



SUMMARY ACTUARIAL VALUATION REPORT

for the

City of Pittsburgh Pension Funds

as of

January 1, 2017

Report Date: April 30, 2018

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Section One: Introduction

This report presents a summary of the results of the January 1, 2017 actuarial valuation reports (AVRs) of the City of Pittsburgh's Policemen's, Firemen's and Municipal Pension Funds. It is intended to serve as a quick reference and overview of the three valuations. Consult the individual reports for additional detail.

The City Controller obtained third-party advice from which he has determined that the dedicated stream of revenue created by Ordinances 42 and 44 of 2010 can be recognized as a pension plan asset for purposes of the required actuarial reports under Act 205. The Board of Trustees of the Comprehensive Municipal Pension Trust Fund has unanimously directed us to combine the assets listed in the CAFR with the value of the revenue stream as determined by an independent accounting firm, GTM Lender Advisors, LLC. The value so provided is consistent with Paragraph 3.5 (Assets that are Difficult to Value) of ASOP 44, Selection and Use of Asset Valuation Methods for Pension Valuations. The Public Employee Retirement Commission accepted the revised actuarial valuation reports as of January 1, 2011, and subsequent valuation reports which included the present value of the revenue stream as a pension plan asset for Act 205 actuarial valuation purposes. The inclusion of the present value of this stream of future parking revenues does not imply that it necessarily qualifies as a pension plan asset under GAS accounting or for any other purpose.

These valuations were prepared to satisfy the funding and disclosure requirements of Act 205 of 1984, and should be used for no other purpose. Each year the City is required to budget its minimum contribution for the following year. Under Act 205, this budgeted amount is referred to as the Minimum Municipal Obligation (MMO). The calculation of the MMO depends upon the actuarial cost components that are determined by the AVRs. The funded status measures in the AVRs are not intended to be appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to factors such 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.

One of the cost components of the Minimum Municipal Obligation is an amortization payment calculated according to specified rules of Act 205. The minimum amortization under Act 205 reflects the utilization of provisions of Act 82 of 1998 for which the City qualified. Under those provisions, the Unfunded Actuarial Accrued Liability as of January 1, 1998 is being amortized over 40 years calculated pursuant to special procedures described beginning on page 7. Bases for subsequent years are established according to the normal procedures of Act 205 of 1984 and amortized over various periods according to the source of the change in unfunded liability such as experience gains or losses, benefit changes, and assumption changes. These periods are not limited by average future service because the City qualifies for Distress Level II according to the requirements under Act 205 of 1984.

Because the Act 82 amortization methodology does not result in an actuarially appropriate funding level, we also present an actuarially recommended amortization payment based on a 30-year “fresh start” amortization payment commencing as of January 1, 2011 and additional amortization bases added thereafter according to the normal procedures of Act 205 of 1984.

The use of pension bond proceeds to reduce the Unfunded Actuarial Accrued Liability has split the funding of the pension plan into debt service and actuarial costs. Debt service payments repay the money borrowed and subsequently deposited into the plan. Information concerning the annual debt service is contained in Section Six. Section Three of this report summarizes the development of the actuarial cost components. The City’s MMO is determined by summing these components and deducting estimated employee contributions. The three components of the plan’s annual actuarial requirement are normal cost, administrative expenses and an amortization amount.

Normal cost is the portion of cost that is allocated to the current year, if the cost of each employee’s prospective pension is allocated over his or her expected total employment period.

Administrative expenses are based upon current expense amounts paid from the plans.

The *amortization amount* is contributed when current asset levels are less, to date, than the target specified by Act 205 for funding. In Act 205 and actuarial language, this target is termed Actuarial Accrued Liability. As the term *accrued* suggests, this amount represents the portion of pension benefit liabilities allocated to service performed before the valuation date.

The insufficiency of current assets compared to the Actuarial Accrued Liability is referred to as the *Unfunded Actuarial Accrued Liability*. This insufficiency developed over the years for a variety of reasons. Two significant reasons are benefit improvements made after retirement, and benefit improvements made before retirement, which are related to prior service. Prior funding would not

have anticipated these improvements. Additionally, prior contributions may have been at less than actuarially sound levels.

Since 1985, the annual contribution requirements for the pension plans have been based upon actuarial standards set forth in Act 205 of 1984.

2017 Results

The actuarial cost components as of January 1, 2017 are as follows:

	Police	Fire	Municipal	Combined
Normal Cost as a % of Payroll	10.577%	15.705%	7.611%	10.673%
Admin. Expense as a % of Payroll	1.000%	1.100%	0.700%	0.906%
Gross Normal Cost %	11.577%	16.805%	8.311%	11.579%
Act 205 Minimum Amortization Payment	\$10,724,872	\$15,066,339	\$10,402,353	\$36,193,564

Beginning with the 2009 valuations, the reports also show an alternate amortization payment basis for funding purposes. The 2017 reports show the development of these amounts, based on amortizing the 2011 unfunded actuarial accrued liability over a “fresh-start” 30-year period and adding subsequent gain/loss bases. This amount is higher than the Act 205 minimum. These actuarially recommended amortization payments as of January 1, 2017 are as follows:

	Police	Fire	Municipal	Combined
Actuarially Recommended Amortization Payment	\$20,562,701	\$19,192,152	\$13,800,362	\$53,555,215

Pension bonds were issued and deposited into the Municipal Plan in December 1996 and all three plans in March 1998. The annual debt service on these bonds is approximately \$32.21 million for 2017. Over time, the debt service and amortization schedules will allow the City to eliminate the Unfunded Actuarial Accrued Liability with payments that increase less and have a lower present value than the increasing amortization schedule included in prior actuarial valuations.

Changes Since the 2015 Actuarial Valuation

Actuarial costs for pension plans may change significantly from one valuation date to the next. These cost changes may be due to plan experience, changes in plan provisions, or changes in actuarial assumptions.

Normal costs, which are attributable to the current year's service, will usually change more moderately than the amortization amount. Unless plan provisions or assumptions change, normal costs as a percentage of payroll usually remain fairly stable over time. The changes that do occur are influenced by changes in the demographics of active plan participants.

The amortization amounts typically change by a greater amount from year to year. The total amortization payment is affected by changes in the Actuarial Accrued Liability due to experience gains and losses, contribution gains and losses, modifications in actuarial assumptions and modifications in plan provisions.

Changes in Plan Provisions

There have been no benefit changes since January 1, 2003 affecting current participants in either the Policemen's or Firemen's Plans, and no benefit changes since January 1, 2006 affected current participants in the Municipal Plan.

Changes in Actuarial Assumptions

Several assumption changes were made for the January 1, 2017 AVRs, based on the January 1, 2017 experience study. Act 205 requires that the City have an experience study prepared every four years. The purpose of the experience study is to compare the plan's actual experience with the valuation assumptions. The comparison can indicate that actuarial assumptions should be changed. See the Experience Study and individual plans' AVRs for further explanation of the changes made. For 2017, new assumption change bases totaling \$58,685,088, with annual amortization payments of \$6,102,956, were established.

Experience Changes

The goal in selecting actuarial assumptions is to provide a reasonable estimate of actual experience over the long range. However, actual experience will always deviate somewhat from expected experience, especially over the short run. These experience gains or losses reduce or increase, respectively, actuarial contribution requirements for the future. Experience gains or losses are amortized over a 20-year period.

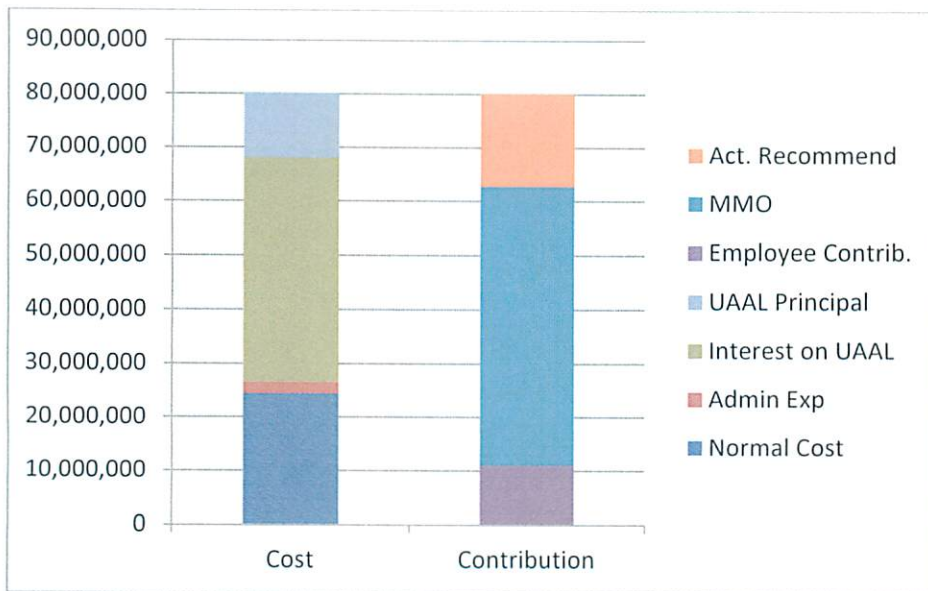
A plan's ability to pay benefits depends, in large part, on its earnings on accumulated funds. What does not come from those earnings must arise from future contributions. Thus, favorable or unfavorable investment experience between valuations will often have the largest impact on the gain or loss from experience compared to actuarial assumptions for the period. These gains or losses will then decrease or increase, respectively, future contribution requirements.

For 2017, new experience loss bases totaling \$478,002 were established under the minimum funding rules of Act 205 (Table 3); new experience loss bases totaling \$19,668,334 were established for the actuarially recommended contribution (Table 3b). The primary sources of the experience loss were investment losses (discussed below) and contributions that were less than required (based on the January 1, 2015 AVRs) when not taking into account Act 82 (under the actuarially required contribution) and losses generated by the Act 82 amortization calculation when taking that calculation into account. A contribution loss occurs due to the advance budgeting process of Act 205 when costs increase from valuation to valuation and recognition of that increase is delayed. The City contributed more than the MMOs in both 2015 and 2016.

Included in the overall experience losses was a combined loss of \$13,985,119 due to return on the actuarial value of assets (AVA) that was less than the previously assumed 7.5% annual rate. Under the Act 44 of 2009 smoothing method interest is credited on the AVA each year at a rate that is one percent less than the assumed interest rate of the plan. Please refer to the AVR for any of the plans for a description of the asset smoothing method and explanation of its deviation from Actuarial Standards of Practice.

A more complete discussion of the actuarial experience gain or loss for each plan is included in the Commentary and Actuarial Disclosures section of that plan's actuarial valuation report.

