City of Lansing
Employees' Retirement System

Actuarial Valuation
For Funding and Contributions

as of December 31, 2019

December, 2020

BOOMERSHINE CONSULTING GROUP, L.L.C.
ACTUARIAL & RETIREMENT PLAN SOLUTIONS

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Executive Summary

December 14, 2020

City of Lansing Employees' Retirement System
124 W. Michigan Avenue
8th Floor
Lansing, MI 48933

Members of the Board:

The following report sets forth the Actuarial Valuation of the City of Lansing Employees' Retirement System (the System) as of December 31, 2019. The report is based on participant data and asset summary as submitted by the Plan Administrator and City finance department. We relied on this information without auditing it.

INVESTMENT PERFORMANCE

The total Market Value of Plan Assets for the plan year ending December 31, 2019 was $196,578,478. Plan assets exclude from this a reserve for healthcare benefits. The total yield of the fund for the plan year ending December 31, 2019 was 14.8% on the market value of assets and 7.4% on an actuarial basis, taking into account recognition of prior gains and losses.

The Plan uses a smoothing method to determine the City's contributions. Under this method, asset gains or losses are spread over a 5-year period. The gains and losses are determined every year by comparing actual investment returns with expected asset performance.

Details of the development of the Actuarial Asset Value are shown in Section 1.

FUNDING RECOMMENDATIONS

The City contribution for fiscal year 2021 is $12,349,529, which is estimated to be 48.5% of payroll. About 7% of payroll represents the Normal Cost, with the remaining amount representing a payment towards the System's unfunded liability.

FUNDING PROGRESS

The Actuarial Accrued Liability as of December 31, 2019 is $ 310,674,588 compared to the Actuarial Value of Assets (excluding healthcare reserve) of $160,693,641, resulting in a plan funded ratio of 51.7%. On a market value basis, this ratio is 52.0%.

ASSUMPTION AND METHOD CHANGES

There were no changes in assumptions since the prior valuation.

BENEFIT CHANGES

There were changes in the averaging period for certain bargaining units: Teamsters 214 changed to five years, and District Court to three years. This affects only future retirees (i.e., active employees).

Actuarial Certification

The purposes of this report are to establish the City contribution for the next fiscal year, and to evaluate the funding progress of the System.

The accounting report for the System, under GASB 67 and 68, is provided under separate cover, and serves a different purpose. All the figures presented in this report are to be used for funding and contribution purposes.

This report has been prepared in accordance with generally accepted actuarial principles and practices. In the opinion of the Retirement Board and its actuary, the actuarial assumptions used are reasonable related to Retirement System experience and expectations, and represent the best estimate of Retirement System experience.

The undersigned below are members of the American Academy of Actuaries, and are qualified to render the actuarial opinions presented in this report.

Respectfully Submitted,

BOOMERSHINE CONSULTING GROUP, L.L.C.

Gregory M. Stump, FSA, EA, MAAA, FCA	Sunita K. Bhatia, ASA, EA, MAAA, FCA
Chief Actuary	Senior Consultant/Actuary

Section 1: Plan Asset Information

1.1: Summary of Plan Assets

Market Value of Total Fund as of January 1, 2019		$192,189,675
Receipts:		
Employer Contribution - Pension Fund	0	
Employer Contribution - Healthcare Reserve	380,000	
Member Contributions	1,287,020	
Investment Income		
Interest	843	
Realized Gains/(Loss)	1,127,571	
Market Appreciation (Depreciation)	26,161,778	
Total Additions		28,957,212
Disbursements:		
Member Refunds	37,970	
Distributions to Participants/ Beneficiaries	23,721,416	
Administrative Expenses and Other	4,192	
Investment Expenses	804,831	
Total Disbursements		24,568,409
Net Increase/(Decrease) in Assets		$4,388,803
Market Value of Total Fund as of December 31, 2019		**$196,578,478**

1.2: Reconciliation of Fund Reserves

	EMPLOYEE SAVINGS FUND	RETIREMENT RESERVE	MEMBER BENEFIT RESERVE	HEALTHCARE RESERVE	TOTAL
1/1/2019	$12,745,315	$132,084,679	$15,127,517	$32,232,164	$192,189,675
Additions:					
EE Contributions	1,287,020	-	-		1,287,020
ER Contributions	-	-	-	380,000	380,000
Interest:	3.00%	7.25%	6.18%	6.18%	
Annual Credits	382,359	7,925,749	525,132	2,342,528	11,175,768
Deductions:					
Refunds/Benefits	(37,970)	(22,763,997)	(957,419)	-	(23,759,386)
Adjustment/Transfer	(3,800,594)	19,105,995	-	-	15,305,401
12/31/2019	**$10,576,130**	**$136,352,426**	**$14,695,230**	**$34,954,692**	**$196,578,478**

