Big Spring Firemen's Relief and Retirement Fund

ACTUARIAL VALUATION REPORT

**Actuarial Valuation
as of January 1, 2019
for the Plan Year January 1, 2019 through December 31, 2019**

December 18, 2019

Introduction

This report for the Big Spring Firemen's Relief and Retirement Fund presents the contribution levels to meet the adopted funding policy and shows the plan's funded status as of January 1, 2019. The disclosures required by GASB-67 have been provided in a separate report.

The report is presented in the following sections:

Highlights

The key findings of the valuation are as follows:

- The investment return on market value investment earnings for the prior two years was less than the long term actuarial assumption of 7.75%. The Fund had a 15.15% return on market value after expenses for the 2017 calendar year and a -6.47% return for the 2018 year. The average annual return on market since 1987 was 7.73%.

- The returns measured relative to the actuarial value of assets were different from the returns on market value because the actuarial value of assets is based on 5-year smoothing of investment returns in excess of (or short of) the long term actuarial assumption. The return on actuarial value of assets for 2017 was 8.29% and for 2018 4.65%. As of 1-1-2019 the actuarial value of assets was 108.9% of market value (up from 106.1% as of January 1, 2017), indicating a net deferred investment loss which will be recognized in future years. The significant experience loss in 2008 is no longer included in the 5 year averaging period.

- The unfunded actuarial liability of the plan increased by about $0.97 million over the prior valuation. The key sources of this change are

    1. Rate of return on the smoothed actuarial value of assets less than the long term assumption

    2. Contributions in excess of the normal cost

    3. Pay increases to employees

    4. Change in the mortality assumption to the Public Safety employee version of the Society of Actuaries Pub2010 mortality tables.

- The current contribution rate of 28% (13% from the members and 15% from the City) is sufficient to pay the normal cost (which is about 16.36% of participant payroll) and to amortize the unfunded actuarial liability over **38.33 years** from the 1/1/2019 valuation date. This is outside the 30-year standard previously adopted for the Big Spring FRRF and the recommended 30-year standard published by the State of Texas Pension Review Board (see pages 15-16 for a further discussion of funding standards).

- The amortization period was unfavorably affected by the investment returns for 2017 and 2018 as discussed above.

- To meet a 30 year amortization period, a total contribution rate of 29.50% of pay would be needed based on actuarial value of assets (or 30.64% based on market value of assets).

Recommendations

1. Based on the funding level of the plan and current contribution rates, we recommend that no changes in the plan be made that would increase costs until the funded level of the plan improves. This is consistent with the PRB recommendation.

2. The funded status of the plan should be carefully monitored in the future with annual actuarial valuations, if possible. Investment return should be compared annually with the long term actuarial assumption.

Additional details are presented in other sections of the report.

Summary of Plan Provisions

Credited Service	The number of years of continuous employment with the Fire Department of the City of Big Spring, Texas.
Final average compensation:	The monthly average salary during the five years in which the member earned the highest salary (or the three year average as of December 31, 2006, if higher). Compensation for members hired in 2018 and later is limited to base pay, certificate pay, longevity pay and LFSA required overtime.
Service retirement eligibility:	Attained age 50 with 20 years of service
Monthly accrued benefit:	A monthly benefit equal to 2.55% times years of service times final average compensation.
Contributions:	13% of compensation for member and 15% of salary for employer.
Interest credited on employee contributions	None
Vested benefits:	The monthly accrued benefit multiplied by the following percentages:

Years of Service	Percentage Vested
10	50%
11	55
12	60
13	65
14	70
15	75
16	80
17	85
18	90
19	95
20 or more	100

Deferred to the service retirement date (the later of age 50 and the date the member would have had 20 years of service had he continued his employment with the Big Spring Fire Department).

Separation Benefit:	Return of member contributions without interest for members terminating with less than 10 years of service.

Disability benefit

A disabled member with 10 or more years of service receives his or her vested monthly accrued benefit without reduction for early payments.

However, if the disability is the result of a pre-existing condition, the maximum monthly benefit is $100 regardless of service.

Normal form of benefit:

Monthly annuity payable for life with a guarantee that total monthly benefit paid shall not be less than the employee's accumulated contributions (installment refund guaranteed). Two thirds of the monthly benefit continues to the spouse of a deceased member until the spouse's death or remarriage.

Death Benefits:

:

Spouse
66 2/3% continuation of benefits to spouse (in the event of the death of an active employee, the benefit amount is determined as for a Disability pension).

Minor Children
With spouse in payment status $100 a month; with no spouse in payment status $200 a month; the total of spousal and children's benefits may not exceed the employee's amount.

2018 Plan Changes

Increased the City contribution rate from 13% of pay to 15% of pay

Members hired in the future would have their average monthly salary determined using only base pay, certificate pay, longevity pay and FLSA required overtime.

The maximum retirement benefit is limited to 100% of adjusted final average pay (defined as final average considering only base pay, longevity pay and certificate pay).

Actuarial equivalence factors for early retirement were updated from 8% 1983 GAM mortality to 7.5% with RP2000 mortality.

Plan benefits may not be materially increased unless the funded level of the plan is at least 80% and plan funding is sufficient to amortize the unfunded actuarial liability over 25 years or less.

DROP
(Deferred Retirement Option)

Option 1

- The Firefighter must retire within 5 years of a DROP election.

- The monthly benefit he will receive from the Plan will be determined based upon his salary and Service at the time of his DROP election.

- At the conclusion of the DROP period, the Firefighter will be paid an amount which is the sum of 1) his Employee contributions from the DROP period including interest at 4% compounded annually, plus 2) the product of his monthly benefit amount times the number of months of the DROP period. This amount must be paid within three (3) years in no more than three (3) installments.

Option 2

- Upon retirement, a Firefighter may elect to receive 85% of his regular monthly benefit (with all survivor benefits appropriately reduced) for life and a lump sum equal to 24 times this reduced benefit. This amount must be paid over three years in no more than three installments.

DROP benefits will be actuarially converted to a life only benefit for purposes of determining the "Maximum Service Retirement Benefit."

Plan Assets

This section shows the change in asset values from last year, the current asset mix, and the actuarial value of assets used for calculating contribution requirements. Assets by category and changes from year to year are shown for the years 2014 through 2018 (Exhibit 1A and 1B).

