



PATTONVILLE FIRE PROTECTION DISTRICT

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September 3, 2020

Via Federal Express and e-mail: mruff@senate.mo.gov

Mr. Michael Ruff
Executive Director
Joint Committee on Public Employee Retirement
Missouri State Capital Building, Room 219-A
Jefferson City, MO 65101

RE: Amendment to Pattonville Fire Protection District Defined Benefit Pension Plan

Dear Mr. Ruff:

This letter transmits an Actuarial Cost Statement related to a proposed amendment to the Pattonville Fire Protection District Defined Benefit Pension Plan.

As indicated in the Actuarial Cost Statement the proposed amendment to the Plan effective as of January 1, 2021; (i) will increase the participant's contribution from 2% to 4%; (ii) will eliminate the bridge benefit for participants who terminate employment on or after January 1, 2021; (iii) will eliminate COLA for participants who terminate employment on or after January 1, 2021, and; (iv) will change the formula for calculating retirement benefits for participants who terminate employment on or after January 1, 2021 to the greater of the actuarial equivalent of the grandfathered amount or 80% of the participant's average monthly compensation reduced by years of service based on the hire date of the participant. The Cost Statement of Proposed Changes dated August 31, 2020 is included with this letter as is the January 1, 2020 Actuarial Valuation Report.

Since these changes in the pension plan will have an impact on the cost of the Defined Benefit Pension Plan that benefits the employees of the Pattonville Fire Protection District, we have arranged for the preparation of the attached cost statement in accordance with R.S.Mo Section 105.665 and are, via this transmittal letter, filing this statement with you as the Executive Director of the "Joint Committee on Public Employee Retirement."

Please make the enclosed Actuarial Cost Statement immediately available for public inspection. Thank you for your assistance. If there is anything else you need, please let me know.

Sincerely,

David Dotson, Fire Chief
Plan Administrator

Enclosures



Cost Statement of Proposed Changes

**Pattonville Fire Protection District
Defined Benefit Pension Plan**

August 31, 2020



Certification

This report was prepared for the Pattonville Fire Protection District Defined Benefit Pension Plan to summarize the key results of increasing benefits relating to their pension plan and may not be appropriate for other uses. Please contact Nyhart prior to disclosing this report to any other party or relying on its content for any purpose other than the intended use.

Except where indicated otherwise, the results included in this report are based on the same assumptions, methods, and plan provisions as the January 1, 2020 valuation dated July 22, 2020. This report has been prepared in accordance with generally accepted actuarial principles and practice.

The actuarial assumptions and methods were chosen by the Board. In our opinion, all actuarial assumptions and methods are individually reasonable and in combination represent our best estimate of anticipated experience of the plan. 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); and
- changes in plan provisions or applicable law.

Neither Nyhart nor any of its employees have any relationship with the plan or its sponsor which could impair or appear to impair the objectivity of this report. To the extent that this report or any attachment concerns tax matters, it is not intended to be used and cannot be used by a taxpayer for the purpose of avoiding penalties that may be imposed by law. The consultants indicated below are compliant with the continuing education requirements of the Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion in the United States.

Heath W. Merlak
FSA, EA, MAAA

Elizabeth A. Wiley
FSA, EA



About This Material

This report contains summary information about the January 1, 2020 actuarial results. In addition, it includes cost analysis completed to assess the impact of increases to plan benefits to be effective as of January 1, 2021. Reasonable actuarial techniques and assumptions were used to produce these results.

We have shown the impact of each of the different changes on the January 1, 2020 results, to illustrate the change in contributions, unfunded liability, and funded percentage of the plan. These results are meant to be used to demonstrate the relative impact of benefit increases implemented to the plan.

Note there are key risks such as investment return, salary growth, and longevity when determining pension plan costs. Please see the January 1, 2020 actuarial report dated July 22, 2020 for more information related to the types of risks facing the Pattonville Fire Protection District Defined Benefit Pension Plan.



Missouri State Law

Chapter 105 of the Missouri Revised Statutes requires that, in order for a local public employee retirement system to increase benefits:

- (1) the Plan is at least 80% funded prior to adopting the change; and
- (2) the Plan is at least 75% funded after adopting the change

The plan's funded ratio as of 1/1/2020 is 94.6%.



Description of Plan Changes

The following changes are effective as of January 1, 2021:

- Beginning January 1, 2021 participants must contribute 4% of compensation per annum.
- Participants who terminate employment on or after January 1, 2021 are ineligible to receive a bridge benefit.
- Participants who terminate employment on or after January 1, 2021 are ineligible for a 1% COLA, and will have no annual increases applied to their benefits.
- Participants terminating on or after January 1, 2021 may retire with the greater of
 - a) the actuarial equivalent of the Grandfathered Amount
 - b) 80% of the Participant's Average Monthly Compensation, reduced by years of service less than 20 for employees hired prior to 11/26/2007 and reduced by years of service less than 25 for participants hired on or after 11/26/2007



1/1/2020 Valuation Results

	1/1/2020 Valuation	1/1/2020 Valuation with Plan Changes
Market Value of Assets	\$37,755,491	\$37,755,491
Accrued Liability	\$39,881,691	\$45,107,890
Actuarial Value of Assets	<u>37,736,076</u>	<u>37,736,076</u>
Unfunded Liability, 1/1/2020	\$2,145,615	\$7,371,815
Funded Ratio	94.6%	83.66%
Employer Normal Cost	\$622,373	\$714,662
<i>Employer Normal Cost, as a % of Payroll</i>	9.9%	14.8%
Amortization	193,761	662,706
<i>Amortization, as a % of Payroll</i>	3.1%	10.6%
Interest	<u>59,170</u>	<u>99,859</u>
Recommended Contribution	\$875,304	\$1,477,227
<i>Recommended Contribution, as a % of Payroll</i>	14.0%	23.6%
Employee Normal Cost	\$106,815	\$213,630
Active Members	59	59
Valuation Payroll	\$6,256,846	\$6,256,846