Employees Savings Fund

Purpose	Keep track of employee contribution balances, and interest credited to such. Interest is credited annually at 3.0%.
Relevance to Plan Funding	Does not directly impact plan funding

Retirement Reserve Fund

Purpose	Provides funds to finance regular benefit payments to retirees. Interest is credited annually at the assumed rate of return.
Relevance to Plan Funding	Does not directly impact plan funding

Member Benefit Reserve (MBR)

Purpose	Provides funds to finance supplemental benefit payments to retirees based on prior early retirement programs (while reserve balance is positive). Interest is credited annually at a rate determined by the City finance office.
Relevance to Plan Funding	Actuarial liability for supplemental benefit deemed to be equal to the value of the reserve

Healthcare Reserve

Purpose	Funds invested with pension assets, but segregated to be used for retiree healthcare benefits. Interest is credited annually at the same rate as the MBR.
Relevance to Plan Funding	Excluded from pension assets to determine contributions towards pension funds

1.3: Development of Actuarial Value of Assets

Market Value of Total Fund as of January 1, 2019				**$192,189,675**
Plus: Contributions				1,667,020
Less: Benefit Payments, Refunds				23,759,386
Less: Admin Expenses/Other				4,192
Plus: Expected Return during 2019				13,133,231
Expected Asset Value				$183,226,348
Market Value of Total Fund as of December 31, 2019				$196,578,478
Investment Gain/(Loss) for 2019				13,352,130
Less: 80% of 2019 Gain/(Loss)	80%	*	13,352,130	10,681,704
Less: 60% of 2018 Gain/(Loss)	60%	*	(21,950,315)	(13,170,189)
Less: 40% of 2017 Gain/(Loss)	40%	*	10,726,974	4,290,790
Less: 20% of 2016 Gain/(Loss)	20%	*	(3,364,585)	(672,917)
Total Deferred Gain/(Loss)				$1,129,388
Actuarial Value of Assets, Total Fund - December 31, 2019				$195,449,090
as % of Market Value of Assets				99.4%
Healthcare Reserve as of December 31, 2019				$34,954,692
Adjusted Healthcare Reserve[1]				34,755,450
Actuarial Value of Assets, Pension Plan - December 31, 2019				**$160,693,640**
Estimated Return on the Actuarial Value of Assets			7.4%	

[1] Takes into account asset smoothing

1.4: Historical Investment Returns

Year	Market Value Return	Actuarial Value Return
2010	12.90%	3.30%
2011	2.00%	1.20%
2012	12.21%	2.46%
2013	13.49%	10.41%
2014	6.31%	9.01%
2015	2.16%	6.53%
2016	5.91%	7.36%
2017	13.16%	8.49%
2018	(3.65%)	3.04%
2019	14.82%	7.37%
5 Year Compound Return	6.26%	6.54%
10 Year Compound Return	7.76%	5.87%

Section 2: Participant Summary

2.1: Reconciliation of Plan Participants

	Active Participants	Due Refund	Vested Terminations	Retired	Disabled	Beneficiary /EDRO	Total
Participants as of December 31, 2018	405	60	73	739	27	150	1,454
Retired	(34)	0	(4)	38	0	0	0
Terminated Vested	(9)	0	9	0	0	0	0
Terminated Non-Vested, Refund Paid	(7)	0	(5)	0	0	0	(12)
Terminated Non-Vested, Due Refund	(21)	21	0	0	0	0	0
Disabled	0	0	0	0	0	0	0
Deceased	0	0	0	(20)	0	(7)	(27)
New Beneficiary / EDRO	0	0	0	0	0	13	13
Rehired	3	0	(1)	(2)	0	0	0
New Hires	75	0	0	0	0	0	75
Data Adjustments	1	(1)	0	3	0	(1)	2
Participants as of December 31, 2019	413	80	72	758	27	155	1,505

2.2: Demographic Summary

Active Participants	12/31/2018	12/31/2019
Number of Active Participants	405	413
Average Age	48.5	46.8
Average Service	10.1	8.8
Average Salary	$54,903	$53,727

Inactive Participants	12/31/2018	12/31/2019
Number of Retired Participants	739	758
Average Age	69.6	69.3
Current Average Annual Benefit	$26,859	$27,066
Number of Disabled Participants	27	27
Average Age	64.2	64.7
Current Average Annual Benefit	$20,108	$20,108
Number of Beneficiaries/EDROs	150	155
Average Age	72.6	72.0
Current Average Annual Benefit	$11,013	$10,958
Number of Deferred Vested Participants	73	72
Average Age	53.3	52.7
Current Average Annual Benefit	$11,089	$11,488