The following chart shows the annual cost components of the plan (normal cost, administrative expenses, interest on the unfunded actuarial accrued liability and principal on the unfunded actuarial accrued liability) compared to the annual contribution requirements. As you can see, contributing only the MMO does not cover the entire interest on the unfunded liability, causing the unfunded liability to grow over time even if all assumptions of the plan are realized.



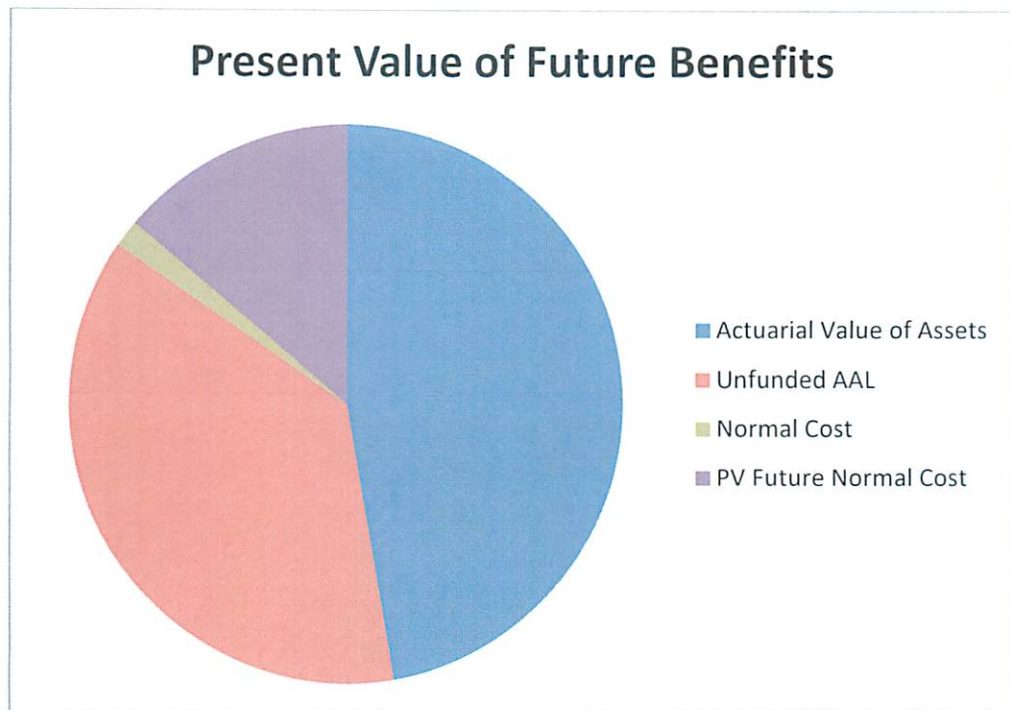
Funded Ratios

A measure of comparison between valuations is the plan’s funded ratio, the actuarial value of assets divided by the actuarial accrued liability. The funded ratios as of January 1, 2017 are as follows:

	Police	Fire	Municipal	Combined
Actuarial Value of Assets	\$261,080,152	\$241,394,024	\$224,014,919	\$726,489,095
Actuarial Accrued Liability	\$483,208,558	\$445,271,063	\$371,330,236	\$1,299,809,857
Percentage Funded	54.0%	54.2%	60.3%	55.9%

The combined funded ratio for the City’s three pension plans is currently 55.9%; as of January 1, 2015, the corresponding ratio was 57.0%, so the current valuations show a decrease of 1.1%. The funded ratio based on the market value of assets is 53.5%.

The following chart shows the present value of all future benefits expected to be paid from the plan for current participants. The area in blue represents the portion currently covered by the actuarial value of assets. The areas in blue and red combined represent the portion of benefits that are considered accrued under the actuarial cost method. The green portion represents the normal cost, or portion to be accrued in the current year. The purple section is the portion of benefits that current active participants are expected to accrue in the future. As you can see, these are very mature plans.



Act 82 of 1998

Act 82 of 1998 has a significant impact on the minimum funding requirements. We believe that the procedure for determining amortization amounts in accordance with Act 82 no longer produces an actuarially appropriate funding level. The adoption of a funding policy based on the alternative Actuarially Recommended Amortization Payment is highly recommended.

Act 82 allowed the City to change the amortization schedule for its Unfunded Actuarial Accrued Liability because during 1998, pension bond proceeds were deposited into the pension plans that changed the ratio of the Actuarial Value of Assets to the Actuarial Accrued Liability by more than 25 percent. Act 82 allowed the City to amortize each plan's January 1, 1998 Unfunded Actuarial Accrued Liability reduced by pension bond proceeds deposited during 1998, over a 40-year period using a special procedure that was mechanically complex but lowered the amortization payment from what it otherwise would have been. The annual amortization payment was calculated in several steps. An amortization payment was calculated that would eliminate the Unfunded Actuarial Accrued Liability net of 1998 bond proceeds over a 40-year period using 8.75 percent interest. Next, the future value of these payments at the end of the 40-year period was calculated using 8.75 percent interest. Finally, an amortization payment was calculated using 10 percent interest that would have the same future value at the end of the 40-year period as the previous calculation. The 10 percent amortization amount became the amortization payment starting in 1998.

There are several drawbacks to this approach in the long-term. Under the Act 82 amortization schedule, the outstanding balance of Unfunded Actuarial Accrued Liability for the affected 1998 base actually grows for several years, extending the funding of obligations beyond normal payment periods and doesn't start to decline until during the year 2024. Therefore, this amortization method does not maintain normal generational funding objectives.

Act 82 requires that each plan's valuation include a comparative interest rate tabulation. This annual tabulation compares the balance of the accumulated Act 82 amortization payments using the actual earnings of the fund during the year, with the balance assuming a 10 percent rate of return. If the fund earns more than 10 percent during the year, there will be an experience gain. If the fund earns less than 10 percent, there will be an experience loss. When this legislation was enacted in 1998, investment conditions were different from the current conditions. An average 10 percent rate of return on a significant block of assets no longer seems reasonable. This balance grows over time and the losses from this source will tend to grow significantly. In fact, because benefits are being paid out as contributions are coming in, the comparative interest rate balance, which isn't adjusted for benefit payments, eventually will become larger than the total market value of assets. In practice, this will likely lead to significant experience losses, an increasing pattern of amortization payments and a funded ratio which will still be well below 100% at the end of the 40-year period due to remaining balances on those losses.

By contrast, funding the plans on the basis of the Actuarially Recommended Amortization Payment is expected to result in a more level amortization schedule, that will result in higher contributions now but ultimately lower contributions, and will likely lead to a funded ratios much closer to 100% by the fixed target year.

Sensitivity Analysis

The actual costs of the plans will be determined by the experience of the plans over time. The present value of the projected liabilities shown in this (or any other) valuation of the plans is dependent upon the assumptions utilized. The assumed interest rate and assumed rates of retirement are two assumptions that have a significant impact on the expected costs of the plan. To highlight the effect of these assumptions on the calculated liabilities of the plan, we have included a sensitivity analysis on Table 6.

Section Two: Certification

Complete summaries of the data, actuarial assumptions and methods and plan provisions used for each valuation are set forth in the individual reports for each pension plan. This report is intended to be a quick reference or overview of the results of the individual reports. This report does not constitute a statement of actuarial opinion; the individual reports do. Please refer to the individual reports for the proper documentation, disclosure and certification of the results that are summarized herein.

In the actuary's opinion, the actuarial assumptions used in the valuations are reasonably related to the experience of the plans and to reasonable expectations, and they represent his best estimate of anticipated experience under the plans. To the best of our knowledge, the individual actuarial valuation reports for each plan are complete and accurate, based on the data outlined therein. We will be happy to answer any questions concerning this report and provide further information as needed.

MOCKENHAUPT BENEFITS GROUP

I, David H. Stimpson, am a member of the American Academy of Actuaries and I meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Prepared by:



David H. Stimpson, E.A., F.C.A., M.A.A.A.
Executive Vice President

Section Three: Development of Contribution Requirements

Table 1: Normal Cost

	<u>Police</u>	<u>Fire</u>	<u>Municipal</u>	<u>Combined</u>
Normal Cost				
Retirement Benefits	\$ 5,963,947	\$ 6,381,899	\$ 4,969,888	\$ 17,315,734
Disability Benefits	1,938,436	2,218,076	646,296	4,802,808
Preretirement Death Benefits	152,088	192,146	56,858	401,092
Postretirement Death Benefits	0	2,771	0	2,771
Refund of Contributions	386,790	109,618	627,152	1,123,560
Medicare Premiums	0	0	41,432	41,432
Vested Withdrawal Benefits	<u>120,977</u>	<u>28,639</u>	<u>579,680</u>	<u>729,296</u>
Total	\$ 8,562,238	\$ 8,933,149	\$ 6,921,306	\$ 24,416,693
Covered Payroll	\$ 80,950,212	\$ 56,881,585	\$ 90,932,504	\$ 228,764,301
(As reported on Form W-2)				
Normal Cost as % of Pay				
Normal Cost	10.577%	15.705%	7.611%	10.673%
Expenses	<u>1.000%</u>	<u>1.100%</u>	<u>0.700%</u>	<u>0.906%</u>
Gross Normal Cost	11.577%	16.805%	8.311%	11.579%

Table 2: Unfunded Actuarial Accrued Liability

	<u>Police</u>	<u>Fire</u>	<u>Municipal</u>	<u>Combined</u>
Actuarial Accrued Liability-Active				
<i>Actuarial Present Value (APV)</i>				
<i>of Future Benefits</i>				
Retirement Benefits	\$197,178,605	\$193,247,303	\$ 174,766,640	\$ 565,192,548
Disability Benefits	35,250,694	45,662,535	13,082,701	93,995,930
Preretirement Death Benefits	2,217,621	2,990,972	1,604,909	6,813,502
Postretirement Death Benefits	0	77,504	0	77,504
Refund of Contributions	2,576,476	1,103,975	2,630,029	6,310,480
Medicare Premiums	0	0	7,290,376	7,290,376
Vested Withdrawal Benefits	<u>2,119,575</u>	<u>557,245</u>	<u>6,888,234</u>	<u>9,565,054</u>
Total	\$239,342,971	\$243,639,534	\$ 206,262,889	\$ 689,245,394
<i>APV of Future Normal Costs</i>	\$(82,723,113)	\$(104,918,308)	\$(49,861,529)	\$(237,502,950)
Actuarial Accrued Liability (AAL)-Total				
Active	\$156,619,858	\$ 138,721,226	\$ 156,401,360	\$ 451,742,444
Deferred Inactive	14,922,240	0	9,193,032	24,115,272
In Payment-Retirement	199,701,534	217,092,509	159,367,103	576,161,146
In Payment-Disability	78,775,204	66,974,537	23,680,873	169,430,614
In Payment - Medicare Premium Benefits	0	0	16,118,012	16,118,012
In Payment-Survivors	<u>33,189,722</u>	<u>22,482,791</u>	<u>6,569,856</u>	<u>62,242,369</u>
Total AAL	\$483,208,558	\$445,271,063	\$371,330,236	\$1,299,809,857
Unfunded Actuarial Accrued Liability				
Total Actuarial Accrued Liability	\$ 483,208,558	\$ 445,271,063	\$ 371,330,236	\$1,299,809,857
Actuarial Value of Assets *	<u>(261,080,152)</u>	<u>(241,394,024)</u>	<u>(224,014,919)</u>	<u>(726,489,095)</u>
Unfunded Actuarial Accrued Liability (UAAL) **	\$ 222,128,406	\$ 203,877,039	\$ 147,315,317	\$ 573,320,762
Funded Ratio	54.0%	54.2%	60.3%	55.9%

* The Actuarial Value of Assets is determined using the tabular smoothing method permitted by Act 44 of 2009.