INVESTMENT RETURN 1987 TO 2018

Year Ended 31-Dec	Average Asset Value	Investment Return Amount	%
1987	1,567,141	151,856	9.69%
1988	1,719,798	68,104	3.96%
1989	1,749,271	259,242	14.82%
1990-91	1,926,054	443,665	10.86%
1992	2,314,880	171,505	7.41%
1993	2,466,908	288,483	11.69%
1994	2,768,786	20,788	0.75%
1995	2,788,327	774,401	27.77%
1996	3,572,464	598,536	16.75%
1997	4,214,255	950,957	22.57%
1998	5,257,802	391,641	7.45%
1999	5,679,201	664,469	11.70%
2000	6,332,894	173,807	2.74%
2001	6,420,161	(266,836)	-4.16%
2002	6,102,887	(230,864)	-3.78%
2003	5,903,811	1,288,773	21.83%
2004	7,129,777	903,021	12.67%
2005	7,971,622	591,201	7.42%
2006	8,545,382	1,155,080	13.52%
2007	9,663,228	692,935	7.17%
2008	10,314,157	(2,449,327)	-23.75%
2009	7,934,626	1,727,136	21.77%
2010	9,767,185	1,208,155	12.37%
2011	10,771,733	(70,944)	-0.66%
2012	9,770,072	987,550	10.11%
2013	9,779,065	1,421,585	14.54%
2014	10,784,760	514,783	4.77%
2015	11,012,664	(168,789)	-1.53%
2016	10,254,317	590,131	5.75%
2017	10,262,951	1,555,137	15.15%
2018	11,670,721	(756,695)	-6.48%
Total		936,125	
Average investment return for the period			7.73%

(Geometric ave annual compounded rate

The internal rate of return reflects interest, dividends, realized gains and losses, unrealized appreciation (for market value), and payments. The timing of contributions to the plan (assumed to be uniform throughout the year) has been taken into account in calculating the internal rate of return.
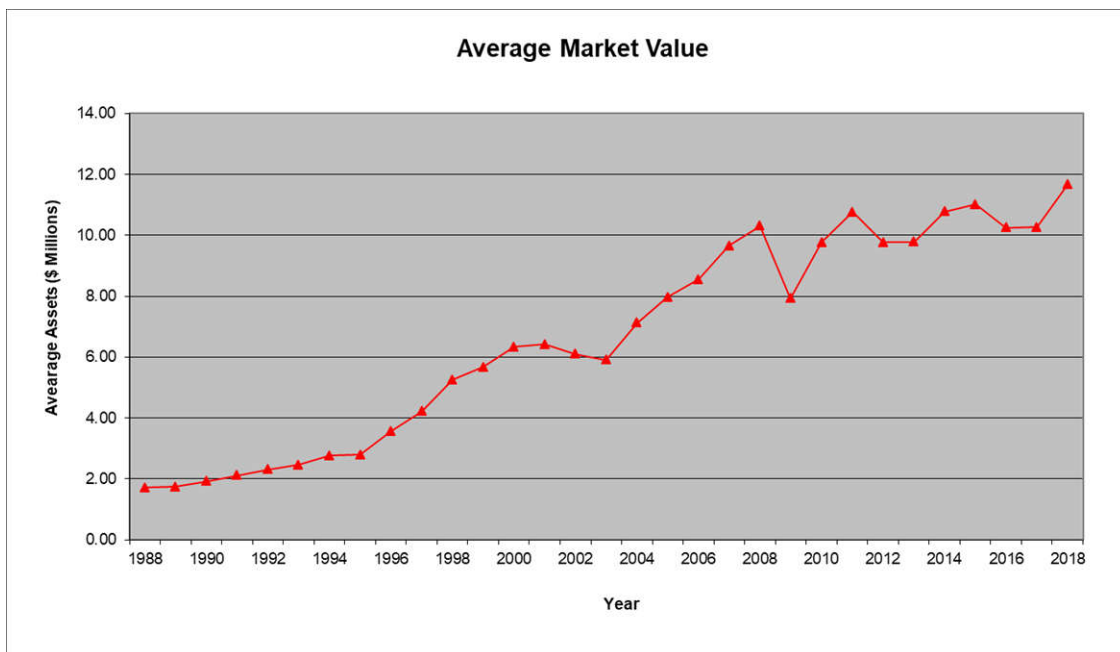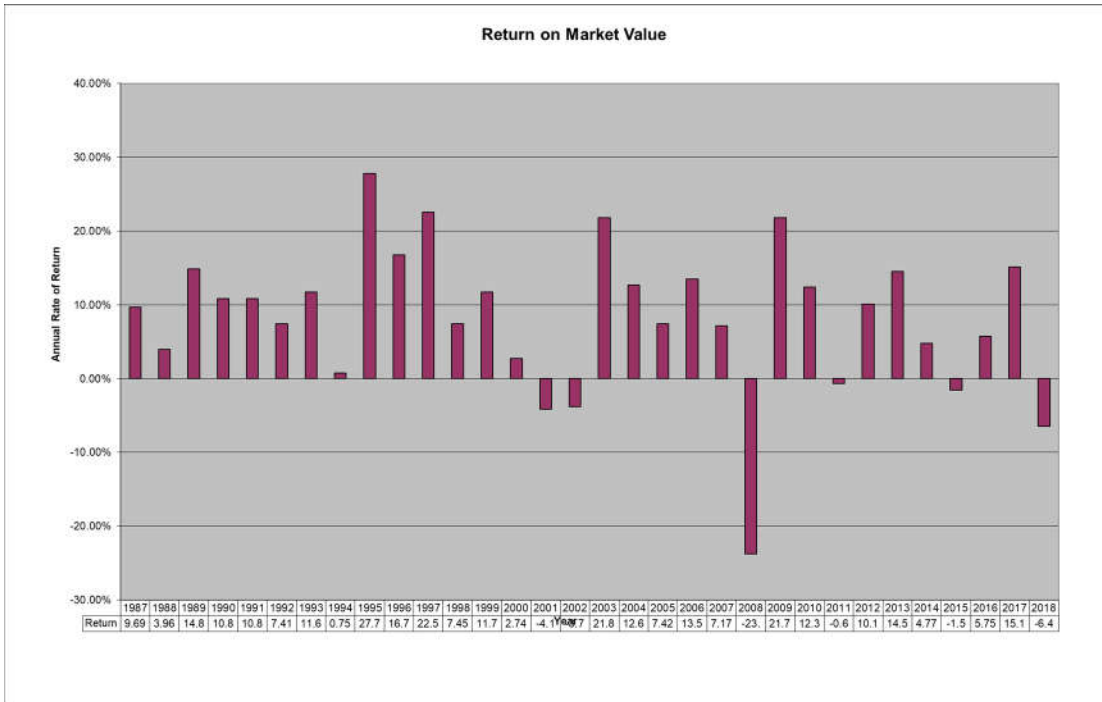
Actuarial Value of Assets

In prior years the actuarial value of assets has been equal to the market value reported by the trustee less any benefits payable at year-end. The actuarial value of assets is equal to the market value as reported by the trustee plus any contributions receivable with regard to the completed plan year. Effective for the January 1, 2003 valuation, investment gains or losses relative to the actuarial assumed rate of return were recognized evenly over five years. The result is termed the *smoothed value* of actuarial assets. This method is specifically authorized by the IRS for actuarial valuations of ERISA covered plans and is widely used for public sector plans as well. The actuarial value of assets is determined by separately spreading the gains or losses relative to the actuarial return assumption over 5 years.

