior years:

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2020	$ (385,418)	$ (77,084)
b.	2019	(40,218)	(8,044)
c.	2018	163,357	32,671
d.	2017	369,213	73,843
e.	2016	(515,652)	(103,130)
f.	Total		$ (81,744)

10.	Actuarial value of assets as of June 30, 2020 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$ 7,220,607
11.	Ratio of actuarial value to market value	102.8%
12.	Estimated annual return on actuarial value of assets	5.2%

* Amounts may not add due to rounding

Development of Actuarial Value of Assets

Hazardous Members Retirement

(Dollar amounts expressed in thousands)*

	Year Ending		June 30, 2020
1.	Actuarial value of assets at beginning of year	$	2,375,106
2.	Market value of assets at beginning of year	$	2,413,708
3.	Net new investments		
	a. Contributions	$	231,679
	b. Benefit payments		(279,616)
	c. Administrative expenses		(1,981)
	d. Subtotal	$	(49,918)
4.	Market value of assets at end of year	$	2,379,704
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	15,914
6.	Assumed investment return rate for fiscal year		6.25%
7.	Expected return for immediate recognition	$	149,297
8.	Excess return for phased recognition	$	(133,383)
9.	Phased-in recognition, 20% of excess return on assets for prior years:		

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2020	$ (133,383)	$ (26,677)
b.	2019	(12,449)	(2,490)
c.	2018	54,598	10,920
d.	2017	120,774	24,155
e.	2016	(162,540)	(32,508)
f.	Total		$ (26,600)

10.	Actuarial value of assets as of June 30, 2020 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	2,447,885
11.	Ratio of actuarial value to market value		102.9%
12.	Estimated annual return on actuarial value of assets		5.2%

* Amounts may not add due to rounding

Schedule of Funding Progress
Retirement Benefits
(Dollar amounts expressed in thousands)

June 30,	Actuarial Value of Assets (AVA)	Actuarial Accrued Liability (AAL)	Unfunded Actuarial Accrued Liability (UAAL) (3) - (2)	Funded Ratio (2)/(3)	Annual Covered Payroll	UAAL as % of Payroll (4)/(6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Non-Hazardous Members			
2011	$ 5,629,611	$ 8,918,085	$ 3,288,474	63.1%	$ 2,276,596	144.4%
2012	5,547,236	9,139,568	3,592,332	60.7%	2,236,546	160.6%
2013	5,637,094	9,378,876	3,741,782	60.1%	2,236,277	167.3%
2014	6,117,134	9,772,523	3,655,389	62.6%	2,272,270	160.9%
2015	6,474,849	10,740,325	4,265,477	60.3%	2,296,716	185.7%
2016	6,535,372	11,076,457	4,541,084	59.0%	2,352,762	193.0%
2017	6,764,873	12,803,510	6,038,637	52.8%	2,452,407	246.2%
2018	6,950,225	13,191,505	6,241,280	52.7%	2,466,801	253.0%
2019	7,049,527	14,356,113	7,306,586	49.1%	2,521,860	289.7%
2020	7,220,607	14,610,868	7,390,261	49.4%	2,565,391	288.1%
			Hazardous Members			
2011	$ 1,779,545	$ 2,859,041	$ 1,079,496	62.2%	$ 466,964	231.2%
2012	1,747,379	3,009,992	1,262,613	58.1%	464,229	272.0%
2013	1,801,691	3,124,206	1,322,514	57.7%	461,673	286.5%
2014	1,967,640	3,288,826	1,321,186	59.8%	479,164	275.7%
2015	2,096,783	3,613,308	1,516,525	58.0%	483,641	313.6%
2016	2,139,119	3,704,456	1,565,337	57.7%	492,851	317.6%
2017	2,238,320	4,649,047	2,410,727	48.1%	541,633	445.1%
2018	2,321,721	4,792,548	2,470,827	48.4%	533,618	463.0%
2019	2,375,106	5,245,365	2,870,259	45.3%	559,353	513.1%
2020	2,447,885	5,431,299	2,983,414	45.1%	568,558	524.7%
			Total CERS Members			
2011	$ 7,409,156	$ 11,777,126	$ 4,367,970	62.9%	$ 2,743,560	159.2%
2012	7,294,615	12,149,560	4,854,945	60.0%	2,700,775	179.8%
2013	7,438,785	12,503,082	5,064,297	59.5%	2,697,950	187.7%
2014	8,084,774	13,061,349	4,976,575	61.9%	2,751,434	180.9%
2015	8,571,632	14,353,633	5,782,001	59.7%	2,780,357	208.0%
2016	8,674,491	14,780,913	6,106,422	58.7%	2,845,613	214.6%
2017	9,003,193	17,452,557	8,449,364	51.6%	2,994,040	282.2%
2018	9,271,946	17,984,053	8,712,107	51.6%	3,000,419	290.4%
2019	9,424,633	19,601,478	10,176,845	48.1%	3,081,213	330.3%
2020	9,668,492	20,042,167	10,373,675	48.2%	3,133,949	331.0%

Summary of Principal Assumptions and Methods

Below is a summary of the principal economic assumptions, cost method, and the method for financing the unfunded actuarial accrued liability:

	Non-Hazardous	Hazardous
Valuation date:	June 30, 2020	June 30, 2020
Actuarial cost method:	Entry Age Normal	Entry Age Normal
Amortization method:	Level percentage of payroll (2% payroll growth assumed)	Level percentage of payroll (2% payroll growth assumed)
Amortization period for contribution rate:	30-year closed period at June 30, 2019 Gains/losses incurring after 2019 will be amortized over separate closed 20-year amortization bases	30-year closed period at June 30, 2019 Gains/losses incurring after 2019 will be amortized over separate closed 20-year amortization bases
Asset valuation method:	5-Year Smoothed Market	5-Year Smoothed Market
Actuarial assumptions:		
Investment rate of return	6.25%	6.25%
Projected salary increases	3.30% to 10.30% (varies by service)	3.55% to 19.05% (varies by service)
Inflation	2.30%	2.30%
Post-retirement benefit adjustments	0.00%	0.00%
Retiree Mortality	System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from MP-2014 mortality improvement scale using a base year of 2019.	System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from MP-2014 mortality improvement scale using a base year of 2019.

Solvency Test
Retirement Benefits
(Dollar amounts expressed in thousands)

June 30,	Actuarial Accrued Liability: Active Member Contributions	Actuarial Accrued Liability: Retired Members & Beneficiaries	Actuarial Accrued Liability: Active Members (Employer Financed)	Valuation Assets	Portion of Aggregate Accrued Liabilities Covered by Assets: Active	Portion of Aggregate Accrued Liabilities Covered by Assets: Retired	Portion of Aggregate Accrued Liabilities Covered by Assets: ER Financed
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Hazardous Members							
2011	$ 1,110,967	$ 5,209,784	$ 2,597,334	$ 5,629,611	100.0%	86.7%	0.0%
2012	1,117,549	5,416,933	2,605,085	5,547,236	100.0%	81.8%	0.0%
2013	1,149,611	5,638,371	2,590,894	5,637,094	100.0%	79.6%	0.0%
2014	1,204,383	5,873,279	2,694,860	6,117,134	100.0%	83.6%	0.0%
2015	1,216,585	6,489,863	3,033,878	6,474,849	100.0%	81.0%	0.0%
2016	1,231,027	6,785,530	3,059,900	6,535,372	100.0%	78.2%	0.0%
2017	1,277,432	7,731,682	3,794,396	6,764,873	100.0%	71.0%	0.0%
2018	1,269,287	8,196,719	3,725,499	6,950,225	100.0%	69.3%	0.0%
2019	1,280,679	8,905,544	4,169,890	7,049,527	100.0%	64.8%	0.0%
2020	1,312,554	9,088,237	4,210,077	7,220,607	100.0%	65.0%	0.0%
Hazardous Members							
2011	$ 382,072	$ 1,768,512	$ 708,457	$ 1,779,545	100.0%	79.0%	0.0%
2012	381,672	1,889,884	738,435	1,747,379	100.0%	72.3%	0.0%
2013	390,471	1,988,030	745,705	1,801,691	100.0%	71.0%	0.0%
2014	415,070	2,077,517	796,239	1,967,640	100.0%	74.7%	0.0%
2015	422,359	2,297,703	893,246	2,096,783	100.0%	72.9%	0.0%
2016	428,713	2,388,712	887,031	2,139,119	100.0%	71.6%	0.0%
2017	458,808	2,910,601	1,279,638	2,238,320	100.0%	61.1%	0.0%
2018	442,637	3,151,058	1,198,853	2,321,721	100.0%	59.6%	0.0%
2019	458,559	3,399,954	1,386,852	2,375,106	100.0%	56.4%	0.0%
2020	454,801	3,606,091	1,370,407	2,447,885	100.0%	55.3%	0.0%

INSURANCE BENEFITS

ACTUARIAL TABLES

Development of Unfunded Actuarial Accrued Liability
Insurance Benefits

(Dollar amounts expressed in thousands)

		June 30, 2020	
		Non-Hazardous (1)	Hazardous (2)
1.	Projected payroll of active members	$ 2,565,391	$ 568,558
2.	Present value of future pay	$ 19,258,846	$ 4,938,999
3.	Normal cost rate		
	a. Total normal cost rate	3.17%	5.33%
	b. Less: member contribution rate	-0.52%	-0.51%
	c. Employer normal cost rate	2.65%	4.82%
4.	Actuarial accrued liability for active members		
	a. Present value of future benefits	$ 2,216,410	$ 783,282
	b. Less: present value of future normal costs	(570,484)	(196,700)
	c. Actuarial accrued liability	$ 1,645,926	$ 586,582
5.	Total actuarial accrued liability		
	a. Retirees and beneficiaries	$ 1,562,540	$ 1,133,807
	b. Inactive members	183,619	20,582
	c. Active members (Item 4c)	1,645,926	586,582
	d. Total	$ 3,392,085	$ 1,740,971
6.	Actuarial value of assets	$ 2,661,351	$ 1,362,028
7.	Unfunded actuarial accrued liability (UAAL) (Item 5d - Item 6)	$ 730,734	$ 378,943
8.	Funded Ratio	78.5%	78.2%

Development of Actuarially Determined Contribution Rate
Insurance Benefits

		June 30, 2020	
		Non-Hazardous (1)	Hazardous (2)
1.	Total normal cost rate	3.17%	5.33%
2.	Less: member contribution rate	-0.52%	-0.51%
3.	Total employer normal cost rate	2.65%	4.82%
4.	Administrative expenses	0.04%	0.08%
5.	Net employer normal cost rate	2.69%	4.90%
6.	UAAL amortization contribution	1.48%	3.83%
7.	Total calculated employer contribution Max (0%, item 5. + item6.)	4.17%	8.73%

Actuarial Balance Sheet

Non-Hazardous Members Insurance

(Dollar amounts expressed in thousands)

		June 30, 2020 (1)	June 30, 2019 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 2,661,351	$ 2,523,249
	b. Present value of future member contributions	$ 118,827	$ 106,109
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 451,657	$ 494,549
	ii. Unfunded accrued liability contributions	730,734	1,044,698
	iii. Total future employer contributions	$ 1,182,391	$ 1,539,247
	d. Total assets	$ 3,962,569	$ 4,168,605
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 570,484	$ 600,658
	ii. Accrued liability	1,645,926	1,737,255
	iii. Total present value of future benefits	$ 2,216,410	$ 2,337,913
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 1,562,540	$ 1,643,126
	c. Present value of benefits payable on account of current inactive members	$ 183,619	$ 187,566
	d. Total liabilities	$ 3,962,569	$ 4,168,605

Actuarial Balance Sheet

Hazardous Members Insurance

(Dollar amounts expressed in thousands)

		June 30, 2020 (1)	June 30, 2019 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 1,362,028	$ 1,313,659
	b. Present value of future member contributions	$ 34,978	$ 31,194
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 161,722	$ 172,736
	ii. Unfunded accrued liability contributions	378,943	419,220
	iii. Total future employer contributions	$ 540,665	$ 591,956
	d. Total assets	$ 1,937,671	$ 1,936,809
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 196,700	$ 203,930
	ii. Accrued liability	586,582	660,018
	iii. Total present value of future benefits	$ 783,282	$ 863,948
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 1,133,807	$ 1,053,842
	c. Present value of benefits payable on account of current inactive members	$ 20,582	$ 19,019
	d. Total liabilities	$ 1,937,671	$ 1,936,809

Reconciliation of Insurance Net Assets

(Dollar amounts expressed in thousands)[1]

	Year Ending June 30, 2020 (1) Non-Hazardous	Year Ending June 30, 2020 (2) Hazardous
1. Value of assets at beginning of year	$ 2,569,511	$ 1,340,714
2. Revenue for the year		
a. Contributions		
i. Member contributions	$ 12,964	$ 2,762
ii. Employer contributions	124,740	56,739
iii. Other contributions (less 401h)	4,528	1,158
iv. Total	$ 142,231	$ 60,659
b. Income		
i. Interest, dividends, and other income	$ 57,263	$ 29,830
ii. Investment expenses	(9,581)	(4,832)
iii. Net	$ 47,682	$ 24,999
c. Net realized and unrealized gains (losses)	(38,523)	(22,683)
d. Total revenue	$ 151,391	$ 62,974
3. Expenditures for the year		
a. Disbursements		
i. Refunds	$ 0	$ 0
ii. Healthcare premium subsidies	135,093	81,849
iii. Other benefit payments[2]	3,293	260
iv. Transfers to other systems	0	0
v. Total	$ 138,386	$ 82,110
b. Administrative expenses and depreciation	903	462
c. Total expenditures	$ 139,289	$ 82,571
4. Increase in net assets (Item 2. - Item 3.)	$ 12,102	$ (19,597)
5. Value of assets at end of year (Item 1. + Item 4.)	$ 2,581,613	$ 1,321,117
6. Net external cash flow		
a. Dollar amount	$ 2,942	$ (21,913)
b. Percentage of market value	0.1%	-1.6%
7. Estimated annual return on net assets	0.4%	0.2%

[1] Amounts may not add due to rounding and include 401h assets

[2] Benefit payments have been offset by Medicare Drug Reimbursements, Insurance Premiums, and Humana Gain Share Payments

Development of Actuarial Value of Assets

Non-Hazardous Members Insurance

(Dollar amounts expressed in thousands)*

	Year Ending	June 30, 2020
1.	Actuarial value of assets at beginning of year	$ 2,523,249
2.	Market value of assets at beginning of year	$ 2,569,511
3.	Net new investments	
	a. Contributions	$ 142,231
	b. Benefit payments	(138,386)
	c. Administrative expenses	(903)
	d. Subtotal	$ 2,942
4.	Market value of assets at end of year	$ 2,581,613
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$ 9,159
6.	Assumed investment return rate for fiscal year	6.25%
7.	Expected return for immediate recognition	$ 160,686
8.	Excess return for phased recognition	$ (151,527)
9.	Phased-in recognition, 20% of excess return on assets for prior years:	

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2020	$ (151,527)	$ (30,305)
b.	2019	(13,849)	(2,770)
c.	2018	63,800	12,760
d.	2017	121,364	24,273
e.	2016	(147,421)	(29,484)
f.	Total		$ (25,527)

10.	Actuarial value of assets as of June 30, 2020 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$ 2,661,351
11.	Ratio of actuarial value to market value	103.1%
12.	Estimated annual return on actuarial value of assets	5.4%

* Amounts may not add due to rounding

Development of Actuarial Value of Assets

Hazardous Members Insurance

(Dollar amounts expressed in thousands)*

	Year Ending	June 30, 2020
1.	Actuarial value of assets at beginning of year	$ 1,313,659
2.	Market value of assets at beginning of year	$ 1,340,714
3.	Net new investments	
	a. Contributions	$ 60,659
	b. Benefit payments	(82,110)
	c. Administrative expenses	(462)
	d. Subtotal	$ (21,913)
4.	Market value of assets at end of year	$ 1,321,117
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$ 2,316
6.	Assumed investment return rate for fiscal year	6.25%
7.	Expected return for immediate recognition	$ 83,110
8.	Excess return for phased recognition	$ (80,794)

9. Phased-in recognition, 20% of excess return on assets for prior years:

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2020	$ (80,794)	$ (16,159)
b.	2019	(6,320)	(1,264)
c.	2018	36,099	7,220
d.	2017	65,383	13,077
e.	2016	(78,507)	(15,701)
f.	Total		$ (12,828)

10.	Actuarial value of assets as of June 30, 2020 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$ 1,362,028
11.	Ratio of actuarial value to market value	103.1%
12.	Estimated annual return on actuarial value of assets	5.4%

* Amounts may not add due to rounding

Schedule of Funding Progress
Insurance Benefits
(Dollar amounts expressed in thousands)

June 30, (1)	Actuarial Value of Assets (AVA) (2)	Actuarial Accrued Liability (AAL) (3)	Unfunded Actuarial Accrued Liability (UAAL) (3) - (2) (4)	Funded Ratio (2)/(3) (5)	Annual Covered Payroll (6)	UAAL as % of Payroll (4)/(6) (7)
			Non-Hazardous Members			
2011	$ 1,433,451	$ 3,073,973	$ 1,640,522	46.6%	$ 2,276,596	72.1%
2012	1,512,854	2,370,771	857,917	63.8%	2,236,546	38.4%
2013	1,628,244	2,443,894	815,650	66.6%	2,236,277	36.5%
2014	1,831,199	2,616,915	785,715	70.0%	2,272,270	34.6%
2015	1,997,456	2,907,827	910,371	68.7%	2,296,716	39.6%
2016	2,079,811	2,988,121	908,310	69.6%	2,352,762	38.6%
2017	2,227,401	3,355,151	1,127,750	66.4%	2,452,407	46.0%
2018	2,371,430	3,092,624	721,194	76.7%	2,466,801	29.2%
2019	2,523,249	3,567,947	1,044,698	70.7%	2,521,860	41.4%
2020	2,661,351	3,392,085	730,734	78.5%	2,565,391	28.5%
			Hazardous Members			
2011	$ 770,790	$ 1,647,703	$ 876,912	46.8%	$ 466,964	187.8%
2012	829,041	1,364,843	535,802	60.7%	464,229	115.4%
2013	892,774	1,437,333	544,558	62.1%	461,673	118.0%
2014	997,733	1,493,864	496,131	66.8%	479,164	103.5%
2015	1,087,707	1,504,015	416,308	72.3%	483,641	86.1%
2016	1,135,784	1,558,818	423,034	72.9%	492,851	85.8%
2017	1,196,780	1,788,433	591,653	66.9%	541,633	109.2%
2018	1,256,306	1,684,028	427,722	74.6%	533,618	80.2%
2019	1,313,659	1,732,879	419,220	75.8%	559,353	74.9%
2020	1,362,028	1,740,971	378,943	78.2%	568,558	66.6%
			Total CERS Members			
2011	$ 2,204,241	$ 4,721,676	$ 2,517,435	46.7%	$ 2,743,560	91.8%
2012	2,341,895	3,735,614	1,393,719	62.7%	2,700,775	51.6%
2013	2,521,018	3,881,227	1,360,209	65.0%	2,697,950	50.4%
2014	2,828,932	4,110,779	1,281,847	68.8%	2,751,434	46.6%
2015	3,085,163	4,411,842	1,326,679	69.9%	2,780,357	47.7%
2016	3,215,595	4,546,939	1,331,344	70.7%	2,845,613	46.8%
2017	3,424,181	5,143,584	1,719,403	66.6%	2,994,040	57.4%
2018	3,627,736	4,776,652	1,148,916	75.9%	3,000,419	38.3%
2019	3,836,908	5,300,826	1,463,918	72.4%	3,081,213	47.5%
2020	4,023,379	5,133,056	1,109,677	78.4%	3,133,949	35.4%

Solvency Test
Insurance Benefits
(Dollar amounts expressed in thousands)

June 30,	Actuarial Accrued Liability: Active Member Contributions	Actuarial Accrued Liability: Retired Members & Beneficiaries	Actuarial Accrued Liability: Active Members (Employer Financed)	Valuation Assets	Portion of Aggregate Accrued Liabilities Covered by Assets: Active	Portion of Aggregate Accrued Liabilities Covered by Assets: Retired	Portion of Aggregate Accrued Liabilities Covered by Assets: ER Financed
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Hazardous Members							
2011	$ -	$ 1,460,808	$ 1,613,165	$ 1,433,451	100.0%	98.1%	0.0%
2012	-	1,146,908	1,223,864	1,512,854	100.0%	100.0%	29.9%
2013	-	1,205,599	1,238,295	1,628,244	100.0%	100.0%	34.1%
2014	-	1,318,183	1,298,732	1,831,199	100.0%	100.0%	39.5%
2015	-	1,372,597	1,535,231	1,997,456	100.0%	100.0%	40.7%
2016	-	1,484,937	1,503,184	2,079,811	100.0%	100.0%	39.6%
2017	-	1,603,438	1,751,713	2,227,401	100.0%	100.0%	35.6%
2018	-	1,525,323	1,567,301	2,371,430	100.0%	100.0%	54.0%
2019	-	1,830,692	1,737,255	2,523,249	100.0%	100.0%	39.9%
2020	-	1,746,159	1,645,926	2,661,351	100.0%	100.0%	55.6%
Hazardous Members							
2011	$ -	$ 771,631	$ 876,071	$ 770,790	100.0%	99.9%	0.0%
2012	-	575,099	789,744	829,041	100.0%	100.0%	32.2%
2013	-	660,955	776,377	892,774	100.0%	100.0%	29.9%
2014	-	700,312	793,553	997,733	100.0%	100.0%	37.5%
2015	-	790,714	713,301	1,087,707	100.0%	100.0%	41.6%
2016	-	879,360	679,458	1,135,784	100.0%	100.0%	37.7%
2017	-	994,764	793,669	1,196,780	100.0%	100.0%	25.5%
2018	-	1,001,717	682,311	1,256,306	100.0%	100.0%	37.3%
2019	-	1,072,861	660,018	1,313,659	100.0%	100.0%	36.5%
2020	-	1,154,389	586,582	1,362,028	100.0%	100.0%	35.4%

SECTION 4

AMORTIZATION BASES

Amortization of Unfunded Liability

Non-Hazardous Members Retirement

Valuation Year Base Established	Original Amortization Base	Remaining at June 30, 2020	Payments for FYE 2022	Funding Period at June 30, 2020
June 30, 2019	$ 7,306,586	$ 7,433,895	$ 450,552	29
June 30, 2020	(43,634)	(43,634)	5,304	20
Total		$ 7,390,261	$ 455,856	
Projected Payroll for FYE 2022			$ 2,616,699	
Amortization Payments as a Percentage of Payroll			17.42%	

Hazardous Members Retirement

Valuation Year Base Established	Original Amortization Base	Remaining at June 30, 2020	Payments for FYE 2022	Funding Period at June 30, 2020
June 30, 2019	$ 2,870,259	$ 2,941,831	$ 178,298	29
June 30, 2020	41,583	41,583	8,609	20
Total		$ 2,983,414	$ 186,907	
Projected Payroll for FYE 2022			$ 579,929	
Amortization Payments as a Percentage of Payroll			32.23%	

Note:
Budgeted contribution rates for FYE 2021 were known at the time of the June 30, 2020 Valuation. Amortization bases established at this valuation date was adjusted accordingly.