Section 3: Valuation Summary

3.1: Summary of Actuarial Liability and Funding Progress

	12/31/2018	12/31/2019
Actuarial Accrued Liability		
Active Employees	$56,513,585	$49,248,025
Member Benefit Fund	15,127,517	14,695,230
Terminated Vested	6,525,346	7,138,187
Retirees and Beneficiaries	225,241,885	239,593,146
Total Actuarial Accrued Liability	$303,408,333	$310,674,588
Actuarial Value of Assets	$172,090,691	$160,693,641
Unfunded Actuarial Accrued Liability	$131,317,642	$149,980,947
Plan Funding Ratio	56.7%	51.7%

3.2: Development of Actuarially Determined Employer Contribution (ADEC)

		12/31/2018	12/31/2019
1)	Total Entry Age Normal Cost	$2,816,418	$2,835,618
2)	Estimated Employee Contributions	1,196,508	1,123,680
3)	Net City Normal Cost: (1) – (2)	$1,619,910	$1,711,938
4)	Valuation Payroll	$23,720,424	$24,772,739
5)	City Normal Cost Rate (% of pay): (3) ÷ (4)	6.8%	6.9%
6)	Amortization of the Unfunded Liability	$8,789,239	$10,307,068
7)	Amortization Rate (% of Pay): (6) ÷ (4)	37.1%	41.6%
8)	Total Contribution Rate: (5) + (7)	43.7%	48.5%
9)	Projected Fiscal Payroll	$24,372,735	$25,453,989
10)	**Actuarially Determined Employer Contribution: (8) x (9)**	**$10,698,401**	**$12,349,529**

Estimated Cash Flow for Next Five Years

Fiscal Year	City Contribution*	Member Contributions	Benefit Payments
2022	$12,700,000	1,150,000	24,400,000
2023	13,000,000	1,180,000	24,700,000
2024	13,400,000	1,210,000	24,900,000
2025	13,600,000	1,240,000	25,200,000
2026	14,000,000	1,270,000	25,400,000

* These amounts are based on one set of assumptions. If actual experience is less favorable, then City contributions will be higher.

Section 4: Actuarial Assumptions and Methods

Funding Method: Entry Age Normal Actuarial Cost Method. The contribution equals the sum of the normal cost and the amount necessary to amortize the unfunded actuarial liability as a level percent of payroll over a closed period of thirty years (22 years remaining as of December 31, 2019).

Asset Smoothing Method: Investment gains and losses are determined annually and each is spread over a 5- year period. This is done on a total fund basis, with an 80% - 120% corridor around market value. The adjusted value of the healthcare reserve is then excluded from the valuation assets.

Investment Return: 7.25% compounded annually, net of investment expenses.

Cost of Living (inflation): The cost of living as measured by the Consumer Price Index (CPI) is assumed to increase at the rate of 2.75% per year.

Salary Increases: Increases in salary are assumed to increase with inflation annually, plus an additional amount that varies based on the service of the member as shown below:

Years of Service	UAW	All Others
0-8	2.35%	1.85%
9-10	2.35%	0.60%
11 +	1.35%	0.60%

Mortality: RP2000 Combined Healthy Tables. For Disabled members, the disabled versions of these tables are assumed. Each of these tables is projected to 2026 using Scale BB and a 50% factor is applied for pre-retirement deaths.

Percent Married: 90% of participants are assumed to be married. Male spouses are assumed to be three years older than their female spouse.

Disability: Rates of disability vary based on the age of the member as shown below. Half of all disabilities are assumed to be duty related. Disability rates are assumed to stop when retirement rates begin.

Sample rates are shown below:

Age	Rate
20	0.0004
30	0.0004
40	0.0013
50	0.0041
60	0.0090

Termination: Rates of termination vary based on the service of the member. Sample Rates are shown below:

	Non-UAW		
Years of Service	**Males**	**Females**	**UAW**
0	22.0%	33.0%	10.0%
1	18.7%	28.1%	7.0%
2	15.9%	23.8%	5.0%
3	13.5%	20.3%	5.0%
5	9.8%	14.6%	4.0%
10	4.3%	6.5%	1.0%
15	0.0%	0.0%	1.0%
20+	0.0%	0.0%	0.5%

Retirement: Rates of retirement vary based on the age of the member as shown below. Rate is applied only if the member is eligible to retire.

