City of Grand Rapids Police and Fire Retirement System

5-Year Experience Study January 1, 2015 through December 31, 2019







July 27, 2020

Board of Trustees City of Grand Rapids Police and Fire Retirement System Grand Rapids, Michigan

Dear Board Members:

Presented in this report are the results of an *actuarial investigation of experience* of the City of Grand Rapids Police and Fire Retirement System. The investigation was conducted for the purpose of updating the actuarial assumptions used in computing Retirement System actuarial liabilities and establishing employer contribution rates.

The investigation was based upon the data furnished for the annual actuarial valuations during the period *January 1, 2015 through December 31, 2019.*

We believe that the actuarial assumptions recommended in this experience study report represent, individually and in the aggregate, reasonable estimates of future experience of the City of Grand Rapids Police and Fire Retirement System.

This report should not be relied on for any purpose other than that described above. It was prepared at the request of the Retirement Board and is intended for use by the Board Members and those designated or approved by the Board Members. This report may be provided to parties other than the Board Members only in its entirety and only with the permission of the Board Members. GRS is not responsible for unauthorized use of this report.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. We certify that, to the best of our knowledge, this report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board.

Board of Trustees City of Grand Rapids Police and Fire Retirement System July 27, 2020 Page 2

The signing individuals are independent of the plan sponsor.

James D. Anderson and Jeffrey T. Tebeau are independent of the plan sponsor, are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Respectfully submitted,

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Executive Summary

The last investigation of actuarial assumptions and methods was prepared for the period from January 1, 2009 through December 31, 2014. In this report, we review the current actuarial assumptions and methods and compare them to the actual experience of the Retirement System for the period from January 1, 2015 through December 31, 2019.

The table below lists each of the primary assumptions and methods that we analyzed, including our recommendations for each item, and the impact of any recommended changes on average liabilities and contributions.

Assumption	Recommendation	Financial Impact
Retirement Rates	Increase	Increase
Turnover Rates	Decrease	Increase
Disability Rates	No Change	No Change
Pre- and Post-Retirement Mortality Rates	Various	Increase
Pay Increases Due to Seniority	No Change	N/A
Price Inflation	Decrease	N/A
Wage Inflation	Decrease	Decrease*
Interest Rate	Decrease	Increase
Total	Various	Increase

*Results in decreased active actuarial liabilities but may have a slight offsetting (increasing) effect on the contribution rate due to lower projected payroll.

The overall impact of the recommendations on the Retirement System was an increase in the computed contribution of approximately 5% to 11% of payroll (depending on the economic assumption set), as shown on page 22.



Introduction

Each year, as of December 31st, the actuarial liabilities of the City of Grand Rapids Police and Fire Retirement System are valued. In order to perform the valuations, assumptions must be made regarding the future experience relating to the following risk areas:

- Rates of retirement among active members;
- Rates of termination of active members;
- Rates of disability among active members;
- Rates of mortality among active members, inactive members, retirants, and beneficiaries;
- Long-term rates of **investment return** to be generated by the assets of the System; and
- Patterns of **salary increases** to active members.

Assumptions should be carefully chosen and continually monitored. Continued use of outdated assumptions can lead to:

- Understated costs resulting in either an inability to pay benefits when due or sharp increases in required contributions at some point in the future; and
- Overstated costs resulting in either benefit levels that are kept below the level that could be supported by the computed rate or an unnecessarily large burden on the current generation of members, employers, and taxpayers.

A single set of assumptions will not be suitable indefinitely. Things change, and our understanding of things also changes. In recognition of this, assumptions used to value the liabilities of the Retirement System should be reviewed and adjusted periodically to recognize changes in experience trends, a changing economic environment (or changing perceptions of the economic environment), and to maintain consistency within the universe of public employee retirement systems.

A common practice among public employee retirement systems is that the actuary recommends a set of demographic assumptions and suggests a range of reasonable alternate economic assumptions. Following discussion involving the actuary, the plan governing body, and other professionals, the plan governing body makes a final choice from the various alternatives.



SECTION A

DEMOGRAPHIC ASSUMPTIONS

Retirement

Discussion: Rates of retirement are used to measure the probabilities of an eligible member retiring from City employment during the next year. During the study period, actual rates of retirement were greater than those expected.

Summary of Experience: The experience during the study period is summarized below:

ActualExpectedActual/Expected12793137%

Proposal: We recommend increasing rates of retirement as shown below. This change will put a slight upward pressure on liabilities.

Retirement Ages	Current Percent Retiring	Proposed Percent Retiring
50	25	20
50	25	30
51	25	30
52	25	30
53	25	30
54	25	30
55	25	35
56	25	35
57	25	35
58	25	35
59	25	35
60	50	50
61	60	60
62	70	70
63	80	80
64	90	90
65	100	100

Rates of Retirement



Turnover

Discussion: The tables below summarize recent experience and the current and proposed rates of termination. During the study period, actual rates of termination were lower than those expected.

Summary of Experience: The experience during the study period is summarized below:

Actual	Expected	Actual/Expected
28	36.7	76%

Proposal: We recommend decreasing rates of turnover as shown below. This change will put slight upward pressure on liabilities.