** The combined Unfunded Actuarial Accrued Liability based on the market value of assets is \$604,379,952. The combined funded ratio based on the market value of assets is 53.5%.

Table 3: Summary of Changes in Unfunded Actuarial Accrued Liability

	<u>Police</u>	<u>Fire</u>	<u>Municipal</u>	<u>Combined</u>
Expected Change in Unfunded Actuarial Accrued Liability				
Normal Cost Assumed	\$ 16,205,313	\$ 15,738,090	\$ 12,338,572	\$ 44,281,975
Admin. Expenses Assumed	1,664,438	1,341,099	1,194,577	4,200,114
Contributions Made	(47,751,792)	(48,388,656)	(35,823,819)	(131,964,267)
Interest Charged*	<u>(1,217,382)</u>	<u>8,181,684</u>	<u>5,684,963</u>	<u>12,649,266</u>
Total	\$ (31,099,423)	\$ (23,127,782)	\$ (16,605,707)	\$ (70,832,912)
Total Change in Unfunded Actuarial Accrued Liability				
Expected Change	\$ (31,099,423)	\$ (23,127,782)	\$ (16,605,707)	\$ (70,832,912)
Plan Experience	32,354,615	19,373,348	15,778,597	67,506,560
Benefit Modification-Actives	0	0	0	0
Benefit Modifications-Retired	0	0	0	0
Changes in Actuarial Assumptions	<u>21,067,579</u>	<u>25,058,741</u>	<u>12,558,768</u>	<u>58,685,088</u>
Total Changes	\$ 22,322,771	\$ 21,304,307	\$ 11,731,658	\$ 55,358,736
Summary				
Unfunded AAL as of 1/1/15	\$ 199,805,635	\$ 182,572,732	\$135,583,659	\$ 517,962,026
Changes Since the Prior Valuation	<u>22,322,771</u>	<u>21,304,307</u>	<u>11,731,658</u>	<u>55,358,736</u>
Unfunded AAL as of 1/1/17	\$ 222,128,406	\$ 203,877,039	\$147,315,317	\$ 573,320,762
Gain/Loss to be Amortized				
Contribution Loss (Gain)	\$ (34,473,468)	\$ (18,929,455)	\$ (13,625,635)	\$ (67,028,558)
Experience Loss (Gain)	<u>32,354,615</u>	<u>19,373,348</u>	<u>15,778,597</u>	<u>67,506,560</u>
Experience Loss (Gain) to be Amortized	\$ (2,118,853)	\$ 443,893	\$ 2,152,962	\$ 478,002

* Includes adjustments to assumed interest based on higher Act 82 interest rate.

Table 3b: Summary of Changes in Unfunded Actuarial Accrued Liability – Without Regard to Act 82

	<u>Police</u>	<u>Fire</u>	<u>Municipal</u>	<u>Combined</u>
Expected Change in Unfunded Actuarial Accrued Liability				
Normal Cost Assumed	\$ 16,205,313	\$ 15,738,090	\$ 12,338,572	\$ 44,281,975
Admin. Expenses Assumed	1,664,438	1,341,099	1,194,577	4,200,114
Contributions Made	(47,751,792)	(48,388,656)	(35,823,819)	(131,964,267)
Interest Charged*	<u>30,235,742</u>	<u>27,326,044</u>	<u>20,425,642</u>	<u>77,987,428</u>
Total	\$ 353,701	\$ (3,983,423)	\$ (1,865,028)	\$ (5,494,750)
Total Change in Unfunded Actuarial Accrued Liability				
Expected Change	\$ 353,701	\$ (3,983,423)	\$ (1,865,028)	\$ (5,494,750)
Plan Experience				
from Investment Return	5,037,981	4,644,178	4,302,960	13,985,119
from all Other Sources	(4,136,490)	(4,415,189)	(3,265,042)	(11,816,721)
Benefit Modification-Actives	0	0	0	0
Benefit Modifications-Retired	0	0	0	0
Changes in Actuarial Assumptions	<u>21,067,579</u>	<u>25,058,741</u>	<u>12,558,768</u>	<u>58,685,088</u>
Total Changes	\$ 22,322,771	\$ 21,304,307	\$ 11,731,658	\$ 55,358,736
Summary				
Unfunded AAL as of 1/1/15	\$ 199,805,635	\$ 182,572,732	\$135,583,659	\$ 517,962,026
Changes Since the Prior Valuation	<u>22,322,771</u>	<u>21,304,307</u>	<u>11,731,658</u>	<u>55,358,736</u>
Unfunded AAL as of 1/1/17	\$ 222,128,406	\$ 203,877,039	\$147,315,317	\$ 573,320,762
Gain/Loss to be Amortized				
Contribution Loss (Gain)	\$ 8,928,823	\$ 4,290,075	\$ 4,281,038	\$ 17,499,936
Experience Loss (Gain)	<u>(901,491)</u>	<u>228,989</u>	<u>1,037,918</u>	<u>2,168,398</u>
Experience Loss (Gain) to be Amortized	\$ 9,830,314	\$ 4,519,064	\$ 5,318,956	\$ 19,668,334

* Interest charged at prior valuation interest rate of 7.5% per year.

Table 4: Amortization of Unfunded Actuarial Accrued Liability

	<u>Police</u>	<u>Fire</u>	<u>Municipal</u>	<u>Combined</u>
Payment for Bases Established				
Prior to 1/1/17				
Initial (Re-established by Act 82 in 1998)	\$ 7,746,181	\$ 4,333,255	\$ 3,132,592	\$ 15,212,028
Other Changes Through 2015	<u>977,892</u>	<u>8,087,270</u>	<u>5,770,528</u>	<u>14,835,690</u>
Total for Previous Bases	\$ 8,724,073	\$12,420,525	\$ 8,903,120	\$ 30,047,718
Payment for Changes as of 1/1/17				
Experience Loss (Gain)	\$ (190,124)	\$ 39,830	\$ 193,184	\$ 42,890
Benefit Modifications-Retired	0	0	0	0
Benefit Modifications-Active	0	0	0	0
Changes in Actuarial Assumptions	<u>2,190,923</u>	<u>2,605,984</u>	<u>1,306,049</u>	<u>6,102,956</u>
Total-New Bases	\$ 2,000,799	\$ 2,645,814	\$ 1,499,233	\$ 6,145,846
Total Payments				
Previous Bases	\$ 8,724,073	\$12,420,525	\$ 8,903,120	\$ 30,047,718
New Bases	<u>2,000,799</u>	<u>2,645,814</u>	<u>1,499,233</u>	<u>6,145,846</u>
Total	\$ 10,724,872	\$15,066,339	\$10,402,353	\$ 36,193,564

Table 5: Actuarial Cost Components for Required Municipal Contributions

	<u>Police</u>	<u>Fire</u>	<u>Municipal</u>	<u>Combined</u>
Normal Cost Percentage (before expenses)				
2015 Percentage	10.751%	14.127%	7.254%	10.236%
Change	<u>-0.174%</u>	<u>1.578%</u>	<u>0.357%</u>	<u>0.437%</u>
2017 Percentage	10.577%	15.705%	7.611%	10.673%
Summary of Normal Cost Percentage				
Normal Cost Before Expenses	10.577%	15.705%	7.611%	10.673%
Administrative Expenses	<u>1.000%</u>	<u>1.100%</u>	<u>0.700%</u>	<u>0.906%</u>
Gross Normal Cost	11.577%	16.805%	8.311%	11.579%
2017 Amortization Payment				
2015 Amortization Payment	\$ 11,522,196	\$ 14,255,417	\$ 10,781,992	\$ 36,559,605
Changes for Bases Fully Amortized	(2,815,268)	(1,759,850)	(1,817,842)	(6,392,960)
Changes For Bases Established 1/1/17	<u>2,017,944</u>	<u>2,570,772</u>	<u>1,438,203</u>	<u>6,026,919</u>
Net Amortization Payment for 1/1/17	\$ 10,724,872	\$ 15,066,339	\$ 10,402,353	\$ 36,193,564
Actuarially Recommended Amortization Payment				
2015 Amortization Payment	\$ 17,784,199	\$ 16,446,682	\$ 12,214,636	\$ 46,445,517
Changes for Bases Fully Amortized	0	0	0	0
Changes for Bases Established 1/1/17	<u>2,778,502</u>	<u>2,745,470</u>	<u>1,585,726</u>	<u>7,109,698</u>
Net Amortization Payment for 1/1/17	\$ 20,562,701	\$ 19,192,152	\$ 13,800,362	\$ 53,555,215

Table 6: Analysis of Sensitivity to Key Assumptions

The actual costs of the plans will be determined by the experience of the plan over time. The present value of the projected liabilities shown in this (or any other) valuation of the plan is dependent upon the assumptions utilized. The assumed interest rate and assumed rates of retirement are two assumptions that have a significant impact on the expected costs of the plans.

To highlight the effect of these assumptions, we have calculated the normal cost and projected liabilities of the plans assuming a one percent decrease and increase in the assumed interest rate and assuming that participants retire at twice the assumed rates.