See Exhibit 1C for the development of the smoothed value of assets.
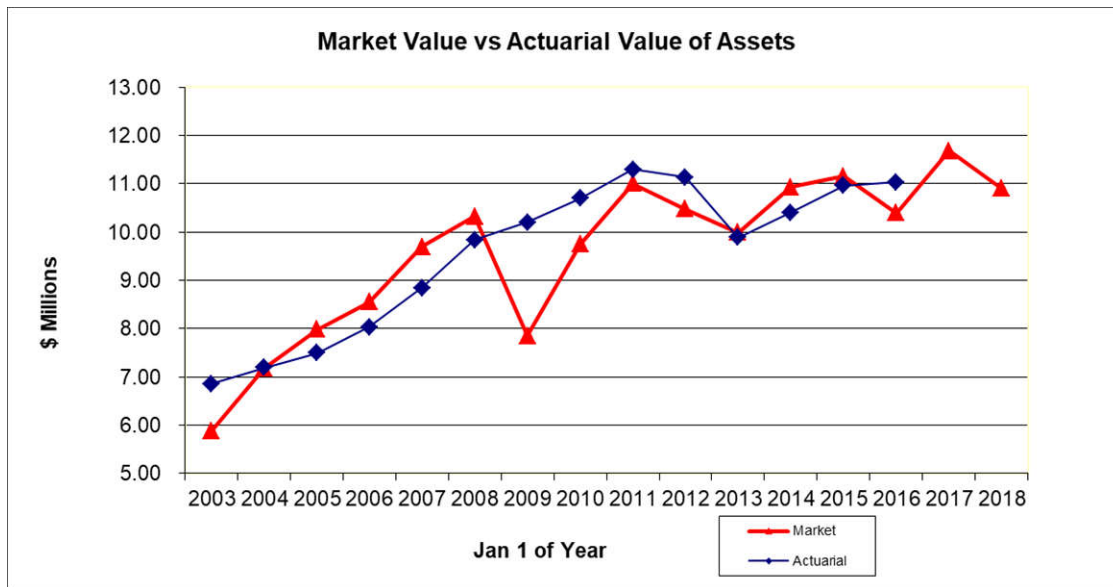
RECONCILIATION OF PLAN ASSETS

December 31, 2017 to December 31, 2018

Receipts		2018
Contributions		
Employer	$ 633,568	
Employee	549,091	
Interest and Dividends	325,708	
Net Realized Appreciation/(Depreciation)	1,247,915	
Total		$ 2,756,281

Disbursements

Benefit Payments	$ 1,193,698	Some are really (
Return of member contributions	11,096	
Expenses	96,424	
Total		1,301,219

Reconciliation

Market Value as of December 31, prior year		$ 11,681,789
Excess of Receipts over Disbursements		1,455,063
Unrealized Appreciation /(Depreciation) during the year		(2,233,893)
Market Value of Invested Assets as of December 31		$ 10,902,959
Contributions Receivable		0
Payables		0
Market Value as of December 31		$ 10,902,959

Average return on assets (BAI method)	before expense	**-5.68%**
	net of expense	**-6.47%**

RECONCILIATION OF PLAN ASSETS

December 31, 2016 to December 31, 2017

Receipts		2017	
Contributions			
Employer	$ 488,555		
Employee	488,555		
Interest and Dividends	226,518		
Net Realized Appreciation/(Depreciation)	833,554		
Total		$ 2,037,182	
Disbursements			
Benefit Payments	$ 1,239,066	Some are really ɛ	
Expenses	100,593		
Total		1,350,300	
Reconciliation			
Market Value as of December 31, prior year		$ 10,399,250	
Excess of Receipts over Disbursements		686,882	
Unrealized Appreciation /(Depreciation) during the year		595,657	
Market Value of Invested Assets as of December 31		$ 11,681,789	
Contributions Receivable		0	
Payables		0	
Market Value as of December 31		$ 11,681,789	

Average return on assets (BAI method)	before expense	**16.21%**
	net of expense	**15.16%**

Exhibit 1A

SUMMARY OF PLAN ASSETS

As of December 31, 2014 to December 31, 2018

Category	12/31/2018	Percent	12/31/2017	Percent	12/31/2016	Percent	12/31/2015 Amount	Percent	12/31/2014 Amount	Percent
Cash and Equivalents	$148,371	1%	$391,596	3%	$286,720	3%	$199,546	2%	$170,511	2%
Equities										
Common Stock	5,911,911	54%	7,204,370	62%	6,235,760	60%		0%	0	0%
Collective Funds		0%		0%		0%	6,027,299	56%	6,168,434	55%
REIT	1,198,092	11%	1,150,418	10%	1,053,453	10%	275,687	3%	376,068	3%
Balanced		0%		0%		0%	1,442,616	13%		0%
Total	$7,110,003	65%	$8,354,788	72%	$7,289,213	70%	$7,745,603	72%	$6,544,502	59%
Fixed Income										
Government bond	0	0%	0	0%	0	0%	0	0%	0	0%
Collective Funds	3,637,355	33%	2,935,063	25%	2,811,467	27%	2,754,357	26%	4,442,009	40%
Mortgage-related	0	0%	0	0%	0	0%	0	0%	0	0%
Total	$3,637,355	33%	$2,935,063	25%	$2,811,467	27%	$2,754,357	26%	$4,442,009	40%
Other - accrued income	7,228	0%	342	0%	11,850	0%	10	0%	0	0%
Total Invested Assets	$10,902,958	100%	$11,681,789	100%	$10,399,250	100%	$10,699,517	100%	$11,157,022	100%
Contributions Receivable	0		0		0		0		0	
Payables	0		0		0		0		0	
Market Value of Assets	**$10,902,958**		**$11,681,789**		**$10,399,250**		**$10,699,517**		**$11,157,022**	

RECONCILIATION OF PLAN ASSETS

December 31, 2013 to December 31, 2018

Receipts	2018	2017	2016	2015	2014
Contributions					
Employer	$ 633,568	$ 488,555	$519,911	$525,572	$496,046
Employee	549,091	488,555	519,911	525,572	496,046
Interest and Dividends	325,708	226,518	192,368	236,806	280,664
Net Realized Appreciation/(Depreciation)	1,247,915	833,554	270,547	65,248	113,178
Total	$ 2,756,281	$ 2,037,182	$1,502,738	$1,353,197	$1,385,933
Disbursements					
Benefit Payments	1,193,698	1,249,707	1,930,220	1,339,860	1,277,131
Expenses	96,424	100,593	100,928	61,331	80,057
Total	1,301,219	1,350,300	2,031,149	1,401,192	1,357,189
Reconciliation					
Market Value as of December 31, prior year	$11,681,789	$10,399,250	$10,699,517	$11,157,022	$10,927,280
Excess of Receipts over Disbursements	1,455,063	686,882	(528,411)	(47,995)	28,744
Unrealized Appreciation /(Depr) during the year	(2,233,893)	595,657	228,144	(409,511)	200,998
Market Value of Invested Assets December 31	$10,902,959	$11,681,789	$10,399,250	$10,699,517	$11,157,022
Contributions Receivable	0	0	0	0	0
Payables	0	0	0	0	0
Market Value as of December 31	**$10,902,959**	**$11,681,789**	**$10,399,250**	**$10,699,517**	**$11,157,022**