Cost Projections Considerations

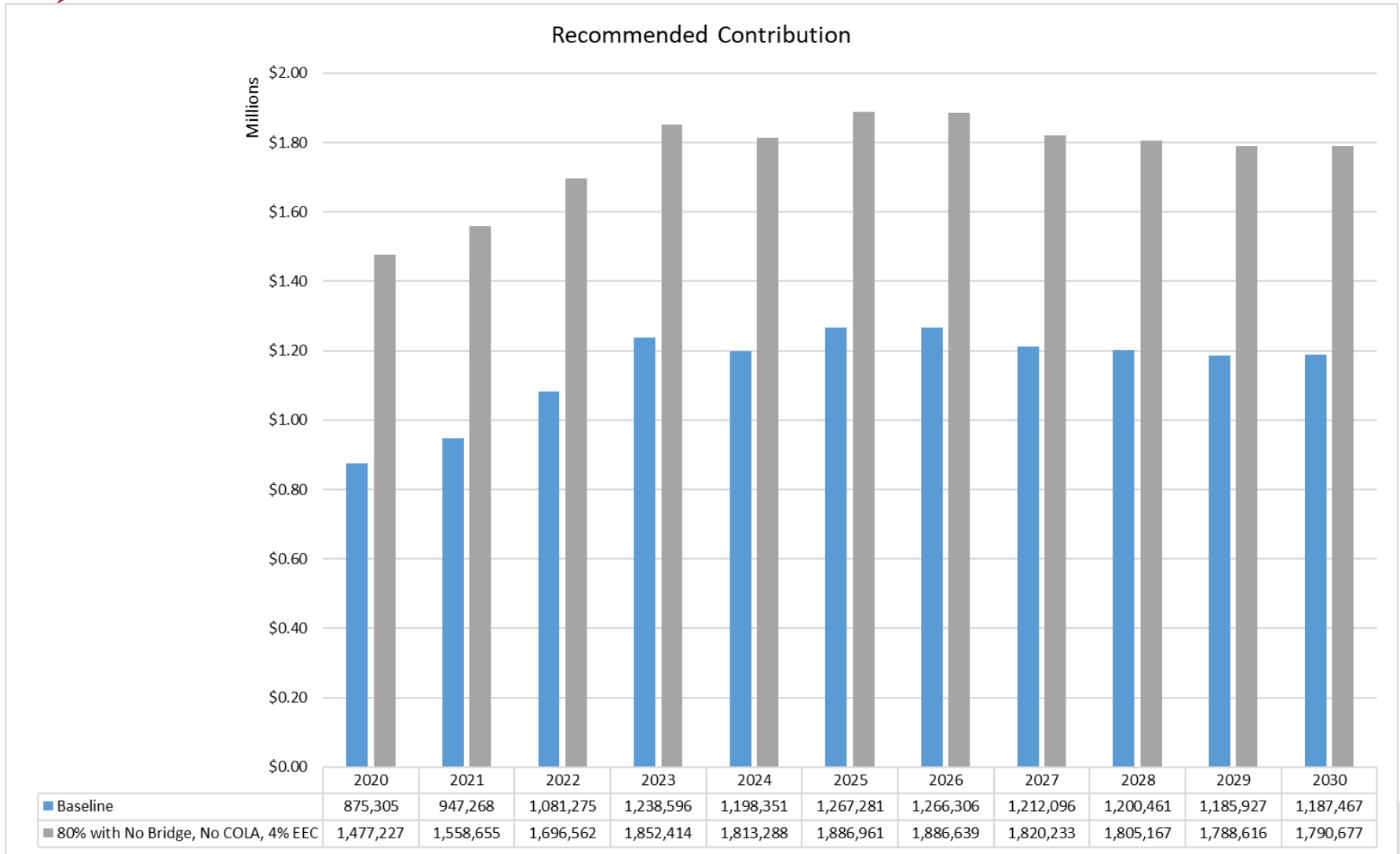
- The 10-year cost projections use the same actuarial assumptions as disclosed in the annual valuation report. Other assumptions are described in the Appendix.
- The 10-year projections assume the plan changes occur at January 1, 2020. This shows the sensitivity of results on the current population. If the changes occur at a later date, the impact would be smaller which reflects that participants that retire before the plan change would receive the current benefit structure. Actual plan changes are proposed to occur on January 1, 2021.
- We have assumed the District contributes the recommended contribution each year.
- We have reflected up-to-date asset information as of 1/1/2020 and assumed 0% asset return for 2020. Future year returns are assumed to be 7.25%.
- All calculations shown in these results are based on Data and Assumptions from the January 1, 2020 Valuation. More information on the demographics of the population and the actuarial assumptions used can be found in the January 1, 2020 Valuation Report.
- New firefighter demographics are based on new hire experience during 2019. Ten firefighters are assumed to meet participation at 1/1/2021, then the population is assumed to remain flat thereafter.



Cost Projection Considerations

- The cost projections contained in this report are based on data as of January 1, 2020. Assumptions used in measuring the liabilities are consistent with the January 1, 2020 actuarial report dated July 22, 2020 unless stated otherwise. Reasonable actuarial techniques and assumptions were used to produce the cost projections. Data was provided by the District.
- The following pages show cost projections under one specific economic scenario and is meant to be used for illustration purposes only. Actual results will vary from projections shown in this report due to actual participant data, actual asset returns, and any assumption changes that may be warranted.
- These projections reflect numerous assumptions and one should focus on the general trend of the results rather than the absolute dollar amounts.

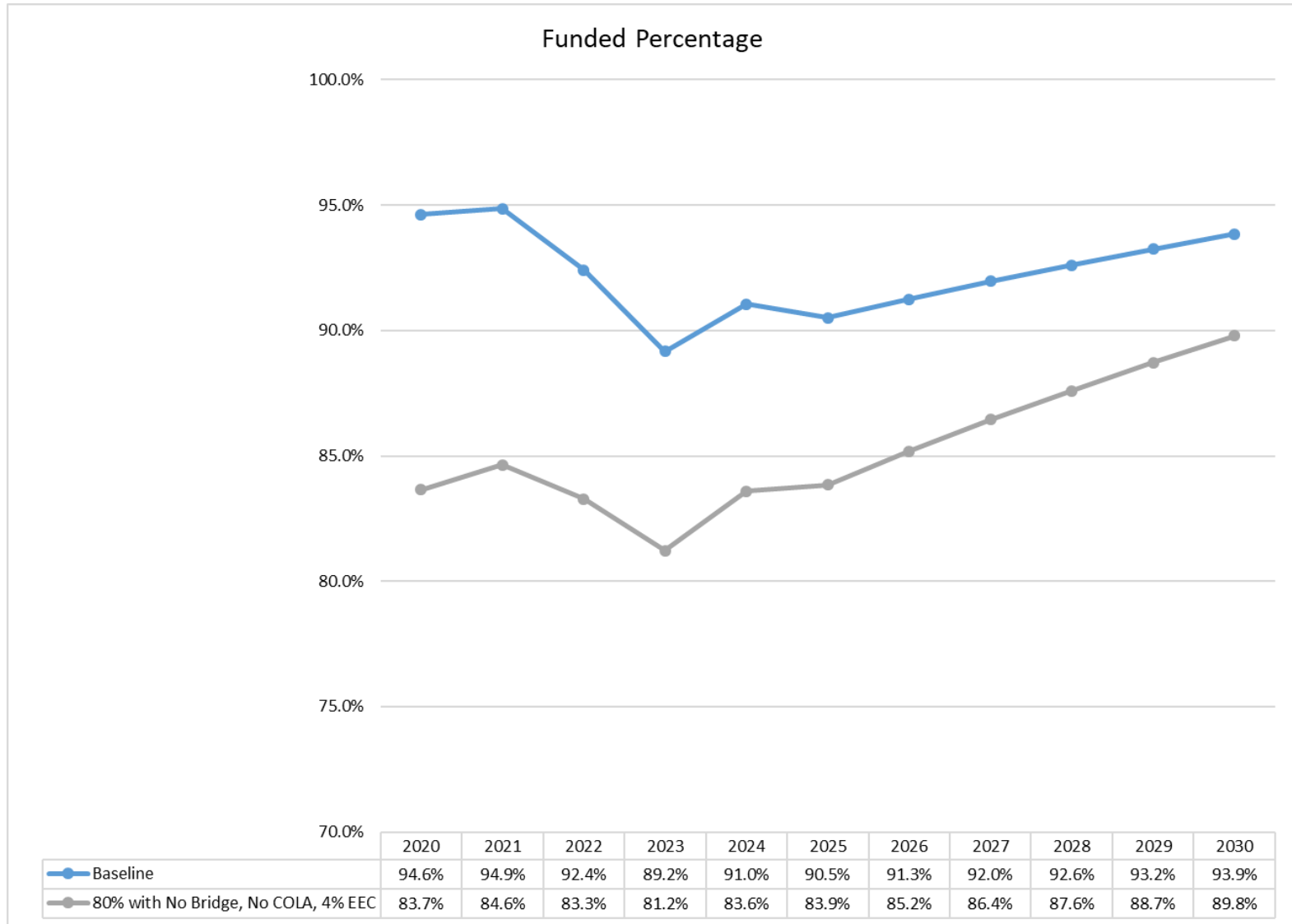
Recommended Contribution



This scenario assumed a 0% return during plan year ending 12/31/2020 and 7.25% for each thereafter.