-	Current		Prop	osed
Sample	% of Active members Separating within Next Year		% of Activ Separating wi	e members thin Next Year
Ages	Police	Fire	Police	Fire
25	4.60	2.76	3.45	2.07
30	3.80	2.28	2.85	1.71
35	2.60	1.56	1.95	1.17
40	1.80	1.08	1.35	0.81
45	1.40	0.84	1.05	0.63
50	1.20	0.72	0.90	0.54
55	1.20	0.72	0.90	0.54
60	1.20	0.72	0.90	0.54

Turnover Rates



Disability

Discussion: The tables below summarize recent experience and the current rates of disability. The actual number of disability retirements was in line with expectations.

Summary of Experience: The experience during the study period is summarized below:

ActualExpectedActual/Expected1717.796%

Proposal: We recommend no changes to the current rates of disability.

Rates of Disability

	Current	Proposed
Sample	% of Active Members Becoming	% of Active Members Becoming
Ages	Disabled Within Next Year	Disabled within Next Year
20	0.12 %	0.12 %
25	0.12	0.12
30	0.12	0.12
35	0.27	0.27
40	0.59	0.59
45	1.05	1.05
50	1.68	1.68
55	2.51	2.51

Duty/Non-Duty Disability Split

Discussion: We recommend no change to the current duty/non-duty disability split. The current assumption is shown below:

		Duty Related	Non-Duty Related
Cause of Disability:	Men	75%	25%
	Women	75%	25%



Mortality

Mortality Experience

Post-retirement mortality is an important component in cost calculations and should be updated from time to time to reflect current and expected future longevity improvements. Pre-retirement mortality is a relatively minor component in cost calculations. The frequency of pre-retirement deaths is so low that mortality assumptions based on actual experience can only be produced for very large retirement systems, if at all.

Actuarial Standards of Practice

Actuarial Standards of Practice (ASOP) No. 35 Disclosure Section 4.1.1 states, "The disclosure of the mortality assumption should contain sufficient detail to permit another qualified actuary to understand the provision made for future mortality improvement. If the actuary assumes zero mortality improvement after the measurement date, the actuary should state that no provision was made for future mortality improvement." The current mortality rates used in the valuation include a provision for future mortality improvement.

New Mortality Tables and Projection Scale

Recently, the Society of Actuaries (SOA) published a mortality study specific to public sector retirement systems. This very comprehensive study includes numerous mortality tables created for each classification of employee (General members, Public Safety, Teachers, Survivors, Juvenile, headcount-weighted, benefit-weighted, above median, below median). In addition, the SOA updates mortality projection scales annually – the latest published table is called the MP-2019 Projection Scale – which accounts for future improvements in mortality that are expected to occur. Lastly, the SOA recommends the use of 'fully generational' (2-dimensional) projection scales.

Discussion: The mortality assumption used in the annual valuations of the Retirement System measures the probabilities of members dying before retirement and the probability of each benefit payment being made after retirement. While there were more deaths than expected (137 actual vs. 100.6 expected) among retirees over the experience period, the membership in this group is not sufficiently large to set mortality expectations for the future. The mortality tables currently used in the annual valuation of the Retirement System is the RP-2014 mortality tables projected to the year 2019 using projection scale MP-2014. As noted above, newer mortality tables have been released, reflecting declining mortality rates among retired public employees and the Mortality Projection scales have been updated each year through 2019. This is reflected in the most recent published mortality tables released in 2019 by the SOA (Pub-2010 mortality tables, projection scale MP-2019). Lastly, note that the Pub-2010 table is required for State reporting for 2020 under Public Act 202.

We recommend the use of the Pub-2010 amount-weighted Public Safety tables, in conjunction with the MP-2019 Projection Scale on a fully generational basis.



Mortality (Continued)

Proposal: We recommend the following mortality tables for use in future valuations of the Retirement System; this change will slightly increase measured liabilities:

- Healthy Pre-Retirement: The Pub-2010 Amount-Weighted, Public Safety, Employee, Male and Female tables, a base year of 2010 and future mortality improvements projected using scale MP-2019.
- Healthy Post-Retirement: The Pub-2010 Amount-Weighted, Public Safety, Healthy Retiree, Male and Female tables, with a base year of 2010 and future mortality improvements projected using scale MP-2019.
- Disability Retirement: The Pub-2010 Amount-Weighted, Public Safety, Disabled Retiree, Male and Female, with a base year of 2010 and future mortality improvements projected using scale MP-2019.



Mortality (Concluded)

	Pre-Reti Futur	irement e Life	Healthy Post Futur	-Retirement e Life	Disabled R Futur	letirement e Life	
Sample	Expectan	cy (Years)	Expectan	Expectancy (Years)		Expectancy (Years)	
Age Now	Men	Women	Men	Women	Men	Women	
50	35.05	39.48	33.25	35.95	23.75	28.16	
55	30.36	34.71	28.92	31.44	20.96	24.79	
60	25.81	30.01	24.73	27.02	18.26	21.51	
65	21.48	25.39	20.70	22.74	15.56	18.23	
70	17.41	20.87	16.85	18.67	12.93	15.02	
75	13.64	16.54	13.26	14.86	10.41	12.06	
80	10.20	12.42	10.01	11.41	8.08	9.45	

Summary of Life Expectancies Under the Current Tables

Summary of Life Expectancies Under the Proposed Tables

	Pre-Ret	irement	Healthy Post	t-Retirement	Disabled F	letirement
	Futur	e Life	Futur	e Life	Futur	e Life
Sample	Expectance	cy (Years)^	Expectanc	cy (Years)^	Expectanc	y (Years)^
Age Now	Men	Women	Men	Women	Men	Women
50	38.66	41.18	35.50	37.50	34.03	36.13
55	33.53	36.03	30.43	32.38	29.16	31.26
60	28.50	30.95	25.55	27.50	24.50	26.69
65	23.61	25.92	20.96	22.86	20.17	22.38
70	18.87	20.95	16.67	18.46	16.14	18.25
75	14.35	16.16	12.74	14.37	12.41	14.33
80	10.15	11.67	9.32	10.78	9.19	10.78

^ Using sample ages as of 2019.