Interest Rate Sensitivity

	<u>1% Decrease</u>	<u>Current %</u>	<u>1% Increase</u>
Interest Rate	6.25%	7.25%	8.25%
Actuarial Accrued Liability	\$1,430,448,831	\$1,299,809,857	\$1,188,083,885
Actuarial Value of Assets	<u>(726,489,095)</u>	<u>(726,489,095)</u>	<u>(726,489,095)</u>
Unfunded Actuarial Accrued Liability	\$703,959,736	\$573,320,762	\$461,594,790
Funded Ratio	50.8%	55.9%	61.1%
Normal Cost	\$30,150,820	\$24,416,693	\$19,941,412
Actuarially Recommended Amortization Payment	\$62,986,878	\$53,555,215	\$44,812,579
Estimated Impact on Actuarially Recommended Contribution	\$15,165,790	N/A	\$(13,217,917)

Retirement Assumption Sensitivity

	<u>Current Retirement Rates</u>	<u>Double the Current Retirement Rates</u>
Actuarial Accrued Liability	\$ 1,299,809,857	\$ 1,350,983,369
Actuarial Value of Assets	<u>(726,489,095)</u>	<u>(726,489,095)</u>
Unfunded Actuarial Accrued Liability	\$ 573,320,762	\$ 624,494,274
Funded Ratio	55.9%	53.8%
Normal Cost	\$24,416,693	\$26,661,911
Actuarially Recommended Amortization Payment	\$53,555,215	\$58,877,005
Estimated Impact on Actuarially Recommended Contribution	N/A	\$7,567,008

Section Four: Participant Summaries

Active Members

	<u>Police</u>	<u>Fire</u>	<u>Municipal</u>	<u>Combined</u>
Reconciliation from Prior Valuation				
Active at 1/1/15	856	611	1,694	3,161
New Members	200	118	371	689
Status Change or Transfers In	2	10	0	12
Termination-Vested Benefits	(16)	0	(8)	(24)
Other Terminations or Transfers Out	(40)	(4)	(191)	(235)
Death	(1)	(1)	(3)	(5)
Disability	0	(9)	(5)	(14)
Regular Retirement	(72)	(55)	(140)	(267)
Data Adjustments (Net)	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Active at 1/1/17	929	670	1,718	3,317
Current Membership Summary				
Number Active at 1/1/17	929	670	1,718	3,317
Average Monthly Compensation	\$5,324	\$6,887	\$3,939	\$4,922
Average Ages				
At Hire	28.5	30.2	34.7	32.0
At Valuation Date	41.9	43.3	48.2	45.4
At Normal Retirement	52.3	53.0	60.6	56.7

Inactive Members

	<u>Police</u>	<u>Fire</u>	<u>Municipal</u>	<u>Combined</u>
Number as of 1/1/17				
Regular Retirement	683	567	1,343	2,593
Disability Retirement	317	227	233	777
Survivors	<u>470</u>	<u>305</u>	<u>103</u>	<u>878</u>
Total in Payment	1,470	1,099	1,679	4,248
Deferred Vested	<u>40</u>	<u>0</u>	<u>56</u>	<u>96</u>
Total	1,510	1,099	1,735	4,344
 Average Monthly Benefits				
Regular Retirement	\$ 2,550	\$ 3,280	\$ 1,192	\$ 2,006
Disability Retirement	\$ 2,115	\$ 2,560	\$ 1,051	\$ 1,926
Survivor	\$ 786	\$ 815	\$ 593	\$ 773
Deferred Vested	\$ 2,809	\$ 0	\$ 1,671	\$ 2,145
 Reconciliation from Prior Valuation - Number in Payment Status				
Number as of 1/1/15	1,466	1,100	1,643	4,209
New Payees	125	94	181	400
Cessation of Benefits	(121)	(95)	(146)	(362)
Net Data Adjustments	<u>0</u>	<u>0</u>	<u>1</u>	<u>1</u>
Number as of 1/1/17	1,470	1,099	1,679	4,248

Section Five: Plan Assets

Combined Municipal Pension Trust Fund Calendar Year 2015

Source of Asset Information

The assets of the Aggregated Trust for the City's pension plans are summarized in the following tables based on the information provided by the City and by Maher Duessel. As directed by the Trustees of the City of Pittsburgh Comprehensive Municipal Pension Trust Fund, the values represent a combination of the assets listed in the City's 2015 Comprehensive Annual Financial Report (CAFR) and the present value calculated by GTM Lender Advisors, LLC of the dedicated stream of revenues created by City Ordinances 42 & 44 of 2010. Assets are shown at market value.

Summary of Values for Aggregated Trust

	<u>1/1/15</u>	<u>1/1/16</u>
Invested Portfolio	\$394,224,222	\$377,263,629
Dedicated Funding from Parking Assets	278,702,580	285,856,330
Accrued Interest	502,471	439,614
Accrued Contributions	0	0
Due from ICA	0	2,900,000
Accrued Expenses and Other Payables	<u>(2,661,230)</u>	<u>(2,800,517)</u>
Market Value of Assets - Accrual Basis	\$670,768,043	\$663,659,056

Summary of Transactions for the Aggregated Trust

Balance as of January 1, 2015		\$670,768,043
Contributions Toward Pension Liability		
- Policemen's	\$22,199,430	
- Firemen's	22,733,033	
- Municipal	<u>16,350,714</u>	61,283,178
Miscellaneous and Pass Through Items		5,569,038
Interest and Dividends		4,349,478
Net Appreciation (Decline) in Fair Value of Investments		14,280,168
Payments to Participants		
- Policemen's	\$ 34,042,062	
- Firemen's	31,003,565	
- Municipal	<u>25,382,948</u>	(90,428,575)
Expenses		<u>(2,162,274)</u>
Balance as of December 31, 2015		\$663,659,056

Undivided Participation Calculation Calendar Year 2015 - Accrual Basis

	<u>Policemen's</u>	<u>Firemen's</u>	<u>Municipal</u>	<u>Total</u>
January 1, 2015 Market Value	\$247,240,380	\$220,913,824	\$202,613,838	\$670,768,043
Plan-Specific Contributions	23,373,302	22,972,620	18,464,515	64,810,437
Plan-Specific Distributions	<u>(34,533,416)</u>	<u>(31,250,876)</u>	<u>(25,630,426)</u>	<u>(91,414,718)</u>
Sub-Total	\$236,080,266	\$212,635,569	\$195,447,927	\$644,163,762
Allocation Percentages for Non-Investment Expenses	36.65%	33.01%	30.34%	100.00%
Allocated Non-Investment Expenses	(113,026)	(101,802)	(93,573)	(308,401)
Allocation Basis of Invested Portfolio	\$116,086,321	\$128,004,349	\$134,746,512	\$378,837,182
Allocation Percentages for Invested Portfolio	30.64%	33.79%	35.57%	100.00%
Allocated Investment Expenses	(265,897)	(293,195)	(308,638)	(867,730)
Allocated Investment Earnings	43,413	47,870	50,391	141,674
Allocation Percentages for Parking Revenue (Established 1/1/2011)	45.22%	31.90%	22.88%	100.00%
Allocated Change in Parking Asset Present Value	<u>9,284,579</u>	<u>6,548,374</u>	<u>4,696,796</u>	<u>20,529,750</u>
December 31, 2015 Market Value	\$245,029,336	\$218,836,816	\$199,792,904	\$663,659,056

Contributions and Distributions for 2015 - Accrual Basis

Plan-Specific Contributions	<u>Policemen's</u>	<u>Firemen's</u>	<u>Municipal</u>	<u>Total</u>
General Municipal Pension System State Aid	\$6,845,778	\$4,885,360	\$6,528,190	\$18,259,328
Member Contributions	3,522,891	4,256,291	3,121,519	10,900,701
City Contributions	11,830,762	13,591,382	6,701,006	32,123,149
Pass Through Contributions	1,173,872	228,728	2,079,118	3,481,718
Miscellaneous Income	<u>0</u>	<u>10,859</u>	<u>34,683</u>	<u>45,542</u>
Total Contributions	\$23,373,302	\$22,972,620	\$18,464,515	\$64,810,437
Plan-Specific Distributions				
Benefit Payments to Participants	\$33,681,336	\$31,001,673	\$24,557,546	\$89,240,555
Refunds to Participants	360,726	1,892	825,402	1,188,020
Administrative Expenses	<u>491,354</u>	<u>247,311</u>	<u>247,478</u>	<u>986,143</u>
Total Distributions	\$34,533,416	\$31,250,876	\$25,630,426	\$91,414,718

Combined Municipal Pension Trust Fund Calendar Year 2016

Source of Asset Information

The assets of the Aggregated Trust for the City's pension plans are summarized in the following tables based on the information provided by the City and by Maher Duessel. As directed by the Trustees of the City of Pittsburgh Comprehensive Municipal Pension Trust Fund, the values represent a combination of the assets listed in the City's 2016 Comprehensive Annual Financial Report (CAFR) and the present value calculated by GTM Lender Advisors, LLC of the dedicated stream of revenues created by City Ordinances 42 & 44 of 2010. Assets are shown at market value.

Summary of Values for the Aggregated Trust

	<u>1/1/16</u>	<u>1/1/17</u>
Invested Portfolio	\$ 377,263,629	\$ 403,563,859
Dedicated Funding from Parking Assets	285,856,330	293,607,504
Accrued Interest	439,614	406,916
Accrued Contributions	0	0
Due From ICA	2,900,000	0
Accrued Expenses and Other Payables	<u>(2,800,517)</u>	<u>(2,148,375)</u>
Market Value of Assets – Accrual Basis	\$ 663,659,056	\$ 695,429,904

Summary of Transactions for the Aggregated Trust

Balance as of January 1, 2016		\$ 663,659,056
Contributions Toward Pension Liability		
-Policemen's	\$ 25,552,362	
-Firemen's	25,655,622	
-Municipal	<u>19,473,105</u>	70,681,088
Miscellaneous and Pass Through Items		3,362,164
Interest and Dividends		4,182,349
Net Appreciation (Decline) in Fair Value of Investments		48,231,787
Payments to Participants		
-Policemen's	\$ 34,126,264	
-Firemen's	32,410,125	
-Municipal	<u>26,120,998</u>	(92,657,387)
Expenses		<u>(2,029,153)</u>
Balance as of December 31, 2016		\$ 695,429,904