Funded Ratio



This scenario assumed a 0% return during plan year ending 12/31/2020 and 7.25% for each thereafter.



Projection Summary

Baseline

Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Funding Liability	\$39,881,692	\$41,162,349	\$42,620,145	\$44,116,302	\$45,635,914	\$47,252,521	\$48,922,877	\$50,616,417	\$52,043,213	\$53,449,465	\$54,712,291
Actuarial Value of Assets	\$37,736,075	\$39,050,039	\$39,384,560	\$39,333,961	\$41,551,325	\$42,768,975	\$44,642,281	\$46,549,041	\$48,198,959	\$49,839,649	\$51,349,461
Market Value of Assets	\$37,755,491	\$36,435,832	\$37,798,886	\$39,312,066	\$41,013,270	\$42,768,975	\$44,642,281	\$46,549,041	\$48,198,959	\$49,839,649	\$51,349,461
Funded %	94.62%	94.87%	92.41%	89.16%	91.05%	90.51%	91.25%	91.96%	92.61%	93.25%	93.85%
Unfunded Liability	\$2,145,617	\$2,112,310	\$3,235,585	\$4,782,341	\$4,084,589	\$4,483,546	\$4,280,596	\$4,067,376	\$3,844,254	\$3,609,816	\$3,362,830
Actuarial Recommended Contribution	\$875,305	\$947,268	\$1,081,275	\$1,238,596	\$1,198,351	\$1,267,281	\$1,266,306	\$1,212,096	\$1,200,461	\$1,185,927	\$1,187,467
as % of Total Salary	14.0%	14.3%	16.3%	18.5%	17.8%	18.5%	18.3%	17.5%	17.5%	17.1%	17.2%
Total Salary	\$6,256,846	\$6,623,264	\$6,642,118	\$6,702,242	\$6,738,014	\$6,851,414	\$6,902,447	\$6,917,461	\$6,878,590	\$6,923,046	\$6,897,301

Plan Design Changes


Year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Funding Liability	\$45,107,890	\$46,908,219	\$48,909,665	\$50,964,167	\$53,071,271	\$55,323,914	\$57,621,369	\$59,901,259	\$61,920,779	\$63,905,039	\$65,746,509
Actuarial Value of Assets	\$37,736,075	\$39,707,186	\$40,730,098	\$41,392,467	\$44,362,251	\$46,391,859	\$49,085,005	\$51,783,438	\$54,244,182	\$56,695,029	\$59,030,790
Market Value of Assets	\$37,755,491	\$37,074,774	\$39,130,771	\$41,361,470	\$43,819,645	\$46,391,859	\$49,085,005	\$51,783,438	\$54,244,182	\$56,695,029	\$59,030,790
Funded %	83.66%	84.65%	83.28%	81.22%	83.59%	83.85%	85.19%	86.45%	87.60%	88.72%	89.79%
Unfunded Liability	\$7,371,815	\$7,201,033	\$8,179,567	\$9,571,700	\$8,709,020	\$8,932,055	\$8,536,364	\$8,117,821	\$7,676,597	\$7,210,010	\$6,715,719
Actuarial Recommended Contribution	\$1,477,227	\$1,558,655	\$1,696,562	\$1,852,414	\$1,813,288	\$1,886,961	\$1,886,639	\$1,820,233	\$1,805,167	\$1,788,616	\$1,790,677
as % of Total Salary	23.6%	23.5%	25.5%	27.6%	26.9%	27.5%	27.3%	26.3%	26.2%	25.8%	26.0%
Total Salary	\$6,256,846	\$6,623,264	\$6,642,118	\$6,702,242	\$6,738,014	\$6,851,414	\$6,902,447	\$6,917,461	\$6,878,590	\$6,923,046	\$6,897,301

This scenario assumed a 0% return during plan year ending 12/31/2020 and 7.25% for each thereafter.



Final Statements

- The plan is over 80% funded before the implementation of plan changes, and at least 75% funded after the implementation of plan changes.
- The plan sponsor is currently paying at least the recommended contribution on an annual basis.
- The proposed change would not in any way impair the ability of the plan to meet the obligations in effect at this time.
- Additional contributions to the plan are not mandated for the 2020 plan year. Future contribution obligations are increased in projected future years comparing to the current plan design.
- The assumptions used for the valuation and related projections produced results which, in the aggregate, are reasonable.



Appendix



2020 Actuarial Assumptions and Methods

➤ **Funding Interest Rate**

7.25%

➤ **Salary Increases**

2.50% per Year

➤ **Mortality Rates**

PubS-2010 with generational improvements using
Scale MP-2019

➤ **Expense Loading**

None

➤ **Actuarial Cost Method**

Entry Age Normal

➤ **Amortization Method**

20-year closed level dollar amortization of UAAL

➤ **Asset Valuation Method**

Gains and losses on the Market Value of Assets are
recognized over five years

➤ **Retirement Rates**

Non-Uniformed: 100% at age 62

Uniformed: 50% at age 55, 50% at age 56,
and 100% at age 57

➤ **Withdrawal Rates**

age 25	4.9%
30	3.7%
35	2.3%
40	1.1%
45	0.3%

➤ **Disability Rates**

Per 1,000 employees

age 25	0.3
35	0.3
45	0.9
55	4.2



Cost Projection Actuarial Assumptions and Methods

- **Funding Interest Rate**

7.25%

- **Asset Return**

7.25% per year unless otherwise noted

- **Assumed Contribution**

The recommended contribution each year beginning in 2020

- **Population Growth**

the population is projected to remain flat after 1/1/2021. Ten new employees are assumed to meet participation at 1/1/2021.

- **Population Growth**

New entrants are based on new hire demographic data in 2019.

- **All other methods, assumptions**

As described in the January 1, 2020 draft valuation report.



Summary of Plan Provisions

➤ **Normal Retirement**

Eligibility – Uniformed: Age 57* Non-Uniformed: Age 62

Benefit – 50% of average monthly compensation multiplied by a fraction of participant's actual service in completed years to the date of determination divided by the participant's service to retirement, but not more than 20 years (25 years for employees after 11/25/2007.) Minimum benefit of actuarial equivalent benefit under prior plan.

(Proposed change: 80% of average monthly compensation replaces 50% of average monthly compensation above)

* Uniformed employees hired before January 1, 2013 and age 50 on or before January 1, 2013 have a normal retirement age of 55

➤ **Early Retirement**

Uniformed

Eligibility – age 55 with 5 years of service

Benefit – benefit is reduced 5% per year from age 57. Benefits accrued prior to January 1, 2013 are unreduced for early retirement.

Non-Uniformed

Eligibility – age 55 with 10 years of service

Benefit – actuarially reduced accrued benefit



Summary of Plan Provisions

➤ **Bridge Benefit**

Eligibility – Uniformed retirees between ages 55 and 62

Benefit – 20% of average monthly compensation paid until participant is one month past age 62, reduced for service less than 20 or 25 years at NRA depending on hire date.

(Proposed change: Bridge benefit is eliminated for participants terminating employment on or after January 1, 2021)

➤ **Death Benefit**

Eligibility – immediate

Benefit – Actuarial equivalent of vested accrued benefit paid to beneficiary

➤ **Vesting**

Eligibility – 10-year graded vesting: 50% at 5 years, increasing 10% per year to 100% at 10 years

Benefit – Accrued benefit paid at Normal Retirement

➤ **Cost of Living Increase**

1% retiree increase every January 1

(Proposed change: 1% COLA is eliminated for participants terminating employment on or after January 1, 2021)

➤ **Payment Form Options**

The unreduced payment form is a life annuity. Several other actuarially equivalent payment form options are available, including a partial lump sum payment.