SECTION B

ECONOMIC ASSUMPTIONS

Summary of Findings - Economic Assumptions

Economic assumptions include **long-term rates of investment return** (net of administrative and investment expenses), **wage inflation** (the across-the-board portion of salary increases), and pay increases due to **merit and seniority**. Unlike demographic activities, economic activities do not lend themselves to analysis solely on the basis of internal historical patterns because both salary increases and investment return are affected more by external forces; namely inflation (both wage and price), general productivity changes, and the local economic environment which defy accurate long-term prediction. Estimates of economic activities are generally selected on the basis of the expectations in an inflation-free environment and then both long-term rates of investment return and wage inflation are increased by some provision for long-term inflation.

If inflation and/or productivity increases are lower than expected, it will probably result in both actual rates of salary increases and investment return below the assumed rates. Salaries increasing at rates less than expected produce lower liabilities. However, actual investment return below the assumed rate of investment return (whether due to manager performance, change in the mix of assets, or general market conditions) results in lower than expected asset amounts.

Sources considered in the analysis of the economic assumptions included:

- Actual System experience over the last five years (i.e., merit and seniority pay increases);
- Future expectations of various investment firms;
- Forward-looking price inflation forecasts from various sources; and
- Historical observations of inflation statistics (both price and wage) and investment returns.

Current economic assumptions for the System are as follows:

Investment Return	7.15%
Wage Inflation	3.25%
Price Inflation	2.50%
Spread Between Investment Return and Wage Inflation	3.90%
Spread Between Investment Return and Price Inflation	4.65%



Economic Assumptions – ASOP No. 27

Guidance regarding the selection of economic assumptions for measuring pension obligations is provided by Actuarial Standards of Practice (ASOP) No. 27. The standard requires that the selected economic assumptions be consistent with each other. That is, the selection of the investment return assumption should be consistent with the selection of the wage inflation and price inflation assumptions.

The recently adopted revision of ASOP No. 27 (applicable to valuation dates on or after September 30, 2014) defines a reasonable economic assumption as an assumption that has the following characteristics:

- (a) It is appropriate for the purpose of the measurement;
- (b) It reflects the actuary's professional judgment;
- (c) It takes into account historical and current economic data that is relevant as of the valuation date;
- (d) It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof; and
- (e) It has no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included and disclosed under Section 3.5.1, or when alternative assumptions are used for the assessment of risk.

Public Act 202. Under Public Act 202 of the State of Michigan, Michigan municipalities will be required to report liabilities under new uniform assumption guidelines. While the current guidelines are currently only for reporting purposes (and not funding), city governments may be encouraged to use these new assumptions for funding. The guidelines include the following (for fiscal year 2020 reporting):

- Investment return no higher than 7.0%;
- Assumed wage inflation no lower than 3.5%*;
- Mortality assumption that uses a version of the Pub-2010 table*; and
- Amortization period no longer than 19 years for pension plans.
- * Or based on an actuarial experience study conducted within the last five years.



Price Inflation. While no specific price inflation assumption is necessary in order to perform the actuarial valuation, price inflation is a key component of the underlying wage inflation and interest rate assumptions. The chart on the next page shows forward-looking inflation expectations from various published sources. Over the past 50 years, price inflation has averaged 4.0% -- heavily affected by the high inflationary period of the 1970's and early 1980's. During the past decade, price inflation averaged 1.8%. The 2019 annual report of the Social Security Trustees uses 2.6% as the intermediate assumption.
Based upon the reviewed data, we suggest the Board adopt the price inflation assumption of 2.25%.



Forward-Looking Price Inflation Forecasts ^a	
Congressional Budget Office ^b	
5-Year Annual Average	2.46%
10-Year Annual Average	2.38%
Federal Reserve Bank of Philadelphia ^c	
5-Year Annual Average	2.20%
10-Year Annual Average	2.20%
Federal Reserve Bank of Cleveland ^d	
10-Year Expectation	1.71%
20-Year Expectation	1.93%
30-Year Expectation	2.09%
Federal Reserve Bank of St. Louis ^e	
10-Year Breakeven Inflation	1.61%
20-Year Breakeven Inflation	1.81%
30-Year Breakeven Inflation	1.78%
U.S. Department of the Treasury ^f	
10-Year Breakeven Inflation	1.65%
20-Year Breakeven Inflation	1.78%
30-Year Breakeven Inflation	1.87%
50-Year Breakeven Inflation	1.95%
100-Year Breakeven Inflation	2.00%
Social Security Trustees ^g	
Ultimate Intermediate Assumption	2.60%

^aVersion 2019-12-31 by Gabriel, Roeder, Smith & Company. Revised 2020-02-26.

^bThe Budget and Economic Outlook: 2020 to 2030, Release Date: January 2020, Consumer Price Index (CPI-U), Percentage Change from Fourth Quarter to Fourth Quarter, 5-Year Annual Average (2020 - 2024), 10-Year Annual Average (2020 - 2029).