Undivided Participation Calculation Calendar Year 2016 - Accrual Basis

	<u>Policemen's</u>	<u>Firemen's</u>	<u>Municipal</u>	<u>Total</u>
January 1, 2016 Market Value	\$245,029,336	\$218,836,816	\$199,792,904	\$663,659,056
Plan-Specific Contributions	26,710,287	25,874,981	21,301,906	73,887,174
Plan-Specific Distributions	<u>(34,584,952)</u>	<u>(32,665,448)</u>	<u>(26,365,666)</u>	<u>(93,616,066)</u>
Sub-Total	\$ 237,154,671	\$ 212,046,349	\$ 194,729,143	\$ 643,930,163
Allocation Percentages for Non-Investment Expenses	36.83%	32.93%	30.24%	100.00%
Allocated Non-Investment Expenses	(120,972)	(108,164)	(99,330)	(328,466)
Allocation Basis of Invested Portfolio	\$113,925,442	\$125,133,298	\$132,391,093	\$371,449,833
Allocation Percentages for Invested Portfolio	30.67%	33.69%	35.64%	100.00%
Allocated Investment Expenses	(227,577)	(249,966)	(264,464)	(742,008)
Allocated Investment Earnings	9,643,731	10,592,470	11,206,839	31,443,040
Allocation Percentages for Parking Revenue (Established 1/1/2011)	45.22%	31.90%	22.88%	100.00%
Allocated Change in Parking Asset Present Value	<u>9,554,764</u>	<u>6,738,935</u>	<u>4,833,475</u>	<u>21,127,174</u>
December 31, 2016 Market Value	\$256,004,618	\$229,019,624	\$210,405,662	\$695,429,904

Contributions and Distributions for 2016 - Accrual Basis

	<u>Policemen's</u>	<u>Firemen's</u>	<u>Municipal</u>	<u>Total</u>
Plan-Specific Contributions				
General Municipal Pension System State Aid	\$7,340,656	\$5,704,539	\$7,445,647	\$20,490,843
Member Contributions	3,609,255	3,947,756	3,350,315	10,907,326
City Contributions	14,602,451	16,003,327	8,677,142	39,282,919
Pass Through Contributions	1,157,926	208,236	1,801,421	3,167,583
Miscellaneous Income	<u>0</u>	<u>11,123</u>	<u>27,380</u>	<u>38,503</u>
Total Contributions	\$26,710,287	\$25,874,981	\$21,301,906	\$73,887,174
Plan-Specific Distributions				
Benefit Payments to Participants	\$33,720,761	\$32,409,184	\$25,493,272	\$91,623,217
Refunds to Participants	405,503	941	627,726	1,034,170
Administrative Expenses	<u>458,688</u>	<u>255,323</u>	<u>244,668</u>	<u>958,679</u>
Total Distributions	\$34,584,952	\$32,665,448	\$26,365,666	\$93,616,066

Calculation of Actuarial Value of Assets: Description of Method

The Actuarial Value of Assets is the greater of the Market Value of Assets or the value determined by a Tabular Smoothing Method which takes the Actuarial Value of Assets from the prior valuation report and brings it forward using a specified interest rate. The Actuarial Value of Assets in the prior report, contributions by year, and annual disbursements are each credited with interest at a rate of 1 percent less than the prior valuation interest rate assumption. The resulting value is further subject to a minimum of 80 percent and a maximum of 120 percent of the market value of assets.

Development of the Actuarial Value of Assets

	Police	Firemen	Municipal	Total
Market Value of Assets at January 1, 2017	\$256,004,618	229,019,624	\$210,405,662	\$695,429,904
Actuarial Value of Assets at January 1, 2015	\$249,288,242	\$228,146,021	\$210,113,317	\$687,547,580
Contributions During 2015	23,373,302	22,961,761	18,429,832	64,764,895
Disbursements During 2015	(34,912,339)	(31,645,873)	(26,032,637)	(92,590,849)
Interest Credited During 2015	<u>15,603,508</u>	<u>14,347,496</u>	<u>13,268,842</u>	<u>43,219,846</u>
Actuarial Value of Assets at January 1, 2016	\$253,352,713	\$233,809,406	\$215,779,354	\$702,941,472
Tabular Smoothing Value of Assets at				
January 1, 2016	\$253,352,713	\$233,809,406	\$215,779,354	\$702,941,472
Contributions During 2016	26,710,287	25,863,858	21,274,526	73,848,671
Disbursements During 2016	(34,933,501)	(33,023,578)	(26,729,461)	(94,686,540)
Interest Credited During 2016	<u>15,950,652</u>	<u>14,744,339</u>	<u>13,690,500</u>	<u>44,385,491</u>
Actuarial Value of Assets at January 1, 2017	\$261,080,152	\$241,394,024	\$224,014,919	\$726,489,094
Low Limit: 80% of Market Value	\$204,803,694	\$183,215,699	\$168,324,530	\$556,343,923
High Limit: 120% of Market Value	\$307,205,541	\$274,823,548	\$252,486,795	\$834,515,884
Actuarial Value of Assets at January 1, 2017	\$261,080,152	\$241,394,024	\$224,014,919	\$726,489,095

Section Six: Schedule of Debt Service Payments by Plan Arising from the Issuance of Pension Obligation Bonds

Year	1996 Issue Municipal	1998 Issue Municipal	Municipal Subtotal	1998 Issue Police	1998 Issue Fire	Total
1997	\$1,834,529.78		\$1,834,529.78			\$ 1,834,529.78
1998	3,089,976.25	\$1,873,403.84	4,963,380.09	\$3,921,658.75	\$2,531,176.79	11,416,215.63
1999	3,093,905.00	3,965,451.43	7,059,356.43	8,301,011.75	5,357,765.57	20,718,133.75
2000	3,089,965.00	3,952,795.18	7,042,760.18	8,274,518.00	5,340,665.57	20,657,943.75
2001	3,093,050.00	3,940,071.43	7,033,121.43	8,247,882.95	5,323,474.37	20,604,478.75
2002	3,093,065.00	3,927,111.43	7,020,176.43	8,220,753.35	5,305,963.97	20,546,893.75
2003	3,094,772.50	3,914,050.18	7,008,822.68	8,193,411.80	5,288,316.77	20,490,551.25
2004	3,092,930.00	3,900,853.93	6,993,783.93	8,165,787.65	5,270,487.17	20,430,058.75
2005	3,092,285.00	4,215,898.93	7,308,183.93	8,825,281.84	5,696,147.98	21,829,613.75
2006	3,092,631.25	4,141,574.68	7,234,205.93	8,669,696.42	5,595,727.65	21,499,630.00
2007	3,094,008.75	4,140,402.43	7,234,411.18	8,667,242.51	5,594,143.81	21,495,797.50
2008	3,091,210.00	4,129,471.22	7,220,681.22	8,644,359.86	5,579,374.54	21,444,415.62
2009	3,093,890.00	4,136,108.02	7,229,998.02	8,658,252.89	5,588,341.59	21,476,592.50
2010	3,091,950.00	4,147,130.21	7,239,080.21	8,681,326.00	5,603,233.79	21,523,640.00
2011	3,090,225.00	4,152,755.21	7,242,980.21	8,693,101.00	5,610,833.79	21,546,915.00
2012	3,093,220.00	5,122,623.89	8,215,843.89	10,723,359.45	6,921,234.16	25,860,437.50
2013	3,092,690.00	5,684,604.41	8,777,294.41	11,899,772.03	7,680,532.31	28,357,598.75
2014	3,092,940.00	5,679,272.19	8,772,212.19	11,888,609.92	7,673,327.89	28,334,150.00
2015	3,091,015.00	5,731,435.63	8,822,450.63	11,997,805.38	7,743,806.49	28,564,062.50
2016	3,091,390.00	5,729,424.69	8,820,814.69	11,993,595.82	7,741,089.49	28,555,500.00
2017	3,093,365.00	6,550,975.62	9,644,340.62	13,713,375.79	8,851,096.09	32,208,812.50
2018	3,091,415.00	5,193,528.14	8,284,943.14	10,871,785.68	7,017,033.68	26,173,762.50
2019	3,093,792.50	6,476,899.43	9,570,691.93	13,558,309.64	8,751,010.93	31,880,012.50
2020	3,094,545.00	6,477,531.68	9,572,076.68	13,559,633.15	8,751,865.17	31,883,575.00
2021	3,093,937.50	6,477,401.18	9,571,338.68	13,559,359.97	8,751,688.85	31,882,387.50
2022	3,091,260.00	6,478,435.06	9,569,695.06	13,561,524.21	8,753,085.73	31,884,305.00
2023	3,090,625.00	6,479,074.06	9,569,699.06	13,562,861.85	8,753,949.09	31,886,510.00
2024	3,090,967.50	6,478,846.81	9,569,814.31	13,562,386.14	8,753,642.05	31,885,842.50

Section Seven: Historical Information

Actuarial information is included in the following charts for the last five biennial actuarial valuations. However, contribution information is included annually beginning with 2012.

The information contained elsewhere in this report provides detailed information on liabilities for each plan as of January 1, 2017 and the changes in the funding components during the year ending December 31, 2016. This section examines funding trends that emerged during the last five actuarial valuation periods. Also, a five-year review of contributions to fund the benefits has been included and a comparison of the actuarial value of assets for the last four valuations has been added.

The goal of the actuarial funding method is to accumulate enough assets by an employee's retirement date so that these assets and the interest they earn will pay benefits for the remainder of the employee's life, and possibly to a beneficiary. As active employees approach retirement, accumulated assets will increase each year. As retirement benefits are paid the accumulated assets will decrease. At any point in time, there is a theoretical asset level that should be achieved, known as the Actuarial Accrued Liability.

A number of factors can have an impact on the Actuarial Accrued Liability. The January 1, 2017 valuation reports include several assumption changes, which have changed the actuarial accrued liability. No benefit changes were included in the valuation.

Chart No. 1 shows the Actuarial Accrued Liability for each plan and the total for all plans from the actuarial valuations prepared in the period 2009 through 2017. Each of the Funds' Actuarial Accrued Liability increases over the period, which is the expected trend. Actuarial assumptions were changed in the 2009, 2013 and 2017 valuations that also increased the reported Actuarial Accrued Liability.

Comparing the assets and the Actuarial Accrued Liability as of a given date determines whether the funding is ahead of or behind schedule. Each of the City's plans is behind schedule because the Actuarial Accrued Liability is greater than the assets. This deficit is known as the Unfunded Actuarial Accrued Liability. Over time, annual amortization payments to the funds, calculated using the valuation interest rate will eliminate the Unfunded Actuarial Accrued Liability.

In 1996 and in 1998, the City issued pension obligation bonds and deposited the proceeds into the funds to reduce the gap between the Actuarial Accrued Liability and the assets. The debt service on the bonds is lower than the corresponding amortization payments because the interest rate on the bonds is lower than the valuation interest rate. As a result, the City is paying less money each year to provide pension benefits.