➤ **Employee contributions**

1% of compensation for 2013 and 2% of compensation for 2014 and later.

(Proposed change: 4% of compensation beginning January 1, 2021)



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Pattonville Fire Protection District Defined Benefit Pension Plan

January 1, 2020
Actuarial Valuation Report

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Actuarial Certification

At the request of the plan sponsor, this report summarizes the actuarial results of the Pattonville Fire Protection District Defined Benefit Pension Plan as of January 1, 2020. The purpose of this report is to communicate the following results of the valuation:

- Funded Status;
- and Determine Recommended Contribution;

This report has been prepared in accordance with the applicable Federal and State laws. Consequently, it may not be appropriate for other purposes. Please contact Nyhart prior to disclosing this report to any other party or relying on its content for any purpose other than that explained above. Failure to do so may result in misrepresentation or misinterpretation of this report.

The results in this report were prepared using information provided to us by other parties. The census and asset information has been provided to us by the employer. We have reviewed the provided data for reasonableness when compared to prior information provided, but have not audited the data. Where relevant data may be missing, we have made assumptions we believe to be reasonable. We are not aware of any significant issues with and have relied on the data provided. Any errors in the data provided may result in a different result than those provided in this report. A summary of the data used in the valuation is included in this report.

The actuarial assumptions and methods were chosen by the employer. In our opinion, all actuarial assumptions and methods are individually reasonable and in combination represent our best estimate of anticipated experience of the plan. 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); and
- changes in plan provisions or applicable law.

We did not perform an analysis of the potential range of future measurements due to the limited scope of our engagement. This report has been prepared in accordance with generally accepted actuarial principles and practice.

Neither Nyhart nor any of its employees have any relationship with the plan or its sponsor which could impair or appear to impair the objectivity of this report. To the extent that this report or any attachment concerns tax matters, it is not intended to be used and cannot be used by a taxpayer for the purpose of avoiding penalties that may be imposed by law.

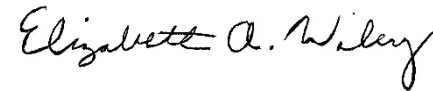
Actuarial Certification

The undersigned are compliant with the continuing education requirements of the Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion in the United States and are available for any questions.

Nyhart



Heath Merlak, FSA, EA, MAAA
Enrollment Number: 20-05967



Elizabeth Wiley, FSA, EA
Enrollment Number: 20-08544

July 22, 2020
Date

Executive Summary

The actuarial report provides the plan sponsor with several ways to measure the funded status of the pension plan. The following detail is included in the report:

- Recommended Contribution
- Asset Performance
- Plan Demographics

This report is filled with actuarial terminology. However, the ultimate objective of the valuation is to provide a rational method of funding the plan. It is necessary to fund the benefit promised by the employer in a manner that is logical and employer friendly, yet safeguards the participants' interest. The actuarially derived contribution, however, is not the true cost of the pension plan. The true cost is illustrated by the following formula:

$$\text{Ultimate Pension Cost} = \text{Benefits Paid} - \text{Investment Income} + \text{Plan Expenses}$$

While the plan's liability and normal cost determine the current contribution recommendations, the true cost is controlled only by the "defined" benefit and investment income generated by the underlying assets. The actuarial process only controls the timing of costs.

We suggest that a plan sponsor treat the actuarial report as you would treat a scorecard. It is simply a measure of progress toward the ultimate goal of paying all pension benefits when participants retire.

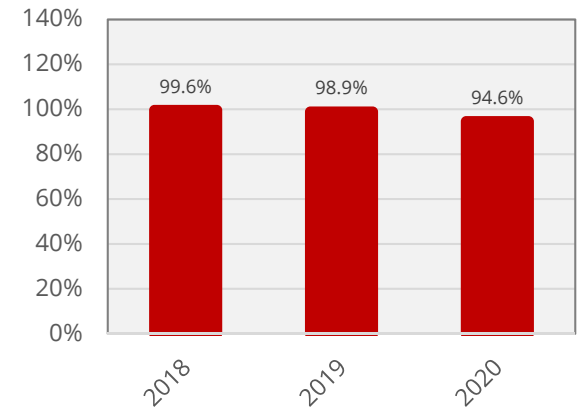
Executive Summary

Summary Results

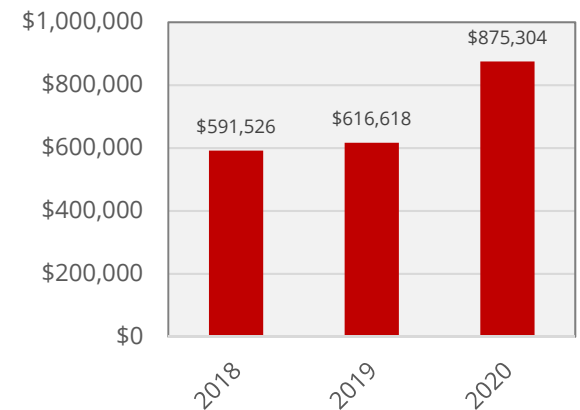
The actuarial valuation's primary purpose is to produce a scorecard measure displaying the funding progress of the plan toward the ultimate goal of paying benefits at retirement. The accrued liability is based on an entry age level percentage of pay.

	January 1, 2019	January 1, 2020
Funded Status Measures		
Accrued Liability	\$36,526,972	\$39,881,691
Actuarial Value of Assets	\$36,121,679	\$37,736,076
Unfunded Actuarial Accrued Liability (UAAL)	\$405,293	\$2,145,615
Funded Percentage (AVA)	98.9%	94.6%
Funded Percentage (MVA)	83.2%	94.7%
Cost Measures		
Recommended Contribution for Year Beginning	\$616,618	\$875,304
Recommended Contribution (as a percentage of payroll)	9.5%	14.0%
Asset Performance		
Market Value of Assets (MVA)	\$30,396,251	\$37,755,491
Actuarial Value of Assets (AVA)	\$36,121,679	\$37,736,076
Actuarial Value/Market Value	118.8%	99.9%
Market Value Rate of Return	-19.5%	25.18%
Actuarial Value Rate of Return	3.6%	5.2%
Participant Information		
Active Participants	61	59
Terminated Vested Participants	1	3
Retirees and Beneficiaries	40	41
Total	102	103
Expected Payroll	\$6,499,698	\$6,256,846

History of Funded Ratio



History of Recommended Contribution



Executive Summary

Changes since Prior Valuation and Key Notes

The discount rate decreased from 7.75% to 7.25% to better reflect recent experience and anticipated future returns. The change in interest assumption results in an increase in accrued liability and normal cost.

The mortality table has been updated from the RP-2014 Mortality Table projected from 2006 with the Mortality Improvement Scale MP-2018 to the PubS-2010 Mortality Table with the Mortality Improvement Scale MP-2019. This change results in an increase in liability and normal cost.

There have been no changes to plan provisions since the previous valuation.