^cSurvey of Professional Forecasters, Fourth Quarter 2019, Release Date: November 15, 2019, Headline CPI, Annualized Percentage Points, 5-Year Annual Average (2019 - 2023), 10-Year Annual Average (2019 - 2028).

^dInflation Expectations, Model output date: December 1, 2019.

^eThe breakeven inflation rate represents a measure of expected inflation derived from X-Year Treasury Constant Maturity Securities and X-Year Treasury Inflation-Indexed Constant Maturity Securities. Observation date: December 1, 2019.

^fThe Treasury Breakeven Inflation (TBI) Curve, Monthly Average Rates, December 2019.

^gThe 2019 Annual Report of The Board of Trustees of The Federal Old-Age And Survivors Insurance and Federal Disability Insurance Trust Funds, April 25, 2019, Long-range (75-year) assumptions, Intermediate, Consumer Price Index (CPI-W), for 2021 and later.



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Wage Inflation. Wage inflation consists of two components: 1) a portion due to pure price inflation (i.e., increases due to changes in the CPI); and 2) increases in average salary levels in excess of pure price inflation (i.e., increases due to changes in productivity levels, supply and demand in the labor market and other macroeconomic factors). The long-term rate of increase in National Average Earnings over the last 50 years is higher than the current assumption, although shorter term averages are lower. It is expected that, in the long run, salary increases in all parts of the country will be close to the national averages. However, few economists are forecasting a repeat of the high inflation rates experienced in the 1970s. Given our suggestion for a 2.25% price inflation assumption, we believe a reasonable range for this assumption is from 2.75% to 3.25% a year. We suggest adopting a wage inflation assumption of 3.00%.

	Annual Increases in				
Year	Prices (CPI-U)	Wages (NAE)	Difference		
3-year Avg.	2.0%	2.6%	0.6%		
5-year Avg.	1.5%	2.9%	1.4%		
10-year Avg.	1.8%	2.3%	0.5%		
20-year Avg.	2.2%	3.0%	0.8%		
30-year Avg.	2.5%	3.3%	0.8%		
50-year Avg.	4.0%	4.6%	0.6%		



Pay increases due to merit and seniority. The tables below summarize recent experience and the current and proposed rates of salary. During the study period rates of salary increases were slightly lower than expected. In addition to analyzing experience, we analyzed the most recent publicly-available collective labor bargaining agreements. We noted that while wage schedules and across the board increases may differ by union and positions, on average the current assumptions result is a similar salary projection. Therefore we propose no change to the current assumption.

Period Ending	Salary Increases for (Memb	Continuing Active Pers	Difference Between Actual and
12/31	Expected	Actual	Expected
2015	5.21%	5.74%	0.53%
2016	5.55%	5.51%	-0.04%
2017	5.14%	4.21%	-0.93%
2018	5.47%	4.52%	-0.95%
2019	5.57%	5.53%	-0.05%
		Average	-0.30%

	Salar	y Increase Assump	tions
Service	For	an Individual Mem	nber
at Beginning	Merit &	Base	Increase
of Year	Seniority	(Economic)	Next Year
1	17.00%	3.00%	20.00%
2	7.00	3.00	10.00
3	6.00	3.00	9.00
4	5.00	3.00	8.00
5	4.00	3.00	7.00
6 and over	1.00	3.00	4.00



Investment Return. The investment return assumption is the actuarial assumption that has the largest impact on actuarial valuation results. As more of the actuarial accrued liabilities are related to non-active members, the <u>nominal</u> (as opposed to real) investment return assumption becomes a more prominent factor. Since one of Grand Rapids' fundamental financial objectives is the receipt of level contributions over time, the discount rate assumption is set equal to the investment return assumption (with perhaps an adjustment for conservatism).

<u>Analysis</u>

The assumed rate of investment return generally depends on factors such as the plan's investment policy and capital market expectations.

Our analysis is based on the GRS Capital Market Assumption Modeler (CMAM). Because GRS is a benefits consulting firm and does not develop or maintain capital market expectations, we request and monitor forward-looking expectations developed by several major forecasting firms. We update our CMAM on an annual basis. The capital market assumptions in the 2019 CMAM are from the following forecasters (in alphabetical order): Aon Hewitt, BlackRock, BNY Mellon, Callan, JPMorgan, Meketa, Marquette Associates, Mercer, NEPC, PCA, RVK, Summit Strategies, Voya and Wilshire. We believe the benefit of performing this analysis using multiple forecasting firms is to recognize the uncertain nature of the items affecting the selection of the investment return assumption.

While there may be differences in asset classes, investment horizons, inflation assumptions, treatment of investment expenses, excess manager performance (i.e., alpha), etc., we have attempted to align the various assumption sets from the different forecasters to be as consistent as possible.

In the following chart, all returns are net of investment expenses and have no assumption for excess manager performance (alpha) in excess of active management fees.

For purposes of this analysis, we have used the following investment allocation for the <u>Retirement System</u> summarized below:

Asset Class	Target Allocation
U.S. Equity	17.75%
Non-U.S. Equity	17.75%
Private Equity	5.00%
Global Low Volatility Equity	10.00%
Private Credit	5.00%
Core Fixed Income	24.50%
U.S. REITs	5.00%
U.S. TIPS	5.00%
MLPs	5.00%
Commodities	5.00%
Total	100%



Based upon the approximate target asset allocation, future expectations of various forecasters were analyzed. The next few exhibits show the results of this analysis. Final expected nominal investment return results are based upon a 2.25% price inflation assumption. We used the actuarial assumption for price inflation rather than the consultant assumption, in order to be consistent with the calculation of liabilities. Investment results presented are net of expenses.