Chart No. 2 shows the Unfunded Actuarial Accrued Liability for each plan and the total for all plans from the actuarial valuations prepared from 2009 through 2017. The Unfunded Actuarial Accrued Liability declined at January 1, 2011 because of the contribution gain that resulted from the inclusion of the present value of future parking revenue as a City contribution for 2010. The Unfunded Actuarial Accrued Liability increased at January 1, 2013 due to assumption changes, the magnitude of which exceeded the net experience gains of each plan. The Unfunded Actuarial Accrued Liability increased at January 1, 2015, largely because of experience and contribution losses in each plan. The Unfunded Actuarial Accrued Liability increased on January 1, 2017 largely

because of assumption changes including lower interest rate, updated mortality assumption and revised rates of retirement among others.

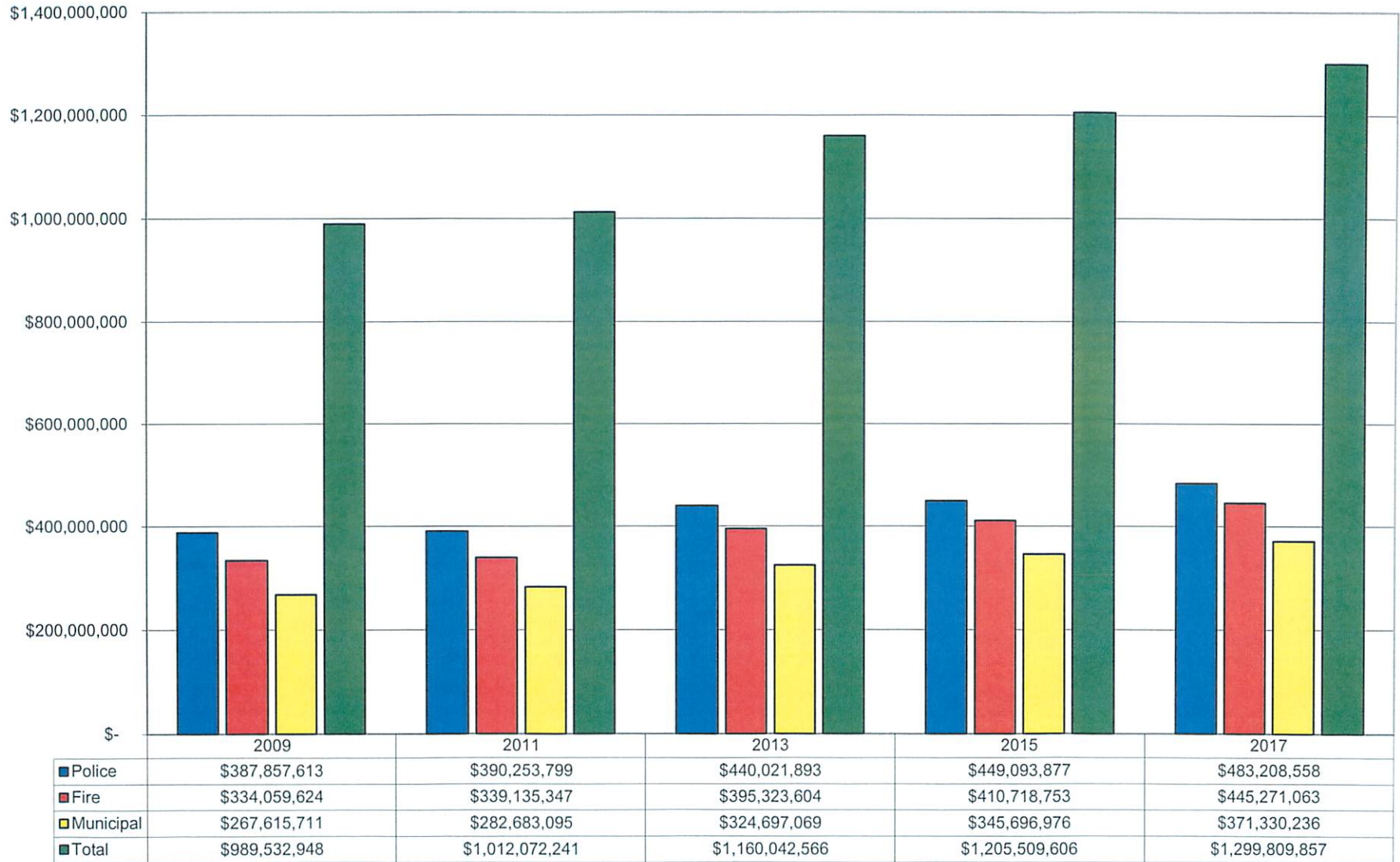
Chart No. 3 provides the Funding Ratio for each fund and the average Funding Ratio for the 2009 through 2017 period. The Funding Ratio is the ratio of assets to the Actuarial Accrued Liability. In 1996, assets averaged 23.5 percent of the Actuarial Accrued Liability. Because of the pension obligation bonds, investment earnings in excess of the actuarial assumption and other changes noted above, the average peaked in 2000 at 67.0 percent. The return on investment in 2000, 2001, and 2002 and benefit improvements caused the average 2003 funding ratio to fall to 40.8 percent. The Funding Ratio increased slightly in 2005, but retracted by 2.7 percent in 2007, mostly due to experience losses in the Firemen's Fund. The ratio dropped by 7.4 percent to 34.3 percent in 2009 as a result of the large investment losses in 2008 and, to a lesser extent, by a decrease in the assumed interest rate from 8.75 percent to 8.0 percent. The funding ratio increased by 28.1 percent in 2011 to 62.4 percent due to the inclusion of the present value of future parking revenue as a pension plan asset. Funding ratios in 2009 through 2017 would be lower if the actuarial value of assets had not been changed to a value based on a tabular smoothing method. The funding ratio declined by 4.2 percent from 2011 to 2013, mainly because of assumption changes. It again declined by 1.2% from 2013 to 2015, largely because of experience and contribution losses. From 2015 to 2017 the funding ratio declined largely because of assumption changes.

Charts No. 4 through 7 provide information on the sources of the money to fund pension benefits on an individual and on an aggregate basis. Contributions for 2012 through 2016 are shown as a percentage of the total pay as reported on Form W-2 for each group. The City Contribution is the money paid by the City directly to the pension plans. Debt service is the annual payment made by the City to retire the pension obligation bonds.

The complete schedule of debt service payments is included in Section Six. The employees' contributions are withheld from employees' paychecks and paid directly to the pension plans. State Aid is the City's allocation from the two percent premium tax on foreign fire and casualty insurance, which the City deposits into the plans. State Aid could also be used to pay debt service, but the City would have to make additional contributions to the pension plans equal to the amount of State Aid used to pay debt service. In the future, if the City's Minimum Municipal Obligation falls below the State Aid allocation, the extra State Aid could be used to pay debt service.

Charts No. 8 through 11 provide information comparing the actuarial accrued liability to the actuarial value and market value of assets by plan and for all plans combined as of biennial valuation dates from January 1, 2009 to January 1, 2017.

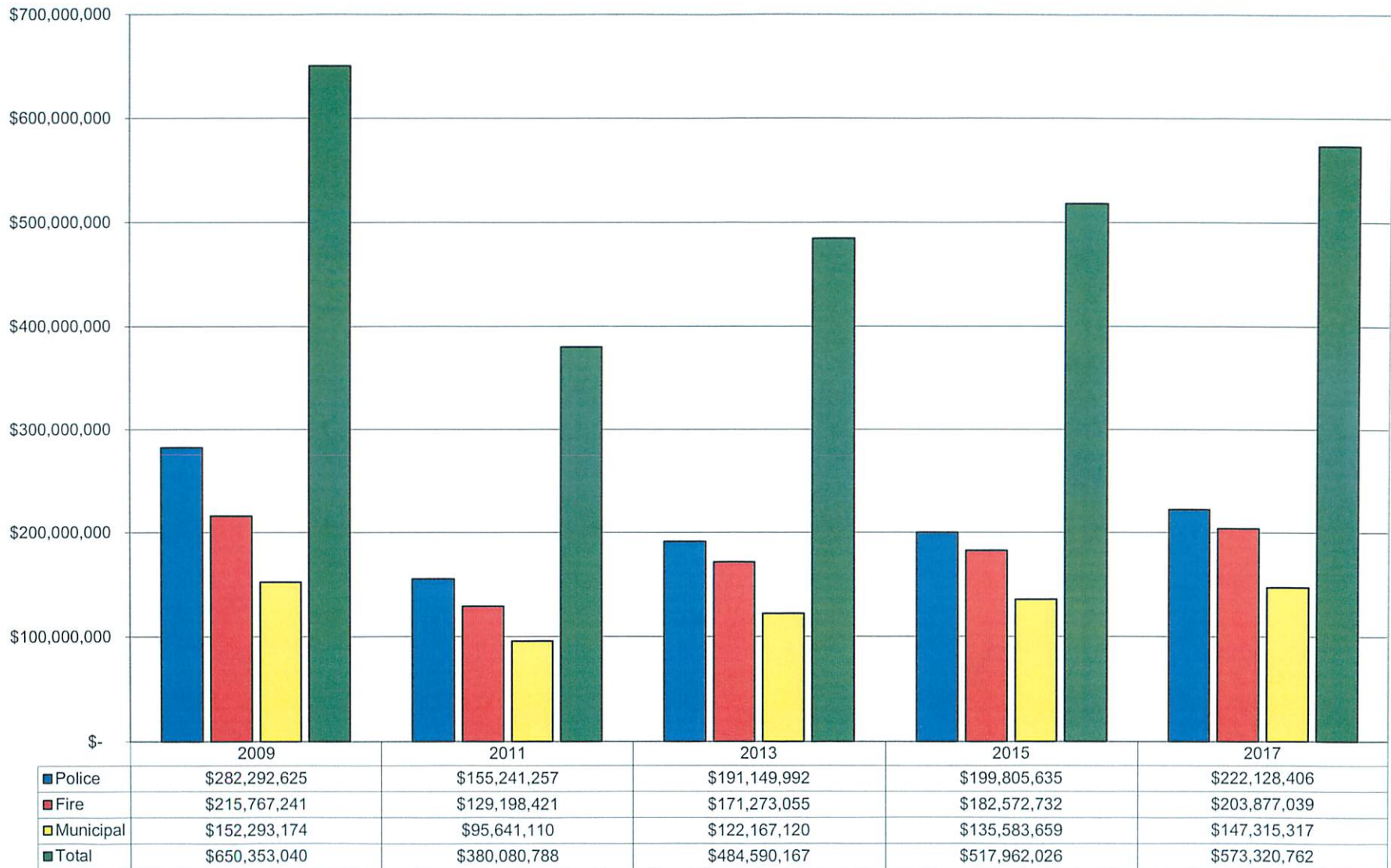
Chart No. 1
Actuarial Accrued Liability



Assumption changes in the 2009, 2013 and 2017 valuations increased the Actuarial Accrued Liability.