Average return on assets (BAI method)	before expense	-5.68%	before expense	16.21%	before expense	6.77%	before expense	-0.98%	before expense	5.54%
	net of expense	-6.47%	net of expense	15.16%	net of expense	5.76%	net of expense	-1.53%	net of expense	4.77%

DEVELOPMENT OF THE ACTUARIAL VALUE OF ASSETS
as of January 1, 2019

Market Value as of December 31, 2013	$10,927,280	
Contributions	992,091	
Benefit Payments and Expenses	(1,357,189)	
Expected investment earnings at 8%	855,055	
Expected Market Value as of December 31, 2014		$11,417,237
Actual Market Value as of December 31, 2014		11,157,022
Investment Loss (Gain) for 2014		$260,215
Market Value as of December 31, 2014	$11,157,022	
Contributions	1,051,143	
Benefit Payments and Expenses	(1,401,192)	
Expected investment earnings at 8%	873,889	
Expected Market Value as of December 31, 2015		$11,680,863
Actual Market Value as of December 31, 2015		10,699,517
Investment Loss (Gain) for 2015		$981,347
Market Value as of December 31, 2015	$10,699,517	
Contributions	1,039,822	
Benefit Payments and Expenses	(2,031,149)	
Expected investment earnings at 8%	809,538	
Expected Market Value as of December 31, 2016		$10,517,728
Actual Market Value as of December 31, 2016		10,399,250
Investment Loss (Gain) for 2016		$118,478
Market Value as of December 31, 2016	$10,399,250	
Contributions	977,110	
Benefit Payments and Expenses	(1,350,300)	
Expected investment earnings at 7.75%	787,120	
Expected Market Value as of December 31, 2017		$10,813,180
Actual Market Value as of December 31, 2017		11,681,789
Investment Loss (Gain) for 2017		($868,609)

Investment Loss (Gain) for 2017   ($868,609)

Market Value as of December 31, 2017	$11,681,789	
Contributions	1,182,659	
Benefit Payments and Expenses	(1,301,219)	
Expected investment earnings at 7.75%	896,543	
Expected Market Value as of December 31, 2018		$12,459,772
Actual Market Value as of December 31, 2018		10,902,959

Investment Loss (Gain) for 2018 $1,556,813

Actuarial asset method: 5 year phase-in of gains or losses relative to assumed earnings

Year	(Gains) and Losses	Percent Recognized	Percent Deferred	Deferred Amount
2014	260,215	100%	0%	$0
2015	981,347	80%	20%	$196,269
2016	128,478	60%	40%	$51,391
2017	(868,609)	40%	60%	($521,166)
2018	1,556,813	20%	80%	$1,245,450
Total	$2,058,243			$971,945

Marker Value of Assets as of January 1, 2019	$10,902,959
Actuarial Value of Assets as of January 1, 2019 before receivable	$11,874,904
Refund Payable	0
Actuarial Value of Assets as of January 1, 2019 with receivable	**$11,874,904**
Ratio of Actuarial Value to Market Value	108.91%

Plan Funding Requirements

The exhibit in this section develops the contribution rate needed to meet the funding policy adopted for the plan. Under the funding policy combined member and city contributions are to be sufficient to meet the cost of current service (the *normal cost*) and to amortize any remaining unfunded actuarial liability over a period of 40 years or less (preferably 15 to 25 years). Amortization is calculated as a percentage of payroll rather than a level dollar basis. Total payroll is assumed to increase at 4.5% per annum in determining the amortization amount.

Applying this funding standard involves actuarial assumptions and the selection of an actuarial cost method. Five actuarial cost methods are in common use in the United States; the method selected for the Big Spring Firemen's Relief and Retirement Fund Retirement System is the *entry age normal cost method*. See the Actuarial Method and Assumptions section of this report for a description of this cost method. The purpose of a cost method is to assign the long term cost of a retirement program to specific periods of time.

Actuarial Value of Assets

Effective with the 1-1-2003 valuation the actuarial value of assets was developed using 5-year smoothing. Under this method investment gains and losses relative to the actuarial rate of return (8%) are spread uniformly over 5 years. Actuarial assets relative to the actuarial assumed rate were initialized by separately amortizing the gains or losses for each of the prior 5 years. See Exhibit 1C of the prior section.

Required Contributions

Exhibit 2 shows the development of the unfunded actuarial liability and amortization period for the years beginning with 2000, using the actuarial assumptions in effect for such valuations. The actuarial valuation as of January 1, 2013 reflects the increase in member contribution rate from 12% to 13% of pay, and inclusion of overtime pay within limits (2011 amendment). The January 1, 2015 actuarial valuation reflects the increase in the City contribution from 12% of pay to 13% of pay. The 2017 actuarial valuation (after agreed upon plan changes) reflects the increase in City contributions to 15% of pay and certain other changes. There were no changes plan provisions from the prior (2017) valuation.

Actuarial assumptions were changed to adopt the recently published mortality table for public safety employees as recommended by Actuarial Standards of Practice No. 35. The mortality for this table is projected for mortality improvement using the MP-2018 projection. See Exhibit 2A.

The current contribution rate of 13% of pay from the members and 15% of pay from the City is sufficient to meet the accruing normal cost of the plan and to amortize the unfunded actuarial liability by level percentage of pay contributions over a period of **38.33** years.

Recommendations

The most recent (6/30/2017) actuarial funding standards published by the State of Texas Pension Review Board states:

> *"An actuarially funded defined benefit public retirement system is considered actuarially*

*sound if an actuary determines that it has sufficient money to pay the ongoing normal cost
and amortize the unfunded liability over a period of no more than 30 years, preferably 15
to 25 years… Benefit increases should not be adopted if all plan changes being considered
cause a material increase in the amortization period and if the resulting amortization
period exceeds 25 years."*

The remaining amortization period on the valuation date was **38.33** years. The measured
funding level of the plan is outside the recommended 30 year maximum limits of the PRB
guidelines. The increase in the amortization period from 2017 is primarily due to investment
results but also includes the impact of the change in the mortality assumption.

The Pension Review Board Guidelines includes four other recommended standards.

1. The funding of a pension plan should reflect all plan obligations and assets. (This
   actuarial valuation reflects all obligations and assets, with smoothing adjustment.)