The arithmetic expected return developed from this asset allocation is shown in the table below. Note that the arithmetic return is in general higher than the median return due to the compounding effect of random returns. In general, the difference between the arithmetic and median return will be larger for larger standard deviation of returns. We have shown the standard deviation of returns as the investment risk in Column 9.

ASOP No. 27 acknowledges that for any given economic assumption, there is a reasonable range of opinions on that assumption. This is evident from the summaries we show from CMAM.

Investment Consultant	Investment Consultant Expected Nominal Return	Investment Consultant Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Plan Incurred Administrative Expenses	Expected Nominal Return Net of Expenses (6)-(7)	Standard Deviation of Expected Return (1-Year)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	4.78%	2.20%	2.58%	2.25%	4.83%	0.14%	4.69%	11.12%
2	6.63%	2.50%	4.13%	2.25%	6.38%	0.14%	6.24%	12.03%
3	6.13%	2.20%	3.93%	2.25%	6.18%	0.14%	6.04%	9.53%
4	6.25%	2.00%	4.25%	2.25%	6.50%	0.14%	6.36%	9.73%
5	6.74%	2.25%	4.49%	2.25%	6.74%	0.14%	6.60%	11.40%
6	6.88%	2.26%	4.62%	2.25%	6.87%	0.14%	6.73%	11.94%
7	6.84%	2.21%	4.63%	2.25%	6.88%	0.14%	6.74%	11.82%
8	7.22%	2.50%	4.72%	2.25%	6.97%	0.14%	6.83%	10.83%
9	6.92%	2.00%	4.92%	2.25%	7.17%	0.14%	7.03%	11.69%
10	7.09%	2.30%	4.79%	2.25%	7.04%	0.14%	6.90%	9.63%
11	7.26%	2.31%	4.96%	2.25%	7.21%	0.14%	7.07%	10.95%
12	7.13%	1.70%	5.43%	2.25%	7.68%	0.14%	7.54%	11.22%
13	7.59%	2.00%	5.59%	2.25%	7.84%	0.14%	7.70%	10.41%
14	7.90%	2.15%	5.76%	2.25%	8.01%	0.14%	7.87%	11.55%
Average	6.81%	2.18%	4.63%	2.25%	6.88%	0.14%	6.74%	10.99%

Investment Return Expectations of Various Forecasters

The average expected nominal return from Column 8 is 6.74%. This is the average arithmetic rate of return. Note that the arithmetic rate of return represents the average future expected return, which is higher than the median future expected. Setting the valuation assumption at the arithmetic expected return means that over time the average accumulated assets are expected to grow at this rate. However, in any given year it is less than 50% likely that this return will be achieved. From the perspective of the Actuarial Standards of Practice, this may be considered a reasonable assumption. Adjusting to the median return (as noted on the following page) is also a reasonable assumption.



Next, we compare the probabilities of achieving returns over a 10-year horizon. We compute the 40th, 50th, and 60th percentiles of returns as well as the probability of achieving the current assumption of 7.00% over a 10-year horizon. Note that the investment horizon for most of the capital market assumption sets is between 5 and 10 years. A different assumption would result in a different distribution of returns.

Investment Consultant	Distributi Geometr 40th	ion of 10-Yea ic Net Nomin 50th	r Average Ial Return 60th	Probability of Exceeding 7.15%	Probability of Exceeding 6.75%	Probability of Exceeding 6.50%	Probability of Exceeding 6.25%
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	3.23%	4.11%	5.00%	19.49%	22.71%	24.88%	27.16%
2	4.61%	5.56%	6.52%	33.77%	37.68%	40.20%	42.76%
3	4.86%	5.61%	6.38%	30.53%	35.30%	38.41%	41.61%
4	5.15%	5.92%	6.69%	34.43%	39.31%	42.46%	45.67%
5	5.10%	6.00%	6.91%	37.42%	41.69%	44.42%	47.19%
6	5.13%	6.07%	7.03%	38.73%	42.84%	45.47%	48.12%
7	5.15%	6.09%	7.03%	38.78%	42.94%	45.59%	48.27%
8	5.43%	6.29%	7.15%	40.03%	44.61%	47.52%	50.45%
9	5.48%	6.40%	7.33%	41.93%	46.22%	48.93%	51.65%
10	5.71%	6.47%	7.24%	41.18%	46.36%	49.64%	52.94%
11	5.64%	6.51%	7.38%	42.63%	47.21%	50.11%	53.01%
12	6.07%	6.96%	7.86%	47.85%	52.38%	55.21%	58.02%
13	6.37%	7.20%	8.03%	50.56%	55.44%	58.46%	61.44%
14	6.34%	7.25%	8.17%	51.13%	55.53%	58.25%	60.95%
Average	5.30%	6.17%	7.05%	39.18%	43.59%	46.40%	49.23%

Investment Return Expectations of Various Forecasters

The 50th percentile return is also related to the geometric average return. The geometric average of a sequence of returns over a number of years is the compound average of those returns over the number of years compounded. As the number of years in the geometric average increases and if the distributions of returns each year are independent and identically distributed, then the geometric average will converge to the median return. The median return is a reasonable rate of return for purposes of the valuation. The average of 50th percentile returns is 6.17% per year.