Amortization of Unfunded Liability

Non-Hazardous Members Insurance

Valuation Year Base Established	Original Amortization Base	Remaining at June 30, 2020	Payments for FYE 2022	Funding Period at June 30, 2020
June 30, 2019	$ 1,044,698	$ 1,063,380	$ 64,449	29
June 30, 2020	(332,646)	(332,646)	(26,161)	20
Total		$ 730,734	$ 38,288	

Projected Payroll for FYE 2022	$ 2,584,339
Amortization Payments as a Percentage of Payroll	1.48%

Hazardous Members Insurance

Valuation Year Base Established	Original Amortization Base	Remaining at June 30, 2020	Payments for FYE 2022	Funding Period at June 30, 2020
June 30, 2019	$ 419,220	$ 422,022	$ 25,578	29
June 30, 2020	(43,079)	(43,079)	(3,570)	20
Total		$ 378,943	$ 22,008	

Projected Payroll for FYE 2022	$ 574,057
Amortization Payments as a Percentage of Payroll	3.83%

Note:
Budgeted contribution rates for FYE 2021 were known at the time of the June 30, 2020 Valuation. Amortization bases established at this valuation date was adjusted accordingly.

SECTION 5

MEMBERSHIP INFORMATION

Membership Tables

Summary of Membership Data

(Total dollar amounts expressed in thousands)

		Non-Hazardous June 30, 2020 (1)	Hazardous June 30, 2020 (2)	Total June 30, 2020 (3)	Total June 30, 2019 (4)
1.	Active members				
a.	Males	29,390	8,403	37,793	37,610
b.	Females	51,860	1,016	52,876	53,370
c.	Total members	81,250	9,419	90,669	90,980
d.	Total annualized prior year salaries	$ 2,565,391	$ 568,558	$ 3,133,949	$ 3,081,213
e.	Average salary[2]	$ 31,574	$ 60,363	$ 34,565	$ 33,867
f.	Average age	47.8	38.4	46.8	46.7
g.	Average service	9.1	10.0	9.2	9.2
h.	Member contributions with interest	$ 1,312,554	$ 454,801	$ 1,767,355	$ 1,739,238
i.	Average contributions with interest[2]	$ 16,155	$ 48,285	$ 19,492	$ 19,117
2.	Vested inactive members[1]				
a.	Number	50,599	1,767	52,366	52,550
b.	Total annual deferred benefits	$ 79,948	$ 7,643	$ 87,591	$ 84,783
c.	Average annual deferred benefit[2]	$ 1,580	$ 4,325	$ 1,673	$ 1,613
d.	Average age at the valuation date	52.9	45.8	52.7	52.1
3.	Nonvested inactive members[1]				
a.	Number	45,093	1,823	46,916	42,415
b.	Total member contributions with interest	$ 55,824	$ 6,533	$ 62,357	$ 53,574
c.	Average contributions with interest[2]	$ 1,238	$ 3,584	$ 1,329	$ 1,263
4.	Service retirees				
a.	Number	55,440	8,639	64,079	62,768
b.	Total annual benefits	$ 660,553	$ 245,663	$ 906,216	$ 875,847
c.	Average annual benefit[2]	$ 11,915	$ 28,437	$ 14,142	$ 13,954
d.	Average age at the valuation date	70.7	62.1	69.6	69.4
5.	Disabled retirees				
a.	Number	4,028	565	4,593	4,774
b.	Total annual benefits	$ 46,502	$ 9,547	$ 56,049	$ 57,986
c.	Average annual benefit[2]	$ 11,545	$ 16,898	$ 12,203	$ 12,146
d.	Average age at the valuation date	65.9	57.6	64.9	64.5
6.	Beneficiaries				
a.	Number	5,946	1,248	7,194	7,020
b.	Total annual benefits	$ 56,404	$ 19,581	$ 75,985	$ 72,097
c.	Average annual benefit[2]	$ 9,486	$ 15,690	$ 10,562	$ 10,270
d.	Average age at the valuation date	68.1	58.5	66.5	66.6

[1] Vested inactive member section includes Tier 1 members eligible for a benefit equal to the actuarially equivalent of two times the member's contribution balance.

[2] Average dollar amounts shown are expresed to the dollar.

Summary of Historical Active Membership

	Active Members		Covered Payroll[1]		Average Annual Pay	
June 30,	Number	Percent Increase /(Decrease)	Amount in Thousands	Percent Increase /(Decrease)	Amount	Percent Increase /(Decrease)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Non-Hazardous Members			
2011	85,285		$ 2,276,596		$ 26,694	
2012	83,052	-2.6%	2,236,546	-1.8%	26,929	0.9%
2013	81,815	-1.5%	2,236,277	0.0%	27,333	1.5%
2014	81,115	-0.9%	2,272,270	1.6%	28,013	2.5%
2015	80,852	-0.3%	2,296,716	1.1%	28,406	1.4%
2016	80,664	-0.2%	2,352,762	2.4%	29,167	2.7%
2017	82,198	1.9%	2,452,407	4.2%	29,835	2.3%
2018	81,818	-0.5%	2,466,801	0.6%	30,150	1.1%
2019	81,506	-0.4%	2,521,860	2.2%	30,941	2.6%
2020	81,250	-0.3%	2,565,391	1.7%	31,574	2.0%
			Hazardous Members			
2011	9,407		$ 466,964		$ 49,640	
2012	9,130	-2.9%	464,229	-0.6%	50,847	2.4%
2013	9,123	-0.1%	461,673	-0.6%	50,605	-0.5%
2014	9,194	0.8%	479,164	3.8%	52,117	3.0%
2015	9,172	-0.2%	483,641	0.9%	52,730	1.2%
2016	9,084	-1.0%	492,851	1.9%	54,255	2.9%
2017	9,495	4.5%	541,633	9.9%	57,044	5.1%
2018	9,263	-2.4%	533,618	-1.5%	57,607	1.0%
2019	9,474	2.3%	559,353	4.8%	59,041	2.5%
2020	9,419	-0.6%	568,558	1.6%	60,363	2.2%

[1] Covered payroll is the annualized, projected compensation for the following year and does not include payroll attributable to working retirees.

Distribution of Active Members by Age and by Years of Service

Non-Hazardous Members

Attained Age	Years of Credited Service												
	0	1	2	3	4	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over	Total
	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.
Under 20	134	7	1	1	1	0	0	0	0	0	0	0	144
	$13,998	$23,814	$14,403	$26,876	$13,611	$0	$0	$0	$0	$0	$0	$0	$14,565
20-24	1,442	761	326	150	46	19	0	0	0	0	0	0	2,744
	$18,364	$24,110	$26,935	$28,377	$30,663	$39,594	$0	$0	$0	$0	$0	$0	$21,876
25-29	1,446	1,195	855	622	405	631	8	0	0	0	0	0	5,162
	$20,919	$26,009	$28,647	$31,486	$32,439	$35,670	$36,749	$0	$0	$0	$0	$0	$27,382
30-34	1,230	1,115	878	713	588	1,506	447	10	0	0	0	0	6,487
	$19,907	$25,862	$28,104	$28,706	$31,331	$37,227	$42,863	$39,983	$0	$0	$0	$0	$29,676
35-39	1,162	1,091	911	695	581	1,787	1,110	476	27	0	0	0	7,840
	$20,165	$24,690	$26,648	$28,812	$29,778	$34,510	$43,399	$46,184	$57,224	$0	$0	$0	$31,293
40-44	1,054	1,006	857	739	633	2,101	1,376	1,104	499	18	0	0	9,387
	$20,749	$25,211	$26,836	$27,851	$29,554	$33,131	$40,662	$46,381	$50,219	$61,997	$0	$0	$33,286
45-49	872	804	673	639	583	2,232	1,809	1,447	1,040	272	4	0	10,375
	$20,820	$26,232	$26,383	$28,596	$28,432	$31,268	$35,872	$41,975	$50,703	$59,737	$110,676	$0	$34,380
50-54	781	803	604	576	522	2,070	1,995	2,008	1,546	490	57	8	11,460
	$20,797	$27,470	$27,870	$29,856	$29,315	$31,077	$34,318	$36,762	$43,294	$52,895	$63,402	$94,026	$34,159
55-59	635	725	520	501	463	1,969	1,999	2,260	2,003	648	125	40	11,888
	$19,637	$25,539	$25,667	$28,243	$29,098	$31,350	$34,260	$33,957	$37,109	$45,862	$60,338	$63,180	$33,061
60-64	476	517	405	431	363	1,579	1,545	1,680	1,438	649	124	51	9,258
	$17,936	$21,810	$25,980	$25,744	$25,464	$29,696	$32,669	$34,996	$35,759	$41,751	$47,641	$62,893	$31,807
65 & Over	535	452	342	308	264	1,365	1,147	985	589	338	118	62	6,505
	$12,620	$19,446	$18,941	$21,472	$22,650	$24,642	$28,662	$33,078	$35,092	$38,956	$41,362	$57,104	$27,050
Total	9,767	8,476	6,372	5,375	4,449	15,259	11,436	9,970	7,142	2,415	428	161	81,250
	$19,509	$25,066	$26,706	$28,329	$29,123	$31,914	$35,744	$37,740	$40,981	$46,900	$52,306	$62,282	$31,574

Distribution of Active Members by Age and by Years of Service

Hazardous Members

Attained Age	Years of Credited Service												
	0	1	2	3	4	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over	Total
	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.
Under 20	9	0	0	0	0	0	0	0	0	0	0	0	9
	$20,363	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$20,363
20-24	218	157	79	29	11	0	0	0	0	0	0	0	494
	$35,121	$46,640	$46,299	$46,427	$53,082	$0	$0	$0	$0	$0	$0	$0	$41,633
25-29	193	245	270	240	182	250	1	0	0	0	0	0	1,381
	$35,538	$47,909	$51,243	$51,695	$51,800	$55,061	$39,186	$0	$0	$0	$0	$0	$49,291
30-34	98	138	169	161	159	841	203	1	0	0	0	0	1,770
	$34,963	$48,022	$49,810	$53,342	$52,650	$59,517	$63,998	$51,002	$0	$0	$0	$0	$55,665
35-39	58	59	52	77	67	490	692	218	9	1	0	0	1,723
	$37,280	$48,546	$50,371	$52,542	$53,793	$59,804	$67,644	$71,054	$75,457	$101,515	$0	$0	$62,495
40-44	25	31	27	36	40	210	408	600	166	8	0	0	1,551
	$40,744	$45,327	$48,130	$52,749	$52,305	$57,528	$66,429	$71,499	$82,299	$91,668	$0	$0	$67,178
45-49	21	15	21	21	27	102	236	401	306	69	3	0	1,222
	$39,383	$38,070	$43,333	$38,886	$53,338	$55,018	$64,378	$70,155	$82,435	$90,610	$121,159	$0	$69,838
50-54	12	10	15	17	9	72	147	213	138	50	11	0	694
	$43,764	$55,233	$42,634	$44,357	$50,292	$54,190	$61,941	$67,196	$79,613	$87,861	$102,655	$0	$67,366
55-59	4	4	8	8	10	30	93	108	54	32	8	4	363
	$40,625	$48,979	$49,403	$49,565	$50,826	$49,789	$64,758	$67,342	$70,332	$81,702	$88,542	$103,011	$66,062
60-64	2	7	2	2	1	17	36	37	13	7	4	3	131
	$48,946	$46,583	$30,365	$56,617	$39,606	$52,983	$63,644	$64,731	$65,975	$79,958	$68,997	$100,476	$62,743
65 & Over	1	1	2	2	3	6	23	24	11	3	1	4	81
	$26,709	$39,575	$44,321	$42,336	$68,929	$44,342	$53,479	$66,618	$81,244	$55,104	$67,232	$93,849	$62,258
Total	641	667	645	593	509	2,018	1,839	1,602	697	170	27	11	9,419
	$35,796	$47,439	$49,495	$51,351	$52,508	$58,166	$65,680	$70,007	$80,490	$87,173	$94,231	$98,988	$60,363

Distribution of Annuitant Monthly Benefit by Status and Age
Non-Hazardous Retirees and Beneficiaries
(Dollar amounts expressed in thousands)

	Retirement		Disability		Survivors & Beneficiaries		Total	
Current Age	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Under 50	290	$ 6,457	158	$ 1,733	713	$ 5,856	1,161	$ 14,046
50 - 54	1,096	24,760	287	3,669	272	2,495	1,655	30,924
55 - 59	4,005	69,577	565	7,528	442	4,449	5,012	81,554
60 - 64	8,648	126,306	924	11,303	692	7,820	10,264	145,429
65 - 69	13,169	161,162	811	9,439	829	8,641	14,809	179,242
70 - 74	12,231	130,492	619	6,637	923	9,248	13,773	146,378
75 - 79	7,935	75,399	393	3,869	775	7,470	9,103	86,738
80 - 84	4,803	42,262	199	1,780	649	5,681	5,651	49,723
85 - 89	2,277	17,731	60	466	409	3,223	2,746	21,421
90 And Over	986	6,408	12	77	242	1,521	1,240	8,006
Total	**55,440**	**$ 660,553**	**4,028**	**$ 46,502**	**5,946**	**$ 56,404**	**65,414**	**$ 763,459**

*Amounts may not add due to rounding

Distribution of Annuitant Monthly Benefit by Status and Age
Hazardous Retirees and Beneficiaries
(Dollar amounts expressed in thousands)

	Retirement		Disability		Survivors & Beneficiaries		Total	
Current Age	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Under 50	1,034	$ 35,186	144	$ 2,574	305	$ 2,991	1,483	$ 40,752
50 - 54	1,287	42,979	95	1,716	85	1,280	1,467	45,975
55 - 59	1,484	46,638	103	1,858	112	1,971	1,699	50,467
60 - 64	1,390	37,765	80	1,232	143	2,350	1,613	41,346
65 - 69	1,520	40,351	86	1,325	186	3,466	1,792	45,143
70 - 74	1,065	24,545	37	580	169	3,107	1,271	28,232
75 - 79	534	11,337	15	197	116	2,240	665	13,774
80 - 84	241	4,958	1	33	85	1,376	327	6,367
85 - 89	68	1,567	4	31	39	675	111	2,274
90 And Over	16	336	0	0	8	124	24	460
Total	**8,639**	**$ 245,663**	**565**	**$ 9,547**	**1,248**	**$ 19,581**	**10,452**	**$ 274,791**

*Amounts may not add due to rounding

Non-Hazardous Retired Lives Summary

Form of Payment	Male Lives Number	Male Lives Monthly Benefit Amount	Female Lives Number	Female Lives Monthly Benefit Amount	Total Number	Total Monthly Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Basic	6,264	$ 6,608,007	22,989	$ 17,424,343	29,253	$ 24,032,350
Joint & Survivor:						
100% to Beneficiary	4,135	4,780,196	2,595	1,754,289	6,730	6,534,485
66 2/3% to Beneficiary	877	1,650,162	765	836,477	1,642	2,486,639
50% to Beneficiary	1,222	2,022,028	1,901	2,213,958	3,123	4,235,987
Pop-up Option	4,379	7,135,639	4,305	4,636,690	8,684	11,772,329
Social Security Option:						
Age 62 Basic	236	398,826	541	573,642	777	972,468
Age 62 Survivorship	582	1,025,354	371	373,903	953	1,399,257
Partial Deferred (Old Plan)	0	0	0	0	0	0
Widows Age 60	0	0	0	0	0	0
5 Years Certain	0	0	0	0	0	0
10 Years Certain	0	0	0	0	0	0
10 Years Certain & Life	1,468	1,627,524	3,783	3,009,629	5,251	4,637,153
15 Years Certain & Life	661	705,867	1,021	784,673	1,682	1,490,540
20 Years Certain & Life	500	709,812	873	650,272	1,373	1,360,084
Total:	20,324	$ 26,663,415	39,144	$ 32,257,877	59,468	$ 58,921,292

Hazardous Retired Lives Summary

Form of Payment	Male Lives Number	Male Lives Monthly Benefit Amount	Female Lives Number	Female Lives Monthly Benefit Amount	Total Number	Total Monthly Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Basic	1,319	$ 2,742,066	407	$ 654,721	1,726	$ 3,396,787
Joint & Survivor:						
100% to Beneficiary	1,373	2,943,928	66	91,305	1,439	3,035,232
66 2/3% to Beneficiary	366	940,136	22	50,915	388	991,051
50% to Beneficiary	508	1,265,399	60	135,790	568	1,401,189
Pop-up Option	3,683	9,715,352	178	385,770	3,861	10,101,122
Social Security Option:						
Age 62 Basic	108	163,958	12	10,106	120	174,064
Age 62 Survivorship	287	481,764	20	35,162	307	516,926
Partial Deferred (Old Plan)	0	0	0	0	0	0
Widows Age 60	0	0	0	0	0	0
5 Years Certain	0	0	0	0	0	0
10 Years Certain	107	246,491	5	7,092	112	253,583
10 Years Certain & Life	260	564,764	73	133,635	333	698,398
15 Years Certain & Life	108	212,018	21	36,626	129	248,644
20 Years Certain & Life	190	401,059	31	49,480	221	450,539
Total:	8,309	$ 19,676,934	895	$ 1,590,602	9,204	$ 21,267,537

Non-Hazardous Beneficiary Lives Summary

Form of Payment	Male Lives Number	Male Lives Monthly Benefit Amount	Female Lives Number	Female Lives Monthly Benefit Amount	Total Number	Total Monthly Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Basic	27	$ 9,831	62	$ 55,941	89	$ 65,772
Joint & Survivor:						
100% to Beneficiary	526	323,097	2,037	1,467,329	2,563	1,790,426
66 2/3% to Beneficiary	76	48,055	278	231,953	354	280,008
50% to Beneficiary	171	74,838	419	250,587	590	325,425
Pop-up Option	266	231,748	904	972,183	1,170	1,203,931
Social Security Option:						
Age 62 Basic	1	1,291	5	4,806	6	6,097
Age 62 Survivorship	31	20,204	167	208,269	198	228,473
Partial Deferred (Old Plan)	0	0	0	0	0	0
Widows Age 60	0	0	0	0	0	0
5 Years Certain	104	78,585	96	68,924	200	147,509
10 Years Certain	150	102,304	180	148,376	330	250,679
10 Years Certain & Life	76	57,008	110	102,921	186	159,928
15 Years Certain & Life	46	41,283	89	79,008	135	120,291
20 Years Certain & Life	45	32,193	80	89,593	125	121,786
Total:	1,519	$ 1,020,436	4,427	$ 3,679,888	5,946	$ 4,700,325

Hazardous Beneficiary Lives Summary

Form of Payment	Male Lives Number	Male Lives Monthly Benefit Amount	Female Lives Number	Female Lives Monthly Benefit Amount	Total Number	Total Monthly Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Basic	20	$ 10,150	84	$ 93,935	104	$ 104,084
Joint & Survivor:						
100% to Beneficiary	32	22,251	340	424,831	372	447,083
66 2/3% to Beneficiary	1	329	60	88,723	61	89,052
50% to Beneficiary	11	8,029	103	97,538	114	105,567
Pop-up Option	44	28,380	350	612,516	394	640,896
Social Security Option:						
Age 62 Basic	0	0	0	0	0	0
Age 62 Survivorship	0	0	111	153,832	111	153,832
Partial Deferred (Old Plan)	0	0	0	0	0	0
Widows Age 60	0	0	3	2,669	3	2,669
5 Years Certain	5	7,497	4	4,210	9	11,708
10 Years Certain	18	19,240	21	19,931	39	39,171
10 Years Certain & Life	3	4,651	11	9,344	14	13,995
15 Years Certain & Life	4	1,224	5	6,879	9	8,103
20 Years Certain & Life	3	1,645	15	13,909	18	15,554
Total:	141	$ 103,396	1,107	$ 1,528,318	1,248	$ 1,631,714

Schedule of Retirants Added to And Removed from Rolls

(Dollar amounts except average allowance expressed in thousands)

Year Ended	Added to Rolls	Removed from Rolls	Rolls End of the Year		% Increase in Annual Benefit	Average Annual Benefit
	Number	Number	Number	Annual Benefits		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non-Hazardous						
2011	3,250	1,077	43,211	$ 483,594		$ 11,191
2012	3,300	1,207	45,304	515,008	6.5%	11,368
2013	3,570	1,198	47,676	557,979	8.3%	11,704
2014	3,480	1,221	49,935	582,958	4.5%	11,674
2015	4,020	1,304	52,651	617,551	5.9%	11,729
2016	4,409	721	56,339	661,217	7.1%	11,736
2017	4,141	1,467	59,013	667,468	0.9%	11,311
2018	4,650	1,725	61,938	710,374	6.4%	11,469
2019	4,472	1,871	64,539	747,117	5.2%	11,576
2020	3,550	2,675	65,414	763,459	2.2%	11,671
Hazardous						
2011	502	102	6,468	$ 160,259		$ 24,777
2012	483	73	6,878	173,221	8.1%	25,185
2013	519	104	7,293	182,635	5.4%	25,043
2014	469	116	7,646	191,008	4.6%	24,981
2015	526	138	8,034	202,153	5.8%	25,162
2016	604	75	8,563	215,302	6.5%	25,143
2017	576	141	8,998	226,681	5.3%	25,192
2018	779	190	9,587	245,675	8.4%	25,626
2019	608	172	10,023	258,813	5.3%	25,822
2020	621	192	10,452	274,791	6.2%	26,291

SECTION 6

ASSESSMENT AND DISCLOSURE OF RISK

Risks Associated with Measuring the Accrued Liability And Actuarially Determined Contribution

(As Required by ASOP No. 51)

The determination of CERS's accrued liability and actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. The risk measures illustrated in this section are intended to aid stakeholders in understanding the effects of future experience differing from the assumptions used in performing an actuarial valuation. These risk measures may also help with illustrating the potential volatility in the funded status and actuarially determined contributions that result from differences between actual experience and the expected experience based on the actuarial assumptions.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience (economic and demographic) differing from the assumptions, changes in assumptions due to changing conditions, changes in contribution requirements due to modifications to the funding policy, and changes in the liability and cost due to changes in plan provisions or applicable law. The scope of this actuarial valuation does not include any analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the System's future financial condition include:

- Investment risk – actual investment returns may differ from expected returns;
- Longevity risk – members may live longer or shorter than expected and receive pensions for a time period different than assumed;
- Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future contributions differing from expected;
- Salary and payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liabilities or contributions differing from expected;
- Asset/Liability mismatch – changes in assets may be inconsistent with changes in liabilities, thereby altering the relative difference between the assets and liabilities which may alter the funded status and contribution requirements;
- Contribution risk – actual contributions may differ from expected future contributions (for example, actual contributions not being paid in accordance with the System's funding policy, withdrawal liability assessments or other anticipated payments to the plan are not being paid, or material changes occurring in the anticipated number of covered employees, covered payroll, or another relevant contribution base).