Chart No. 2

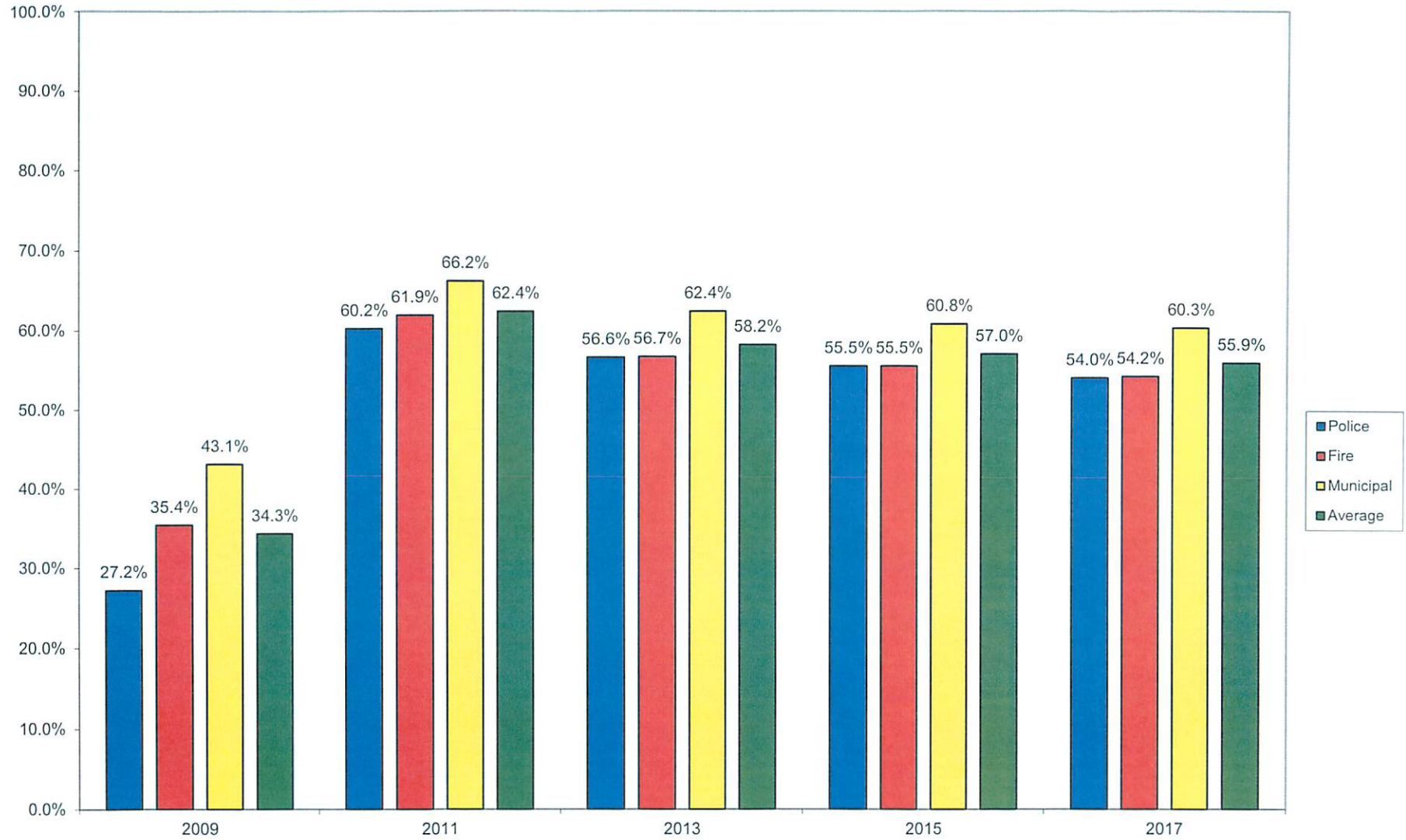
Unfunded Actuarial Accrued Liability



Adoption of the Act 44 smoothing method and a decrease in the valuation interest rate in the 2009 valuation had an impact on the Unfunded Actuarial Accrued Liability (UAAL). The inclusion of the dedicated stream of revenues pursuant to City Ordinances 42 and 44 of 2010 significantly reduced the UAAL in the 2011 valuation. Assumption changes in the 2013 and 2017 valuations increased the UAAL.

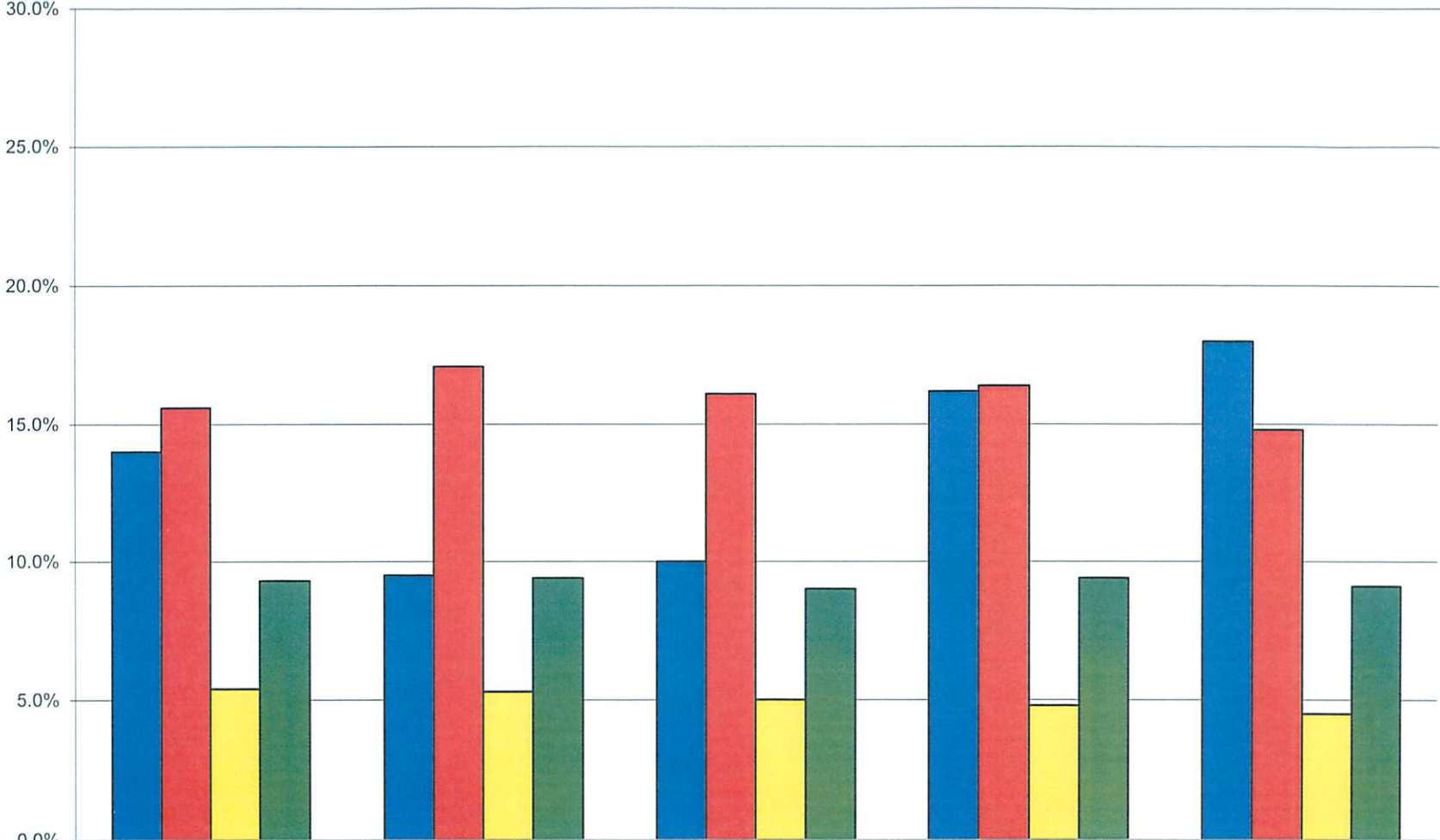
Chart No. 3

Funding Ratio



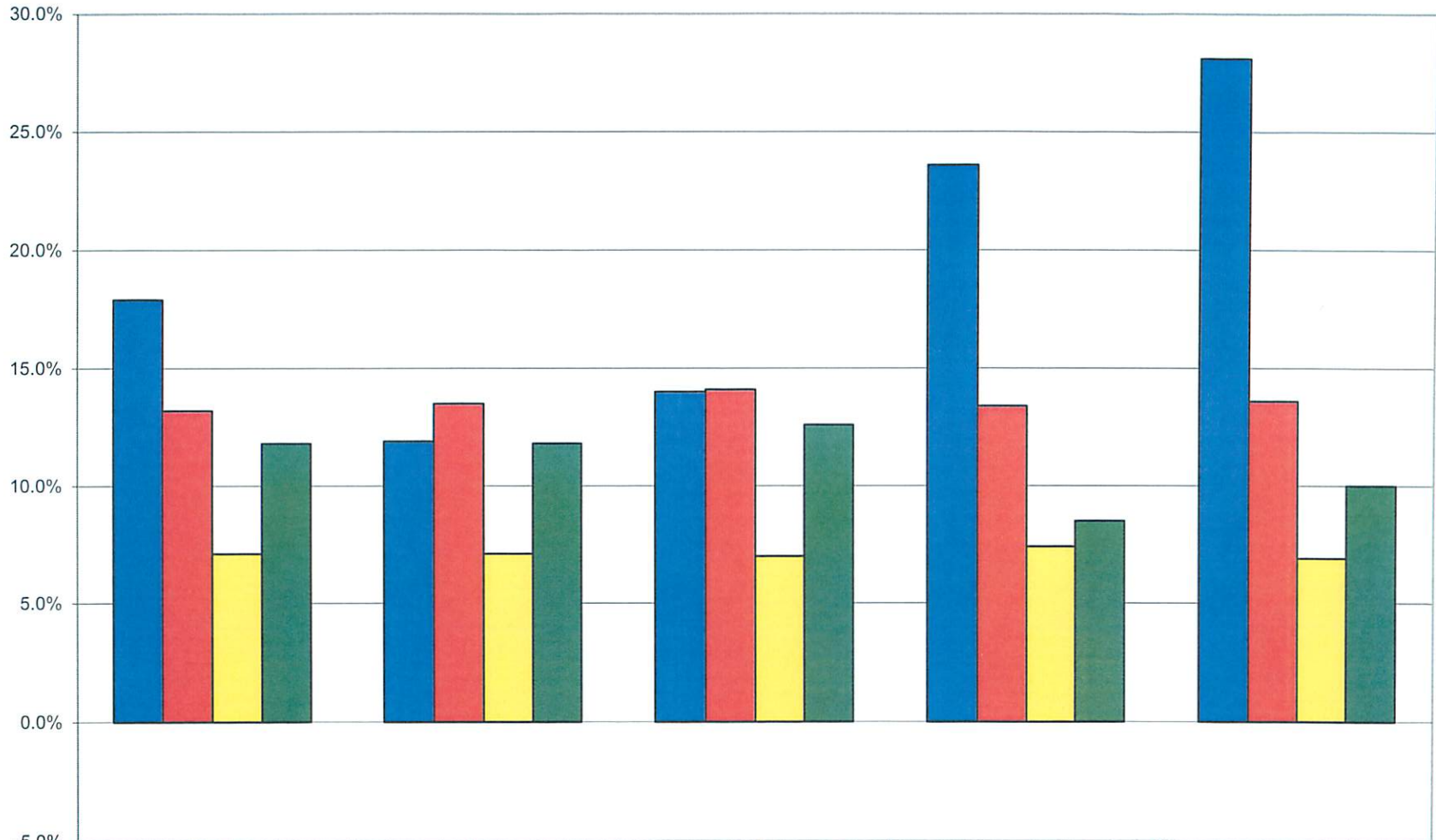
Funding Ratio is the actuarial value of assets divided by the actuarial accrued liability, expressed as a percentage. The Funding Ratios for 2011 and later reflect the inclusion in the actuarial value of assets of the dedicated stream of revenues pursuant to Ordinances 42 and 44 of 2010.