The current version of ASOP No. 27 suggests that either the expected geometric return (i.e., 50th percentile) or the expected arithmetic return is suitable for use as a reasonable investment return assumption. Based on the average of each of the forecasters' expectations, this would result in a range of 6.17% to 6.74% for the Retirement System. Nothing in this report should be construed as GRS giving investment advice.

Our analysis generally indicates forward-looking expectations lower than currently assumed for the assumed rate of return. The following table summarizes our preferred range of assumptions. It is important to note that an assumption outside of the preferred range is not necessarily unreasonable under ASOP No. 27.

Preferred Range of		Assumed Rate of
Expectations	Price Inflation	Return
Low End of Range	2.00%	6.25%
Midpoint of Range	2.25%	6.75%
High End of Range	2.50%	7.00%
Current Assumption	2.50%	7.15%

We have illustrated the approximate impact on contribution requirements if the investment return assumption were changed to 7.00%, 6.75% or 6.50% on page 22.



SECTION C

MISCELLANEOUS ASSUMPTIONS AND METHODS

Retirement System Option Factors

Option factors are calculated using the current interest assumption and the assumed rates of mortality. If a retiring member elects an optional form of benefit, the assumed benefit is multiplied by the appropriate option factor to produce the benefit actually payable. As a matter of common practice, option factors are usually revised to correspond to the new interest and mortality assumptions adopted with an experience study.

Currently, option factors for survivor benefits are calculated using a 7.25% interest rate assumption and the RP-2014 Healthy Annuitant Mortality Table projected to 2019 using the MP-2014 mortality improvement scale. Examples of option factors calculated using the current and the first alternate assumption sets are shown below. After the new demographic assumptions are adopted, we recommend the actuarial factors as shown under Proposed be adopted for retirements on or after January 1, 2021 to allow time for administrative changes. We would also recommend that any such change be reviewed by legal counsel.

Retiring Participants' Ages		50% Join	t & Survivor	100% Joint & Survivor		
Retiree	Beneficiary	Current	Proposed	Current	Proposed	
50	45	0.95285	0.95956	0.90995	0.92227	
55	50	0.94139	0.94666	0.88926	0.89872	
60	55	0.92765	0.93032	0.86506	0.86972	
65	60	0.91043	0.91035	0.83558	0.83545	

Option Factor Comparison*

* Not all available options are shown. Does not consider COLA assumptions that are specific to group. Actual option factors will be based on applicable COLA assumptions.

- Current 7.25% interest rate assumption and a 90%/10% unisex blend of the RP-2014 Healthy Annuitant Mortality Table projected to 2019 using the MP-2014 mortality improvement scale.
- Proposed 7.00% interest rate assumption and an 90%/10% unisex blend of the Pub-2010 Amount-Weighted, Public Safety, Healthy Retiree, Male and Female tables, with future mortality improvements projected to 2025 using scale MP-2019.



Amortization Policy

Unfunded actuarial accrued liabilities were amortized by (principal & interest combined) level dollar contributions as according to the schedule below. The weighted average remaining period is 26.82 years. This change was made by the City per City Code Section 1.263 and first reflected in the December 31, 2015 valuation report.

			Ρ	rojected to	Remaining				
В	ase	Current	Co	ontribution	Financing	Ar	mortization	Dollar	% of Payroll
Y	'ear	Balance		Period	Period		Factor	Payment	Contribution
2	015	\$ 78,449,469	\$	81,892,416	26 yrs.		16.422793	\$4,986,510	11.82%
2	016	3,812,911		3,985,710	27		16.791291	237,368	0.57%
2	017	4,118,805		4,310,911	28		17.146377	251,418	0.59%
2	018	17,119,615		17,939,031	29		17.488539	1,025,759	2.43%
2	019	 8,029,981		8,423,435	30		17.818247	472,742	1.12%
U	AAL	\$ 111,530,781	\$	116,551,503	27		15.992835	\$6,973,797	16.53%

We do not recommend changing the period at this time. Lastly, we note that under Public Act 202, the maximum allowed amortization period is 19 years for pension plan 2020 reporting.

Asset Valuation Method

The City of Grand Rapids Police and Fire Retirement System currently uses a 5-year asset smoothing method with no corridor. The Funding Value of Assets recognizes assumed investment income fully each year. Differences between actual and assumed investment income are phased-in over a closed 5-year period. This is a very common method among public retirement systems. Most systems use an averaging period between 3 and 10 years with 5 being the most common. We do not recommend any changes at this time.

Load for Service Purchases

We received data from Retirement System staff containing current reported service purchase balances in the amount of \$2.5 million for active members. We have established the liability for service purchases to be approximately \$3.9 million – based on applying valuation interest to the initial contributions reported.

Load for 13th Check

We have tested the market rate measure of returns both historically (against actual experience) and on a forward-looking basis (via a stochastic model). We expect that the returns on assets for the 13th check group will be reduced by 70 to 80 basis points going forward. To reflect this expectation, we placed a 7.5% load on affected liabilities (member not eligible for automatic post-retirement increases).