Age	UAW	Age	Others
50-54	50%	50-57	55%
55-64	30%	58	15%
65+	100%	59	5%
		60-64	15%
		65	60%
		65-69	25%
		70+	100%

Changes in assumptions since the prior valuation

The assumptions above are based on the most recent experience study, covering 2012 through 2015. No changes in actuarial assumptions were made during 2020. The next study will cover 2015 through 2020, with any changes effective 12/31/2020.

Section 5: Summary of Plan Benefits

All benefits are subject to the language in the City Ordinance and relevant collective bargaining agreements.

Employee Group Covered:	Teamsters, UAW, Exempt, District Court (except Judges), Executive Pay, Newly hired elected officials do not become members of this Plan.
Normal Retirement Age (All Members - New Plan):	Age 50 with 25 years of service or at age 58 with 8 years of service.
Normal Retirement Age (Old Plan):	UAW - Age 50 with 25 years of service or at age 58 with 8 years of service. All Others - 8 years of service and attainment of the earlier of age 58 or the age at which age plus service is at least 65.
Normal Form of Benefit:	Single life annuity

Member Contributions:

	Old Plan	New Plan
UAW	2.95%	3.00% effective 10/18/2013
Teamsters 214	3.75%	6.50% (5.00% for hires after September 2012)
Teamsters 243 (formerly Teamsters 580)	3.50%	6.50% (5.00% for hires after 5/9/2014 for T243 CTP and Supervisors)
District Court Teamsters	3.50%	5.50% (5.00% for hires after 4/1/2014 for DCT243)
District Court Exempt	4.50%	4.50% (5.50% for hires after 12/1/2003)
Exempt	3.75%	6.50%
Executive Pay Plan, Council Staff, Mayoral Staff	3.75%	6.50%
Non-Bargaining	3.75%	6.50% (5.00% for hires after 1/1/2017)
Elected Officials	3.25%	No Defined Benefit Plan

Compensation:	Member's Salary, wages, and longevity bonus. In addition, Compensation may include up to 80 hours of compensatory time for members not eligible for overtime pay.
Final Average Compensation:	The average of the highest annual compensation paid over 2 consecutive years (T214 @3 years; DCT @5 years) of credited service within the last 10 years of credited service immediately preceding a member's termination of employment.

Normal Retirement Benefit Formula (New Plan):

UAW*	2.75% of Final Average Compensation times years of credited service; 1.70% of Final Average Compensation times years of credited service for new hires after October 21, 2013. 1.50% of Final Average Compensation times years of credited service for new hires after January 9, 2017, and for Service after this date for the post 10/18/2013 hires.

*UAW members hired on or after October 21, 2013 but prior to the ratification of the 2016-2019 agreement (January 9, 2017) have a 1.70% of pay multiplier for credited service prior to the ratification of the 2016-2019 agreement (January 9, 2017) and a 1.50% multiplier for credited service following the ratification of the 2016-2019 agreement (January 9, 2017), except the pension shall not exceed 110% of base wage. UAW members hired on or after ratification of the 2016- 2019 agreement (January 9, 2017) will have a benefit multiplier of 1.50% of pay, except the pension shall not exceed 110% of base wage.

Teamsters 214 & Teamsters 243 (formerly Teamsters 580)	1.80% of Final Average Compensation times years of credited service; 1.25% of Final Average Compensation times years of credited service for employees hired after 9/30/2012 in Teamsters 214 and hired after 05/19/2014 in T243 (CTP and Sup).
All Others	1.60% of Final Average Compensation times years of credited service; 1.25% of Final Average Compensation times years of credited service for new hires after 4/1/14 in DCT243, after 6/1/14 for District Court Exempt and after 1/1/2017 for Non-Bargaining Personnel;

Normal Retirement Benefit Formula (Old Plan):

UAW and Elected Officials	2.75% of Final Average Compensation times for the first 35 years of credited service, plus 1.5% of Final Average Compensation for the next 5 years of service, plus 1.0% of Final Average Compensation for service in excess of 40 years, with a maximum of 100% of Final Average Compensation.
District Court Teamsters	2.30% of Final Average Compensation times years of credited service.
All Others	2.80% of Final Average Compensation times for the first 35 years of credited service, plus 1.5% of Final Average Compensation for the next 5 years of service, plus 1.0% of Final Average Compensation for service in excess of 40 years, with a maximum of 100% of Final Average Compensation.

Termination Prior to Retirement

Eligibility	Vesting is after 8 years of credited service
Form of Benefit	Benefit is payable as a Life Annuity beginning at age 58 for new Plan Members and at the age at which age plus service equals 65 for Old Plan Members (except UAW).