Effects of certain experience can generally be anticipated. For example, if investment returns since the most recent actuarial valuation is less (or more) than the assumed rate of return, then the funded status of the plan can be expected to decrease (or increase) more than anticipated.

The contribution rate in this report was established in accordance with applicable Statutes and assumptions adopted by the Board. However, stakeholders should be aware that the scheduled contribution rates specified in State Code do not necessarily guarantee that the contribution requirements will not increase in a future year.

Employer Risk with Contribution Rates

Currently KRS collects contributions from participating employers based on the employer's total payroll of employees who are earning benefits in CERS (i.e. covered payroll). The actuarially determined contribution rate is comprised of two components - the normal cost rate (to pay for the benefits accruing in the next year) and the unfunded amortization (to pay for the benefits accrued by members in previous years). The unfunded amortization is calculated by first determining the dollar amount necessary to pay for the unfunded liability based on KRS's funding policy, and then by dividing that dollar amount by expected covered payroll to convert that contribution requirement to a percentage of payroll (i.e. a contribution rate).

As the contribution requirement, as a percentage of payroll, increases then there is increased incentive for participating employers to make deliberate business action to reduce their payroll reported to the System in order to reduce their pension cost.

Plan Specific Risk Measures

Risks faced by a pension plan evolve over time. A relatively new plan with virtually no assets and paying few benefits will experience lower investment risk than a mature plan with a significant amount of assets and large number of members receiving benefits. There are a few measures that can assist stakeholders in understanding and comparing the maturity of a plan to other systems, which include:

- Ratio of market value of assets to payroll: The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. If assets are approximately the same as covered payroll, an investment return that is 5% different than assumed would equal 5% of payroll. In another example, if the assets are approximately twice as large as covered payroll, an investment return that is 5% different than assumed would equal 10% of payroll. A ratio that increases over time generally indicates the potential of an increasing volatility in employer contribution rates as a percentage of payroll.
- Ratio of actuarial accrued liability to payroll: The ratio of actuarial accrued liability to payroll can be used as a measure to indicate the potential volatility of contributions due to volatility in the liability experience. For instance, if the actuarial accrued liability is 5 times the size of the covered payroll, then a change in the liability that is 2% different than expected would be a change in magnitude that is 10% of payroll. A ratio that increases over time generally indicates the potential of an increasing volatility in employer contribution rates as a percentage of payroll.
- Percentage of Expected Contributions Actually Received: This measure identifies the percentage difference between the contributions the fund expects to receive during the fiscal year to and actual contributions received by the fund during the fiscal year. A percentage that is less than 100% means that actual contributions the fund received were less than the expected contributions determined by a prior actuarial valuation. On the other hand, a percentage that is greater than 100% means that actual contributions the fund received were more than the expected contributions.

- Ratio of active to retired members: A relatively mature open plan is likely to have close to the same number of actives to retirees resulting in a ratio that is around 1.0. On the other hand, a super-mature plan, or a plan that is closed to new entrants will have more retirees than active members resulting in a ratio below 1.0. As this ratio declines, a larger portion of the total actuarial accrued liability in the System is attributable to retirees. This metric also typically moves in tandem with the liability to payroll metric, which provides an indication of potential contribution volatility.

The following tables provide a summary of these measures for CERS Non-Hazardous and Hazardous Funds for the current year and the prior four years so stakeholders can identify how these measures are trending. While ASOP No. 51 requires this disclosure with respect to only the retirement funds, we have included this information for the insurance funds for completeness.

CERS Non-Hazardous

	Retirement Fund					Insurance Fund				
	June 30,					June 30,				
	2020	2019	2018	2017	2016	2020	2019	2018	2017	2016
Ratio of the market value of assets to total payroll	2.74	2.84	2.85	2.73	2.60	1.01	1.02	0.98	0.90	0.83
Ratio of actuarial accrued liability to payroll	5.70	5.69	5.35	5.22	4.71	1.32	1.41	1.25	1.37	1.27
Ratio of net cash flow to market value of assets	-2.7%	-3.5%	-3.4%	-3.5%	-4.4%	0.1%	0.7%	0.0%	0.1%	-0.2%
Percentage of Expected Contribution Actually Received	82% [1]	72%	96%	97%	95%	102% [1]	87%	101%	97%	92%
Ratio of actives to retirees and beneficiaries	1.24	1.26	1.32	1.39	1.43					

[1] Expected contribution for FYE2020 based on the actuarially determined contribution rate of 27.28% from the June 30, 2018 valuation and expected compensation based on census data from the June 30, 2019 valuation

CERS Hazardous

	Retirement Fund					Insurance Fund				
	June 30,					June 30,				
	2020	2019	2018	2017	2016	2020	2019	2018	2017	2016
Ratio of the market value of assets to total payroll	4.19	4.32	4.40	4.10	4.07	2.32	2.40	2.40	2.20	2.16
Ratio of actuarial accrued liability to payroll	9.55	9.38	8.98	8.58	7.52	3.06	3.10	3.16	3.30	3.16
Ratio of net cash flow to market value of assets	-2.1%	-2.8%	-2.6%	-2.5%	-3.0%	-1.7%	-1.0%	-1.4%	-1.5%	0.0%
Percentage of Expected Contribution Actually Received	80% [1]	71%	100%	103%	102%	104% [1]	92%	104%	101%	98%
Ratio of actives to retirees and beneficiaries	0.90	0.95	0.97	1.06	1.06					

[1] Expected contribution for FYE2020 based on the actuarially determined contribution rate of 46.50% from the June 30, 2018 valuation and expected compensation based on census data from the June 30, 2019 valuation

APPENDIX A

ACTUARIAL ASSUMPTIONS AND METHODS

Summary of Actuarial Methods and Assumptions

The following presents a summary of the actuarial assumptions and methods used in the valuation of the County Employees Retirement System.

In general, the assumptions and methods used in the valuation are based on the actuarial experience study for the five-year period ending June 30, 2018 and adopted by the Board in April 2019.

Investment return rate:

Assumed annual rate of 6.25% net of investment expenses for the retirement funds and the insurance funds

Price Inflation:

Assumed annual rate of 2.30%

Payroll Growth Assumption (used for amortization of unfunded accrued liabilities):

Assumed annual rate of 2.00%

Rates of Annual Salary Increase:

Assumed rates of annual salary increases are shown below.

Service Years	Annual Rates of Salary Increase					
	Merit & seniority		Price Inflation & Productivity		Total Increase	
	Non-Hazardous	Hazardous	Non-Hazardous	Hazardous	Non-Hazardous	Hazardous
0	7.00%	15.50%	3.30%	3.55%	10.30%	19.05%
1	4.00%	4.00%	3.30%	3.55%	7.30%	7.55%
2	3.00%	2.00%	3.30%	3.55%	6.30%	5.55%
3	1.50%	1.25%	3.30%	3.55%	4.80%	4.80%
4	1.25%	1.00%	3.30%	3.55%	4.55%	4.55%
5	1.25%	1.00%	3.30%	3.55%	4.55%	4.55%
6	1.00%	1.00%	3.30%	3.55%	4.30%	4.55%
7	1.00%	0.50%	3.30%	3.55%	4.30%	4.05%
8	0.75%	0.50%	3.30%	3.55%	4.05%	4.05%
9	0.75%	0.00%	3.30%	3.55%	4.05%	3.55%
10	0.50%	0.00%	3.30%	3.55%	3.80%	3.55%
11	0.50%	0.00%	3.30%	3.55%	3.80%	3.55%
12	0.25%	0.00%	3.30%	3.55%	3.55%	3.55%
13	0.25%	0.00%	3.30%	3.55%	3.55%	3.55%
14	0.25%	0.00%	3.30%	3.55%	3.55%	3.55%
15 & Over	0.00%	0.00%	3.30%	3.55%	3.30%	3.55%

Retirement rates:

Assumed annual rates of retirement are shown below. Rates are only applicable for members who are eligible for a service retirement.

	Non-Hazardous					Hazardous		
	Normal Retirement		Early Retirement[1]			Members participating before 9/1/2008[2]	Members participating between 9/1/2008 and 1/1/2014[3]	Members participating after 1/1/2014[3]
Age	Male	Female	Male	Female	Service			
Under 45	35.0%	27.0%			5	17.0%		
45	35.0%	27.0%			6	17.0%		
46	35.0%	27.0%			7	17.0%		
47	35.0%	27.0%			8	17.0%		
48	35.0%	27.0%			9	17.0%		
49	35.0%	27.0%			10	17.0%		
50	30.0%	27.0%			11	17.0%		
51	30.0%	27.0%			12	17.0%		
52	30.0%	27.0%			13	17.0%		
53	30.0%	27.0%			14	17.0%		
54	30.0%	27.0%			15	17.0%		
55	30.0%	27.0%	4.0%	5.0%	16	17.0%		
56	30.0%	27.0%	4.0%	5.0%	17	17.0%		
57	30.0%	27.0%	4.0%	5.0%	18	17.0%		
58	30.0%	27.0%	4.0%	5.0%	19	17.0%		
59	30.0%	27.0%	4.0%	5.0%	20	30.0%		
60	30.0%	27.0%	4.0%	8.0%	21	22.5%		
61	30.0%	27.0%	4.0%	9.0%	22	18.0%		
62	30.0%	40.0%	15.0%	20.0%	23	21.0%		
63	30.0%	35.0%	15.0%	18.0%	24	24.0%		
64	30.0%	30.0%	15.0%	16.0%	25	27.0%	21.6%	16.0%
65	30.0%	30.0%			26	30.0%	24.0%	16.0%
66	30.0%	27.0%			27	33.0%	26.4%	16.0%
67	30.0%	27.0%			28	36.0%	28.8%	16.0%
68	30.0%	27.0%			29	39.0%	31.2%	16.0%
69	30.0%	27.0%			30+	39.0%	31.2%	100.0%
70	30.0%	27.0%						
71	30.0%	27.0%						
72	30.0%	27.0%						
73	30.0%	27.0%						
74	30.0%	27.0%						
75	100.0%	100.0%						

[1] The annual rate of retirement is 11% for male members and 12% for female members with 25-26 years of service.

[2] The annual rate of retirement is 100% at age 62.

[3] The annual rate of retirement is 100% at age 60.

Non-Hazardous System: For members hired after 7/1/2003, the rates shown above are multiplied by 80% if he member is under age 65 to reflect the different retiree health insurance benefit.

Hazardous System: For members hired after 7/1/2003 and prior to 9/1/2008, the rates shown above are multiplied by 80% if the member is under age 62 to reflect the different retiree health insurance benefit.

Disability rates:

An abbreviated table with assumed rates of disability is show below.

Age	Non-Hazardous		Hazardous	
	Male	Female	Male	Female
20	0.04%	0.04%	0.07%	0.07%
30	0.06%	0.06%	0.12%	0.12%
40	0.14%	0.14%	0.26%	0.26%
50	0.39%	0.39%	0.73%	0.73%
60	1.02%	1.02%	1.90%	1.90%

Withdrawal rates (for causes other than disability and retirement):

Assumed annual rates of withdrawal are shown below and include pre-retirement mortality rates as described on the next page.

Service Years	Annual Rates of Withdrawal	
	Non-Hazardous	Hazardous
1	20.00%	20.00%
2	15.58%	9.11%
3	12.48%	7.24%
4	10.66%	6.14%
5	9.37%	5.37%
6	8.37%	4.76%
7	7.56%	4.27%
8	6.87%	3.85%
9	6.27%	3.49%
10	5.74%	3.18%
11	5.27%	2.89%
12	4.84%	2.63%
13	4.45%	2.40%
14	4.09%	2.18%
15	3.76%	1.98%
16	3.45%	1.80%
17	3.16%	1.62%
18	2.89%	1.46%
19	2.64%	1.30%
20	2.39%	1.16%
21	2.16%	0.00%
22	1.94%	0.00%
23	1.74%	0.00%
24	1.54%	0.00%
25	1.35%	0.00%
26 & Over	0.00%	0.00%

Mortality Assumption:

Pre-retirement mortality: PUB-2010 General Mortality table, for the Non-Hazardous System, and the PUB-2010 Public Safety Mortality table for the Hazardous System, projected with the ultimate rates from the MP-2014 mortality improvement scale using a base year of 2010.

Post-retirement mortality (non-disabled): System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from the MP-2014 mortality improvement scale using a base year of 2019.

The following table provides the life expectancy for a non-disabled retiree in future years based on the assumption with full generational projection:

Life Expectancy for an Age 65 Retiree in Years					
Gender	**Year of Retirement**				
	2020	**2025**	**2030**	**2035**	**2040**
Male	21.0	21.4	21.8	22.2	22.6
Female	24.0	24.4	24.8	25.2	25.6

Post-retirement mortality (disabled): PUB-2010 Disabled Mortality table, with a 4-year set-forward for both male and female rates, projected with the ultimate rates from the MP-2014 mortality improvement scale using a base year of 2010.

Marital status:

100% of employees are assumed to be married, with the female spouse 3 years younger than the male spouse.

Line of Duty Disability

Non-Hazardous: 2% of disabilities are assumed to occur in the line of duty

Hazardous: 50% of disabilities are assumed to occur in the line of duty

Line of Duty Death

25% of deaths are assumed to occur in the line of duty

Dependent Children:

For members in the Hazardous Plan who receive a duty-related death or disability benefit, the member is assumed to be survived by two dependent children, each age 6 with payments for 15 years.

Form of Payment:

Members are assumed to elect a life-only annuity at retirement.

Actuarial Cost Method:

Entry Age Normal, Level Percentage of Pay. The Entry Age Normal actuarial cost method allocates the System's actuarial present value of future benefits to various periods based upon service. The portion of the present value of future benefits allocated to years of service prior to the valuation date is the actuarial accrued liability, and the portion allocated to years following the valuation date is the present value of future normal costs. The normal cost is determined for each active member as the level percent of pay necessary to fully fund the expected benefits to be earned over the career of each individual active member. The normal cost is partially funded with active member contributions with the remainder funded by employer contributions.

Health Care Age Related Morbidity/Claims Utilization:

To model the impact of aging on the underlying health care costs for Medicare retirees, the valuation relied on the Society of Actuaries' 2013 Study "Health Care Costs – From Birth to Death". Table 4 (Development of Plan Specific Medicare Age Curve) was used to model the impact of aging for ages 65 and over.

Health Care Cost Trend Rates:

Year	Non-Medicare Plans[1]	Medicare Plans[1]	Dollar Contribution[2]
2022	6.40%	2.90%[3]	1.50%
2023	6.30%	6.30%	1.50%
2024	6.20%	6.20%	1.50%
2025	6.10%	6.10%	1.50%
2026	6.00%	6.00%	1.50%
2027	5.80%	5.80%	1.50%
2028	5.60%	5.60%	1.50%
2029	5.40%	5.40%	1.50%
2030	5.20%	5.20%	1.50%
2031	5.00%	5.00%	1.50%
2032	4.80%	4.80%	1.50%
2033	4.60%	4.60%	1.50%
2034	4.40%	4.40%	1.50%
2035	4.20%	4.20%	1.50%
2036 & Beyond	4.05%	4.05%	1.50%

[1]All increases are assumed to occur on January 1. The 2021 premiums were known at the time of the valuation and were incorporated into the liability measurement
[2]Applies to members participating on or after July 1, 2003. All increases are assumed to occur on July 1.
[3] Humana provided "Not to Exceed" 2022 Medicare premiums, which were incorporated into the liability measurement and resulted in an assumed 2.90% increase in Medicare premiums at January 1, 2022.

Health care trend assumptions are based on the model issued by the Society of Actuaries "Getzen model of Long-Run Medical Cost Trends for the SOA; Thomas E. Getzen, iHEA and Temple University 2014 © Society of Actuaries.

The underlying assumptions used to develop the health care trend rates include:

- A short run period-this is a period for which anticipated health care trend rates are manually set based on local information as well as plan-specific and carrier information.
- Long term real GDP growth – 1.75%
- Long term rate of inflation – 2.30%
- Long term nominal GDP growth – 4.05%
- Year that excess rate converges to 0 – 2036

Health care trend rates are thus the manually set rates for the short run period and rates which decline to an ultimate trend rate which equals the assumed nominal long term GDP growth rate.

Health Care Participation Assumptions:

- Active members are assumed to elect health coverage at retirement at the following participation rates.

Service at Retirement	Members participating before 7/1/2003*	Members participating after 7/1/2003
Under 10	50%	100%
10-14	75%	100%
15-19	90%	100%
Over 20	100%	100%

* 100% of members with a duty disability or a duty death (in service) benefit are assumed to elect coverage at retirement.

- Future retirees are assumed to have a similar distribution by plan type as the current retirees.

Medicare Plan	Participation Percentage
Medical Only[1]	6%
Essential Plan	8%
Premium Plan	86%

[1] Includes Medicare Advantage Mirror Plans

Non-Medicare Plan	Participation Percentage
LivingWell Limited	4%
LivingWell Basic	2%
LivingWell CDHP	33%
LivingWell PPO	61%

- 50% of deferred vested members participating before July 1, 2003 are assumed to elect health coverage at retirement. 100% of deferred vested members participating after July 1, 2003 are assumed to elect health coverage at retirement.

- Deferred vested members receiving insurance benefits from the non-hazardous fund are assumed to begin health coverage at age 55 for members participating before September 1, 2008, at age 60 for members participating on or after September 1, 2008 but before January 1, 2014, and at age 65 for members participating on or after January 1, 2014.

- Deferred vested members receiving insurance benefits from the hazardous fund are assumed to begin health coverage at age 50 for members participating before January 1, 2014 and at age 60 for members participating on or after January 1, 2014.

- 75% of future retirees, with hazardous service, are assumed to elect spouse health care coverage. No dependent coverage is assumed for members who only have non-hazardous service. 100% of spouses with health care coverage are assumed to continue coverage after the member's death.

Other Assumptions

1. Valuation payroll (used for determining the amortization contribution rate): Current fiscal year payroll.

2. Individual salaries used to project benefits: For salary amounts prior to the valuation date, the salary from the last fiscal year is projected backward with the valuation salary scale assumption. For future salaries, the salary from the last fiscal year is projected forward with one year's salary scale.

3. Pay increase timing: Beginning of (fiscal) year. This is equivalent to assuming that reported salaries represent amounts paid to members during the year ending on the valuation date.

4. Current active members that terminate employment (for reasons other than retirement, disability, or death) are assumed to commence their retirement benefits at first unreduced retirement eligibility. Members are assumed to elect a refund of member contributions if the value of their account balance exceeds the present value of the deferred benefit. Members participating in the Cash Balance plan are assumed to elect to receive a lump sum of their cash balance account if their account balance exceeds the present value of the deferred benefit and the member is not eligible for insurance benefits at termination.

5. The beneficiaries of current active members that die while active are assumed to commence their survivor benefits at the member's first unreduced retirement eligibility. Beneficiaries are assumed to elect a refund of member contributions if the value of the member's account balance exceeds the present value of the survivor benefit. Beneficiaries of active members that die while in the line of duty are assumed to commence their survivor benefits immediately at the death of the member.

6. There will be no recoveries once disabled.

7. Cash Balance Provisions: The cash balance interest crediting rate while a member is an active employee is assumed to equal 5.6875% (based upon the 6.25% assumed investment return). The interest crediting rate after a member terminates employment is 4%.

8. Decrement timing: Decrements of all types are assumed to occur mid-year. Decrement rates are used as described in this report, without adjustment for multiple decrement table effects.

9. Service: All members are assumed to accrue 1 year of benefit and eligibility service each year.

10. 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.

11. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.

12. Current Inactive Population (Retirement Fund): All non-vested members are assumed to take an immediate refund of member contributions. Vested members are assumed to elect an immediate refund of member contributions at the valuation date if the value of their account balance exceeds the present value of their deferred benefit. Non-hazardous members are assumed to retire at age 65. Hazardous members hired prior to September 1, 2008 are assumed to retire at age 55 and hazardous members hired on or after September 1, 2008 are assumed to retire at age 60.

Participant Data

Participant data was supplied in electronic text files. There were separate files for (i) active and inactive members, and (ii) members and beneficiaries receiving benefits.

The data for active and terminated members included date of birth, gender, date of participation, benefit tier indicator, service with the current system, total vesting service, salary, employee contribution account balances, and employer pay credits for members participating in the cash balance plan. For retired members and beneficiaries, the data included date of birth, gender, spouse's date of birth (where applicable), amount of monthly benefit, date of retirement, and form of payment code.

Assumptions were made to correct for missing, bad, or inconsistent data. These had no material impact on the results presented.

Changes in assumptions since the prior valuation:

- The assumed increase in future health care costs, or trend assumption, is reviewed on an annual basis and was updated to better reflect the plan's anticipated long-term healthcare cost increases.
- The assumed impact of the Cadillac Tax (previously a 0.9% load on employer paid non-Medicare premiums for those who became participants prior to July 1, 2003) was removed to reflect its repeal since the prior valuation.