2. The allocation of the normal cost portion of the contributions should be level or
   declining as a percent of payroll over all generation of taxpayers, and should be
   calculated under applicable actuarial standards. (The *entry age normal cost method*
   used in the valuation meets this standard.)

3. Funding of the unfunded actuarial accrued liability should be level or declining as a
   percent of payroll over the amortization period. (The adopted amortization method
   meets this standard.)

4. The choice of assumptions should be reasonable, and should comply with applicable
   actuarial standards. (We believe the actuarial assumptions to be within the range of
   reasonable assumptions and to be consistent with Actuarial Standards of Practice.)

Note that the actuarial assumptions do not include any inherent margins. Pay increases,
turnover, and retirement rate assumptions are based on Texas firefighter experience. Mortality is
a best estimate with projected future mortality improvement. The other assumptions are
investment return and inflation

Also recognizing the deferred investment losses that are included in the actuarial value of assets
(smoothed assets), ***we recommend no changes in plan design that increase the long term cost
of the Plan until the funded level of the plan improves. The current provisions of the plan
and PRB recommendations also impose a limit on plan improvements.***

Note that adding future hires to the plan will be helpful because the combined contribution for
them is greater than the normal cost and thus can be used to pay interest and principal on the
unfunded actuarial liability**.**

Key Funding Terms

Normal Cost Contribution   The *entry age normal cost method* is used to develop the normal cost contribution for the plan. Under this cost method the normal cost is calculated as the level percentage of pay sufficient to fund all benefits if contributed from hire to termination or retirement.

Unfunded Actuarial Liability   The unfunded actuarial liability is the excess of the total accrued liability over the actuarial value of assets. The total accrued liability is an amount equal to the theoretical accumulation of normal costs from the earliest plan entry date until the valuation date for all participants in the plan.

<div align="right">Exhibit 2A</div>

Impact of Assumption Change on Contribution Requirements

Pro Forma for 2019 Plan Year

Total Contribution Rate	*28%*	*28%*		*28%*	
Interest Rate/ Pay Increases	*7.75%/4.5%*	*7.75%/4.5%*	*Percent*	*7.75%/4.5%*	*Percent*
Mortality:	**RP2000p**	**Pub2010PS + AA**	**Change**	**Pub2010PS + MP-2018**	**Change**
Actuarial liability (entry age normal method)					
Retired, survivors and deferred vested	$ 12,333,412	$ 12,580,187	2.0%	$ 12,596,845	0.1%
Active employees	9,530,468	9,798,328	2.8%	9,717,607	-0.8%
Total	$ 21,863,880	$ 22,378,515		$ 22,314,452	
Assets	11,874,904	11,874,904		11,874,904	0.0%
Unfunded Actuarial Liability	$ 9,988,976	$ 10,503,611	5.2%	$ 10,439,548	-0.6%
Annual amount to amortize the unfunded actuarial liability over 30 years from 1-1-92	$ 2,122,001	$ 2,231,328	5.2%	$ 2,217,718	-0.6%
Annual normal cost	686,018	701,408	2.2%	696,787	-0.7%
Administrative expenses	50,000	50,000		50,000	
One half year's interest	106,780	111,523		110,830	
Total annual contribution	$ 2,964,800	$ 3,094,258	4.4%	$ 3,075,335	-0.6%
Valuation payroll as of January 1	$ 4,259,859	$ 4,259,859		$ 4,259,859	0.0%
Amortization years for current contributior	**33.88**	**39.55**	5.67	**38.33**	(1.22)
Required contribution rate for 30 year Rolling amortization from valuation date	$ 1,223,794	$ 1,264,542	3.3%	$ 1,256,795	-0.6%
Percent of payroll	28.73%	29.69%		29.50%	

As a measure of the long term cost of the plan we also present the entry age normal cost as a % of pay

16.10%	16.47%	16.36%

Development of Plan Contribution Requirements

Plan Year	*2006*	*2008*	*2010*	*2012*	*2013*	*2015*	*2017*	*2019*
Plan Change:		*Hi-5 Pay*	*Hi-5 Pay*	*Hi-5 Pay*	*Hi-5 Pay*	*Hi-5 Pay*	*City: 15%*	
Assets:	*Smoothed*	*Smoothed*	*Smoothed*	*Smoothed*	*Smoothed*	*Smoothed*	*Smoothed*	*Smoothed*
Mortality:	*UP94p2000*	*RP2000p*	*RP2000p*	*RP2000p*	*RP2000p*	*RP2000p*	*RP2000p*	*Pub2010PS*
Actuarial liability (entry age normal method)								
Retired, survivors and deferred vested	$ 5,269,225	$ 9,031,611	$11,133,227	$13,582,614	$13,008,308	$13,700,489	$12,970,022	$12,596,845
Active employees	6,337,421	5,408,880	4,935,371	4,565,758	4,425,604	6,295,944	7,534,488	9,717,607
Total	$11,606,646	$14,440,491	$16,068,598	$18,148,372	$17,433,912	$19,996,433	$20,504,510	$22,314,452
Assets	8,029,457	9,837,578	10,699,811	11,133,176	9,889,540	10,962,120	11,033,641	11,874,904
Unfunded Actuarial Liability	$ 3,577,189	$ 4,602,913	$ 5,368,787	$ 7,015,196	$ 7,544,372	$ 9,034,313	$ 9,470,869	$10,439,548
Annual amount to amortize the unfunded actuarial liability over 30 years from 1-1-92	$ 273,857	$ 352,383	$ 519,916	$ 793,732	$ 853,606	$ 1,243,717	$ 2,021,596	$ 2,217,718
Annual normal cost	315,207	350,627	404,266	393,571	354,312	453,334	545,439	696,787
Administrative expenses	10,000	40,000	40,000	50,000	50,000	50,000	50,000	50,000
One half year's interest	17,679	27,579	36,256	46,579	47,387	66,576	97,617	110,830
Total annual cost	$ 622,174	$ 770,589	$ 1,000,437	$ 1,283,882	$ 1,305,305	$ 1,813,627	$ 2,714,652	$ 3,075,335
Valuation payroll as of January 1	$ 2,219,825	$ 2,760,912	$ 3,312,629	$ 3,356,918	$ 3,173,050	$ 3,634,001	$ 3,766,262	$ 4,259,859
Required total contribution for 30 year fixed period from 1-1-92 as a percent of payroll	28.03%	27.91%	30.20%	38.25%	41.14%	49.91%	72.08%	72.19%
Amortization years for current contribution level	32.26	25.66	22.06	27.00	30.85	28.65	27.56	**38.33**
Required contribution rate for 30 year Rolling amortization from valuation date	$ 518,581	$ 637,292	$ 731,789	$ 813,985	$ 799,962	$ 934,058	$ 1,033,358	$ 1,256,795
Percent of payroll	23.36%	23.08%	22.09%	24.25%	25.21%	25.70%	27.44%	29.50%

GASB-25 Disclosure Information

GASB-25 Disclosures

GASB-25 requires disclosure of the plan's funding progress on an actuarial basis and a comparison of actual employer contributions with those required under the funding policy adopted for the plan. Additional disclosures are required under GASB 27 if the contributions to the plan are less than the annual required contributions under the funding policy of the plan.