SECTION D

CONTRIBUTION RATES BASED ON PROPOSED CHANGES

Effects of Recommended Changes in Actuarial Assumptions on Retirement System Contribution and Funded Percent Summary of Assumption Sets

	Econo	mic Assumpt	ions	
	Net Rate of	Data of	ufletien.	Demographia
Accumption Sot	Investment	Kate of	Sprood	Demographic
Assumption Set	Return	wage	Spread	Assumptions
A. Published Results	7.15%	3.25%	3.90%	Current
B. Proposed Demographic	7.15%	3.25%	3.90%	Proposed
C. Alternate Economic I	7.00%	3.00%	4.00%	Proposed
D. Alternate Economic II	6.75%	3.00%	3.75%	Proposed
E. Alternate Economic III	6.50%	3.00%	3.50%	Proposed



Effects of Recommended Changes in Actuarial Assumptions on Retirement System Contribution and Funded Percent Results as of December 31, 2019[#]

	December 31, 2019 Valuation	Prop II	osed Demograph ndicated Econom	ic Assumptions ic Assumption	s and s
Economic Assumptions	Current	Current	Alternate 1	Alternate 2	Alternate 3
Investment Return	7.15%	7.15%	7.00%	6.75%	6.50%
Wage Inflation	3.25%	3.25%	3.00%	3.00%	3.00%
Demographic Assumptions	Current	Proposed	Proposed	Proposed	Proposed
Contributions for		% of Gross	S-Up Active Payro	oll	
Total Normal Cost	22.85%	25.03%	25.23%	26.75%	28.39%
Member Contributions*	10.76%	10.77%	10.77%	10.77%	10.77%
Employer Normal Cost	12.09%	14.26%	14.46%	15.98%	17.62%
Unfunded Actuarial Accrued Liabilities	16.53%	17.67%	19.05%	20.72%	22.37%
COMPUTED EMPLOYER RATE	28.62%	31.93%	33.51%	36.70%	39.99%
Illustrative Contribution [^] (\$ millions)	\$ 12.1	\$ 13.5	\$ 14.1	\$ 15.4	\$ 16.8
Funded Ratio	79.7%	78.5%	77.4%	75.2%	73.1%

[#] Illustrative impact. New assumptions will first be effective for the next actuarial valuation.

* Weighted average of various contribution rates.

^ Based on projected fiscal year payroll.

A change in assumptions will not change the long-term cost of the plan – only the timing of contributions to support the promised benefits.



SECTION E

COMPLETE LISTING OF RECOMMENDED ASSUMPTIONS

Proposed Retirement Rates

Retirement	Percent	
Ages	Retiring	
50	30	
51	30	
52	30	
53	30	
54	30	
55	35	
56	35	
57	35	
58	35	
59	35	
60	50	
61	60	
62	70	
63	80	
64	90	
65	100	



Proposed Withdrawal Rates

	% of Activ	ve members
Sample	Separating w	vithin Next Year
Ages	Men	Women
25	2.45	2.07
25	3.45	2.07
30	2.85	1.71
35	1.95	1.17
40	1.35	0.81
45	1.05	0.63
50	0.90	0.54
55	0.90	0.54
60	0.90	0.54



Proposed Mortality Rates

Pre-Retirement Mortality Rates

Healthy Post-Retirement Mortality Rates

Disabled Post-Retirement Mortality Rates

	% Dying Next Year*			
	Public Safety			
Age	Male	Female		
20	0.0426%	0.0174%		
21	0.0434%	0.0188%		
22	0.0432%	0.0192%		
23	0.0432%	0.0208%		
24	0.0432%	0.0224%		
25	0.0432%	0.0241%		
26	0.0460%	0.0258%		
27	0.0487%	0.0276%		
28	0.0514%	0.0306%		
29	0.0540%	0.0324%		
30	0.0552%	0.0354%		
31	0.0575%	0.0371%		
32	0.0595%	0.0399%		
33	0.0612%	0.0425%		
34	0.0626%	0.0448%		
35	0.0648%	0.0468%		
36	0.0666%	0.0485%		
37	0.0666%	0.0511%		
38	0.0687%	0.0521%		
39	0.0702%	0.0540%		
40	0.0702%	0.0556%		
40	0.0721%	0.0570%		
41	0.0721/0	0.0594%		
42	0.0762%	0.0594%		
45	0.0702%	0.0007%		
44	0.0787%	0.0050%		
45	0.0822%	0.0050%		
46	0.0859%	0.0684%		
47	0.0909%	0.0725%		
48	0.0963%	0.0761%		
49	0.1040%	0.0812%		
50	0.1123%	0.0878%		
51	0.1212%	0.0949%		
52	0.1325%	0.1026%		
53	0.1445%	0.1107%		
54	0.1570%	0.1200%		
55	0.1721%	0.1294%		
56	0.1896%	0.1396%		
57	0.2076%	0.1503%		
58	0.2288%	0.1593%		
59	0.2519%	0.1694%		
60	0.2756%	0.1785%		
61	0.3014%	0.1864%		
62	0.3287%	0.1954%		
63	0.3564%	0.2035%		
64	0.3841%	0.2121%		
65	0.4138%	0.2202%		
		·I		