Development of Baseline Claims Cost

For non-Medicare retirees, the initial per capita costs were based on the plan premiums effective January 1, 2021, and are used for both current and future retirees. An inherent assumption in this methodology is that the projected future retirees will have a similar distribution by plan type as the current retirees. The spouse/dependent premium of $903.52 for non-Medicare retirees is based on a blending of Family and Couple premiums for the current retirees that have over 4 years of hazardous service. The fully-insured premiums KRS pays the Kentucky Employees' Health Plan (KEHP) are blended rates based on the combined experience of active and retired members. Because the average cost of providing health care benefits to retirees under age 65 is higher than the average cost of providing health care benefits to active employees, there is an implicit rate subsidy for the non-Medicare eligible retirees. Actuarial Standard of Practice No. 6 (ASOP No. 6) requires aging subsidies (or implicit rate subsidies) to be recognized. However, the KRS health insurance trusts are only used to reimburse KEHP for the employer's portion of the blended premiums. Said another way, the trusts are not used to fund the difference between the underlying retiree claims and the blended KEHP premiums. As a result, the retiree health care liabilities developed in this report for the non-Medicare retirees are based solely on the premiums charged by KEHP, without any age-adjustment. GASB Statements No. 74 and No. 75 prohibit such a deviation from ASOP No. 6. The liabilities developed in this report are solely for the purpose of funding the benefits paid by the health insurance funds and are not appropriate for financial statement disclosures required by GASB. GRS provides separate GASB reports to KRS which include the liabilities associated with the implicit rate subsidy.

For those not eligible for Medicare		
Age	Member	Spouse/Dependents
<65	$738.54	$903.52

For Medicare retirees, the initial per capita costs were estimated based on the plan premiums effective January 1, 2021, and are used for both current and future retirees. An inherent assumption in this methodology is that the projected future retirees will have a similar distribution by plan type as the current retirees. Age graded and sex distinct premiums are utilized for retirees over the age of 65. These costs are appropriate for the unique age and sex distribution currently existing. Over the future years covered by this valuation, the age and sex distribution will most likely change. Therefore, our process "distributes" the average premium over all age/sex combinations and assigns a unique premium for each combination. The age/sex specific costs more accurately reflect the health care utilization and cost at that age.

For those eligible for Medicare		
Age	Male	Female
65	$184.81	$174.31
75	216.22	210.98
85	228.64	231.33

Appendix B of the report provides a full schedule of premiums.

Mehdi Riazi is a Member of the American Academy of Actuaries (MAAA) and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Mehdi Riazi, FSA, EA, FCA, MAAA

APPENDIX B

BENEFIT PROVISIONS

Summary of Benefit Provisions for County Employees Retirement System (CERS)

CERS Non-Hazardous Employees

Retirement: Tier 1, Participation before 9/1/2008

Normal Retirement Eligibility	Age 65 with at least 1 month of service credit; or Any age with at least 27 years of service
Benefit Amount	If a member has at least 48 months of service, the monthly benefit is 2.00% times final average compensation times years of service. For members who began participating prior to 8/1/2004, the monthly benefit is 2.20% times final average compensation times years of service. If a member has less than 48 months of service, the monthly benefit is the actuarial equivalent of two times the member's contributions with interest. Final average compensation is based on the member's highest 5 years of compensation.
Early Retirement Eligibility	Any age (prior to age 65) with at least 25 years of service; or Age 55 with at least 5 years of service
Early Retirement Reduction	Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement eligibility precedes the member's normal retirement date.

CERS Non-Hazardous Employees (continued)

Retirement: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014

Normal Retirement Eligibility	Age 65 with at least 5 years of service; or Rule of 87 (Age 57 or older if age plus service equals 87)
Benefit Amount	The monthly benefit is equal to the applicable benefit multiplier times final average compensation times years of service.

Years of Service	Benefit Multiplier
10 or less	1.10%
10-20	1.30%
20-26	1.50%
26-30	1.75%
Greater than 30*	2.00%

* The 2.00% benefit multiplier only applies to service credit in excess of 30 years. If a member has greater than 30 years of service at retirement, service prior to 30 years will be multiplied by the 1.75% benefit multiplier.

Final compensation is based on the member's last 5 years of compensation.

Early Retirement Eligibility	Age 60 with at least 10 years of service
Early Retirement Reduction	Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement date precedes the member's normal retirement eligibility.

Retirement: Tier 3, Participation on or after 1/1/2014

Normal Retirement Eligibility	Age 65 with at least 5 years of service; or Rule of 87 (Age 57 or older if age plus service equals 87)
Benefit Amount	Each year that the member is active, a 4.00% employer pay credit and the employee's 5.00% contribution will be credited to each member's hypothetical cash balance account. The hypothetical account will earn interest at a minimum rate of 4%, annually. If the System's geometric average net investment return for the previous five years exceeds 4%, then the hypothetical account will be credited with an additional amount of interest in that year equal to 75% of the amount of the return which exceeds 4%. All interest credits will be applied to the hypothetical account balance on June 30 based on the account balance as of June 30 of the previous year. At retirement, the member's hypothetical account balance may be converted into an annuity based on an actuarial factor.
Early Retirement Eligibility	N/A

CERS Non-Hazardous Employees (continued)

Deferred Vested Benefit: Tier 1, Participation before 9/1/2008

Eligibility	At least 1 month of service credit
Benefit Amount	Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age

Deferred Vested Benefit: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014

Eligibility	5 years of service
Benefit Amount	Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age

Deferred Vested Benefit Tier 3, Participation on or after 1/1/2014

Eligibility	5 years of service
Benefit Amount	At termination of employment, members may choose to leave their account balance with the System and retire once they are eligible. The hypothetical account balance will earn 4% annual interest after termination. Members may also choose to withdrawal their entire accumulated balance. If a member does not have 5 years of service at termination, the member is eligible to receive a partial refund of their account balance. This refund includes the member's contributions with interest.

Disability Retirement: Participation before 8/1/2004

Eligibility	60 months of service (requirement is waived if line of duty disability)
Disability Benefit	Disability benefits are calculated in the same manner as the normal retirement benefit with years of service and final compensation being determined as of the date of disability, except that service credit shall be added to the person's total service beginning with the last date of paid employment and continuing to the member's 65th birthday, with total service not exceeding 25 years. Total service credit added shall not be greater than the member's actual service at disability. For members with at least 25 years of service on the last day of paid employment but less than 27 years of service, total service shall be 27 years. For members with 27 or more years of service credit, actual service will be used.

CERS Non-Hazardous Employees (continued)

Disability Retirement: Participation on or after 8/1/2004 but before 1/1/2014

Eligibility	60 months of service (requirement is waived if line of duty disability)
Disability Benefit	The higher of 20% of the member's final monthly rate of pay or the member's normal retirement benefit (without reduction for early retirement) with years and final compensation being determined as of the date of disability.

Disability Retirement: Participation on or after 1/1/2014

Eligibility	60 months of service (requirement is waived if line of duty disability)
Disability Benefit	The higher of 20% of the member's final monthly rate of pay or the member's retirement benefit calculated at the member's normal retirement date.

Line of Duty Disability Benefit

Disability Benefit	If the disability is a direct result of an act in the line of duty, the benefit shall not be less than 25% of the member's final monthly rate of pay. Additionally, each eligible dependent child will receive 10% of the member's monthly final rate of pay up to a maximum of 40%.

Pre-Retirement Death Benefit

Eligibility	Eligible for early or normal retirement; or Under age 65 with at least 60 months of service and actively working at the time of death; or At least 144 months of service, if no longer actively working
Spouse Benefit	The member's retirement benefit calculated in the same manner as if the member had retired on the day of the member's death and elected a 100% joint and survivor benefit. The benefit is actuarially reduced if the member dies prior to their normal retirement age.

Pre-Retirement Death Benefit (Death in the Line of Duty)

Eligibility	One month of service credit
Spouse Benefit	A $10,000 lump sum payment plus a monthly payment of 75% of the deceased member's final monthly average pay. Each dependent child will receive 10% of the final monthly average pay (not to exceed a total child benefit of 25% while the spouse is alive). A spouse may also elect the non-line of duty death benefit.
Child Benefit	In the event there is no surviving spouse, the benefit is 50% of final monthly average pay for one child, 65% of final monthly average pay for two children, or 75% of final monthly average pay for three or more eligible children.

CERS Non-Hazardous Employees (continued)

Post-Retirement Death Benefit

Eligibility	48 months of service, and in receipt of retirement benefits
Death Benefit	A $5,000 lump sum payment

Member Contributions

Tier 1, Participation before 9/1/2008	5% of creditable compensation. Members who do not receive a retirement benefit are entitled to a full refund of contributions with interest. The annual interest rate is set by the KRS board, not less than 2.0%.
Tier 2, Participation on or after 9/1/2008 but before 1/1/2014	5% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest. The annual interest rate is 2.5%.
Tier 3, Participation after 1/1/2014	5% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest.

Changes since the Prior Valuation

- House Bill 271 passed during the 2020 legislative session and removed provisions that reduce the monthly payment to a surviving spouse of a member whose death was due to a duty-related injury upon remarriage of the spouse. It also increased benefits for a very small number of beneficiaries.

CERS Hazardous Employees

Retirement: Tier 1, Participation before 9/1/2008

Normal Retirement Eligibility	Age 55 with at least 1 month of service credit; or Any age with at least 20 years of service
Benefit Amount	If a member has at least 60 months of service, the monthly benefit is 2.50% times final average compensation times years of service. If a member has less than 60 months of service, the monthly benefit is the actuarial equivalent of two times the member's contributions with interest. Final average compensation is based on the member's highest 3 years of compensation.
Early Retirement Eligibility	Age 50 with at least 15 years of service
Early Retirement Reduction	Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement date precedes the member's normal retirement eligibility.

CERS Hazardous Employees (continued)

Retirement: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014

Normal Retirement Eligibility	Age 60 with at least 5 years of service; or Any age with at least 25 years of service
Benefit Amount	The monthly benefit is equal to the applicable benefit multiplier times final average compensation times years of service.

Years of Service	Benefit Multiplier
10 or less	1.30%
10-20	1.50%
20-25	2.25%
Greater than 25	2.50%

Final average compensation is based on the member's highest 3 years of compensation.

Early Retirement Eligibility	Age 50 with at least 15 years of service
Early Retirement Reduction	Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement date precedes the member's normal retirement eligibility.

Retirement: Tier 3, Participation on or after 1/1/2014

Normal Retirement Eligibility	Age 60 with at least 5 years of service; or Any age with at least 25 years of service
Benefit Amount	Each year that the member is active, a 7.50% employer pay credit and the employee's 8.00% contribution will be credited to each member's hypothetical cash balance account. The hypothetical account will earn interest at a minimum rate of 4%, annually. If the System's geometric average net investment return for the previous five years exceeds 4%, then the hypothetical account will be credited with an additional amount of interest in that year equal to 75% of the amount of the return which exceeds 4%. All interest credits will be applied to the hypothetical account balance on June 30 based on the account balance as of June 30 of the previous year. At retirement, the member's hypothetical account balance may be converted into an annuity based on an actuarial factor.
Early Retirement Eligibility	N/A

CERS Hazardous Employees (continued)

Deferred Vested Benefit: Tier 1, Participation before 9/1/2008

Eligibility	At least 1 month of service credit
Benefit Amount	Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age

Deferred Vested Benefit: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014

Eligibility	5 years of service
Benefit Amount	Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age

Deferred Vested Benefit Tier 3, Participation on or after 1/1/2014

Eligibility	5 years of service
Benefit Amount	At termination of employment, members may choose to leave their account balance with the System and retire once they are eligible. The hypothetical account balance will earn 4% annual interest after termination. Members may also choose to withdrawal their entire accumulated balance. If a member does not have 5 years of service at termination, the member is eligible to receive a partial refund of their account balance. This refund includes the member's contributions with interest.

Disability Retirement: Participation before 8/1/2004

Eligibility	60 months of service (requirement is waived if line of duty disability)
Disability Benefit	Disability benefits are calculated in the same manner as the normal retirement benefit with years of service and final compensation being determined as of the date of disability, except that if the member has less than 20 years of service at disability, service credit shall be added to the person's total service beginning with the last date of paid employment and continuing to the member's 55th birthday, with total service not exceeding 20 years. Total service credit added shall not be greater than the member's actual service at disability.

CERS Hazardous Employees (continued)

Disability Retirement: Participation on or after 8/1/2004 but before 1/1/2014

Eligibility	60 months of service (requirement is waived if line of duty disability)
Disability Benefit	The higher of 25% of the member's final monthly rate of pay or the member's normal retirement benefit (without reduction for early retirement) with years and final compensation being determined as of the date of disability.

Disability Retirement: Participation on or after 1/1/2014

Eligibility	60 months of service (requirement is waived if line of duty disability)
Disability Benefit	The higher of 25% of the member's final monthly rate of pay or the member's retirement benefit calculated at the member's normal retirement date.

Line of Duty Disability Benefit

Disability Benefit	If the disability is a direct result of an act in the line of duty, the benefit shall not be less than 25% of the member's final monthly rate of pay. Additionally, each eligible dependent child will receive 10% of the member's monthly final rate of pay up to a maximum of 40%.

Pre-Retirement Death Benefit

Eligibility	Eligible for early or normal retirement; or Under age 55 with at least 60 months of service and actively working at the time of death; or At least 144 months of service, if no longer actively working
Spouse Benefit	The member's retirement benefit calculated in the same manner as if the member had retired on the day of the member's death and elected a 100% joint and survivor benefit. The benefit is actuarially reduced if the member dies prior to their normal retirement age.

Pre-Retirement Death Benefit (Death in the Line of Duty)

Eligibility	One month of service credit
Spouse Benefit	A $10,000 lump sum payment plus a monthly payment of 75% of the deceased member's final monthly average pay. Each dependent child will receive 10% of the final monthly average pay (not to exceed a total child benefit of 25% while the spouse is alive). A spouse may also elect the non-line of duty death benefit.
Non-Spouse Benefit	If the beneficiary is only one person who is a dependent receiving at least 50% of his or her support from the member, the beneficiary may elect a lump sum payment of$10,000.
Child Benefit	In the event there is no surviving spouse, the benefit is 50% of final monthly average pay for one child, 65% of final average pay for two children, or 75% of final average pay for three or more eligible children.

CERS Hazardous Employees (continued)

Post-Retirement Death Benefit

Eligibility	48 months of service, and in receipt of retirement benefits
Death Benefit	A $5,000 lump sum payment

Member Contributions

Tier 1, Participation before 9/1/2008	8% of creditable compensation. Members who do not receive a retirement benefit are entitled to a full refund of contributions with interest. The annual interest rate is set by the KRS board, not less than 2.0%.
Tier 2, Participation on or after 9/1/2008 but before 1/1/2014	8% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest. The annual interest rate is 2.5%.
Tier 3, Participation after 1/1/2014	8% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest.

Changes since the Prior Valuation

- House Bill 271 passed during the 2020 legislative session removed provisions that reduce the monthly payment to a surviving spouse of a member whose death was due to a duty-related injury upon remarriage of the spouse. It also increased benefits for a very small number of beneficiaries.

Summary of Main Retiree Insurance Benefit Provisions

Insurance Tier 1: Participation began before 7/1/2003

Benefit Eligibility Recipient of a retirement allowance

Benefit Amount

Non-Hazardous Service	Percentage of Member Premium Paid by Retirement System	Hazardous Service	Percentage of Member & Dependent Premium Paid by Retirement System
Less than 4 years	0%	Less than 4 years	0%
4 – 9 years	25%	4 – 9 years	25%
10 – 14 years	50%	10 – 14 years	50%
15 – 19 years	75%	15 – 19 years	75%
20 or more years	100%	20 or more years	100%

The percentage paid by the retirement system is applied to the 'contribution' plan selected by the KRS Board.

Duty Disability Retirement If disability was a result of injuries sustained while in the line of duty, the member receives 100% of the maximum contribution for the member and dependents. This benefit is provided to members in the Non-hazardous and Hazardous plans alike.

Duty Death in Service If an active employee's death was a result of injuries sustained while in the line of duty, the member's spouse and children receive a fully subsidized health insurance benefit. This benefit is provided to members in the Non-hazardous and Hazardous plans alike.

Non-Duty Death in Service If the surviving spouses is in receipt of a pension allowance, he or she is eligible for continued health coverage. The percentage of the premium paid for by the retirement system is based on the member's years of hazardous service at the time of death.

Surviving Spouse of a Retiree A surviving spouse of a retiree, who is in receipt of a pension allowance, will receive a premium subsidy based on the member's years of hazardous service.

Hazardous employees who retired prior to August 1, 1998 System's contribution for spouse and dependents is based on total service.

Insurance Tier 2: Participation began on or after 7/1/2003, but before 9/1/2008

Benefit Eligibility	Recipient of a retirement allowance with at least 120 months of service at retirement
Non-Hazardous Subsidy	Monthly contribution of $10 for each year of earned non-hazardous service. The monthly contribution is increased by 1.5% each July 1. As of July 1, 2020, the Non-Hazardous monthly contribution was $13.78/year of service. Upon the retiree's death, the surviving spouse may continue coverage (if in receipt of a retirement allowance) but will be 100% responsible for the premiums.
Hazardous Subsidy	Monthly contribution of $15 for each year of earned hazardous service. The monthly contribution is increased by 1.5% each July 1. As of July 1, 2020, the Hazardous monthly contribution was $20.68/year of service. Upon the retiree's death, the surviving spouse of a hazardous duty member will receive a monthly contribution of $10 ($13.78 as of July 1, 2020) for each year of hazardous service.
Duty Disability Retirement	If disability was a result of injuries sustained while in the line of duty, the member receives a benefit equal to at least 20 times the Non-Hazardous monthly contribution. This benefit is provided to members in the Non-Hazardous and Hazardous plans alike.
Duty Death in Service	If an active employee's death was a result of injuries sustained while in the line of duty, the member's spouse and children receive a fully subsidized health insurance benefit. This benefit is provided to members in the Non-Hazardous and Hazardous plans alike.
Non-Duty Death in Service	If the surviving spouse is in receipt of a pension allowance, he or she is eligible for continued health coverage. The percentage of the premium paid for by the retirement system is based on the member's years of hazardous service at the time of death.

Insurance Tier 3: Participation began on or after 9/1/2008

Tier 3 insurance benefits are identical to Tier 2, except Tier 3 members are required to have at least 180 months of service in order to be eligible.

Monthly Health Plan Premiums – Effective January 1, 2021

Non-Medicare Plan Options					
Plan Option	Single	Parent Plus	Couple	Family	Family X-Ref
LivingWell PPO[1]	$753.76	$1,075.44	$1,653.10	$1,841.08	$907.84
LivingWell CDHP	732.26	1,011.78	1,383.08	1,545.50	846.00
LivingWell Basic	704.08	970.78	1,501.56	1,673.40	825.88
Living Well Limited	626.48	892.76	1,374.22	1,530.02	753.62

Medicare Plan Options	
Medical Only Plan	$184.30
Medicare Advantage Mirror Essential Plan	215.41
Medicare Advantage Mirror Premium Plan	310.04
Kentucky Retirement Systems – Essential Plan[2]	46.16
Kentucky Retirement Systems – Premium Plan[3]	222.74

[1] Contribution plan selected by the KRS Board was the LivingWell PPO plan option for non-Medicare retirees.
[2] Contribution rate for retirees selected by the KRS board remains at $75.56.
[3] Contribution rate for retirees selected by the KRS board remains at $252.51.

Dollar Contribution Amount for Insurance Tier 2 and Tier 3

Monthly contribution amounts per year of service as of July 1, 2020.

Non-Hazardous Service	Hazardous Service
$13.78	$20.68

Changes since the Prior Valuation

There have been no changes in benefit provisions since the prior actuarial valuation.

APPENDIX C

GLOSSARY

Glossary

Actuarial Accrued Liability (AAL): That portion, as determined by a particular Actuarial Cost Method, of the Actuarial Present Value of Future Plan Benefits which is not provided for by future Normal Costs. It is equal to the Actuarial Present Value of Future Plan Benefits minus the actuarial present value of future Normal Costs.

Actuarial Assumptions: Assumptions as to future experience under the Fund. These include assumptions about the occurrence of future events affecting costs or liabilities, such as:

- mortality, withdrawal, disablement, and retirement;
- future increases in salary;
- future rates of investment earnings and future investment and administrative expenses;
- characteristics of members not specified in the data, such as marital status;
- characteristics of future members;
- future elections made by members; and
- other relevant items.

Actuarial Cost Method or ***Funding Method:*** A procedure for allocating the Actuarial Present Value of Future Benefits to various time periods; a method used to determine the Normal Cost and the Actuarial Accrued Liability. These items are used to determine the ADC.

Actuarial Gain or ***Actuarial Loss:*** A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two Actuarial Valuation dates. Through the actuarial assumptions, rates of decrements, rates of salary increases, and rates of fund earnings have been forecasted. To the extent that actual experience differs from that assumed, Actuarial Accrued Liabilities emerge which may be the same as forecasted, or may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., the fund's assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, actuarial losses are the result of unfavorable experience, i.e., actual results that produce actuarial liabilities which are larger than projected. Actuarial gains will shorten the time required for funding of the actuarial balance sheet deficiency while actuarial losses will lengthen the funding period.

Actuarially Equivalent: Of equal actuarial present value, determined as of a given date and based on a given set of Actuarial Assumptions.

Actuarial Present Value (APV): The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions. For purposes of this standard, each such amount or series of amounts is:

a. adjusted for the probable financial effect of certain intervening events (such as changes in compensation levels, marital status, etc.)

b. multiplied by the probability of the occurrence of an event (such as survival, death, disability, termination of employment, etc.) on which the payment is conditioned, and

c. discounted according to an assumed rate (or rates) of return to reflect the time value of money.

Actuarial Present Value of Future Plan Benefits: The Actuarial Present Value of those benefit amounts which are expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and past and anticipated future compensation and service credits. The Actuarial Present Value of Future Plan Benefits includes the liabilities for active members, retired members, beneficiaries receiving benefits, and inactive, non-retired members either entitled to a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.

Actuarial Valuation: The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan. An Actuarial valuation for a governmental retirement system typically also includes calculations that provide the financial information of the plan, such as the funded ratio, unfunded actuarial accrued liability and the ADC.

Actuarial Value of Assets or ***Valuation Assets:*** The value of the Fund's assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets, but commonly actuaries use a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the ADC.

Actuarially Determined: Values which have been determined utilizing the principles of actuarial science. An actuarially determined value is derived by application of the appropriate actuarial assumptions to specified values determined by provisions of the law.

Actuarially Determined Contribution (ADC): The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation. The ADC consists of the Employer Normal Cost and the Amortization Payment.