Duty Disability

Eligibility	Members are eligible for Duty Disability Retirement benefits immediately upon employment.
Benefit Amount	Benefit is paid at the effective date of disability retirement as a Life Annuity and is equal to the accrued Retirement Benefit, with additional service granted to age 60. During the worker's compensation period, the disability benefit may not exceed the difference between the member's final compensation and the worker's compensation amount. Upon the attainment of age 60, disabled retirees are transferred to service retirement status.

Non-Duty Disability

Eligibility	Members are eligible for Non-Duty Disability Retirement benefits after completing 10 years of service.
Benefit Amount	Benefit is paid at the effective date of disability retirement as a Life Annuity and is equal to the accrued Retirement Benefit, with a minimum benefit equal to 25% of final average compensation.

Death incurred in the Line of Duty

Eligibility	Benefit is payable to the survivors of a member who died as a result of an injury or disease arising out of and in the course of duty.
Benefit Amount	Benefit is paid upon termination of the survivor's workers' compensation period as a Life Annuity and is equal to the survivor's weekly workers' compensation converted to an annual basis.

Non-Duty Pre-Retirement Death

Eligibility	The non-duty pre-retirement death benefit is payable upon the death of a member after earning 8 years of credited service.
Benefit Amount	Benefit is paid to the surviving spouse as a Joint and Survivor benefit and is computed in the same manner as the Normal Retirement Benefit.

Optional Benefit Forms

Prior to retirement, a member may elect to convert the retirement allowance into a benefit of equivalent actuarial value in accordance with one of the optional forms described below.

a. Cash Refund Annuity - If a member dies before receiving the total value of accumulated member contributions, the remaining member contributions are payable to designated beneficiary(ies) at the time of death.
b. 50% or 100% Joint and Survivor Annuity
c. Social Security Level Income ("Equating Pension") - Any member who retires prior to age 65 may elect to have his retirement allowance actuarially equated to provide an increase retirement allowance to age 65, and a reduced retirement allowance payable thereafter. 'The increased retirement allowance shall approximate the sum of the member's reduced retirement allowance 'payable after age 65 and the member's estimated Social Security Primary Insurance Amount.

Post - Retirement Benefit Adjustments

One-time post-retirement benefit increases were granted in 1984, 1987 and 1998.

Effective January 1, 1999, and each January 1 thereafter, certain eligible retirees and beneficiaries receive annual benefit increases, financed by the Members' Benefit Fund reserve while it maintains a positive balance. Retirees/Beneficiaries must meet both of the following conditions:

1) Has been retired at least 6 months as of the January 1 increase date

2) Age 60 as of the January 1 increase date

For a retiree/beneficiary who elected a 50% or 100% Joint and Survivor Annuity, the maximum annual increase is equal to $200 ($100 for the beneficiary if 50% option is elected) times a ratio of the original Joint and Survivor benefit to the original straight life annuity benefit.

For all other retirees/beneficiaries, the maximum annual increase is $200.

Changes in Plan provisions since the prior valuation

None.

Glossary of Terms

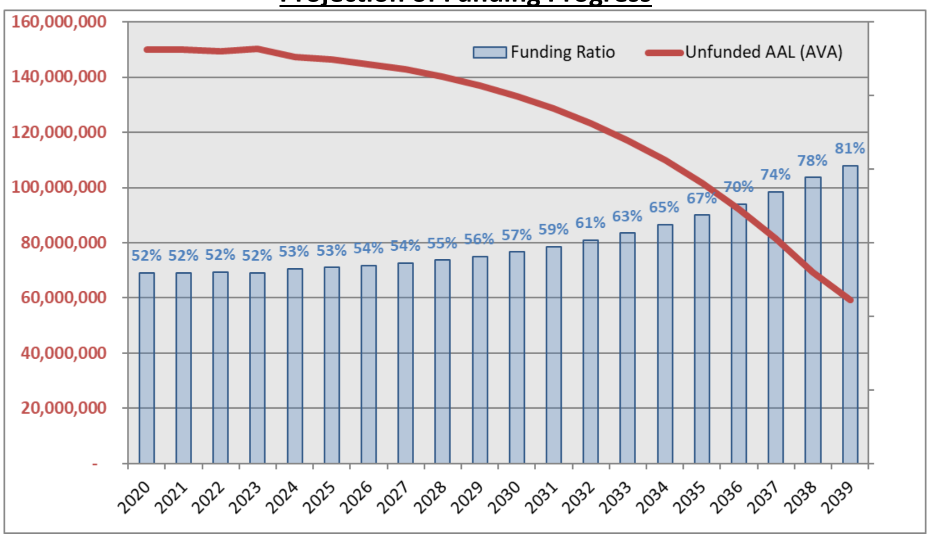
Actuarial Accrued Liability (AAL):	The portion of benefits deemed to be accrued by participants based on past service. The AAL serves as the asset **funding** target, when annual contributions are determined.
Actuarial Value of Assets (AVA):	The smoothed value of assets, used to compute the Unfunded AAL. The purpose of the AVA is to control volatility in annual **cash contributions**.
Amortization of Unfunded Liability:	The portion of the **annual cash contribution** that represents a portion of the Unfunded AAL. The amortization can be positive or negative.
Actuarially Determined Employer Contribution (ADEC):	The contribution determined by the actuary for **funding purposes**.
Market Value of Assets (MVA):	The total value of Plan assets available to pay benefits.
Normal Cost:	That portion of the annual contribution that represents one year's accrual of benefits. In funding calculations, this is known as the Service Cost.
Unfunded Actuarial Accrued Liability:	The difference between the Actuarial Value of Assets and the Actuarial Accrued Liability, used for **funding purposes**.