Executive Summary

Five Year Valuation Summary

	01/01/2016*	01/01/2017*	01/01/2018	01/01/2019	01/01/2020
Funding					
Accrued Liability	\$32,111,389	\$33,476,997	\$35,610,656	\$36,526,972	\$39,881,691
Actuarial Value of Assets	\$27,286,020	\$33,546,118	\$35,451,497	\$36,121,679	\$37,736,076
Unfunded Actuarial Accrued Liability	\$4,825,369	(\$69,121)	\$159,159	\$405,293	\$2,145,615
Funded Percentage	85.0%	100.2%	99.6%	98.9%	94.6%
Normal Cost (NC)	\$1,000,690	\$976,107	\$667,071	\$665,931	\$729,188
NC as a Percent of Covered Payroll	16.3%	14.8%	10.2%	10.2%	11.7%
Actual Contribution	\$950,000	\$1,270,000	\$1,090,000	\$1,500,000	TBD
Recommended Contribution	\$1,078,243	\$1,013,225	\$591,526	\$616,618	\$875,304
Recommended Contribution (% of Pay)	17.5%	15.3%	9.0%	9.5%	14.0%
Interest Rate	7.75%	7.75%	7.75%	7.75%	7.25%
Expense Load Assumption	N/A	N/A	N/A	N/A	N/A
Rate of Return					
Actuarial Value of Assets	5.8%	10.3%	12.3%	3.6%	5.2%
Market Value of Assets	-8.1%	25.8%	15.8%	-19.5%	25.2%
Demographic Information					
Active Participants	62	64	63	61	59
Terminated Vested Participants	0	0	0	1	3
Retired Participants	34	34	36	37	38
Beneficiaries	3	3	3	3	3
Disabled Participants	0	0	0	0	0
Total Participants	99	101	102	102	103
Covered Payroll	\$6,157,780	\$6,615,619	\$6,539,822	\$6,499,698	\$6,256,846
Average Covered Pay	\$99,319	\$103,369	\$103,807	\$106,552	\$106,048

***Valuation results for the 2016 and 2017 plan years were determined under the aggregate cost method. Accrued liabilities shown are the actuarial present values of accrued benefits under ASC 960, and the asset values shown are based on market value.**

Executive Summary

Identification of Risks

The results presented in this report are shown as single point values. However, these values are derived using assumptions about future markets and demographic behavior. If actual experience deviates from our assumptions, the actual results for the plan will consequently deviate from those presented in this report. Therefore, it is critical to understand the risks facing this pension plan. The following table shows the risks we believe are most relevant to the Pattonville Fire Protection District Defined Benefit Pension Plan. The risks are generally ordered with those we believe to have the most significance at the top. Also shown are possible methods by which a more detailed assessment of the risk can be performed.

Type of Risk	Method to Assess Risk
Investment Return	Scenario Testing; Stress Testing
Contribution Risk	Scenario Testing; Stress Testing
Participant Longevity	Scenario Testing; Stress Testing
Salary Growth	Annual Gain/(Loss) Analysis; Assumption Study; Review similar plan's experience (survey)

Plan Maturity Measures - January 1, 2020

Each pension plan has a distinct life-cycle. New plans promise future benefits to active employees and then accumulate assets to pre-fund those benefits. As the plan matures, benefits are paid and the pre-funded assets begin to decumulate until ultimately, the plan pays out all benefits. A plan's maturity has a dramatic influence on how risks should be viewed. The following maturity measures illustrate where the Pattonville Fire Protection District Defined Benefit Pension Plan falls in its life-cycle.

Duration of Liabilities: 12.2

Duration is the most common measure of plan maturity. It is defined as the sensitivity of the liabilities to a change in the interest rate assumption. The metric also approximates the weighted average length of time, in years, until benefits are expected to be paid. A plan with high duration is, by definition, more sensitive to changes in interest rates. A plan with low duration is more susceptible to risk if asset performance deviates from expectations as there would be less time to make up for market losses in adverse market environments while more favorable environments could result in trapped surplus from gains. Conversely, high duration plans can often take on more risk when investing, and low duration plans are less sensitive to interest rate fluctuations.

Demographic Distribution - Ratio of Actively Accruing Participants to All Participants: 57.3%

A plan with a high ratio is more sensitive to fluctuations in salary (if a salary-based plan) and statutory changes. A plan with a low ratio is at higher risk from demographic experience. Such a plan should pay close attention to valuation assumptions as there will be less opportunity to realize future offsetting gains or losses when current experience deviates from assumptions. Plans with a low ratio also have limited opportunities to make alterations to plan design to affect future funded status.

Asset Leverage - Ratio of Payroll for Plan Participants to Market Value of Assets: 16.6%

Younger plans typically have a large payroll base from which to draw in order to fund the plan while mature plans often have a large pool of assets dedicated to providing benefits to a population primarily consisting of members no longer on payroll. Plans with low asset leverage will find it more difficult to address underfunding, as the contributions needed to make up the deficit will represent a higher percentage of payroll than for a plan with high asset leverage.

Benefit Payment Percentage - Ratio of Annual Benefit Payments to Market Value of Assets: 5.0%

As a plan enters its decumulation phase, a larger percentage of the pre-funded assets are paid out each year to retirees. A high percentage is not cause for alarm as long as the plan is nearly fully funded. However, such a plan is more sensitive to negative asset performance, especially if cash contributions are not an option to make up for losses.

Assets and Liabilities

The basic building blocks of the actuarial report are contained in this section. These include:

- Actuarial Accrued Liabilities
- Asset Information
- Summary of Contributions

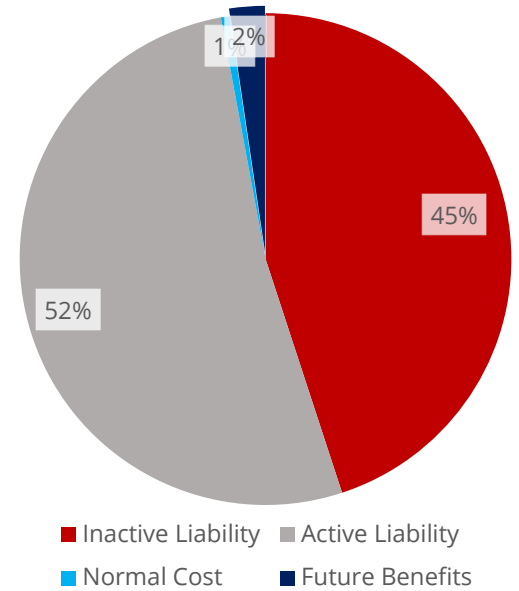
Assets and Liabilities

Present Value of Future Benefits

The Present Value of Future Benefits represents the future benefits payable to the existing participants.

	January 1, 2020
Present Value of Future Benefits	
Active participants	
Retirement	\$24,479,976
Disability	\$466,501
Death	\$147,442
Termination	\$169,161
Total active	\$25,263,080
Inactive participants	
Retired participants	\$19,992,317
Beneficiaries	\$340,861
Terminated vested participants	\$782,723
Total inactive	\$21,115,901
Total	\$46,378,981
Present value of future payrolls	\$52,181,391

Breakdown of Present Value of Future Benefits



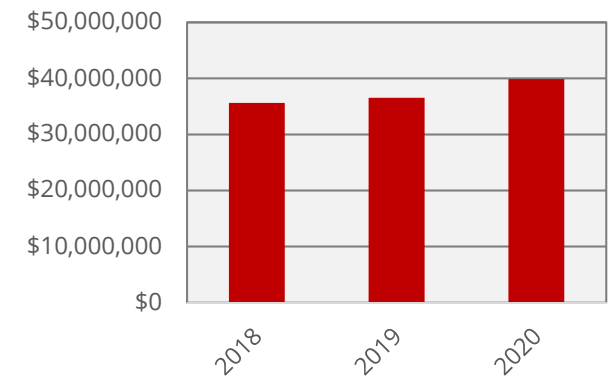
Assets and Liabilities

Actuarial Accrued Liability

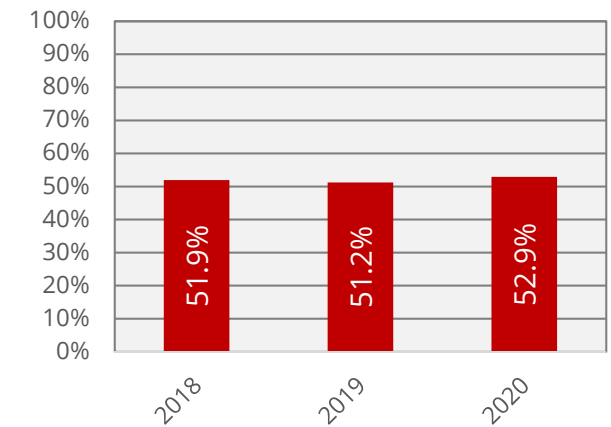
The Actuarial Accrued Liability measures the present value of benefits earned as of the valuation date, using a specified set of actuarial assumptions.