Amortization Method: A method for determining the Amortization Payment. The most common methods used are level dollar and level percentage of payroll. Under the Level Dollar method, the Amortization Payment is one of a stream of payments, all equal, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the Amortization payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the stream of payments increases at the assumed rate at which total covered payroll of all active members will increase.

Amortization Payment: The portion of the pension plan contribution or ADC which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

Closed Amortization Period: A specific number of years that is counted down by one each year, and therefore declines to zero with the passage of time. For example if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc. See Funding Period and Open Amortization Period.

Decrements: Those causes/events due to which a member's status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or termination.

Defined Benefit Plan: A retirement plan that is not a Defined Contribution Plan. Typically a defined benefit plan is one in which benefits are defined by a formula applied to the member's compensation and/or years of service.

Defined Contribution Plan: A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, and the plan's earnings are allocated to each account, and each member's benefits are a direct function of the account balance.

Employer Normal Cost: The portion of the Normal Cost to be paid by the employers. This is equal to the Normal Cost less expected member contributions.

Experience Study: A periodic review and analysis of the actual experience of the Fund which may lead to a revision of one or more actuarial assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified as deemed appropriate by the Actuary.

Funded Ratio: The ratio of the actuarial value of assets (AVA) to the actuarial accrued liability (AAL). Plans sometimes calculate a market funded ratio, using the market value of assets (MVA), rather than the AVA.

Funding Period or ***Amortization Period:*** The term "Funding Period" is used two ways. In the first sense, it is the period used in calculating the Amortization Payment as a component of the ADC. This funding period specified in State statute. In the second sense, it is a calculated item: the number of years in the future that will theoretically be required to amortize (i.e., pay off or eliminate) the Unfunded Actuarial Accrued Liability, based on a statutory employer contribution rate, and assuming no future actuarial gains or losses.

GASB: Governmental Accounting Standards Board.

GASB 67 and ***GASB 68***: Governmental Accounting Standards Board Statements No. 67 and No. 68. These are the governmental accounting standards that set the accounting and reporting rules for public retirement systems and the employers that sponsor, participate in, or contribute to them. Statement No. 67 sets the accounting rules for the financial reporting of the retirement systems, while Statement No. 68 sets the rules for the employers that sponsor, participate in, or contribute to public retirement systems.

Normal Cost: That portion of the Actuarial Present Value of pension plan benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method. Any payment in respect of an Unfunded

Actuarial Accrued Liability is not part of Normal Cost (see Amortization Payment). For pension plan benefits which are provided in part by employee contributions, Normal Cost refers to the total of employee contributions and employer Normal Cost unless otherwise specifically stated. Under the entry age normal cost method, the Normal Cost is intended to be the level cost (when expressed as a percentage of pay) needed to fund the benefits of a member from hire until ultimate termination, death, disability or retirement.

Open Amortization Period: An open amortization period is one which is used to determine the Amortization Payment but may not decrease by exactly one year in the subsequent year's actuarial valuation. For instance, if the initial period is set as 30 years, the same 30-year period is used in determining the Amortization Period each year.

Unfunded Actuarial Accrued Liability: The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. This value may be negative in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus.

Valuation Date or Actuarial Valuation Date: The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Plan Benefits is determined. The expected benefits to be paid in the future are discounted to this date.

State Police Retirement System (SPRS)

Actuarial Valuation Report
as of June 30, 2020

P: 469.524.0000 | www.grsconsulting.com

December 3, 2020

Board of Trustees
Kentucky Retirement Systems
Perimeter Park West
1260 Louisville Road
Frankfort, KY 40601

Subject: Actuarial Valuation as of June 30, 2020

Dear Trustees of the Board:

This report describes the current actuarial condition of the State Police Retirement System (SPRS) and provides the actuarially determined employer contribution rates for fiscal year ending June 30, 2022. In addition, the report analyzes changes in the System's financial condition and provides various summaries of the data.

Separate reports are issued with regard to valuation results determined in accordance with Governmental Accounting Standards Board (GASB) Statements 67, 68, 74 and 75. Results of this report should not be used for any other purpose without consultation with the undersigned. Valuations are prepared annually as of June 30, the first day of the plan year for KRS. This report was prepared at the request of the Board of Trustees of the Kentucky Retirement Systems (Board) and is intended for use by the KRS staff and those designated or approved by the Board.

FINANCING OBJECTIVES AND FUNDING POLICY

In 2019, the Board recommended the employer contribution rates for the fiscal years beginning July 1, 2020 and ending June 30, 2022. However, during the 2020 legislative session, only contribution rates through June 30, 2021 were budgeted. Therefore, the Board must recommend the employer contribution rates for the fiscal year beginning July 1, 2021 and ending June 30, 2022. The contribution rates determined by these actuarial valuations are intended to become effective twelve months after the valuation date and, as such, are intended to be used by the Board for recommending these required contribution rates effective July 1, 2021.

The employer contribution rate is determined in accordance with Section 61.565 of Kentucky Statute, which was last amended by SB249 (passed during the 2020 legislative session). As specified by the Statute, the employer contribution rate is comprised of a normal cost contribution and an actuarial accrued liability contribution.

The actuarial accrued liability contribution is calculated by amortizing the unfunded accrued liability as of June 30, 2019 over a closed 30-year amortization period. Gains and losses incurring in future years (including those incurred in this June 30, 2020 valuation) are amortized as separate closed 20-year amortization bases. Prior to the passage of SB249, the unfunded liability was amortized as one amortization base over a closed 30-year period beginning July 1, 2013 (i.e. the amortization period would have been 23 years as of June 30, 2020).

Assumptions and Methods

The Board of Trustees, in consultation with the actuary, sets the actuarial assumptions and methods used in the actuarial valuation. An experience study was conducted after the June 30, 2018 actuarial valuation and the Board adopted updated assumptions for first use in the June 30, 2019 actuarial valuation.

The assumed increase in future healthcare costs, or trend assumption, is reviewed on an annual basis and was updated since the June 30, 2019 valuation to better reflect the plan's anticipated long-term healthcare cost increases. There were no other changes in actuarial assumptions since the prior valuation.

The results of the actuarial valuation are dependent on the actuarial assumptions used. Actual results can, and almost certainly will, differ as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rate, and funding periods. The actuarial calculations are intended to provide information for rational decision making.

This report was prepared using our proprietary valuation model and related software which in our professional judgment has the capability to provide results that are consistent with the purposes of the valuation. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

Benefit Provisions

The benefit provisions reflected in these valuations are those which were in effect on June 30, 2020. House Bill 271 passed during the 2020 legislative session and removed provisions that reduce the monthly payment to a surviving spouse of a member whose death was due to a duty-related injury upon remarriage of the spouse. It also increased benefits for a very small number of beneficiaries. There were no other material benefit provision changes since the prior valuation.

IMPACT DUE TO COVID-19

This actuarial valuation is performed as of June 30, 2020, which is approximately three months after the start of the COVID-19 pandemic in the United States. It is uncertain how the mortality and other demographic behavior (e.g. retirement and turnover) may change during the next couple years. However, if government budgets are constrained then we would expect lower than expected salary increases for individual members and a possible reduction in active membership until the Commonwealth's economy recovers. There may also be increased volatility and uncertainty in future investment returns.

DATA

Member data for retired, active and inactive members was supplied as of June 30, 2020, by the KRS staff. The staff also supplied asset information as of June 30, 2020. We did not audit this data, but we did apply a number of tests to the data, and we concluded that it was reasonable and consistent with the prior year's data. GRS is not responsible for the accuracy or completeness of the information provided to us by KRS.

CERTIFICATION

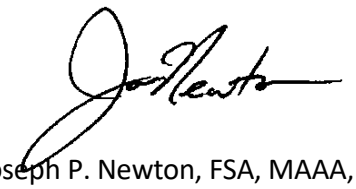
We certify that the information presented herein is accurate and fairly portrays the actuarial position of SPRS as of June 30, 2020.

All of our work conforms with generally accepted actuarial principles and practices, and is in conformity with the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of Kentucky Code of Laws and, where applicable, the Internal Revenue Code, ERISA, and the Statements of the Governmental Accounting Standards Board.

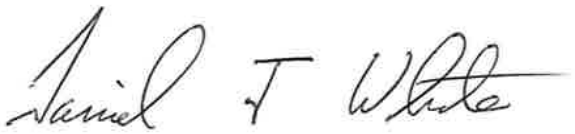
The undersigned are independent actuaries and consultants. Mr. Newton and Mr. White are Enrolled Actuaries. All three of the undersigned are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries. All of the undersigned are experienced in performing valuations for large public retirement systems.

Sincerely,

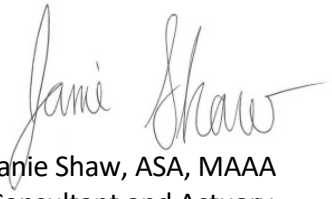
Gabriel, Roeder, Smith & Co.



Joseph P. Newton, FSA, MAAA, EA
Pension Market Leader and Actuary



Daniel J. White, FSA, MAAA, EA
Senior Consultant and Actuary



Janie Shaw, ASA, MAAA
Consultant and Actuary

Table of Contents

SECTION 1

EXECUTIVE SUMMARY

Summary of Principal Results

(Dollar amounts expressed in thousands)

	SPRS	
	June 30, 2020	June 30, 2019
Actuarially Determined Contribution[1]:		
Retirement	127.99%	123.79%
Insurance	18.07%	19.69%
Total	146.06%	143.48%
Contribution Rate for Next Fiscal Year[2]	146.06%	143.48%
Assets:		
Retirement		
• Actuarial value (AVAR)	$296,126	$282,162
• Market value (MVAR)	$293,949	$286,165
• Ratio of actuarial to market value of assets	100.7%	98.6%
Insurance		
• Actuarial value (AVAI)	$207,018	$197,395
• Market value (MVAI)	$201,340	$201,206
• Ratio of actuarial to market value of assets	102.8%	98.1%
Funded Status:		
Retirement		
• Actuarial accrued liability	$1,053,158	$1,045,318
• Unfunded accrued liability on AVAR	$757,032	$763,156
• Funded ratio on AVAR	28.1%	27.0%
• Unfunded accrued liability on MVAR	$759,209	$759,153
• Funded ratio on MVAR	27.9%	27.4%
Insurance		
• Actuarial accrued liability	$276,144	$276,809
• Unfunded accrued liability on AVAI	$69,126	$79,414
• Funded ratio on AVAI	75.0%	71.3%
• Unfunded accrued liability on MVAI	$74,804	$75,603
• Funded ratio on MVAI	72.9%	72.7%
Membership:		
• Number of		
- Active Members	798	883
- Retirees and Beneficiaries	1,669	1,647
- Inactive Members	589	557
- Total	3,056	3,087
• Projected payroll of active members	$46,145	$47,752
• Average salary of active members	$57,826	$54,079

[1] Actuarially Determined Contributions calculated as of June 30, 2019 reflect SB249, which changed the amortization period to 30 years as of June 30, 2019.

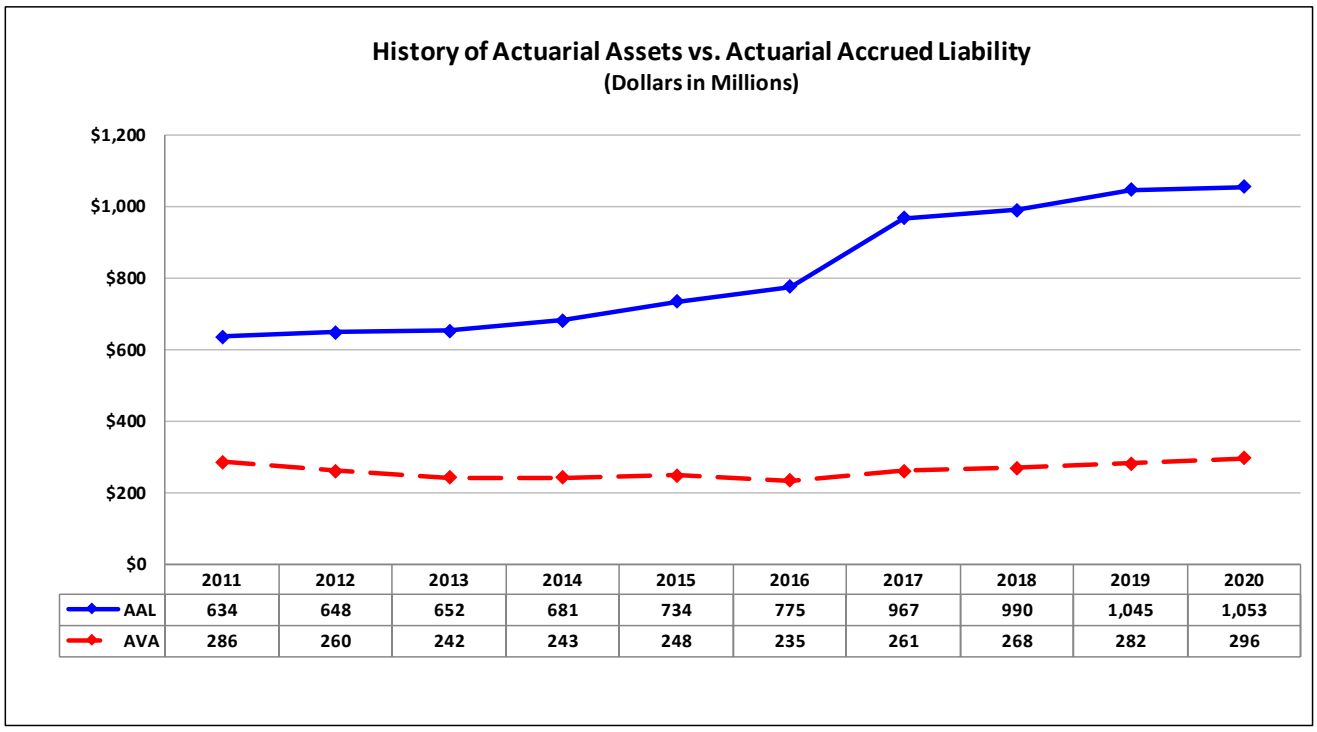
[2] The 2020 legislative session did not set the contribution rates for FYE 2022. Contribution rates for FYE 2022 will be based on the June 30, 2020 Valuation.

Executive Summary (Continued)

Retirement Fund

The unfunded actuarial accrued liability of the retirement fund decreased by $6 million since the prior year's valuation to $757 million. This decrease was slightly less than expected due to small liability and investment losses.

Below is a chart with the historical actuarial value of assets and actuarial accrued liability. The divergence in the assets and liability over the last ten years has generally been due to: (1) actual contributions being insufficient to finance the unfunded actuarial accrued liability, (2) decreases in the assumed rate of return between 2015 and 2017, and (3) actual investment experience being less than the investment return assumption.



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AAL	634	648	652	681	734	775	967	990	1,045	1,053
AVA	286	260	242	243	248	235	261	268	282	296

Executive Summary (Continued)

Summary of Change in Financial Condition of the Insurance Fund

Both the 2021 non-Medicare and Medicare premiums were lower than expected based on the prior year's actuarial assumptions, which resulted in lower than expected accrued liability for the insurance fund.

Specifically, the non-Medicare premiums were expected to increase by 6.25% from calendar year 2020 to calendar year 2021 (i.e. the medical trend assumption for non-Medicare premiums used in the prior year's actuarial valuation) and the actual premiums increased by approximately 3%. The Medicare premiums were expected to increase by 5.50% from calendar year 2020 to calendar year 2021 (i.e. the medical trend assumption for Medicare premiums used in the prior year's actuarial valuation) and the actual premiums decreased. The decrease to the Medicare premiums was primarily due to the repeal of the "Health Insurer Fee" in December 2019.

In conjunction with the review of the healthcare per capita claims cost, the assumed increase in future healthcare costs, or trend assumption, is reviewed on an annual basis. The trend assumption was updated since the June 30, 2019 valuation to better reflect the plan's anticipated long-term healthcare cost increases. In general, the updated assumption is assuming higher future increases in healthcare costs. Additionally, the assumed impact of the "Cadillac Tax" (previously, a 0.9% load on employer paid non-Medicare premiums for those who became participants prior to July 1, 2003) was removed to reflect its repeal since the prior valuation.

Since the prior year's valuation, the unfunded actuarial accrued liability of the insurance fund decreased by $10 million since the prior year's valuation to $69 million. The largest source of this decrease is due to a $17 million decrease in the liability due to the premium experience and corresponding healthcare trend assumption change. The corresponding funded ratio increased from 71.3% at June 30, 2019 to 75.0% at June 30, 2020.

SECTION 2

DISCUSSION

Discussion

The State Police Retirement System (SPRS) is a defined benefit pension fund that provides pensions and health care coverage for uniformed state police officers. SPRS includes hazardous duty benefits only. This report presents the result of the June 30, 2020 actuarial funding valuation for both the Retirement Fund and Insurance Fund.

The primary purposes of the valuation report are to describe the current actuarial condition of the System and provide the actuarially determined employer contribution rates for fiscal year ending June 30, 2022. In addition, the report analyzes changes in the System's financial condition and provides various summaries of the data.

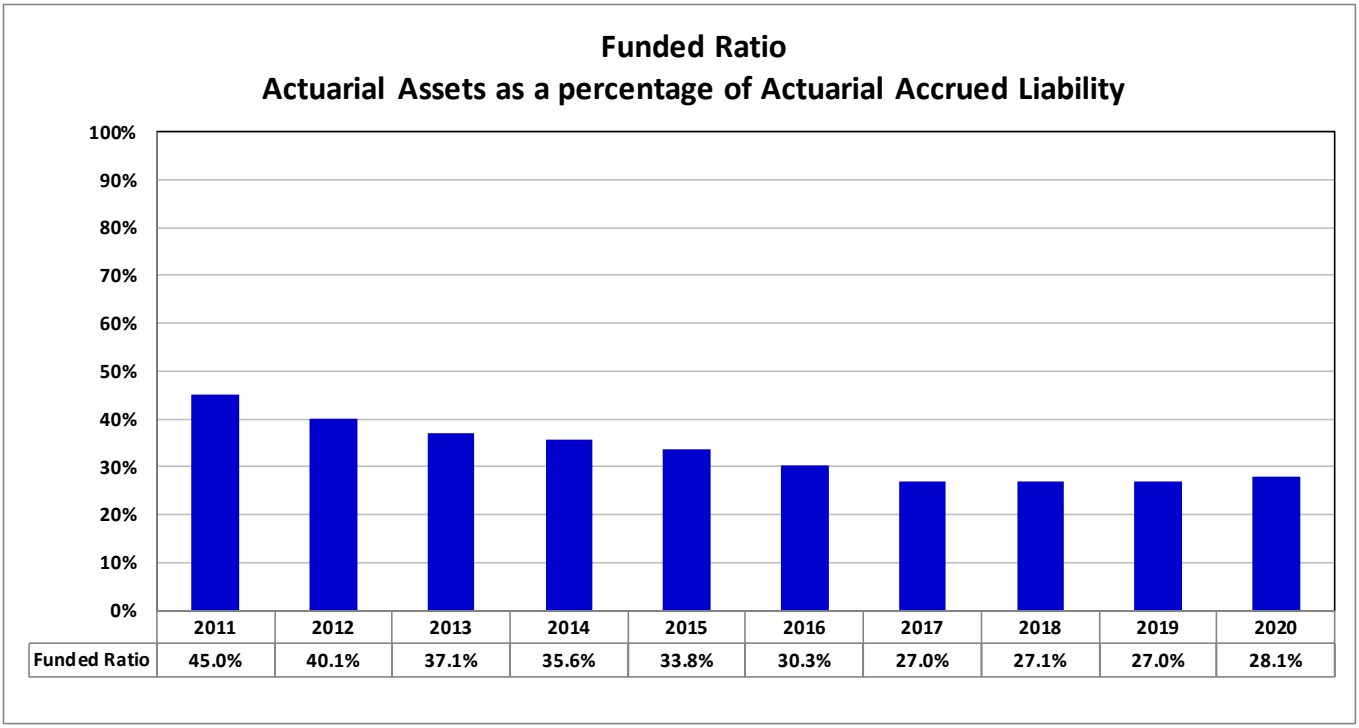
The actuarially determined contribution rates consist of two components: a normal cost rate and an amortization cost to finance the unfunded actuarial accrued liability. The normal cost rate is the theoretical amount which would be required to pay the members' benefits, based on the current plan provisions, if this amount had been contributed from each member's entry date and if the fund's experience exactly followed the actuarial assumptions. This is the amount that it should cost to provide the benefits for an average member. Since members contribute to the fund, only the excess of the normal rate over the member contribution rate is included in the employer contribution rate. The amortization cost is the amount, expressed as a percentage of payroll, necessary to amortize the unfunded actuarial accrued liability. The payroll growth rate and discount rate assumptions are selected by the Board. The funding period is specified in Section 61.565 of Kentucky Statute.

All of the actuarial and financial tables referenced by the other sections of this Report appear in Section 3. Section 4 provides additional details related to the calculation of the amortization of the unfunded actuarial accrued liability. This section was added to the report this year due to the change in the amortization methodology related to SB249 (passed during the 2020 legislative session). Section 5 provides member data and statistical information. Section 6 provides a discussion of various risk measures, which are intended to aid stakeholders in understanding the effects of future experience differing from the assumptions used in performing an actuarial valuation. Appendices A and B provide summaries of the principle actuarial assumptions and methods and plan provisions. Finally, Appendix C provides a glossary of technical terms that are used throughout this report.

Funding Progress

The following chart provides a ten-year history of the retirement fund's funded ratio (i.e. the Actuarial Value of Assets divided by the Actuarial Accrued Liability). The decline in the funded ratio over the last ten years has generally been due to: (1) actual contributions being insufficient to finance the unfunded actuarial accrued liability, (2) decreases in the assumed rate of return between 2015 and 2017, and (3) actual investment experience being less than the investment return assumption.

The funded ratio increased from 2019 to 2020 for the retirement fund. Assuming the actuarially determined contributions are actually paid in future years and absent future unfavorable experience we expect the funded ratio to continue improving. Also, the dollar amount of the unfunded actuarial accrued liability, or the difference between the actuarial accrued liability and the actuarial value of assets, is expected to begin decreasing. Table 9, Schedule of Funding Progress, in the following section of the report provides additional detail regarding the funding progress of the Retirement Funds.