Appendix I: 20 Year Projection of Funding and Contributions

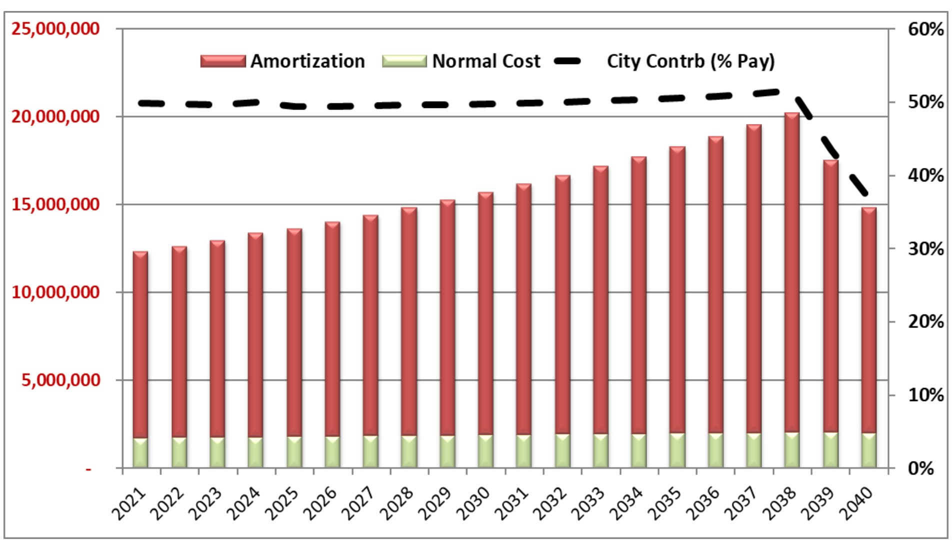
The graphs below show a projection of expected funding progress and City contributions to the Fund. We can see that the Plan is on a path to eventually reducing the unfunded liability (top graph, red line) and improving the funding ratio. During this time, the City contribution rate is expected to remain near 50% of payroll, before eventually declining. The actual funding progress and contributions over this time period will differ from what is shown here, due to the actual experience of the Plan.

As shown in the second graph the majority of the contribution is currently, and is expected to continue to be, a payment towards the unfunded actuarial liability.

Projection of Funding Progress



Projection of City Contributions



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Appendix II: History of Employer Contributions and Funding Progress

Historical Employer Contributions

Fiscal Year Ending	Actuarially Determined Employer Contribution	Actual Employer Contribution	
6/30/2012	$7,596,879	$7,523,534	(1)
6/30/2013	8,586,536	8,586,536	(2)
6/30/2014	9,361,000	9,361,000	
6/30/2015	10,548,000	10,548,000	(3)
6/30/2016	10,182,000	10,182,000	
6/30/2017	10,247,000	10,247,000	(4)
6/30/2018	10,185,060	10,843,000	
6/30/2019	10,880,932	10,880,932	(5)
6/30/2020	10,695,401	10,695,401	(6)
6/30/2021	12,349,529	To be determined	

(1) The FY 2012 City contribution was reduced by $73,345 in recognition of additional contributions by United Auto Workers (UAW) employees, which were negotiated and contributed after the establishment of the June 30, 2012 Contribution from the December 31, 2010 valuation.

(2) Fiscal year 2013 Contribution reflects changes made to actuarial assumptions based on an Experience Study. Changes included a decrease in the assumed rate of return from 8.0% to 7.8%. A closed amortization period was also adopted as of 12/31/2011, beginning at 30 years and decreasing each year until 15 years is reached.