GASB 25 and 27 were superseded by GASB 67 effective for the 2014 plan year. A separate actuarial report is prepared for the GASB 67 and 68 disclosure requirements. Certain GASB 25 disclosures are continued in this report to maintain a plan financial history.

A key measurement is the Actuarial Accrued Liability (AAL). One of several possible actuarial cost methods may be selected for determining the Actuarial Accrued Liability. In the case of the Big Spring Firemen's Relief and Retirement Fund Employees' Retirement System, the actuarial cost method is the same as used for determining the contribution requirements of the plan, namely the entry age normal cost method.

Exhibit 3 presents the schedule of funding progress for the plan.

Actual and required employer contributions to the plan are considered to be equal or sufficiently close under the funding policy adopted for the plan (30 year level percentage of pay amortization or less) so the provisions of GASB 27 are met without additional expense accrual requirements. The investment performance and demographic experience of the plan should be closely monitored, preferably by annual actuarial valuations of the plan.

Exhibit 4 summarizes the actuarial method and assumptions used in the last nine actuarial valuations of the plan.

Exhibit 3

SCHEDULE OF FUNDING PROGRESS

Actuarial Valuation Date	Actuarial Value of Assets	Actuarial Accrued Liability (AAL)	Unfunded AAL (UAAL)	Funded Ratio	Covered Payroll	UAAL as a Percentage of Covered Payroll
1/1/1994	2,753,155 *	4,374,799	1,621,644	62.9%	1,201,032	135.0%
1/1/1997	4,197,613 *	5,485,602	1,287,989	76.5%	1,710,009	75.3%
1/1/2000	6,355,356 *	7,814,776	1,459,420	81.3%	1,654,359	88.2%
1/1/2003	6,853,922 **	9,588,552	2,734,630	71.5%	2,086,466	131.1%
1/1/2006	8,029,825 **	11,606,646	3,576,821	69.2%	2,219,825	161.1%
1/1/2008	9,837,578 **	14,585,360	4,747,782	67.4%	2,760,912	172.0%
1/1/2010	10,699,811 **	16,068,598	5,368,787	66.6%	3,312,629	162.1%
1/1/2012	11,133,176 **	18,148,372	7,015,196	61.3%	3,356,918	209.0%
1/1/2013	9,889,540 **	17,433,912	7,544,372	56.7%	3,173,050	237.8%
1/1/2015	10,962,120 **	19,996,433	9,034,313	54.8%	3,634,001	248.6%
1/1/2017	11,033,641 **	20,504,510	9,470,869	53.8%	3,766,262	251.5%
1/1/2019	11,874,904 **	22,314,452	10,439,548	53.2%	4,259,859	245.1%

* Market value

** 5-year actuarial smoothed value

Exhibit 4
SUMMARY OF ACTUARIAL METHODS AND ASSUMPTIONS

Valuation date	1/1/2006	1/1/2008	1/1/2010	1/1/2012 to 1/1/2015	1/1/2017	1/1/2019
Actuarial cost method	Entry age	Entry age	Entry age	Entry age	Entry age	Entry age
Amortization method	Level percent of payroll	Level percent of payroll	Level percent of payroll	Level percent of payroll	Level percent of payroll	Level percent of payroll
Remaining amortization period	30 years	30 years	30 years	30 years	30 years	30 years
Asset valuation method	5 year actuarial asset smoothing	5 year actuarial asset smoothing	5 year actuarial asset smoothing	5 year actuarial asset smoothing	5 year actuarial asset	5 year actuarial asset
Actuarial assumptions						
Interest rate	8%	8%	8%	8%	7.75%	7.75%
Pay increases	5%*	5%*	5%*	5%*	4.5%*	4.5%*
Mortality	UP1994p2000	RP 2000 fully projected	RP 2000 fully projected	RP 2000 fully projected	RP 2000 fully projected	Pub2010 Public Safety MP-2018 projection
Retirement rates	Age 52 with 20 years	Age 52 with 20 years	Age 52 with 20 years	Age 52 with 20 years	Age 52 with 20 years	Age 52 with 20 years
Turnover	Graded by age and service	Graded by age and service	Graded by age and service	Graded by age and service	Graded by age and service	Graded by age and service

* With additional increases for the first 10 years of service

Note that the Pension Review Board Guidelines recommend a maximum amortization period of 40 years with 15 to 25 years being preferable. The plan has historically used a 30 year standard.

Participant Census Data

This section summarizes the census data used in the actuarial valuation and provides plan membership statistics. The exhibits in this section present the following information:

Summary of active participants by age and service groupings.
Includes counts and average pay by age

Retired participants by age with average pension and average age

We maintain a database of participant information for the Big Spring Firemen's Relief and Retirement Fund which is available to you for ad hoc queries and special reports.

SUMMARY OF ACTIVE EMPLOYEES FOR LAST 10 VALUATIONS

Dec 31 of	Number	Ave Age	Ave Service	Ave Salary	Percentage increase
1989	46	36.1	9.1	21,704	
1991	46	37.8	11.0	22,037	0.8%
1993	51	37.8	11.1	23,550	3.4%
1996	66	35.5	9.2	25,909	3.2%
1999	56	36.8	11.0	29,542	4.5%
2002	61	36.0	10.5	34,204	3.7%
2005	57	37.3	10.6	38,944	4.4%
2007	54	34.4	8.1	43,382	5.5%
2009	55	33.3	7.3	47,951	10.5%
2011	52	33.1	6.8	48,893	2.0%
2013	52	32.6	6.4	48,340	(1.1)%
2015	59	32.5	6.5	55,445	14.7%
2017	63	33.0	6.8	59,254	6.9%
2019	64	34.9	8.3	65,786	11.0%

Includes one DROP participant as of January 1, 2019

AGE AND SERVICE OF ACTIVE PARTICIPANTS

1/1/2019

Age Group	Years of Service												
	0 - 4		5 - 9		10 - 14		15 - 19		20 - 24		25 - 29		All Service	
	Count	Ave Pay	Count	Ave Pay	Count	Ave Pay	Count	Ave Pay	Count	Ave Pay	Count	Ave Pay	Count	Ave Pay
20 - 24	8	47,036	0		0		0		0				8	47,036
25 - 29	8	53,104	7	63,854	0		0		0				15	58,120
30 - 34	9	52,310	5	61,232	2	107,340	0		0				16	61,977
35 - 39	3	49,354	3	64,327	0		1	96,804	0				7	62,549
40 - 44	0		1	49,668	1	67,821	5	84,915	2	103,366			9	83,199
45 - 49	0		0		2	80,429	1	115,449	3	102,100			6	97,101
50 - 54	0		0		0		1	83,111	1	69,978			2	76,544
55 - 59	0		0		0		0		0				0	
60 - 64	0		0		0		0		0				0	
65 - 69	0		0		0		1	48,242	0				1	48,242
Totals	28		16		5		9		6		0		64	

Includes one particpant who elected DROP in October 2018

Age is in completed years (age last birthday) on the census date.