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Funded Ratio	45.0%	40.1%	37.1%	35.6%	33.8%	30.3%	27.0%	27.1%	27.0%	28.1%

Asset Gains/ (Losses)

The actuarial value of assets ("AVA") is based on a smoothed market value of assets, using a systematic approach to phase-in the difference between the actual and expected investment return on the market value of assets (adjusted for receipts and disbursements during the year). This is appropriate because it dampens the short-term volatility inherent in investment markets. The return is computed net of investment expenses.

Retirement Fund

The actuarial value of assets for the retirement fund increased from $282 million to $296 million since the prior valuation. The rate of return on the market value of assets on a dollar-weighted basis for the prior fiscal year was a 2.2% which is less than the 5.25% expected annual return. The return on an actuarial (smoothed) asset value was 4.4%, which resulted in a $2.3 million loss for the fiscal year. This difference in the estimated return on market value and actuarial value illustrates the smoothing effect of the asset valuation method. The market value of assets is $2 million less than the actuarial value of assets, which signifies that the retirement fund is in a position of deferred losses to be realized in future years.

Table 6 in the following section of this report provides asset information that was included in the annual financial statements of the System, as well as the estimated yield on a market value basis. Table 7 provides the development of the actuarial value of assets and the estimated yield on an actuarial value basis.

Actuarial Gains/ (Losses)

The annual actuarial valuation is a snapshot analysis of the benefit liabilities, assets and funded position of the funds as of the first day of the plan year. In any one fiscal year, the experience can be better or worse from that which is assumed or expected. The actuarial assumptions do not necessarily attempt to model what the experience will be for any one given fiscal year, but instead try to model the overall experience over many years. Therefore, as long as the actual experience of a retirement system is reasonably close to the current assumptions, the long-term funding requirements of the system will remain relatively consistent.

Below are tables that separately show a reconciliation of the actuarial gains / (losses) since the prior actuarial valuation for the retirement and health insurance funds, which include the effect of asset and liability gains and losses, changes in assumptions, changes in plan provisions, etc.

Experience Gain or (Loss)
(Dollar amounts expressed in thousands)

	Retirement	Insurance
A. Calculation of total actuarial gain or loss		
1. Unfunded actuarial accrued liability (UAAL), previous year	$ 763,156	$ 79,414
2. Normal cost and administrative expenses	13,079	4,067
3. Less: contributions for the year	(64,220)	(13,329)
4. Interest accrual	38,723	4,674
5. Expected UAAL (Sum of Items 1 - 4)	$ 750,738	$ 74,826
6. Actual UAAL as of June 30,2020	$ 757,032	$ 69,126
7. Total gain (loss) for the year (Item 5 - Item 6)	$ (6,294)	$ 5,700
B. Source of gains and losses		
8. Asset gain (loss) for the year	$ (2,330)	$ (1,692)
9. Liability experience gain (loss) for the year	(3,964)	7,392
10. Plan Change	—	—
11. Assumption change	—	—
12. Total	$ (6,294)	$ 5,700

The liability experience gain shown above for the insurance fund includes a $17 million gain due to the fund's favorable premium experience and corresponding healthcare trend assumption change. See the discussion in the Executive Summary for additional information.

Actuarial Assumptions and Methods

In determining costs and liabilities, actuaries use assumptions about the future, such as rates of salary increase, probabilities of retirement, termination, death and disability, and an annual investment return assumption. The Board of Trustees, in consultation with the actuary, sets the actuarial assumptions and methods used in the actuarial valuation. An experience study was conducted after the June 30, 2018 actuarial valuation and the Board adopted updated assumptions for first use in the June 30, 2019 actuarial valuation.

In conjunction with the review of the healthcare per capita claims cost, the assumed increase in future healthcare costs, or trend assumption, is reviewed on an annual basis. The trend assumption was updated since the June 30, 2019 valuation to better reflect the plan's anticipated long-term healthcare cost increases. There were no other changes in actuarial assumptions since the prior valuation.

It is our opinion that the assumptions are internally consistent, reasonable, and reflect anticipated future experience of the System. Appendix A includes a summary of the actuarial assumptions and methods used in this valuation.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. This report does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

Benefit Provisions

Appendix B of this report includes a summary of the major benefit provisions for System.

House Bill 271 passed during the 2020 legislative session and removed provisions that reduce the monthly payment to a surviving spouse of a member whose death was due to a duty-related injury upon remarriage of the spouse. It also increased benefits for a very small number of beneficiaries.

There were no other material plan provision changes since the prior valuation.

SECTION 3

ACTUARIAL TABLES

Actuarial Tables

Development of Unfunded Actuarial Accrued Liability

(Dollar amounts expressed in thousands)

		June 30, 2020	
		Retirement (1)	Insurance (2)
1.	Projected payroll of active members	$ 46,145	$ 46,145
2.	Present value of future pay	$ 455,711	$ 422,334
3.	Normal cost rate		
	a. Total normal cost rate	26.46%	7.69%
	b. Less: member contribution rate	-8.00%	-0.44%
	c. Employer normal cost rate	18.46%	7.25%
4.	Actuarial accrued liability for active members		
	a. Present value of future benefits	$ 297,451	$ 90,788
	b. Less: present value of future normal costs	(107,873)	(22,282)
	c. Actuarial accrued liability	$ 189,578	$ 68,506
5.	Total actuarial accrued liability		
	a. Retirees and beneficiaries	$ 854,711	$ 203,813
	b. Inactive members	8,869	3,825
	c. Active members (Item 4c)	189,578	68,506
	d. Total	$ 1,053,158	$ 276,144
6.	Actuarial value of assets	$ 296,126	$ 207,018
7.	Unfunded actuarial accrued liability (UAAL) (Item 5d - Item 6)	$ 757,032	$ 69,126
8.	Funded Ratio	28.1%	75.0%

Actuarial Present Value of Future Benefits

(Dollar amounts expressed in thousands)

		June 30, 2020	
		Retirement (1)	Insurance (2)
1.	Active members		
	a. Service retirement	$ 283,481	
	b. Deferred termination benefits and refunds	3,389	
	c. Survivor benefits	2,184	
	d. Disability benefits	8,397	
	e. Total	$ 297,451	$ 90,788
2.	Retired members		
	a. Service retirement	$ 777,384	
	b. Disability retirement	12,195	
	c. Beneficiaries	65,132	
	d. Total	$ 854,711	$ 203,813
3.	Inactive members		
	a. Vested terminations	$ 8,494	$ 3,825
	b. Nonvested terminations	375	N/A
	c. Total	$ 8,869	$ 3,825
4.	Total actuarial present value of future benefits	$ 1,161,031	$ 298,426

Development of Actuarially Determined Contribution Rate

		June 30, 2020	
		Retirement (1)	Insurance (2)
1.	Total normal cost rate		
	a. Service retirement	23.92%	
	b. Deferred termination benefits and refunds	1.04%	
	c. Survivor benefits	0.33%	
	d. Disability benefits	1.17%	
	e. Total	26.46%	7.69%
2.	Less: member contribution rate	-8.00%	-0.44%
3.	Total employer normal cost rate	18.46%	7.25%
4.	Administrative expenses	0.58%	0.15%
5.	Net employer normal cost rate	19.04%	7.40%
6.	UAAL amortization contribution	108.95%	10.67%
7.	Total calculated employer contribution	127.99%	18.07%

Actuarial Balance Sheet

Retirement Benefits

(Dollar amounts expressed in thousands)

		June 30, 2020 (1)	June 30, 2019 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 296,126	$ 282,162
	b. Present value of future member contributions	$ 36,457	$ 37,475
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 71,416	$ 76,268
	ii. Unfunded accrued liability contributions	757,032	763,156
	iii. Total future employer contributions	$ 828,448	$ 839,424
	d. Total assets	$ 1,161,031	$ 1,159,061
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 107,873	$ 113,743
	ii. Accrued liability	189,578	196,921
	iii. Total present value of future benefits	$ 297,451	$ 310,664
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 854,711	$ 840,795
	c. Present value of benefits payable on account of current inactive members	$ 8,869	$ 7,602
	d. Total liabilities	$ 1,161,031	$ 1,159,061

Actuarial Balance Sheet

Insurance Benefits

(Dollar amounts expressed in thousands)

		June 30, 2020 (1)	June 30, 2019 (2)
1.	Assets - Present and Expected Future Resources		
	a. Current assets (actuarial value)	$ 207,018	$ 197,395
	b. Present value of future member contributions	$ 2,921	$ 2,782
	c. Present value of future employer contributions		
	i. Normal cost contributions	$ 19,361	$ 22,337
	ii. Unfunded accrued liability contributions	69,126	79,414
	iii. Total future employer contributions	$ 88,487	$ 101,751
	d. Total assets	$ 298,426	$ 301,928
2.	Liabilities - Present Value of Expected Future Benefit Payments		
	a. Active members		
	i. Present value of future normal costs	$ 22,282	$ 25,119
	ii. Accrued liability	68,506	76,850
	iii. Total present value of future benefits	$ 90,788	$ 101,969
	b. Present value of benefits payable on account of current retired members and beneficiaries	$ 203,813	$ 196,513
	c. Present value of benefits payable on account of current inactive members	$ 3,825	$ 3,446
	d. Total liabilities	$ 298,426	$ 301,928

Reconciliation of Net Assets

(Dollar amounts expressed in thousands)[1]

	Year Ending June 30, 2020 (1) Retirement	Year Ending June 30, 2020 (2) Insurance
1. Value of assets at beginning of year	$ 286,165	$ 201,206
2. Revenue for the year		
a. Contributions		
i. Member contributions	$ 4,767	$ 196
ii. Employer contributions	58,358	13,133
iii. Other contributions (less 401h)	1,095	0
iv. Total	$ 64,220	$ 13,329
b. Income		
i. Interest, dividends, and other income	$ 6,618	$ 4,466
ii. Investment expenses	(1,304)	(796)
iii. Net	$ 5,314	$ 3,670
c. Net realized and unrealized gains (losses)	1,028	(2,545)
d. Total revenue	$ 70,562	$ 14,454
3. Expenditures for the year		
a. Disbursements		
i. Refunds	$ 88	$ 0
ii. Regular annuity benefits / Healthcare premiums	62,423	14,215
iii. Other benefit payments[2]	0	33
iv. Transfers to other systems	0	0
v. Total	$ 62,511	$ 14,249
b. Administrative expenses and depreciation	266	71
c. Total expenditures	$ 62,777	$ 14,320
4. Increase in net assets (Item 2. - Item 3.)	$ 7,784	$ 134
5. Value of assets at end of year (Item 1. + Item 4.)	$ 293,949	$ 201,340
6. Net external cash flow		
a. Dollar amount	$ 1,443	$ (991)
b. Percentage of market value	0.5%	-0.5%
7. Estimated annual return on net assets	2.2%	0.6%

[1] Amounts may not add due to rounding. Retirement assets exclude 401h assets. Insurance assets include 401h assets

[2] Insurance benefit payments have been offset by Medicare Drug Reimbursements, Insurance Premiums, and Humana Gain Share Payments

Development of Actuarial Value of Assets

Retirement Benefits

(Dollar amounts expressed in thousands)*

	Year Ending	June 30, 2020
1.	Actuarial value of assets at beginning of year	$ 282,162
2.	Market value of assets at beginning of year	$ 286,165
3.	Net new investments	
	a. Contributions	$ 64,220
	b. Benefit payments	(62,511)
	c. Administrative expenses	(266)
	d. Subtotal	$ 1,443
4.	Market value of assets at end of year	$ 293,949
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$ 6,342
6.	Assumed investment return rate for fiscal year	5.25%
7.	Expected return for immediate recognition	$ 15,062
8.	Excess return for phased recognition	$ (8,720)
9.	Phased-in recognition, 20% of excess return on assets for prior years:	

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2020	$ (8,720)	$ (1,744)
b.	2019	669	134
c.	2018	5,183	1,037
d.	2017	11,623	2,325
e.	2016	(21,455)	(4,291)
f.	Total		$ (2,540)

10.	Actuarial value of assets as of June 30, 2020 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$ 296,126
11.	Ratio of actuarial value to market value	100.7%
12.	Estimated annual return on actuarial value of assets	4.4%

* Amounts may not add due to rounding

Development of Actuarial Value of Assets

Insurance Benefits

(Dollar amounts expressed in thousands)*

	Year Ending		June 30, 2020
1.	Actuarial value of assets at beginning of year	$	197,395
2.	Market value of assets at beginning of year	$	201,206
3.	Net new investments		
	a. Contributions	$	13,329
	b. Benefit payments		(14,249)
	c. Administrative expenses		(71)
	d. Subtotal	$	(991)
4.	Market value of assets at end of year	$	201,340
5.	Net earnings (Item 4. - Item 2. - Item 3.d.)	$	1,125
6.	Assumed investment return rate for fiscal year		6.25%
7.	Expected return for immediate recognition	$	12,544
8.	Excess return for phased recognition	$	(11,419)

9. Phased-in recognition, 20% of excess return on assets for prior years:

	Fiscal Year Ending June 30,	Excess Return	Recognized Amount
a.	2020	$ (11,419)	$ (2,284)
b.	2019	(1,099)	(220)
c.	2018	5,431	1,086
d.	2017	9,723	1,945
e.	2016	(12,288)	(2,458)
f.	Total		$ (1,930)

10.	Actuarial value of assets as of June 30, 2020 (Item 1. + Item 3.d. + Item 7.+ Item 9.f.)	$	207,018
11.	Ratio of actuarial value to market value		102.8%
12.	Estimated annual return on actuarial value of assets		5.4%

* Amounts may not add due to rounding

Schedule of Funding Progress

(Dollar amounts expressed in thousands)

June 30, (1)	Actuarial Value of Assets (AVA) (2)	Actuarial Accrued Liability (AAL) (3)	Unfunded Actuarial Accrued Liability (UAAL) (3) - (2) (4)	Funded Ratio (2)/(3) (5)	Annual Covered Payroll (6)	UAAL as % of Payroll (4)/(6) (7)
			Retirement			
2011	$ 285,581	$ 634,379	$ 348,799	45.0%	$ 48,693	716.3%
2012	259,792	647,689	387,897	40.1%	48,373	801.9%
2013	241,800	651,581	409,780	37.1%	45,256	905.5%
2014	242,742	681,118	438,377	35.6%	44,616	982.6%
2015	248,388	734,156	485,769	33.8%	45,765	1061.4%
2016	234,568	775,160	540,593	30.3%	45,551	1186.8%
2017	261,320	967,145	705,825	27.0%	48,598	1452.4%
2018	268,259	989,528	721,269	27.1%	48,808	1477.8%
2019	282,162	1,045,318	763,156	27.0%	47,752	1598.2%
2020	296,126	1,053,158	757,032	28.1%	46,145	1640.6%
			Insurance			
2011	$ 123,687	$ 438,428	$ 314,740	28.2%	$ 48,693	646.4%
2012	124,372	333,904	209,532	37.2%	48,373	433.2%
2013	136,321	222,327	86,006	61.3%	45,256	190.0%
2014	155,595	234,271	78,676	66.4%	44,616	176.3%
2015	167,775	254,839	87,064	65.8%	45,765	190.2%
2016	172,704	257,197	84,494	67.1%	45,551	185.5%
2017	180,464	276,641	96,177	65.2%	48,598	197.9%
2018	187,535	262,088	74,553	71.6%	48,808	152.7%
2019	197,395	276,809	79,414	71.3%	47,752	166.3%
2020	207,018	276,144	69,126	75.0%	46,145	149.8%

Summary of Principal Assumptions and Methods

Below is a summary of the principal economic assumptions, cost method, and the method for financing the unfunded actuarial accrued liability:

Valuation date:	June 30, 2020
Actuarial cost method:	Entry Age Normal
Amortization method:	Level percentage of payroll (0% payroll growth assumed)
Amortization period for contribution rate:	30-year closed period at June 30, 2019 Gains/losses incurring after 2019 will be amortized over separate closed 20-year amortization bases
Asset valuation method:	5-Year Smoothed Market
Actuarial assumptions:	
Investment rate of return, retirement	5.25%
Investment rate of return, insurance	6.25%
Projected salary increases	3.55% to 16.05% (varies by service)
Inflation	2.30%
Post-retirement pension benefit adjustments	0.00%
Retiree Mortality	System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from MP-2014 mortality improvement scale using a base year of 2019.

Solvency Test

(Dollar amounts expressed in thousands)

June 30,	Actuarial Accrued Liability: Active Member Contributions	Actuarial Accrued Liability: Retired Members & Beneficiaries	Actuarial Accrued Liability: Active Members (Employer Financed)	Valuation Assets	Portion of Aggregate Accrued Liabilities Covered by Assets: Active	Portion of Aggregate Accrued Liabilities Covered by Assets: Retired	Portion of Aggregate Accrued Liabilities Covered by Assets: ER Financed
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Retirement							
2011	$ 43,574	$ 499,194	$ 91,611	$ 285,581	100.0%	48.5%	0.0%
2012	41,139	523,017	83,533	259,792	100.0%	41.8%	0.0%
2013	39,788	535,720	76,072	241,800	100.0%	37.7%	0.0%
2014	41,831	563,011	76,276	242,742	100.0%	35.7%	0.0%
2015	41,567	605,855	86,734	248,388	100.0%	34.1%	0.0%
2016	41,871	636,499	96,791	234,568	100.0%	30.3%	0.0%
2017	44,798	773,982	148,365	261,320	100.0%	28.0%	0.0%
2018	43,835	800,788	144,905	268,259	100.0%	28.0%	0.0%
2019	41,948	848,397	154,973	282,162	100.0%	28.3%	0.0%
2020	40,831	863,580	148,747	296,126	100.0%	29.6%	0.0%
Insurance							
2011	$ -	$ 252,440	$ 185,988	$ 123,687	100.0%	49.0%	0.0%
2012	-	190,259	143,645	124,372	100.0%	65.4%	0.0%
2013	-	139,509	82,818	136,321	100.0%	97.7%	0.0%
2014	-	143,402	90,869	155,595	100.0%	100.0%	13.4%
2015	-	170,447	84,392	167,775	100.0%	98.4%	0.0%
2016	-	177,094	80,103	172,704	100.0%	97.5%	0.0%
2017	-	186,390	90,251	180,464	100.0%	96.8%	0.0%
2018	-	183,151	78,937	187,535	100.0%	100.0%	5.6%
2019	-	199,959	76,850	197,395	100.0%	98.7%	0.0%
2020	-	207,638	68,506	207,018	100.0%	99.7%	0.0%

SECTION 4

AMORTIZATION BASES

Amortization of Unfunded Liability

Retirement

Valuation Year Base Established	Original Amortization Base	Remaining at June 30, 2020	Payments for FYE 2022	Funding Period at June 30, 2020
June 30, 2019	$ 763,156	$ 753,284	$ 49,853	29
June 30, 2020	3,748	3,748	420	20
Total		$ 757,032	$ 50,273	
Projected Payroll for FYE 2022			$ 46,145	
Amortization Payments as a Percentage of Payroll			108.95%	

Insurance

Valuation Year Base Established	Original Amortization Base	Remaining at June 30, 2020	Payments for FYE 2022	Funding Period at June 30, 2020
June 30, 2019	$ 79,414	$ 75,022	$ 5,496	29
June 30, 2020	(5,896)	(5,896)	(571)	20
Total		$ 69,126	$ 4,925	
Projected Payroll for FYE 2022			$ 46,145	
Amortization Payments as a Percentage of Payroll			10.67%	

Note:
Budgeted contribution rates for FYE 2021 were known at the time of the June 30, 2020 Valuation. Amortization bases established at this valuation date was adjusted accordingly.

SECTION 5

MEMBERSHIP INFORMATION

Membership Tables

Summary of Membership Data

(Total dollar amounts expressed in thousands)

		June 30, 2020 (1)	June 30, 2019 (4)
1.	Active members		
a.	Males	781	855
b.	Females	17	28
c.	Total members	798	883
d.	Total annualized prior year salaries	$ 46,145	$ 47,752
e.	Average salary[2]	$ 57,826	$ 54,079
f.	Average age	37.5	36.7
g.	Average service	10.7	10.0
h.	Member contributions with interest	$ 40,831	$ 41,948
i.	Average contributions with interest[2]	$ 51,167	$ 47,506
2.	Vested inactive members[1]		
a.	Number	300	289
b.	Total annual deferred benefits	$ 966	$ 811
c.	Average annual deferred benefit[2]	$ 3,221	$ 2,806
d.	Average age at the valuation date	43.9	43.5
3.	Nonvested inactive members[1]		
a.	Number	289	268
b.	Total member contributions with interest	$ 372	$ 339
c.	Average contributions with interest[2]	$ 1,286	$ 1,264
4.	Service retirees		
a.	Number	1,383	1,363
b.	Total annual benefits	$ 54,996	$ 54,142
c.	Average annual benefit[2]	$ 39,766	$ 39,723
d.	Average age at the valuation date	63.0	63.0
5.	Disabled retirees		
a.	Number	53	54
b.	Total annual benefits	$ 927	$ 959
c.	Average annual benefit[2]	$ 17,498	$ 17,757
d.	Average age at the valuation date	57.9	58.0
6.	Beneficiaries		
a.	Number	233	230
b.	Total annual benefits	$ 6,509	$ 6,303
c.	Average annual benefit[2]	$ 27,936	$ 27,404
d.	Average age at the valuation date	67.1	67.1

[1] Vested inactive member section includes Tier 1 members eligible for a benefit equal to the actuarially equivalent of two times the member's contribution balance.

[2] Average dollar amounts shown are expresed to the dollar.

Summary of Historical Active Membership

	Active Members		Covered Payroll[1]		Average Annual Pay	
June 30,	Number	Percent Increase /(Decrease)	Amount in Thousands	Percent Increase /(Decrease)	Amount	Percent Increase /(Decrease)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2011	965		$ 48,693		$ 50,459	
2012	907	-6.0%	48,373	-0.7%	53,332	5.7%
2013	902	-0.6%	45,256	-6.4%	50,173	-5.9%
2014	855	-5.2%	44,616	-1.4%	52,182	4.0%
2015	937	9.6%	45,765	2.6%	48,842	-6.4%
2016	908	-3.1%	45,551	-0.5%	50,167	2.7%
2017	903	-0.6%	48,598	6.7%	53,818	7.3%
2018	886	-1.9%	48,808	0.4%	55,088	2.4%
2019	883	-0.3%	47,752	-2.2%	54,079	-1.8%
2020	798	-9.6%	46,145	-3.4%	57,826	6.9%

[1] Covered payroll is the annualized, projected compensation for the following year and does not includ payroll attributable to working retirees.