(3) Fiscal year 2015 Contribution reflects changes made to assumed return and inflation from 7.8% and 3.3% to 7.6% and 3.1%, respectively.

(4) Reflects changes made to actuarial assumptions based on an Experience Study completed in 2016, including assumed return of 7.40%, with 2.925% underlying inflation.

(5) Reflects decrease in assumed return to 7.25%.

(6) Paid in calendar year 2020, so not reflected in System assets as of 12/31/2019

Historical Funding Progress

Valuation Date	Actuarial Value of Assets (AVA)	Actuarial Accrued Liability (AAL)	Percentage Funded	Unfunded Actuarial Accrued Liability	
12/31/2010	$187,440,590	$269,461,935	69.6%	$82,021,345	
12/31/2011	177,100,863	287,306,707	61.6%	110,205,844	(1)
12/31/2012	167,569,807	293,974,433	57.0%	126,404,626	
12/31/2013	172,687,582	313,258,746	55.1%	140,571,164	(2)
12/31/2014	177,259,421	309,924,744	57.2%	132,665,323	
12/31/2015	176,031,902	308,794,993	57.0%	132,763,091	
12/31/2016	176,160,086	309,520,574	56.9%	133,360,488	(3)
12/31/2017	178,646,143	305,030,296	58.6%	126,384,153	(4)
12/31/2018	172,090,691	303,408,333	56.7%	131,317,642	
12/31/2019	160,693,641	310,674,588	51.7%	149,980,947	

(1) Reflects changes made to actuarial assumptions based on an Experience Study, including a reduction in the assumed investment return 8.0% to 7.8%.

(2) Reflects changes made to assumed return and inflation from 7.8% and 3.3% to 7.6% and 3.1%, respectively.

(3) Reflects changes made to actuarial assumptions based on an Experience Study completed in 2016, including assumed return of 7.40%, with 2.925% underlying inflation.

(4) Reflects changes made to actuarial assumptions, assumed return of 7.25%, with 2.75% underlying inflation.

Appendix III: Valuation Sensitivity

The figures shown on this page are based on the return assumption of 7.00% with Pub2010 mortality (projected generationally), and in compliance with the State's Uniform assumptions and amortization. The following shows the impact of both a change in the assumptions as well as a decreased amortization period.

Actuarial Accrued Liability Uniform Assumptions	**12/31/2019**
Total Actuarial Accrued Liability	$319,296,863
Actuarial Value of Assets	160,693,641
Unfunded Actuarial Accrued Liability	158,603,222
Plan Funding Ratio	50.3%

	City Contribution Uniform Assumptions	**FY2021**
1)	Total Entry Age Normal Cost	$3,001,910
2)	Estimated Employee Contributions	1,123,680
3)	Net City Normal Cost: (1) – (2)	$1,878,230
4)	Valuation Payroll	$24,772,739
5)	City Normal Cost Rate (% of pay): (3) ÷ (4)	7.6%
6)	Amortization of Unfunded Actuarial Accrued Liability (18 years)	12,164,581
7)	Amortization Rate (% of Pay): (6) ÷ (4)	49.1%
8)	Total Contribution Rate: (5) + (7)	56.7%
9)	Projected Fiscal Payroll	$25,453,989
10)	**Total City Contribution for FY2021: (8) x (9)**	**$14,428,988**

Appendix IV: Risk Assessment

There are a number of risks inherent in managing a pension plan/trust. Some of the most substantial risks include (not an all-inclusive list):

- Investment Return Risk: Future investment returns may be unfavorable compared to what is assumed for Plan funding purposes.
- Investment Volatility Risk: Investment returns will vary from year to year and over time, with a possible single or multiple year significant drop in plan assets. This impacts contribution amounts as well as compound returns.
- Longevity Risk: Plan members and beneficiaries may live longer than projected, and thus be entitled to additional years of benefit payments versus what had been expected.
- Other Demographic Risks: Future demographic experience may be unfavorable compared to expected rates of retirement, termination, and disability. Future salary increases may also be higher than expected, thereby increasing the liability of pay-related benefits.