	January 1, 2020
Active participants	
Retirement	\$18,429,961
Disability	\$279,692
Death	\$90,607
Termination	(\$34,470)
Total Active	\$18,765,790
Inactive participants	
Retired participants	\$19,992,317
Beneficiaries	\$340,861
Terminated vested participants	\$782,723
Total Inactive	\$21,115,901
Total Actuarial Accrued Liability	\$39,881,691
Normal Cost	\$729,188
Interest Rate	7.25%

History of Liabilities



History of the Percentage of Inactive Liability



Assets and Liabilities

Reconciliation of Actuarial Accrued Liabilities

A plan's Actuarial Accrued Liability will change from one year to the next. It increases due to benefit accruals (Normal Cost) and interest, and it decreases as benefits are paid. Demographic experience, assumptions changes, and plan changes can cause increases or decreases.

	January 1, 2020
1. Actuarial Accrued Liability prior year	\$36,526,972
2. Increases or decreases due to:	
(a) Normal Cost	\$665,932
(b) Interest Adjustment	2,810,927
(c) Benefits Paid	(1,880,858)
(d) Demographic Experience	(877,398)
(e) Interest Rate Changes	2,079,547
(f) Mortality Changes	556,569
(g) Other Assumption Changes	0
(h) Plan Changes	0
(i) Other Changes	0
3. Actuarial Accrued Liability current year	\$39,881,691

Assets and Liabilities

Asset Information

The amount of assets backing the pension promise is the most significant driver of volatility and future costs within a pension plan. The investment performance of the assets directly offsets the ultimate cost.

January 1, 2020

Market Value Reconciliation

Market value of assets, beginning of prior year	\$30,396,251
Contributions	
Employer contributions	1,500,000
Employee contributions	123,122
Total	\$1,623,122
Investment income	7,616,976
Benefit payments	(1,880,858)
Administrative expenses	0
Market value of assets, beginning of current year	\$37,755,491

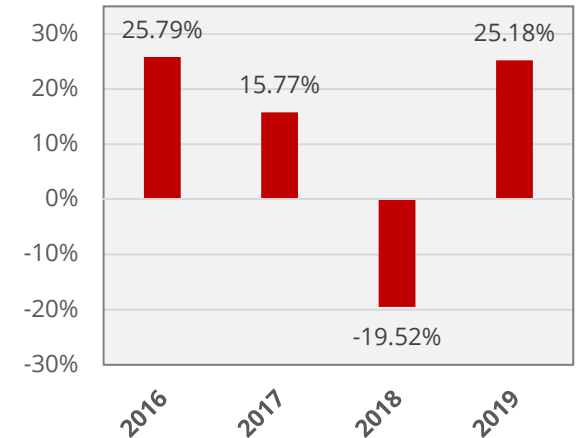
Historical Rates of Return

Rate of return for 2019	25.18%
Rate of return for 2018	-19.52%
Rate of return for 2017	15.77%
Rate of return for 2016	25.79%

Actuarial Value of Assets

Value at beginning of current year	\$37,736,076
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Rates of Return



Monitoring the pension plan's investment performance is crucial to eliminating surprises.

Assets and Liabilities

Asset Information (continued) – 20% Phase in

Plan Assets are used to develop funded percentages and contribution requirements.

January 1, 2020

Investment Gain or (Loss)

1. Prior year's market value of assets	\$30,396,251
2. Employer contributions for the prior plan year	1,500,000
3. Employee contributions for the prior plan year	123,122
4. Benefit payments during the prior plan year	(1,880,858)
5. Administrative expenses during the prior plan year	0
6. Expected earnings at 7.75% to the end of the plan year on	
(a) Market value of assets	\$2,355,709
(b) Contributions	61,722
(c) Benefit payments	(71,523)
(d) Administrative expenses	0
(e) Total expected earnings, (a) + (b) + (c) + (d)	\$2,345,908
7. Expected market value of assets, (1) + (2) + (3) + (4) + (5) + (6e)	\$32,484,423
8. Actual market value of assets	\$37,755,491
9. Investment Gain or (Loss), (8) – (7)	\$5,271,068

Actuarial Value of Assets

10. Market value of assets	\$37,755,491
11. Deferred Investment gains or (losses)	
(a) Current year (80% x \$5,271,068)	\$4,216,854
(b) First prior year (60% x (\$10,399,683))	(6,239,810)
(c) Second prior year (40% x \$2,676,213)	1,070,485
(d) Third prior year (20% x \$4,859,429)	971,886
(e) Total	\$19,415
12. Preliminary actuarial value of assets, (10 – (11e))	\$37,736,076
13. 80% Market value of assets	\$30,204,393
14. 120% Market value of assets	\$45,306,589
15. Final actuarial value of assets	\$37,736,076
16. Return on actuarial value of assets	5.20%

Funding Results

The basic building blocks of the actuarial report are contained in this section. These include:

- Reconciliation of Gain/Loss
- Recommended Contribution

Funding Results

Reconciliation of Gain/Loss

January 1, 2020

Liability (Gain)/Loss

1. Actuarial liability, beginning of prior year	\$36,526,972
2. Normal cost for prior year	665,932
3. Benefit payments	(1,880,858)
4. Expected Interest	2,810,927
5. Change in Assumptions	2,636,116
6. Change in Plan Provisions	0
7. Expected actuarial liability, beginning of current year	\$40,759,089
8. Actual actuarial liability	\$39,881,691
9. Liability Gain/(Loss), (7) – (8)	\$(877,398)

Asset Gain/(Loss)

10. Actuarial value of assets, beginning of prior year	\$36,121,679
11. Contributions	1,623,122
12. Benefit payments	(1,880,858)
13. Administrative expenses	0
14. Expected Investment return	2,789,629
15. Expected actuarial value of assets, beginning of current year	\$38,653,572
16. Actual actuarial value of assets, beginning of current year	\$37,736,076
17. Asset Gain/(Loss), (16) – (15)	\$917,496

Total Gain/(Loss), (17) + (9)

\$40,098

Funding Results

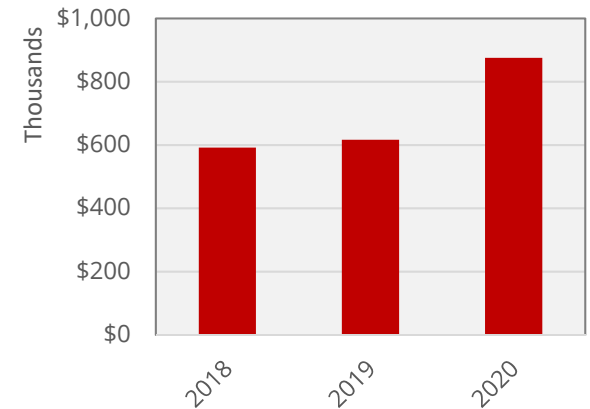
Development of Recommended Contribution

The recommended contribution is the annual amount necessary to fund the plan according to funding policies and/or applicable laws.