Distribution of Active Members by Age and by Years of Service

SPRS Members

Attained Age	Years of Credited Service												
	0 Count & Avg. Comp.	1 Count & Avg. Comp.	2 Count & Avg. Comp.	3 Count & Avg. Comp.	4 Count & Avg. Comp.	5-9 Count & Avg. Comp.	10-14 Count & Avg. Comp.	15-19 Count & Avg. Comp.	20-24 Count & Avg. Comp.	25-29 Count & Avg. Comp.	30-34 Count & Avg. Comp.	35 & Over Count & Avg. Comp.	Total Count & Avg. Comp.
Under 20	0	0	0	0	0	0	0	0	0	0	0	0	0
	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
20-24	0	28	7	0	0	0	0	0	0	0	0	0	35
	$0	$42,201	$44,766	$0	$0	$0	$0	$0	$0	$0	$0	$0	$42,714
25-29	2	29	25	4	18	36	0	0	0	0	0	0	114
	$42,290	$42,876	$44,680	$45,872	$49,088	$50,920	$0	$0	$0	$0	$0	$0	$46,887
30-34	4	10	4	24	8	95	19	0	0	0	0	0	164
	$43,544	$44,163	$44,093	$45,105	$53,530	$52,745	$56,137	$0	$0	$0	$0	$0	$51,099
35-39	0	6	1	6	2	49	50	36	0	0	0	0	150
	$0	$43,093	$45,121	$44,694	$46,221	$54,243	$57,506	$63,666	$0	$0	$0	$0	$56,596
40-44	1	0	0	3	0	29	28	89	21	1	0	0	172
	$44,727	$0	$0	$42,587	$0	$53,170	$59,726	$67,648	$76,025	$76,011	$0	$0	$64,418
45-49	0	1	1	1	0	10	16	37	27	3	1	0	97
	$0	$40,818	$49,198	$44,326	$0	$56,392	$54,007	$68,795	$76,644	$89,137	$106,360	$0	$67,536
50-54	0	0	0	1	0	0	7	14	18	6	2	0	48
	$0	$0	$0	$44,984	$0	$0	$59,210	$66,725	$80,410	$87,644	$79,375	$0	$73,450
55-59	0	0	0	0	0	0	4	6	1	3	1	0	15
	$0	$0	$0	$0	$0	$0	$56,497	$63,274	$73,211	$91,351	$102,620	$0	$70,368
60-64	0	0	0	0	0	0	1	0	1	0	0	1	3
	$0	$0	$0	$0	$0	$0	$54,484	$0	$68,693	$0	$0	$99,885	$74,354
65 & Over	0	0	0	0	0	0	0	0	0	0	0	0	0
	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	7	74	38	39	28	219	125	182	68	13	4	1	798
	$43,354	$42,784	$44,764	$44,903	$50,152	$53,003	$57,386	$66,878	$77,283	$87,949	$91,933	$99,885	$57,826

Distribution of Annuitant Monthly Benefit by Status and Age
Retirees and Beneficiaries
(Dollar amounts expressed in thousands)

	Retirement		Disability		Survivors & Beneficiaries		Total	
Current Age	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount	Number of Annuitants	Total Annual Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Under 50	200	$ 7,723	17	$ 300	32	$ 481	249	$ 8,504
50 - 54	197	7,695	8	180	10	209	215	8,085
55 - 59	187	7,579	5	71	13	222	205	7,872
60 - 64	149	6,159	5	95	18	459	172	6,712
65 - 69	235	9,739	8	89	32	857	275	10,685
70 - 74	235	9,473	8	168	51	1,743	294	11,384
75 - 79	98	3,402	1	1	25	784	124	4,188
80 - 84	49	1,788	1	24	24	803	74	2,614
85 - 89	26	1,066	0	0	18	614	44	1,679
90 And Over	7	372	0	0	10	337	17	709
Total	**1,383**	**$ 54,996**	**53**	**$ 927**	**233**	**$ 6,509**	**1,669**	**$ 62,432**

*Amounts may not add due to rounding

Retired Lives Summary

Form of Payment	Male Lives Number	Male Lives Monthly Benefit Amount	Female Lives Number	Female Lives Monthly Benefit Amount	Total Number	Total Monthly Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Basic	155	$ 466,864	18	$ 49,004	173	$ 515,868
Joint & Survivor:						
100% to Beneficiary	177	548,276	1	4,814	178	553,090
66 2/3% to Beneficiary	90	340,165	2	7,542	92	347,707
50% to Beneficiary	76	279,709	2	7,515	78	287,224
Pop-up Option	663	2,327,776	6	11,214	669	2,338,990
Social Security Option:						
Age 62 Basic	28	70,178	0	0	28	70,178
Age 62 Survivorship	111	209,843	1	4,416	112	214,258
Partial Deferred (Old Plan)	0	0	0	0	0	0
Widows Age 60	0	0	0	0	0	0
5 Years Certain	0	0	0	0	0	0
10 Years Certain	7	24,114	0	0	7	24,114
10 Years Certain & Life	38	129,126	3	6,759	41	135,885
15 Years Certain & Life	17	50,563	1	3,919	18	54,482
20 Years Certain & Life	38	114,498	2	3,979	40	118,476
Total:	1,400	$ 4,561,112	36	$ 99,160	1,436	$ 4,660,272

Beneficiary Lives Summary

Form of Payment	Male Lives Number	Male Lives Monthly Benefit Amount	Female Lives Number	Female Lives Monthly Benefit Amount	Total Number	Total Monthly Benefit Amount
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Basic	2	$ 820	9	$ 10,136	11	$ 10,956
Joint & Survivor:						
100% to Beneficiary	7	10,739	60	166,368	67	177,107
66 2/3% to Beneficiary	2	1,206	14	34,050	16	35,256
50% to Beneficiary	0	0	20	31,123	20	31,123
Pop-up Option	2	1,154	54	154,576	56	155,730
Social Security Option:						
Age 62 Basic	0	0	2	2,281	2	2,281
Age 62 Survivorship	2	934	48	98,472	50	99,406
Partial Deferred (Old Plan)	0	0	0	0	0	0
Widows Age 60	0	0	0	0	0	0
5 Years Certain	0	0	0	0	0	0
10 Years Certain	1	2,038	2	14,018	3	16,056
10 Years Certain & Life	0	0	0	0	0	0
15 Years Certain & Life	0	0	1	721	1	721
20 Years Certain & Life	1	6,686	6	7,092	7	13,778
Total:	17	$ 23,578	216	$ 518,837	233	$ 542,415

Schedule of Retirants Added to And Removed from Rolls

(Dollar amounts except average allowance expressed in thousands)

Year Ended	Added to Rolls	Removed from Rolls	Rolls End of the Year		% Increase in Annual Benefit	Average Annual Benefit
	Number	Number	Number	Annual Benefits		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2011	52	12	1,263	$ 47,467		$ 37,583
2012	52	16	1,299	49,887	5.1%	38,404
2013	63	16	1,346	50,906	2.0%	37,820
2014	95	28	1,413	53,432	5.0%	37,815
2015	62	15	1,460	54,930	2.8%	37,623
2016	65	10	1,515	56,650	3.1%	37,393
2017	30	9	1,536	57,253	1.1%	37,274
2018	81	17	1,600	59,626	4.1%	37,266
2019	74	27	1,647	61,404	3.0%	37,282
2020	61	39	1,669	62,432	1.7%	37,407

SECTION 6

ASSESSMENT AND DISCLOSURE OF RISK

Risks Associated with Measuring the Accrued Liability And Actuarially Determined Contribution

(As Required by ASOP No. 51)

The determination of SPRS's accrued liability and actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. The risk measures illustrated in this section are intended to aid stakeholders in understanding the effects of future experience differing from the assumptions used in performing an actuarial valuation. These risk measures may also help with illustrating the potential volatility in the funded status and actuarially determined contributions that result from differences between actual experience and the expected experience based on the actuarial assumptions.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience (economic and demographic) differing from the assumptions, changes in assumptions due to changing conditions, changes in contribution requirements due to modifications to the funding policy, and changes in the liability and cost due to changes in plan provisions or applicable law. The scope of this actuarial valuation does not include any analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the System's future financial condition include:

- Investment risk – actual investment returns may differ from expected returns;
- Longevity risk – members may live longer or shorter than expected and receive pensions for a time period different than assumed;
- Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future contributions differing from expected;
- Salary and payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liabilities or contributions differing from expected;
- Asset/Liability mismatch – changes in assets may be inconsistent with changes in liabilities, thereby altering the relative difference between the assets and liabilities which may alter the funded status and contribution requirements;
- Contribution risk – actual contributions may differ from expected future contributions (for example, actual contributions not being paid in accordance with the System's funding policy, withdrawal liability assessments or other anticipated payments to the plan are not being paid, or material changes occurring in the anticipated number of covered employees, covered payroll, or another relevant contribution base).

Effects of certain experience can generally be anticipated. For example, if investment returns since the most recent actuarial valuation is less (or more) than the assumed rate of return, then the funded status of the plan can be expected to decrease (or increase) more than anticipated.

The contribution rate in this report was established in accordance with applicable Statutes and assumptions adopted by the Board. However, stakeholders should be aware that the scheduled contribution rates specified in State Code do not necessarily guarantee that the contribution requirements will not increase in a future year.

Employer Risk with Contribution Rates

Currently KRS collects contributions from the Commonwealth based on the total payroll of employees who are earning benefits in SPRS (i.e. covered payroll). The actuarially determined contribution rate is comprised of two components - the normal cost rate (to pay for the benefits accruing in the next year) and the unfunded amortization (to pay for the benefits accrued by members in previous years). The unfunded amortization is calculated by first determining the dollar amount necessary to pay for the unfunded liability based on KRS's funding policy, and then by dividing that dollar amount by expected covered payroll to convert that contribution requirement to a percentage of payroll (i.e. a contribution rate).

As the contribution requirement, as a percentage of payroll, increases then there is increased incentive for participating employers to make deliberate business action to reduce their payroll reported to the System in order to reduce their pension cost.

Plan Specific Risk Measures

Risks faced by a pension plan evolve over time. A relatively new plan with virtually no assets and paying few benefits will experience lower investment risk than a mature plan with a significant amount of assets and large number of members receiving benefits. There are a few measures that can assist stakeholders in understanding and comparing the maturity of a plan to other systems, which include:

- Ratio of market value of assets to payroll: The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. If assets are approximately the same as covered payroll, an investment return that is 5% different than assumed would equal 5% of payroll. In another example, if the assets are approximately twice as large as covered payroll, an investment return that is 5% different than assumed would equal 10% of payroll. A ratio that increases over time generally indicates the potential of an increasing volatility in employer contribution rates as a percentage of payroll.
- Ratio of actuarial accrued liability to payroll: The ratio of actuarial accrued liability to payroll can be used as a measure to indicate the potential volatility of contributions due to volatility in the liability experience. For instance, if the actuarial accrued liability is 5 times the size of the covered payroll, then a change in the liability that is 2% different than expected would be a change in magnitude that is 10% of payroll. A ratio that increases over time generally indicates the potential of an increasing volatility in employer contribution rates as a percentage of payroll.
- Percentage of Expected Contributions Actually Received: This measure identifies the percentage difference between the contributions the fund expects to receive during the fiscal year to and actual contributions received by the fund during the fiscal year. A percentage that is less than 100% means that actual contributions the fund received were less than the expected contributions determined by a prior actuarial valuation. On the other hand, a percentage that is greater than 100% means that actual contributions the fund received were more than the expected contributions.

- Ratio of active to retired members: A relatively mature open plan is likely to have close to the same number of actives to retirees resulting in a ratio that is around 1.0. On the other hand, a super-mature plan, or a plan that is closed to new entrants will have more retirees than active members resulting in a ratio below 1.0. As this ratio declines, a larger portion of the total actuarial accrued liability in the System is attributable to retirees. This metric also typically moves in tandem with the liability to payroll metric, which provides an indication of potential contribution volatility.

The following tables provide a summary of these measures for SPRS for the current year and the prior four years so stakeholders can identify how these measures are trending. While ASOP No. 51 requires this disclosure with respect to only the retirement fund, we have included this information for the insurance fund for completeness.

SPRS

	Retirement Fund					Insurance Fund				
	June 30,					June 30,				
	2020	2019	2018	2017	2016	2020	2019	2018	2017	2016
Ratio of the market value of assets to total payroll	6.37	5.99	5.48	5.26	4.78	4.36	4.21	3.91	3.68	3.54
Ratio of actuarial accrued liability to payroll	22.82	21.89	20.27	19.90	17.02	5.98	5.80	5.37	5.69	5.65
Ratio of net cash flow to market value of assets	0.5%	1.3%	-2.5%	4.5%	-11.7%	-0.5%	-0.2%	-2.3%	-2.3%	-2.2%
Percentage of Expected Contribution Actually Received	101% [1]	101%	101%	121%	92%	141% [1]	100%	103%	103%	112%
Ratio of actives to retirees and beneficiaries	0.48	0.54	0.55	0.59	0.60					

[1] Expected contribution for FYE2020 based on the actuarially determined contribution rate of 140.04% from the June 30, 2018 valuation and expected compensation based on census data from the June 30, 2019 valuation

APPENDIX A

ACTUARIAL ASSUMPTIONS AND METHODS

Summary of Actuarial Methods and Assumptions

The following presents a summary of the actuarial assumptions and methods used in the valuation of the State Police Retirement System.

In general, the assumptions and methods used in the valuation are based on the actuarial experience study for the five-year period ending June 30, 2018 and adopted by the Board in April 2019.

Investment return rate:

Assumed annual rate of 5.25% net of investment expenses for the retirement fund

Assumed annual rate of 6.25% net of investment expenses for the insurance fund

Price Inflation:

Assumed annual rate of 2.30%

Payroll Growth Assumption (used for amortization of unfunded accrued liabilities):

Assumed annual rate of 0.00%

Rates of Annual Salary Increase:

Assumed rates of annual salary increases are shown below.

Service Years	Annual Rates of Salary Increases		
	Merit & Seniority	Price Inflation & Productivity	Total Increase
0	12.50%	3.55%	16.05%
1	5.00%	3.55%	8.55%
2	4.00%	3.55%	7.55%
3	2.00%	3.55%	5.55%
4	2.00%	3.55%	5.55%
5	2.00%	3.55%	5.55%
6	2.00%	3.55%	5.55%
7	1.00%	3.55%	4.55%
8	1.00%	3.55%	4.55%
9	0.00%	3.55%	3.55%
10 & Over	0.00%	3.55%	3.55%

Retirement rates:

Assumed annual rates of retirement are shown below. Rates are only applicable for members who are eligible for a service retirement.

Service	Members participating Before 9/1/2008[1]	Members participating on or after 9/1/2008[2]	Members participating after 1/1/2014[2]
20	22.0%		
21	22.0%		
22	22.0%		
23	28.0%		
24	28.0%		
25	28.0%	17.6%	16.0%
26	28.0%	17.6%	16.0%
27	28.0%	17.6%	16.0%
28	44.0%	22.4%	16.0%
29	44.0%	22.4%	16.0%
30	44.0%	22.4%	100.0%
31	58.0%	22.4%	
32	58.0%	22.4%	
33	58.0%	35.2%	
34	58.0%	35.2%	
35	58.0%	35.2%	
36	58.0%	46.4%	
37	58.0%	46.4%	
38	58.0%	46.4%	
39	58.0%	46.4%	
40+	58.0%	46.4%	

[1] The annual rate of service retirement is 100% at age 55.

[2] The annual rate of service retirement is 100% at age 60.

For members hired after 7/1/2003 and prior to 9/1/2008, the rates shown above are multiplied by 80% if the member is under the age of 55 to reflect the different retiree health insurance benefit.

Disability rates:

An abbreviated table with assumed rates of disability is show below.

Age	Annual Rates of Disability	
	Male	Female
20	0.05%	0.05%
30	0.09%	0.09%
40	0.20%	0.20%
50	0.56%	0.56%
60	1.46%	1.46%

Withdrawal rates (for causes other than disability and retirement):

Assumed annual rates of withdrawal are shown below and include pre-retirement mortality rates as described on the next page.

Service	Annual Rates of Withdrawal
1	15.00%
2	4.82%
3	3.76%
4	3.15%
5	2.71%
6	2.37%
7	2.09%
8	1.86%
9	1.66%
10	1.48%
11	1.32%
12	1.17%
13	1.04%
14	0.92%
15	0.80%
16	0.70%
17	0.60%
18	0.51%
19	0.42%
20	0.34%
21 & Over	0.00%

Mortality Assumption:

Pre-retirement mortality: PUB-2010 Public Safety Mortality, projected with the ultimate rates from the MP-2014 mortality improvement scale using a base year of 2010.

Post-retirement mortality (non-disabled): System-specific mortality table based on mortality experience from 2013-2018, projected with the ultimate rates from the MP-2014 mortality improvement scale using a base year of 2019.

The following table provides the life expectancy for a non-disabled retiree in future years based on the assumption with full generational projection:

Life Expectancy for an Age 65 Retiree in Years					
Gender	**Year of Retirement**				
	2020	**2025**	**2030**	**2035**	**2040**
Male	21.0	21.4	21.8	22.2	22.6
Female	24.0	24.4	24.8	25.2	25.6

Post-retirement mortality (disabled): PUB-2010 Disabled Mortality table, with a 4-year set-forward for both male and female rates, projected with the ultimate rates from the mortality improvement scale using a base year of 2010.

Marital status:

100% of employees are assumed to be married, with the female spouse 3 years younger than the male spouse.

Line of Duty Disability

70% of disabilities are assumed to occur in the line of duty

Line of Duty Death

25% of deaths are assumed to occur in the line of duty

Dependent Children:

For members who receive a duty-related death or disability benefit, the member is assumed to be survived by two dependent children, each age 6 with payments for 15 years.

Form of Payment:

Members are assumed to elect a life-only annuity at retirement.

Actuarial Cost Method:

Entry Age Normal, Level Percentage of Pay. The Entry Age Normal actuarial cost method allocates the System's actuarial present value of future benefits to various periods based upon service. The portion of the present value of future benefits allocated to years of service prior to the valuation date is the actuarial accrued liability, and the portion allocated to years following the valuation date is the present value of future normal costs. The normal cost is determined for each active member as the level percent of pay necessary to fully fund the expected benefits to be earned over the career of each individual active member. The normal cost is partially funded with active member contributions with the remainder funded by employer contributions.

Health Care Age Related Morbidity/Claims Utilization:

To model the impact of aging on the underlying health care costs for Medicare retirees, the valuation relied on the Society of Actuaries' 2013 Study "Health Care Costs – From Birth to Death". Table 4 (Development of Plan Specific Medicare Age Curve) was used to model the impact of aging for ages 65 and over.

Health Care Cost Trend Rates:

Year	Non-Medicare Plans[1]	Medicare Plans[1]	Dollar Contribution[2]
2022	6.40%	2.90%[3]	1.50%
2023	6.30%	6.30%	1.50%
2024	6.20%	6.20%	1.50%
2025	6.10%	6.10%	1.50%
2026	6.00%	6.00%	1.50%
2027	5.80%	5.80%	1.50%
2028	5.60%	5.60%	1.50%
2029	5.40%	5.40%	1.50%
2030	5.20%	5.20%	1.50%
2031	5.00%	5.00%	1.50%
2032	4.80%	4.80%	1.50%
2033	4.60%	4.60%	1.50%
2034	4.40%	4.40%	1.50%
2035	4.20%	4.20%	1.50%
2036 & Beyond	4.05%	4.05%	1.50%

[1]All increases are assumed to occur on January 1. The 2021 premiums were known at the time of the valuation and were incorporated into the liability measurement
[2]Applies to members participating on or after July 1, 2003. All increases are assumed to occur on July 1.
[3] Humana provided "Not to Exceed" 2022 Medicare premiums, which were incorporated into the liability measurement and resulted in an assumed 2.90% increase in Medicare premiums at January 1, 2022.

Health care trend assumptions are based on the model issued by the Society of Actuaries "Getzen model of Long-Run Medical Cost Trends for the SOA; Thomas E. Getzen, iHEA and Temple University 2014 © Society of Actuaries.

The underlying assumptions used to develop the health care trend rates include:

- A short run period-this is a period for which anticipated health care trend rates are manually set based on local information as well as plan-specific and carrier information.
- Long term real GDP growth – 1.75%
- Long term rate of inflation – 2.30%
- Long term nominal GDP growth – 4.05%
- Year that excess rate converges to 0 – 2036

Health care trend rates are thus the manually set rates for the short run period and rates which decline to an ultimate trend rate which equals the assumed nominal long term GDP growth rate.

Health Care Participation Assumptions:

- Active members are assumed to elect health coverage at retirement at the following participation rates.

Service at Retirement	Members participating before 7/1/2003*	Members participating after 7/1/2003
Under 10	100%	100%
10-14	100%	100%
15-19	100%	100%
Over 20	100%	100%

* 100% of members with a duty disability or a duty death (in service) benefit are assumed to elect coverage at retirement.

- Future retirees are assumed to have a similar distribution by plan type as the current retirees.

Medicare Plan	Participation Percentage
Medical Only[1]	6%
Essential Plan	8%
Premium Plan	86%

[1] Includes Medicare Advantage Mirror Plans

Non-Medicare Plan	Participation Percentage
LivingWell Limited	4%
LivingWell Basic	2%
LivingWell CDHP	33%
LivingWell PPO	61%

- 100% of deferred vested members participating are assumed to elect health coverage at retirement.

- Deferred vested members are assumed to begin health coverage at age 50 for members participating before January 1, 2014 and at age 60 for members participating on or after January 1, 2014.

- 75% of future retirees, with hazardous service, are assumed to elect spouse health care coverage. 100% of spouses with health care coverage are assumed to continue coverage after the member's death.

Other Assumptions

1. Valuation payroll (used for determining the amortization contribution rate): Current fiscal year payroll.

2. Individual salaries used to project benefits: For salary amounts prior to the valuation date, the salary from the last fiscal year is projected backward with the valuation salary scale assumption. For future salaries, the salary from the last fiscal year is projected forward with one year's salary scale.

3. Pay increase timing: Beginning of (fiscal) year. This is equivalent to assuming that reported salaries represent amounts paid to members during the year ending on the valuation date.