Service is completed years of credited service on the census date.

Pay is the considered compensation for the preceding plan year.

SUMMARY OF NONACTIVE PARTICIPANTS

January 1, 2019

Age Group	Males Count	Males Benefit	Males Weighted Ave Age	Females Count	Females Benefit	Females Weighted Ave Age	Total Count	Total Benefit	Total Weighted Ave Age
Retired Participants in Payment Status									
50 - 54	1	43,999	54.45				1	43,999	54.45
55 - 59	9	325,533	58.28				9	325,533	58.28
60 - 64	10	338,375	63.33				10	338,375	63.33
65 - 69	7	183,964	67.37				7	183,964	67.37
70 - 74	4	82,470	71.05				4	82,470	71.05
75 - 79	1	19,689	75.23				1	19,689	75.23
80 - 84	1	14,863	80.46				1	14,863	80.46
85 - 89									
90 - 110									
110									
Totals	**33**	**1,008,893**	**63.17**	**0**	**0**		**33**	**1,008,893**	**63.17**
Ave amount		**30,572.52**			**0.00**			**30,572.52**	
Survivors in Payment Status									
55 - 59									
60 - 64				2	23,603	63.87	2	23,603	63.87
65 - 69				2	28,691	67.73	2	28,691	67.73
70 - 74									
75 - 79				4	52,238	75.70	4	52,238	75.70
80 - 84				1	9,608	80.29	1	9,608	80.29
85 - 89									
90 - 110									
Totals	**0**	**0**		**9**	**114,140**	**71.64**	**9**	**114,140**	**71.64**
Ave amount		**0.00**			**12,682.21**			**12,682.21**	
Disabled Participants									
50 - 54									
55 - 59									
60 - 64									
65 - 69	2	14,070	68.22				2	14,070	68.22
70 - 74									
75 - 79	1	14,820	78.29				1	14,820	78.29
80 - 84									
85 - 89									
90 - 110									
Totals	**3**	**28,890**	**73.39**	**0**	**0**		**3**	**28,890**	**73.39**
Ave amount		**9,630.00**			**0.00**			**9,630.00**	
Deferred Vested Former Employees									
30 - 39									
40 - 49	1	10,500	47.02				1	10,500	47.02
50 - 54									
Totals	**1**	**10,500**	**47.02**	**0**	**0**		**1**	**10,500**	**47.02**
Ave amount		**10,500.48**			**0.00**			**10,500.48**	
Grand Totals	**37**	**1,048,284**	**63.29**	**9**	**114,140**	**71.64**	**46**	**1,162,423**	**64.11**
Ave amount		**28,331.99**			**12,682.21**			**25,270.07**	

Actuarial Method and Assumptions

This report assumes the plan will exist as an ongoing entity. All numbers presented are based on this ongoing plan concept with costs and liabilities determined under the projected unit credit actuarial cost method.

Entry Age Normal Cost Method

Under the entry age normal cost method, the normal cost is computed as the level percentage of pay amount which, if paid from the time each employee became a participant until his assumed retirement, would accumulate with interest at the assumed valuation rate to a fund sufficient to pay his retirement benefits

Experience gains (decreases in cost due to favorable experience), or experience losses (increases in cost due to adverse experience), attributable to deviations between the assumed and actual experience of the Plan, are reflected as increases or decreases in the unfunded actuarial liability and, through the amortization amount, the contribution required for the plan.

Valuation of Liabilities

All active participants included in the valuation are assumed to earn one full year of credited service for each year of future participation. In addition, members are assumed to have 6 months of additional service credit at retirement from accrued sick leave, vacation, and compensatory time.

Costs for ancillary benefits provided by the System have been determined in the same manner and on the same basis as costs for normal retirement benefits.

The valuation payroll is equal to annualized 2016 pay, including the pay of DROP employees (none as of January 1, 2019).

Valuation of Assets

The actuarial value of assets is equal to 5 year smoothing of investment experience gains or losses relative to the long term assumed rate of return (7.75%). The gain or loss for any particular year relative to the assumed long term return is recognized evenly over 5 years.

Summary of Actuarial Assumptions

Interest Rate	7.75% per annum
Pay Increases	4.5% per year plus additional percentages for the first 10 years of service
Retirement Rates	Upon the attainment of age 52 or, if later, 20 years of service
Mortality	RP 2000 fully projected for cohort mortality improvement (appropriate versions of this table for employees, annuitants and disabled individuals)
Disability	Rates by age as shown below
Turnover	Rates by age and years of service as shown below
Percent Married	90%
Administration Expense	$50,000 per annum

Additional turnover rates for first five years of service (added to attained age rates)

Year	Rate/thousand
1	50
2	40
3	30
4	20
5	10

Additional pay increases for the first ten years of service (added to basic 5% assumed pay increases)

Year	Additional Percentage	Year	Additional Percentage
1	5.0%	6	2.5%
2	4.5	7	2.0
3	4.0	8	1.5
4	3.5	9	1.0
5	3.0	10	0.5

SUMMARY OF ACTUARIAL ASSUMPTIONS

Interest Rates

Purpose	*Rate*
before retirement	7.75%
after retirement	7.75%

Mortality Tables

Not in pay status	Pub2010PS employee
Healthy annuitants	Pub2010PS annuitant
Disabled annuitants	Pub2010PS disabled

Mortality rates are projected by scale MP-2018

Pay Increase Assumption

Annual rates of pay increase as shown

Turnover

Age-related rates as shown

Retirement Age

Rates of retirement as shown
Rates are only applied if the employee is eligible to retire.