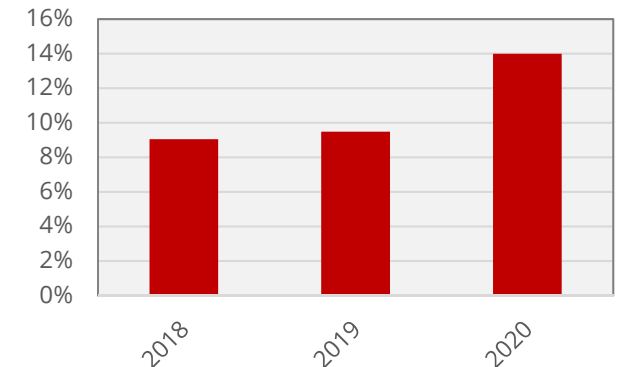
Recommended Contribution

1. Entry Age Accrued Liability	\$39,881,691
2. Actuarial value of assets	37,736,076
3. Unfunded actuarial accrued liability (UAAL), (1)-(2)	\$2,145,615
4. Total Normal Cost	729,188
5. Expected Participant Contributions	(106,815)
6. Net Normal Cost	\$622,373
7. Amortization of UAAL	193,761
8. Applicable Interest	59,170
9. Total Recommended Contribution	\$875,304

History of Recommended Contribution



History of Recommended Contribution (% of Payroll)



Data, Assumptions, and Plan Provisions

- Demographic Information
- Plan Provisions
- Assumptions and Methods

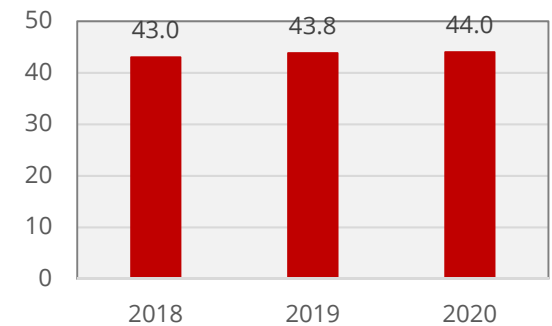
Data, Assumptions, and Plan Provisions

Demographic Information

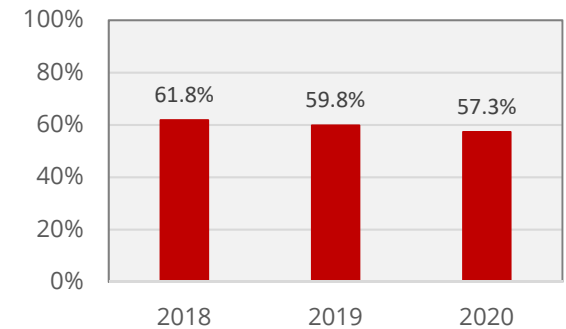
The foundation of a reliable actuarial report is the participant information provided by the plan sponsor. Monitoring trends in demographic information is crucial for long-term pension planning.

	January 1, 2019	January 1, 2020
Participant Counts		
Active Participants	61	59
Retired Participants	37	38
Beneficiaries	3	3
Disabled Participants	0	0
Terminated Vested Participants	1	3
Total Participants	102	103
Active Participant Demographics		
Average Age	43.8	44.0
Average Service	14.8	14.6
Average Compensation	\$106,552	\$106,048
Total Covered Payroll	\$6,499,698	\$6,256,846

History of Average Active Participant Age



History of Active Participant Ratio



Demographic Information (continued)

	January 1, 2019	January 1, 2020	
Retiree Statistics			Monitoring the average age of the population is important due to the relationship of actuarial cost to age. Generally speaking, an older population generates a higher actuarial cost.
Average Age	64.8	65.4	
Average Monthly Benefit	\$3,910	\$3,924	
Beneficiary Statistics			
Average Age	51.9	52.9	Changes in the ratio of active to retired participants can be a significant driver of costs in a volatile asset market.
Average Monthly Benefit	\$1,983	\$1,983	
Disabled Participant Statistics			
Average Age	N/A	N/A	
Average Monthly Benefit	N/A	N/A	
Terminated Vested Participant Statistics			
Average Age	47.2	47.0	
Average Monthly Benefit	\$1,944	\$3,417	

Participant Reconciliation

	Active	Terminated Vested	Retired	Beneficiaries	Totals
Prior Year	61	1	37	3	102
Active					
To Death	0	0	0	0	0
To Terminated Vested	(2)	2	0	0	0
To Lump Sum Cash-Out	0	0	0	0	0
To Retired	(2)	0	2	0	0
Terminated Vested					
To Active	0	0	0	0	0
To Non-Participating	0	0	0	0	0
To Retired	0	0	0	0	0
To Survivor	0	0	0	0	0
To Lump Sum Cash-Out	0	0	0	0	0
To Death	0	0	0	0	0
Retired					
To Death	0	0	(1)	0	(1)
Survivor					
To Death	0	0	0	0	0
Additions	2	0	0	0	2
Departures	0	0	0	0	0
Current Year	59	3	38	3	103

Data, Assumptions, and Plan Provisions

Active Participant Schedule

Active participant information grouped based on age and service.

Age Group	Years of Service									Total	Ave. Comp
	0 to 5	5 to 10	10 to 15	15 to 20	20 to 25	25 to 30	30 to 35	35 to 40	40 & Up		
Under 25										0	\$0
25 to 29		1								1	\$101,075
30 to 34	2	7	1							10	\$97,355
35 to 39	3	6	2							11	\$97,490
40 to 44		3	6	1						10	\$104,655
45 to 49	1		3	6	3					13	\$109,522
50 to 54			2		2	3				7	\$114,913
55 to 59					1	1	4			6	\$120,295
60 to 64							1			1	\$113,334
65 to 69										0	\$0
70 & up										0	\$0
Total	6	17	14	7	6	4	5			59	\$106,048

Data, Assumptions, and Plan Provisions

Plan Effective Date

March 1, 2002.

At that date, the prior defined benefit plan, The Retirement Plan for Employees of the Pattonville – Bridgeton Fire Protection District of St. Louis County, and the prior defined contribution plan, the Pattonville-Bridgeton Terrace Fire Protection District Defined Contribution Plan, are merged into the new plan. Amounts transferred from the prior plans provide the basis for the Grandfathered Benefits provided in the Plan.

Plan Status

The plan provides ongoing benefit accruals and is open to new entrants

Eligibility for Participation

All employees of the Pattonville Fire Protection District who have attained the age of twenty-one and have completed one year of service with the District.

Average Monthly Compensation

The highest average of participant's compensation for any three (3) of the last five (5) consecutive plan years, divided by 12. In no event shall participants' compensation exceed the limitation specified in Section 401(a)(17) of the Internal Revenue Code.

Accrued Benefits

The accrued benefit is determined to be the greater of:

- a) Actuarial equivalent of the participant's Grandfathered Benefit, or
- b) 50% of average monthly compensation multiplied by the fraction of participant's actual service in completed years to the date of determination divided by the participant's service to retirement, but not more than 20 years (for employees of the District prior to 11/26/2007) and not more than 25 years (for employees of the District on or after 11/26/2007.)

Social Security

A participant retiring after the age of 55 but prior to attainment of age 62 will receive an additional monthly benefit equal to 20% of the participant's average monthly compensation. Payment will cease upon attainment of age 62.