4. Current active members that terminated employment (for reasons other than retirement, disability, or death) are assumed to commence their retirement benefits at first unreduced retirement eligibility. Members are assumed to elect a refund of member contributions if the value of their account balance exceeds the present value of the deferred benefit. Members participating in the Cash Balance plan are assumed to elect to receive a lump sum of their cash balance account if their account balance exceeds the present value of the deferred benefit and the member is not eligible for insurance benefits at termination.

5. The beneficiaries of current active members that die while active are assumed to commence their survivor benefits at the member's first unreduced retirement eligibility. Beneficiaries are assumed to elect a refund of member contributions if the value of the member's account balance exceeds the present value of the survivor benefit. Beneficiaries of active members that die while in the line of duty are assumed to commence their survivor benefits immediately at the death of the member.

6. There will be no recoveries once disabled.

7. Cash Balance Provisions: The cash balance interest crediting rate while a member is an active employee is assumed to equal 4.9375% (based upon the 5.25% assumed investment return). The interest crediting rate after a member terminates employment is 4%.

8. Decrement timing: Decrements of all types are assumed to occur mid-year. Decrement rates are used as described in this report, without adjustment for multiple decrement table effects.

9. Service: All members are assumed to accrue 1 year of benefit and eligibility service each year.

10. 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.

11. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.

12. Current Inactive Population (Retirement Fund): All non-vested members are assumed to take an immediate refund of member contributions. Vested members are assumed to elect an immediate refund of member contributions at the valuation date if the value of their account balance exceeds the present value of their deferred benefit. Members hired prior to September 1, 2008 are assumed to retire at age 55 and members hired on or after September 1, 2008 are assumed to retire at age 60.

Participant Data

Participant data was supplied in electronic text files. There were separate files for (i) active and inactive members, and (ii) members and beneficiaries receiving benefits.

The data for active and terminated members included date of birth, gender, date of participation, benefit tier indicator, service with the current system, total vesting service, salary, employee contribution account balances, and employer pay credits for members participating in the cash balance plan. For retired members and beneficiaries, the data included date of birth, gender, spouse's date of birth (where applicable), amount of monthly benefit, date of retirement, and form of payment code.

Assumptions were made to correct for missing, bad, or inconsistent data. These had no material impact on the results presented.

Changes in assumptions since the prior valuation:

- The assumed increase in future health care costs, or trend assumption, is reviewed on an annual basis and was updated to better reflect the plan's anticipated long-term healthcare cost increases.
- The assumed impact of the Cadillac Tax (previously a 0.9% load on employer paid non-Medicare premiums for those who became participants prior to July 1, 2003) was removed to reflect its repeal since the prior valuation.

Development of Baseline Claims Cost

For non-Medicare retirees, the initial per capita costs were based on the plan premiums effective January 1, 2021, and are used for both current and future retirees. An inherent assumption in this methodology is that the projected future retirees will have a similar distribution by plan type as the current retirees. The spouse/dependent premium of $903.52 for non-Medicare retirees is based on a blending of Family and Couple premiums for the current retirees that have over 4 years of hazardous service. The fully-insured premiums KRS pays the Kentucky Employees' Health Plan (KEHP) are blended rates based on the combined experience of active and retired members. Because the average cost of providing health care benefits to retirees under age 65 is higher than the average cost of providing health care benefits to active employees, there is an implicit rate subsidy for the non-Medicare eligible retirees. Actuarial Standard of Practice No. 6 (ASOP No. 6) requires aging subsidies (or implicit rate subsidies) to be recognized. However, the KRS health insurance trusts are only used to reimburse KEHP for the employer's portion of the blended premiums. Said another way, the trusts are not used to fund the difference between the underlying retiree claims and the blended KEHP premiums. As a result, the retiree health care liabilities developed in this report for the non-Medicare retirees are based solely on the premiums charged by KEHP, without any age-adjustment. GASB Statements No. 74 and No. 75 prohibit such a deviation from ASOP No. 6. The liabilities developed in this report are solely for the purpose of funding the benefits paid by the health insurance funds and are not appropriate for financial statement disclosures required by GASB. GRS provides separate GASB reports to KRS which include the liabilities associated with the implicit rate subsidy.

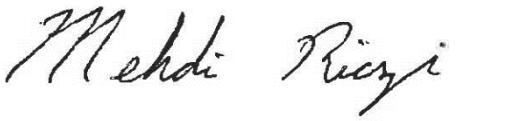
For those not eligible for Medicare		
Age	Member	Spouse/Dependents
<65	$738.54	$903.52

For Medicare retirees, the initial per capita costs were estimated based on the plan premiums effective January 1, 2021, and are used for both current and future retirees. An inherent assumption in this methodology is that the projected future retirees will have a similar distribution by plan type as the current retirees. Age graded and sex distinct premiums are utilized for retirees over the age of 65. These costs are appropriate for the unique age and sex distribution currently existing. Over the future years covered by this valuation, the age and sex distribution will most likely change. Therefore, our process "distributes" the average premium over all age/sex combinations and assigns a unique premium for each combination. The age/sex specific costs more accurately reflect the health care utilization and cost at that age.

For those eligible for Medicare		
Age	Male	Female
65	$184.81	$174.31
75	216.22	210.98
85	228.64	231.33

Appendix B of the report provides a full schedule of premiums.

Mehdi Riazi is a Member of the American Academy of Actuaries (MAAA) and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.



Mehdi Riazi, FSA, FCA, EA, MAAA

APPENDIX B

BENEFIT PROVISIONS

Summary of Benefit Provisions for State Police Retirement System (SPRS)

SPRS Employees

Retirement: Tier 1, Participation before 9/1/2008

Normal Retirement Eligibility	Age 55 with at least 1 month of service credit; or Any age with at least 20 years of service
Benefit Amount	If a member has at least 60 months of service, the monthly benefit is 2.50% times final average compensation times years of service. If a member has less than 60 months of service, the monthly benefit is the actuarial equivalent of two times the member's contributions with interest. Final average compensation is based on the member's highest 3 years of compensation.
Early Retirement Eligibility	Age 50 with at least 15 years of service
Early Retirement Reduction	Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement eligibility precedes the member's normal retirement date.

SPRS Employees (continued)

Retirement: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014

Normal Retirement Eligibility	Age 60 with at least 5 years of service; or Any age with at least 25 years of service
Benefit Amount	The monthly benefit is equal to the applicable benefit multiplier times final average compensation times years of service.

Years of Service	Benefit Multiplier
10 or less	1.30%
10-20	1.50%
20-25	2.25%
Greater than 25	2.50%

Final compensation is based on the member's highest 3 years of compensation.

Early Retirement Eligibility	Age 50 with at least 15 years of service
Early Retirement Reduction	Normal Retirement benefit reduced 6.5% per year for the first five years and 4.5% per year for the next five years for each year the member's retirement date precedes the member's normal retirement eligibility.

Retirement: Tier 3, Participation on or after 1/1/2014

Normal Retirement Eligibility	Age 60 with at least 5 years of service; or Any age with at least 25 years of service
Benefit Amount	Each year that the member is active, a 7.50% employer pay credit and the employee's 8.00% contribution will be credited to each member's hypothetical cash balance account. The hypothetical account will earn interest at a minimum rate of 4%, annually. If the System's geometric average net investment return for the previous five years exceeds 4%, then the hypothetical account will be credited with an additional amount of interest in that year equal to 75% of the amount of the return which exceeds 4%. All interest credits will be applied to the hypothetical account balance on June 30 based on the account balance as of June 30 of the previous year. At retirement, the member's hypothetical account balance may be converted into an annuity based on an actuarial factor.
Early Retirement Eligibility	N/A

SPRS Employees (continued)

Deferred Vested Benefit: Tier 1, Participation before 9/1/2008

Eligibility	At least 1 month of service credit
Benefit Amount	Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age

Deferred Vested Benefit: Tier 2, Participation on or after 9/1/2008 but before 1/1/2014

Eligibility	5 years of service
Benefit Amount	Normal retirement benefit deferred to normal retirement age, or a reduced retirement benefit at an early retirement age

Deferred Vested Benefit Tier 3, Participation on or after 1/1/2014

Eligibility	5 years of service
Benefit Amount	At termination of employment, members may choose to leave their account balance with the System and retire once they are eligible. The hypothetical account balance will earn 4% annual interest after termination. Members may also choose to withdrawal their entire accumulated balance. If a member does not have 5 years of service at termination, the member is eligible to receive a partial refund of their account balance. This refund includes the member's contributions with interest.

Disability Retirement: Participation before 8/1/2004

Eligibility	60 months of service (requirement is waived if line of duty disability)
Disability Benefit	Disability benefits are calculated in the same manner as the normal retirement benefit with years of service and final compensation being determined as of the date of disability, except that if the member has less than 20 years of service at disability, service credit shall be added to the person's total service beginning with the last date of paid employment and continuing to the member's 55th birthday, with total service not exceeding 20 years. Total service credit added shall not be greater than the member's actual service at disability.

SPRS Employees (continued)

Disability Retirement: Participation on or after 8/1/2004 but before 1/1/2014

Eligibility	60 months of service (requirement is waived if line of duty disability)
Disability Benefit	The higher of 25% of the member's final monthly rate of pay or the member's normal retirement benefit (without reduction for early retirement) with years and final compensation being determined as of the date of disability.

Disability Retirement: Participation on or after 1/1/2014

Eligibility	60 months of service (requirement is waived if line of duty disability)
Disability Benefit	The higher of 25% of the member's final monthly rate of pay or the member's retirement benefit calculated at the member's normal retirement date.

Line of Duty Disability Benefit

Disability Benefit	If the disability is a direct result of an act in the line of duty, the benefit shall not be less than 25% of the member's final monthly rate of pay. Additionally, each eligible dependent child will receive 10% of the member's monthly final rate of pay up to a maximum of 40%.

Pre-Retirement Death Benefit

Eligibility	Eligible for early or normal retirement; or Under age 55 with at least 60 months of service and actively working at the time of death; or At least 144 months of service, if no longer actively working
Spouse Benefit	The member's retirement benefit calculated in the same manner as if the member had retired on the day of the member's death and elected a 100% joint and survivor benefit. The benefit is actuarially reduced if the member dies prior to their normal retirement age.

Pre-Retirement Death Benefit (Death in the Line of Duty)

Eligibility	One month of service credit
Spouse Benefit	A $10,000 lump sum payment plus a monthly payment of 75% of the deceased member's final monthly average pay. Each dependent child will receive 10% of the final monthly average pay (not to exceed a total child benefit of 25% while the spouse is alive). A spouse may also elect the non-line of duty death benefit.
Non-Spouse Benefit	If the beneficiary is only one person who is a dependent receiving at least 50% of his or her support from the member, the beneficiary may elect a lump sum payment of $10,000.
Child Benefit	In the event there is no surviving spouse, the benefit is 50% of final monthly average pay for one child, 65% of final average pay for two children, or 75% of final average pay for three or more eligible children.

SPRS Employees (continued)

Post-Retirement Death Benefit

Eligibility	48 months of service, and in receipt of retirement benefits
Death Benefit	A $5,000 lump sum payment

Member Contributions

Tier 1, Participation before 9/1/2008	8% of creditable compensation. Members who do not receive a retirement benefit are entitled to a full refund of contributions with interest. The annual interest rate is set by the KRS board, not less than 2.0%.
Tier 2, Participation on or after 9/1/2008 but before 1/1/2014	8% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest. The annual interest rate is 2.5%.
Tier 3, Participation after 1/1/2014	8% of creditable compensation plus 1% of creditable compensation, which is deposited into the 401(h) account and is not refundable. Members who do not receive a retirement benefit are entitled to a refund of non-401(h) contributions with interest.

Changes since the Prior Valuation

- House Bill 271 passed during the 2020 legislative session and removed provisions that reduce the monthly payment to a surviving spouse of a member whose death was due to a duty-related injury upon remarriage of the spouse. It also increased benefits for a very small number of beneficiaries.

Summary of Main Retiree Insurance Benefit Provisions

Insurance Tier 1: Participation began before 7/1/2003

Benefit Eligibility Recipient of a retirement allowance

Benefit Amount

Non-Hazardous Service	Percentage of Member Premium Paid by Retirement System	Hazardous Service	Percentage of Member & Dependent Premium Paid by Retirement System
Less than 4 years	0%	Less than 4 years	0%
4 – 9 years	25%	4 – 9 years	25%
10 – 14 years	50%	10 – 14 years	50%
15 – 19 years	75%	15 – 19 years	75%
20 or more years	100%	20 or more years	100%

The percentage paid by the retirement system is applied to the 'contribution' plan selected by the KRS Board.

Duty Disability Retirement If disability was a result of injuries sustained while in the line of duty, the member receives 100% of the maximum contribution for the member and dependents.

Duty Death in Service If an active employee's death was a result of injuries sustained while in the line of duty, the member's spouse and children receive a fully subsidized health insurance benefit.

Non-Duty Death in Service If the surviving spouses is in receipt of a pension allowance, he or she is eligible for continued health coverage. The percentage of the premium paid for by the retirement system is based on the member's years of hazardous service at the time of death.

Surviving Spouse of a Retiree A surviving spouse of a retiree, who is in receipt of a pension allowance, will receive a premium subsidy based on the member's years of hazardous service.

Hazardous employees who retired prior to August 1, 1998 System's contribution for spouse and dependents is based on total service.

Insurance Tier 2: Participation began on or after 7/1/2003, but before 9/1/2008

Benefit Eligibility	Recipient of a retirement allowance with at least 120 months of service at retirement
Non-Hazardous Subsidy	Monthly contribution of $10 for each year of earned non-hazardous service. The monthly contribution is increased by 1.5% each July 1. As of July 1, 2020, the Non-Hazardous monthly contribution was $13.78/year of service. Upon the retiree's death, the surviving spouse may continue coverage (if in receipt of a retirement allowance) but will be 100% responsible for the premiums.
Hazardous Subsidy	Monthly contribution of $15 for each year of earned hazardous service. The monthly contribution is increased by 1.5% each July 1. As of July 1, 2020, the Hazardous monthly contribution was $20.68/year of service. Upon the retiree's death, the surviving spouse of a hazardous duty member will receive a monthly contribution of $10 ($13.78 as of July 1, 2020) for each year of hazardous service.
Duty Disability Retirement	If disability was a result of injuries sustained while in the line of duty, the member receives a benefit equal to at least 20 times the Non-Hazardous monthly contribution.
Duty Death in Service	If an active employee's death was a result of injuries sustained while in the line of duty, the member's spouse and children receive a fully subsidized health insurance benefit.
Non-Duty Death in Service	If the surviving spouse is in receipt of a pension allowance, he or she is eligible for continued health coverage. The percentage of the premium paid for by the retirement system is based on the member's years of hazardous service at the time of death.

Insurance Tier 3: Participation began on or after 9/1/2008

Tier 3 insurance benefits are identical to Tier 2, except Tier 3 members are required to have at least 180 months of service in order to be eligible.

Monthly Health Plan Premiums – Effective January 1, 2021

Non-Medicare Plan Options					
Plan Option	Single	Parent Plus	Couple	Family	Family X-Ref
LivingWell PPO[1]	$753.76	$1,075.44	$1,653.10	$1,841.08	$907.84
LivingWell CDHP	732.26	1,011.78	1,383.08	1,545.50	846.00
LivingWell Basic	704.08	970.78	1,501.56	1,673.40	825.88
Living Well Limited	626.48	892.76	1,374.22	1,530.02	753.62

Medicare Plan Options	
Medical Only Plan	$184.30
Medicare Advantage Mirror Essential Plan	215.41
Medicare Advantage Mirror Premium Plan	310.04
Kentucky Retirement Systems – Essential Plan[2]	46.16
Kentucky Retirement Systems – Premium Plan[3]	222.74

[1] Contribution plan selected by the KRS Board was the LivingWell PPO plan option for non-Medicare retirees.
[2] Contribution rate for retirees selected by the KRS board remains at $75.56.
[3] Contribution rate for retirees selected by the KRS board remains at $252.51.

Dollar Contribution Amount for Insurance Tier 2 and Tier 3

Monthly contribution amounts per year of service as of July 1, 2020.

Non-Hazardous Service	Hazardous Service
$13.78	$20.68

Note: Non-Hazardous benefits are applicable to SPRS members with prior service in a Non-Hazardous System.

Changes since the Prior Valuation

There have been no changes to benefit provisions since the prior valuation.

APPENDIX C

GLOSSARY

Glossary

Actuarial Accrued Liability (AAL): That portion, as determined by a particular Actuarial Cost Method, of the Actuarial Present Value of Future Plan Benefits which is not provided for by future Normal Costs. It is equal to the Actuarial Present Value of Future Plan Benefits minus the actuarial present value of future Normal Costs.

Actuarial Assumptions: Assumptions as to future experience under the Fund. These include assumptions about the occurrence of future events affecting costs or liabilities, such as:

- mortality, withdrawal, disablement, and retirement;
- future increases in salary;
- future rates of investment earnings and future investment and administrative expenses;
- characteristics of members not specified in the data, such as marital status;
- characteristics of future members;
- future elections made by members; and
- other relevant items.

Actuarial Cost Method or ***Funding Method:*** A procedure for allocating the Actuarial Present Value of Future Benefits to various time periods; a method used to determine the Normal Cost and the Actuarial Accrued Liability. These items are used to determine the ADC.

Actuarial Gain or ***Actuarial Loss:*** A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two Actuarial Valuation dates. Through the actuarial assumptions, rates of decrements, rates of salary increases, and rates of fund earnings have been forecasted. To the extent that actual experience differs from that assumed, Actuarial Accrued Liabilities emerge which may be the same as forecasted, or may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., the fund's assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, actuarial losses are the result of unfavorable experience, i.e., actual results that produce actuarial liabilities which are larger than projected. Actuarial gains will shorten the time required for funding of the actuarial balance sheet deficiency while actuarial losses will lengthen the funding period.

Actuarially Equivalent: Of equal actuarial present value, determined as of a given date and based on a given set of Actuarial Assumptions.

Actuarial Present Value (APV): The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions. For purposes of this standard, each such amount or series of amounts is:

a. adjusted for the probable financial effect of certain intervening events (such as changes in compensation levels, marital status, etc.)

b. multiplied by the probability of the occurrence of an event (such as survival, death, disability, termination of employment, etc.) on which the payment is conditioned, and

c. discounted according to an assumed rate (or rates) of return to reflect the time value of money.

Actuarial Present Value of Future Plan Benefits: The Actuarial Present Value of those benefit amounts which are expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and past and anticipated future compensation and service credits. The Actuarial Present Value of Future Plan Benefits includes the liabilities for active members, retired members, beneficiaries receiving benefits, and inactive, non-retired members either entitled to a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.

Actuarial Valuation: The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan. An Actuarial valuation for a governmental retirement system typically also includes calculations that provide the financial information of the plan, such as the funded ratio, unfunded actuarial accrued liability and the ADC.

Actuarial Value of Assets or ***Valuation Assets:*** The value of the Fund's assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets, but commonly actuaries use a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the ADC.

Actuarially Determined: Values which have been determined utilizing the principles of actuarial science. An actuarially determined value is derived by application of the appropriate actuarial assumptions to specified values determined by provisions of the law.

Actuarially Determined Contribution (ADC): The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation. The ADC consists of the Employer Normal Cost and the Amortization Payment.

Amortization Method: A method for determining the Amortization Payment. The most common methods used are level dollar and level percentage of payroll. Under the Level Dollar method, the Amortization Payment is one of a stream of payments, all equal, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the Amortization payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay

method, the stream of payments increases at the assumed rate at which total covered payroll of all active members will increase.

Amortization Payment: The portion of the pension plan contribution or ADC which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

Closed Amortization Period: A specific number of years that is counted down by one each year, and therefore declines to zero with the passage of time. For example if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc. See Funding Period and Open Amortization Period.

Decrements: Those causes/events due to which a member's status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or termination.

Defined Benefit Plan: A retirement plan that is not a Defined Contribution Plan. Typically a defined benefit plan is one in which benefits are defined by a formula applied to the member's compensation and/or years of service.

Defined Contribution Plan: A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, and the plan's earnings are allocated to each account, and each member's benefits are a direct function of the account balance.

Employer Normal Cost: The portion of the Normal Cost to be paid by the employers. This is equal to the Normal Cost less expected member contributions.

Experience Study: A periodic review and analysis of the actual experience of the Fund which may lead to a revision of one or more actuarial assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified as deemed appropriate by the Actuary.

Funded Ratio: The ratio of the actuarial value of assets (AVA) to the actuarial accrued liability (AAL). Plans sometimes calculate a market funded ratio, using the market value of assets (MVA), rather than the AVA.

Funding Period or ***Amortization Period:*** The term "Funding Period" is used two ways. In the first sense, it is the period used in calculating the Amortization Payment as a component of the ADC. This funding period is specified in State statute. In the second sense, it is a calculated item: the number of years in the future that will theoretically be required to amortize (i.e., pay off or eliminate) the Unfunded Actuarial Accrued Liability, based on a statutory employer contribution rate, and assuming no future actuarial gains or losses.

GASB: Governmental Accounting Standards Board.

GASB 67 and ***GASB 68***: Governmental Accounting Standards Board Statements No. 67 and No. 68. These are the governmental accounting standards that set the accounting and reporting rules for public retirement systems and the employers that sponsor, participate in, or contribute to them. Statement No. 67 sets the accounting rules for the financial reporting of the retirement systems, while Statement No. 68 sets the rules for the employers that sponsor, participate in, or contribute to public retirement systems.

Normal Cost: That portion of the Actuarial Present Value of pension plan benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method. Any payment in respect of an Unfunded Actuarial Accrued Liability is not part of Normal Cost (see Amortization Payment). For pension plan benefits which are provided in part by employee contributions, Normal Cost refers to the total of employee contributions and employer Normal Cost unless otherwise specifically stated. Under the entry age normal cost method, the Normal Cost is intended to be the level cost (when expressed as a percentage of pay) needed to fund the benefits of a member from hire until ultimate termination, death, disability or retirement.

Open Amortization Period: An open amortization period is one which is used to determine the Amortization Payment but may not decrease by exactly one year in the subsequent year's actuarial valuation. For instance, if the initial period is set as 30 years, the same 30-year period is used in determining the Amortization Period each year.

Unfunded Actuarial Accrued Liability: The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. This value may be negative in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus.

Valuation Date or Actuarial Valuation Date: The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Plan Benefits is determined. The expected benefits to be paid in the future are discounted to this date.