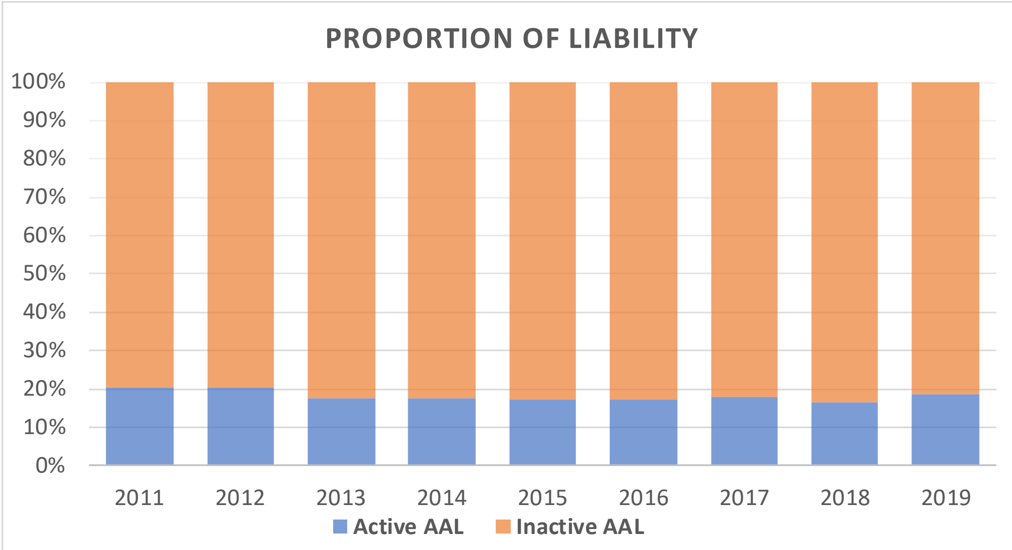
The liabilities in Appendix III versus the body of this Report is an example of the impact of long-term investment return and longevity risk.

Plan Maturity

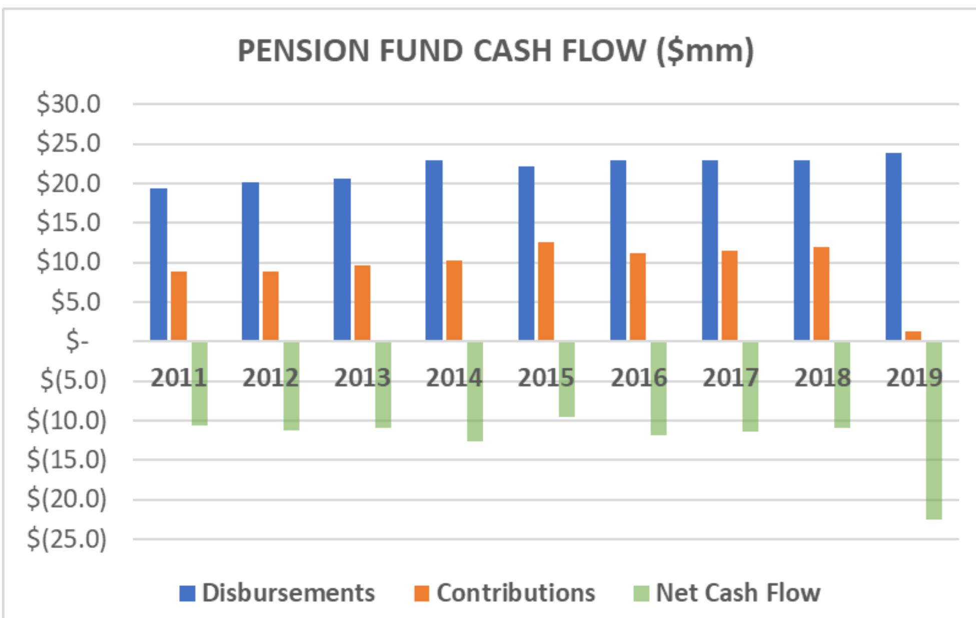
Another challenging risk faced by many pension plans is the maturing of the plan over time. This can be seen in the number of inactive (retirees, beneficiaries, etc.) versus the number of active employees in the plan population, as well as the liability of each group. As the plan matures, several risks emerge, including:

- Higher ratio of assets to payroll, which leads to a greater degree of contribution rate volatility.
- Negative cash flow (benefit payments exceeding contributions), which exacerbates the impact of an economic downturn.
- Greater degree of longevity risk (as illustrated above).
- Higher ratio of Actuarial Accrued Liability to Normal Cost, which causes more contribution volatility when demographic experience is unfavorable.

The following graphs show some of these plan maturity measures in recent years, showing how the plan is maturing over time.



The System's actuarial liability has been at least 80% inactive for the last decade, and has increased slightly over that time period. This is evidence of a very mature plan. As demonstrated by recent funding and as shown in the projections herein, funding progress is limited with this level of population maturity.



The fund has experienced significant negative cash flow (disbursements greater than contributions) in recent years, with a total nine-year negative net cash flow of more than $100 million. This is another indication of a very mature plan. However, continued City contributions at the actuarially determined amounts will lead to funding improvement and a lower level of risk associated with negative cash flows.