Benefits

Normal Retirement

Eligibility	Upon the attainment of age 57 for uniformed employees and age 62 for non-uniformed employees; Uniformed employees hired before January 1, 2013 and born before January 1, 1963 have a normal retirement age of 55
Benefit	Unreduced accrued benefit payable immediately

Data, Assumptions, and Plan Provisions

Early Retirement

Eligibility	Uniformed employees may retire at age 55
Benefit	Accrued retirement benefit reduced 5% per year for each year prior to age 57

Normal Form of Benefit

Married Members	A pension payable for life. However, members are required by law to receive a reduced qualified joint and survivor benefit unless formally elected otherwise.
Single Members	A pension payable for life

Vesting

Prior to October 1, 2003, benefits vest according to the following schedule:

<u>Whole Years of Service</u>	<u>Vested%</u>
Less than 2 years	0%
2	20%
3	40%
4	60%
5	80%
6 years or more	100%

Effective October 1, 2003, participant will vest according to the following schedule, but in no case less than the percentage vested on September 1, 2003 on the prior schedule.

<u>Whole Years of Service</u>	<u>Vested%</u>
Less than 5 years	0%
5	50%
6	60%
7	70%
8	80%
9	90%
10 years or more	100%

Data, Assumptions, and Plan Provisions

Cost of Living Adjustment

Benefits payable will be increased annually, on each January 1, by one percent of the prior benefits paid, as long as the participant survives. Additionally, if the value of the plan's assets exceeds 115% of the actuarial accrued liability, after the projected increase, benefits will be increased by the ratio of the Consumer Price Index on August 31 prior to the date of the increase to the Consumer Price Index on the later of the participant's annuity start date and September 1, 2003.

Employee Contributions

Employees contribute 1% of compensation during 2013 and 2% of compensation in 2014 and later.

Actuarial Equivalence

Actuarial Equivalence will be computed using 7.75% interest and the 1983 Group Annuity Mortality Table for males.

Plan Provisions Not Included

We are not aware of any plan provisions not included in the valuation.

Adjustments Made for Subsequent Events

We are not aware of any event following the measurement date and prior to the date of this report that would materially impact the results of this report.

Data, Assumptions, and Plan Provisions

Except where otherwise indicated, the following assumptions were selected by the plan sponsor with the concurrence of the actuary. Prescribed assumptions are based on the requirements of the relevant law, the Internal Revenue Code, and applicable regulation. The actuary was not able to evaluate the prescribed assumptions for reasonableness for the purpose of the measurement.

Valuation Date	January 1, 2020
Participant and Asset Information Collected as of	January 1, 2020
Cost Method	Entry Age Normal. This method produces a normal cost as a level percentage of pay over the service life of each participant and amortization of the Unfunded Actuarial Accrued Liability (UAAL). Gains and losses are reflected in the UAAL and are included in its amortization.
Amortization Method	20-year closed level dollar amortization of Unfunded Actuarial Accrued Liability
Asset Valuation Method	Market value of assets with a 5-year phase in of gains and losses, subject to a 20% corridor
Interest Rates (CO)	7.25% This rate has been set by the plan sponsor in conjunction with their asset advisor. Detailed evaluation of this assumption was outside the scope of our engagement.
Expense and/or Contingency Loading (FE)	None assumed
Annual Pay Increases (FE)	2.50%. The annual pay increase reflects a long-term anticipated increase based on a review completed in 2017.
Mortality Rates (FE)	
Healthy	PubS-2010 Mortality Table with the Mortality Improvement Scale MP-2019 As the plan is not large enough to have credible experience, mortality assumptions are set to reflect general population trends.

Marital Status and Ages (FE)

100% of males and females assumed to be married and female spouses are assumed to be 3 years younger than male spouses.

Payment Form Election (FE)

100% Single Life Annuity at Normal Retirement

Retirement Rates (FE)

Non-uniformed employees: 100% at age 62
Uniformed employees: 50% at age 55, 50% at age 56, and 100% at age 57

As the plan is not large enough to have credible experience, retirement rates are based on professional judgement and expectation for the general population adjusted as necessary for the specific provisions of the plan.

Disability Rates (FE)

Sample rates as shown below:

<u>Age</u>	<u>Rate</u>
25	0.03%
30	0.03%
35	0.03%
40	0.04%
45	0.09%

As the plan is not large enough to have credible experience, disability rates are determined based on the results of broad population studies.

Withdrawal Rates (FE)

Sample rates as shown below:

<u>Age</u>	<u>Rate</u>
25	4.90%
30	3.70%
35	2.30%
40	1.10%
45	0.30%

As the plan is not large enough to have credible experience, withdrawal rates are based on our professional judgement and expectation for a general population adjusted as necessary for the specific provisions of the plan.

Data, Assumptions, and Plan Provisions

Cost of Living Adjustments (CO)

1.00% per year

New Entrant Profile (FE)

Emerging Liability analysis assumed that each retiree will be replaced by a new employee age 32 earning initially \$56,037 per year.

Changes from Prior Valuation

The discount rate decreased from 7.75% to 7.25% to better reflect recent experience and anticipated future returns. The change in interest assumption results in an increase in accrued liability and normal cost.

The mortality table has been updated from the RP-2014 Mortality Table projected from 2006 with the Mortality Improvement Scale MP-2018 to the PubS-2010 Mortality Table with the Mortality Improvement Scale MP-2019. This change results in an increase in liability and normal cost.

FE indicates an assumption representing an estimate of future experience

MD indicates an assumption representing observations of estimates inherent in market data

CO indicates an assumption representing a combination of an estimate of future experience and observations of market data

Other Measurements

- Schedule of Amortizations
- Emerging Liability Analysis

Other Measurements

Schedule of Amortizations

<u>Date Established</u>	<u>Original Amount</u>	<u>Remaining Period Years</u>	<u>Remaining Balance</u>	<u>Annual Payment</u>
1/1/2018	\$159,159	18	\$151,730	\$14,319
1/1/2019	\$249,710	19	\$244,100	\$22,435
1/1/2020	\$1,749,785	20	\$1,749,785	\$157,007
		Total	<u>\$2,145,615</u>	<u>\$193,761</u>

Other Measurements

Emerging Liability Analysis

The following provides a projection of expected future cash flows:

	Beginning	Expected	Benefit	Asset	Ending
Year	<u>Balance</u>	<u>Contributions*</u>	<u>Payments</u>	<u>Returns</u>	<u>Balance</u>
2020	37,755,491	1,615,517	2,301,779	2,653,834	39,723,063
2021	39,723,063	1,616,898	2,302,831	2,796,444	41,833,575
2022	41,833,575	1,620,480	2,388,638	2,946,346	44,011,763
2023	44,011,763	1,619,368	2,470,167	3,101,309	46,262,273
2024	46,262,273	1,621,061	2,499,155	3,263,420	48,647,599
2025	48,647,599	1,622,835	2,576,403	3,433,556	51,127,587
2026	51,127,587	1,624,190	2,673,310	3,609,843	53,688,310
2027	53,688,310	1,619,504	2,997,642	3,783,738	56,093,910
2028	56,093,910	1,621,400	3,112,051	3,953,997	58,557,256
2029	58,557,256	1,620,598	3,336,842	4,124,441	60,965,453
2030	60,965,453	1,621,587	3,491,660	4,293,423	63,388,803
2031	63,388,803	1,618,689	3,713,355	4,461,079	65,755,216
2032	65,755,216	1,618,326	3,824,185	4,628,626	68,177,984
2033	68,177,984	1,619,642	3,920,478	4,800,786	70,677,934

*Expected Contributions includes employer and employee contributions. Employer contributions are assumed to be level through 2033.