	% Dying N	lext Year*			% Dying N	lext Year*
	Public	Safety			Public Safety	
Age	Male	Female	1	Age	Male	Female
50	0.1797%	0.1437%	1	50	0.3303%	0.2933%
51	0.1982%	0.1635%		51	0.3503%	0.3230%
52	0.2186%	0.1853%		52	0.3739%	0.3576%
53	0.2421%	0.2102%		53	0.4019%	0.3960%
54	0.2694%	0.2389%		54	0.4342%	0.4386%
55	0.3009%	0.2714%		55	0.4719%	0.4849%
56	0.3363%	0.3068%		56	0.5160%	0.5338%
57	0.3767%	0.3447%		57	0.5681%	0.5842%
58	0.4227%	0.3853%		58	0.6278%	0.6372%
59	0.4738%	0.4278%		59	0.6946%	0.6894%
60	0.5303%	0.4738%		60	0.7672%	0.7425%
61	0.5923%	0.5205%		61	0.8466%	0.7959%
62	0.6585%	0.5698%		62	0.9288%	0.8495%
63	0.7294%	0.6227%		63	1.0154%	0.9048%
64	0.8061%	0.6806%		64	1.1042%	0.9626%
65	0.8891%	0.7436%		65	1.1970%	1.0247%
66	0.9800%	0.8135%		66	1.2948%	1.0932%
67	1.0812%	0.8931%		67	1.4006%	1.1703%
68	1.1944%	0.9851%	1	68	1.5156%	1.2572%
69	1.3237%	1.0894%		69	1.6435%	1.3546%
70	1.4709%	1.2103%		70	1.7889%	1.4663%
71	1.6404%	1.3478%		71	1.9556%	1.5915%
72	1.8337%	1.5051%		72	2.1525%	1.7319%
73	2.0544%	1.6840%		73	2.3839%	1.8885%
74	2.3067%	1.8865%		74	2.6566%	2.0616%
75	2.5938%	2.1158%		75	2.9747%	2.2523%
76	2.9204%	2.3738%		76	3.3374%	2.4646%
77	3.2909%	2.6631%		77	3.7453%	2.7013%
78	3.7122%	2.9886%		78	4.1924%	2.9886%
79	4.1887%	3.3522%		79	4.6729%	3.3522%
80	4.7278%	3.7591%		80	5.1864%	3.7591%
81	5.3364%	4.2131%		81	5.7415%	4.2131%
82	6.0196%	4.7162%		82	6.3485%	4.7162%
83	6.7839%	5.2770%		83	7.0241%	5.2770%
84	7.6364%	5.8987%		84	7.7854%	5.8987%
85	8.5846%	6.5888%		85	8.6579%	6.5888%
86	9.6379%	7.3555%		86	9.6379%	7.3555%
8/	10.7993%	8.2079%		8/	10.7993%	8.2079%
88	12.0851%	9.1575%		88	12.0851%	9.1575%
89	13.4966%	10.2124%		89	13.4966%	10.2124%
90	15.0523%	11.3882%		90	15.0523%	11.3882%
91	10.0355%	12.0404%	1	51	18 10070/	12.0404%
92 02	10.1907%	15.3392%	1	92	10.130/%	15 3200%
55	21 1171%	15.5209%	1	93 QA	19.0813% 21.1171%	16 722/19/2
94	21.11/1/0	18 2082%		94	21.11/1/0	18 2082%
95	22.3203/6	10.200376		95	22.3203/6	10.200378
90	24.0/43%	13.0104% 01 5000/	1	90 70	24.0743%	13.8104%
97	25.0000%	21.3332%		97	25.0000%	21.5552%
30	27.4210%	23.33/170	1	30	27.4210%	23.33/170
100	23.2/20%	23.200270	1	39 100	23.2/20%	23.200270
101	31.2304/0	27.3101/0	1	100	31.2304/0	27.3101/0
107	35 3028%	23.7221/0	1	107	35.2710%	23.7221/0
102	37 2999%	33 6715%	1	102	37 2999%	33 6715%
103	39 2536%	35 7737%	1	104	39 2536%	35 7732%
105	41 1519%	37 8479%	1	105	41 1519%	37 8479%
105	42.9921%	39.8838%	1	106	42.9921%	39.8838%
107	44,7481%	41.8393%	1	107	44,7481%	41.8393%
108	46.4297%	43.7197%	1	108	46.4297%	43.7197%
109	48.0045%	45.5171%	1	109	48.0045%	45.5171%
110	49.2895%	47.2105%	1	110	49.2895%	47.2105%

* Actual tables extend further than sample ages shown.

Using Sample ages as of 2019.



Proposed Disability Rates

S	ample Ages	% of Activ Disable	ve Members Beo ed Within Next `	coming Year
	20		0.12 %	
	25		0.12	
	30		0.12	
	35		0.27	
	40		0.59	
	45		1.05	
	50		1.68	
	55		2.51	
	60		0.00	
			Duty Related	Non-Duty Related
Cause of Disability	:	Men	75%	25%
		Women	75%	25%

Proposed Rates of Salary Increase

	Salary Increase Assumptions					
Service	For an Individual Member					
at Beginning	Merit & Base Increase					
of Year	Seniority	(Economic)	Next Year			
1	17.00%	3.00%	20.00%			
2	7.00	3.00	10.00			
3	6.00	3.00	9.00			
4	5.00	3.00	8.00			
5	4.00	3.00	7.00			
6 and over	1.00	3.00	4.00			





July 27, 2020

Board of Trustees City of Grand Rapids Police and Fire Retirement System 300 Monroe Avenue NW Grand Rapids, Michigan 49503

Dear Board Members:

Enclosed is a copy of our report of Retirement System experience. We believe that the actuarial assumptions recommended in this experience study report represent, individually and in the aggregate, reasonable estimates of future experience of the City of Grand Rapids Police and Fire Retirement System. We look forward to meeting with the Board to discuss the results of our review.

If you have any questions, please feel free to call (248) 799-9000.

Sincerely,

James D. anderson

James D. Anderson, FSA, EA, FCA, MAAA

JDA:bd Enclosure

cc: Jeffrey T. Tebeau, GRS David L. Hoffman, GRS