Form of payment

mandatory cashouts	Lump sum
other benefits	Normal form

Other Assumptions

Percent married	90%
Husband/wife age differ	3

Increase in Social Security
  Wage Base   3.00%

		Rates per Thousand			
Age	Mortality		Turnover	Disability	Retirement
	Male	Female			
20	0.410	0.130	173.86	0.60	0
21	0.410	0.130	167.66	0.66	0
22	0.400	0.120	161.90	0.71	0
23	0.390	0.120	156.57	0.76	0
24	0.380	0.110	151.71	0.81	0
25	0.370	0.120	146.99	0.85	0
26	0.380	0.130	142.51	0.90	0
27	0.390	0.140	137.97	0.95	0
28	0.400	0.160	133.51	1.00	0
29	0.410	0.170	129.19	1.05	0
30	0.410	0.190	125.01	1.10	0
31	0.420	0.210	121.00	1.16	0
32	0.430	0.220	117.16	1.22	0
33	0.440	0.250	103.48	1.30	0
34	0.450	0.270	89.95	1.38	0
35	0.470	0.300	76.56	1.47	0
36	0.490	0.320	63.31	1.58	0
37	0.500	0.360	50.18	1.71	0
38	0.530	0.390	47.15	1.85	0
39	0.560	0.430	44.22	2.01	0
40	0.590	0.470	41.38	2.20	0
41	0.620	0.510	38.58	2.42	0
42	0.670	0.550	35.81	2.66	0
43	0.710	0.600	33.05	2.93	0
44	0.760	0.660	30.30	3.24	0
45	0.820	0.720	27.54	3.60	0
46	0.880	0.780	24.79	3.99	0
47	0.950	0.840	22.01	4.43	0
48	1.020	0.910	19.22	4.92	0
49	1.110	0.990	16.39	5.46	0
50	1.200	1.070	13.53	6.06	0
51	1.290	1.150	10.61	6.72	0
52	1.400	1.240	7.64	7.45	1000
53	1.510	1.340	4.59	8.25	1000
54	1.620	1.450	1.67	9.13	1000
55	1.750	1.570	0.00	10.09	1000

Risk Assessment

In measuring pension obligations and determining plan contributions, assumptions about future events need be made. Actuarial assumptions are set according to best estimates of future events. These assumptions are reviewed periodically for continued relevance, and are adjusted where appropriate to reflect changing circumstances or additional insights.

Because the future is unknown, there is risk that future measurements will deviate from expectations if actual experience differs from that assumed. Specific risks that could affect the financial condition of the plan in the future include:

Investment Risk
Pension plans have a long investment horizon, and the assumed return is intended to reflect a long-term view. However, if the actual long-term return turns out to be less (or more) than assumed, plan obligations will be higher (or lower) than calculated, and plan costs will tend to increase (or decrease) over time. For example, if the long-term rate were only 6.75% (rather than the 7.75% assumed), the calculated liability would be 13.0% higher.

Because assets are invested for the long term, the return on plan assets will vary from year to year. The expectation is that lower-than-expected returns in down years will be offset by higher-than-expected returns in good years, and the long-term funding of the plan will not be adversely affected. However, this volatility in return will cause contribution requirements to vary from year to year.

The ratio of plan assets to covered payroll is a good measure of how sensitive the contribution rate is to fluctuating investment return. For most governmental plans, this ratio is between 1.50 and 4.50. The ratio for this plan as of 1/1/2019 is: 2.55

As a rule of thumb, if the investment return in a given single year is 1% lower (or higher) than the assumed 7.75% rate, the contribution rate will increase (or decrease) by 0.1% of pay, times the plan's asset-to-payroll ratio – so, for this plan, 0.26% of payroll.

Through the development of the actuarial value of assets, this rate change is phased in over 5 years. To the extent that investment gains and losses offset each other over a 5-year period, the contribution rate volatility may be dampened.

Demographic Risk
Demographic assumptions are also intended to reflect the long-term characteristics of the plan population, and they also are subject to year-by-year volatility. While there is no simple rule of thumb regarding demographic experience, there are general things to keep in mind:

- Demographic effects on small plan populations cause greater volatility than on large plan populations. One more employee than expected terminating employment will have a larger impact on a workforce of 50 employees, than on a workforce of 500 employees.

- Favorable and unfavorable experience among different employees offset each other to some extent. However, infrequent events affecting the workforce as a whole (such as an across-the-board pay scale adjustment, or a large-scale layoff) will amplify the impact on plan funding.

- The amortization amount (or surplus credit) is calculated as a dollar amount based on cumulative past experience. A significant change in total covered payroll (which could result from a noticeable difference in the number of active participants on the valuation date) could cause this dollar amount to represent a substantial difference when expressed as a percentage of pay.

Contribution Risk

Governmental pension plans are typically funded either on an *actuarial required contribution* (ARC) basis or a *specified contribution* basis with amortization period monitoring. The Texas FRRF plans have historically used the second approach.

Actuarial Required Contribution Funding

The municipality is the plan sponsor and has actuarial valuations to determine the percentage of pay needed to meet the adopted funding standard. The employer contribution rates may change up or down each year. The contribution risk in this case is that the plan sponsor chooses not to make the annual actuarial required contribution for some period. This can degrade the funding of the plan and in the worst case lead to unmet plan liabilities. Contributing less than the recommended amount will of necessity require larger contributions in the future.

In developing a contribution policy that balances out the various objectives of predictability, minimal volatility, and intergenerational equity, it is assumed that the municipality consistently makes the recommended contributions. Contributing less than the recommended amount will of necessity require larger contributions in the future.

Consistently underfunding the plan can cause the contribution rate to spiral out of control, seriously jeopardizing the plan's funded status and the benefit security of its employees and retirees.

Specified Contribution Funding

Under this approach as used in Texas FRRF plans the member contributions and City contribution are both specified as plan provisions as are the benefit payable to participants. The contribution rates and benefits are initially set to an actuarial balance with a targeted amortization period for the unfunded actuarial liability.

As plan experience unfolds, both demographic and investment returns, the amortization period may increase or decrease from the initial target. It is the responsibility of the City and the members to adjust benefit levels for current and/or future participants or to adjust the contribution rates if the experience of the plan is less favorable than the actuarial assumptions. The Pension Review Board has specific recommendation for Texas public retirement plans about the range of recommended amortization periods and changes that might be needed in the plan provisions or funding.

Certification

This report presents the actuarial position of the Big Spring Firemen's Relief and Retirement Fund as of January 1, 2019, in accordance with generally accepted actuarial principles applied on a basis consistent with that of the preceding valuation.

Plan provisions were changed after the 2017 valuation as described in this report. The figures presented for 2017 are the amounts after allowing for plan and actuarial assumption changes approved for 2018. Plan provisions have not changed since these 2018 changes.

Actuarial assumptions were changed for this valuation by updating the mortality assumption to the recently published mortality table for public safety employees developed by the Society of Actuaries. The results of this change are shown in this report.

The valuation results in this report are based on participant and financial data provided by the Board of Trustees of the plan.

In our opinion, each assumption used in combination to calculate liabilities and costs represents our best estimate of anticipated experience under the plan and is reasonably related to the plan experience and to reasonable expectations. However, the most appropriate assumption for different purposes may vary and use of the values in this report for purposes other than those stated should be avoid or discussed with the actuary.
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DEAN ACTUARIES, LLC

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_____12/18/2019_____   _____
Date   Charles E. Dean, FSA, FCA
                                           Enrolled Actuary 17-01249

_____12/18/2019_____   _____
Date   Sean M. Sullivan, FSA
                                           Enrolled Actuary 17-03649