Chart No. 4
City of Pittsburgh Police Relief and Pension Fund
Pension Contributions as a Percent of Actual W-2 Pay



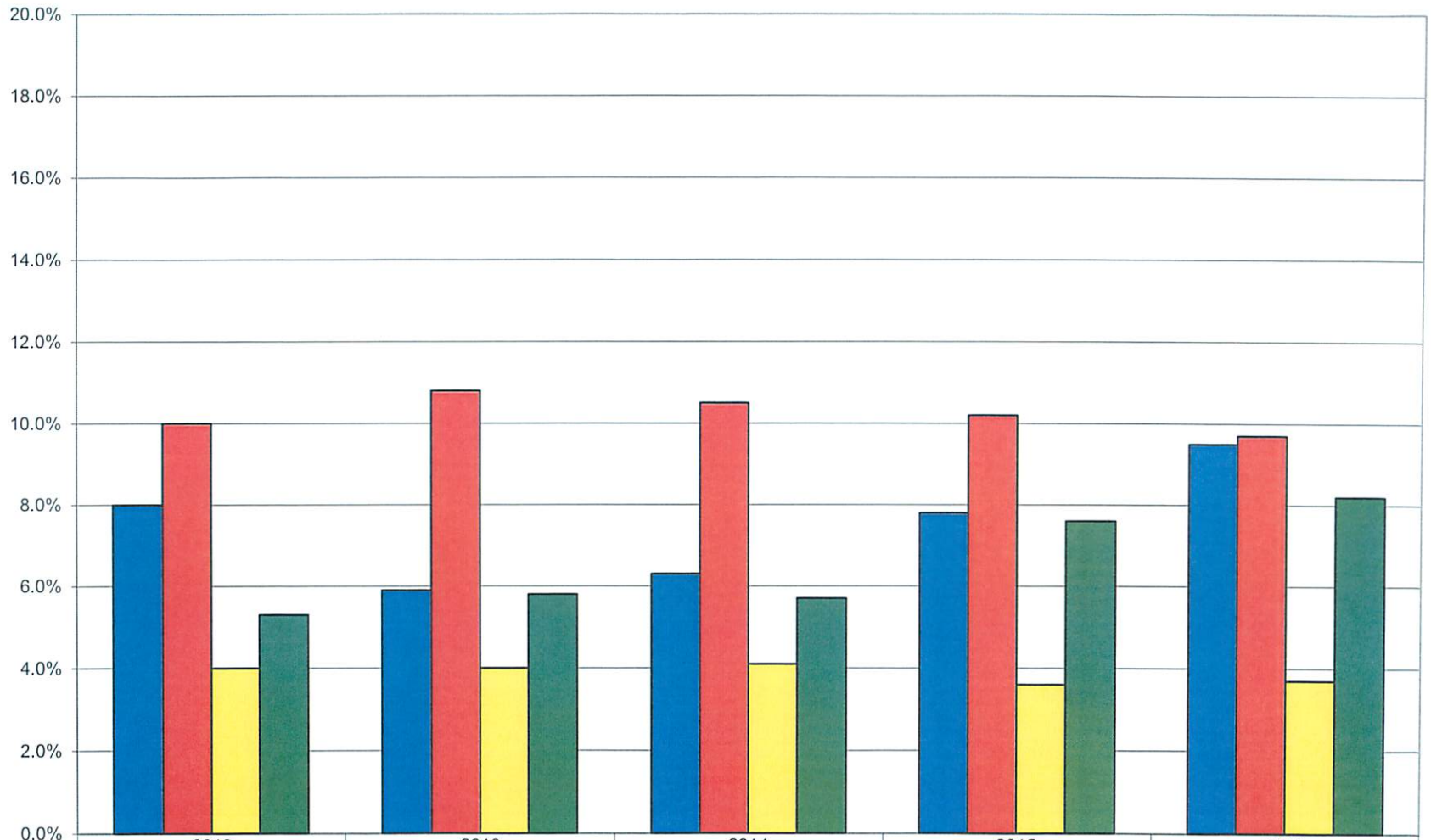
■ City Contribution	14.0%	9.5%	10.0%	16.2%	18.0%
■ Debt Service	15.6%	17.1%	16.1%	16.4%	14.8%
■ Employees	5.4%	5.3%	5.0%	4.8%	4.5%
■ State Aid	9.3%	9.4%	9.0%	9.4%	9.1%

Chart No. 5
City of Pittsburgh Firemen's Relief and Pension Fund
Pension Contributions as a Percentage of Actual W-2 Pay



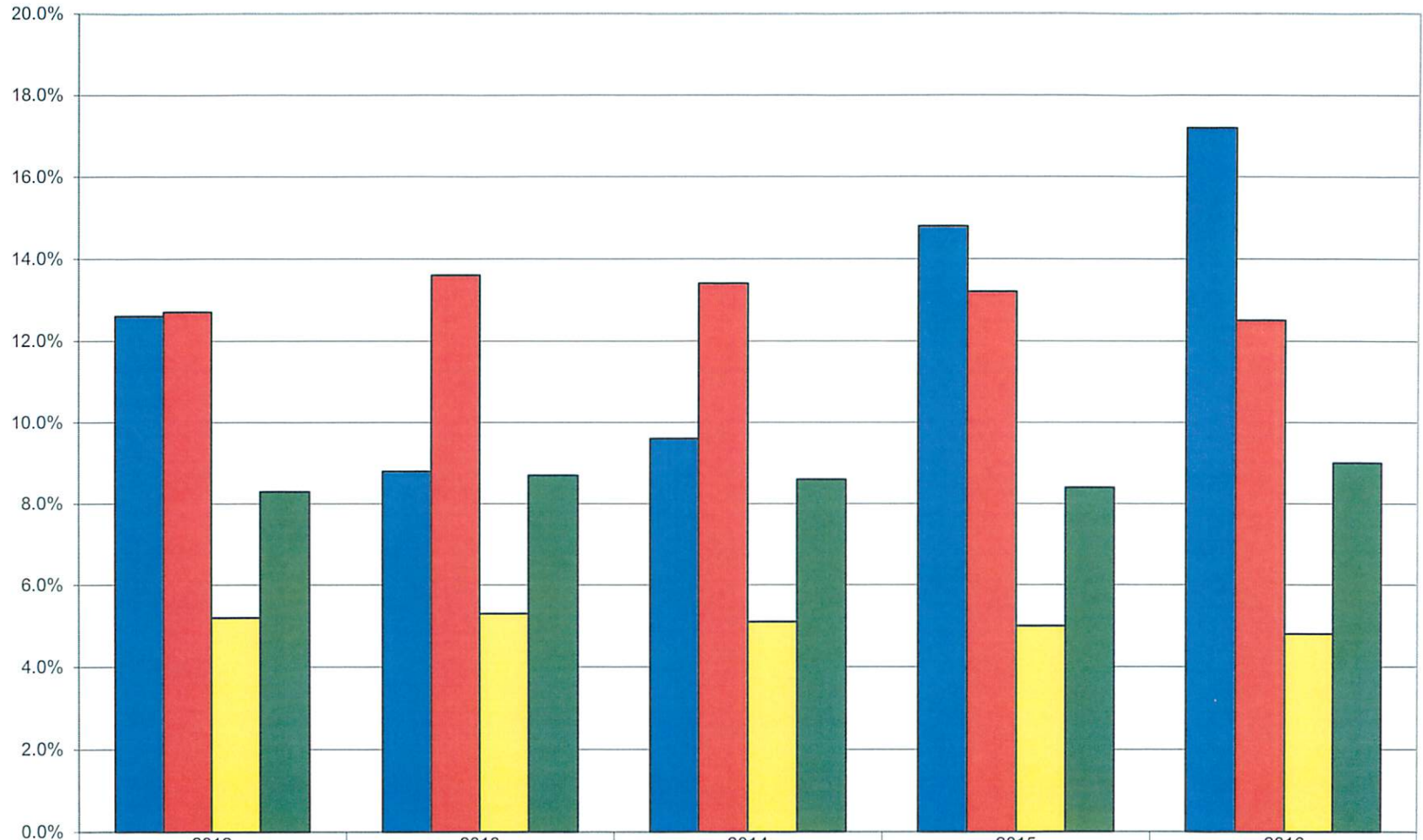
	2012	2013	2014	2015	2016
■ City Contribution	17.9%	11.9%	14.0%	23.6%	28.1%
■ Debt Service	13.2%	13.5%	14.1%	13.4%	13.6%
■ Employees	7.1%	7.1%	7.0%	7.4%	6.9%
■ State Aid	11.8%	11.8%	12.6%	8.5%	10.0%

Chart No. 6
City of Pittsburgh Municipal Retirement Fund
Pension Contributions as a Percentage of Actual W-2 Pay



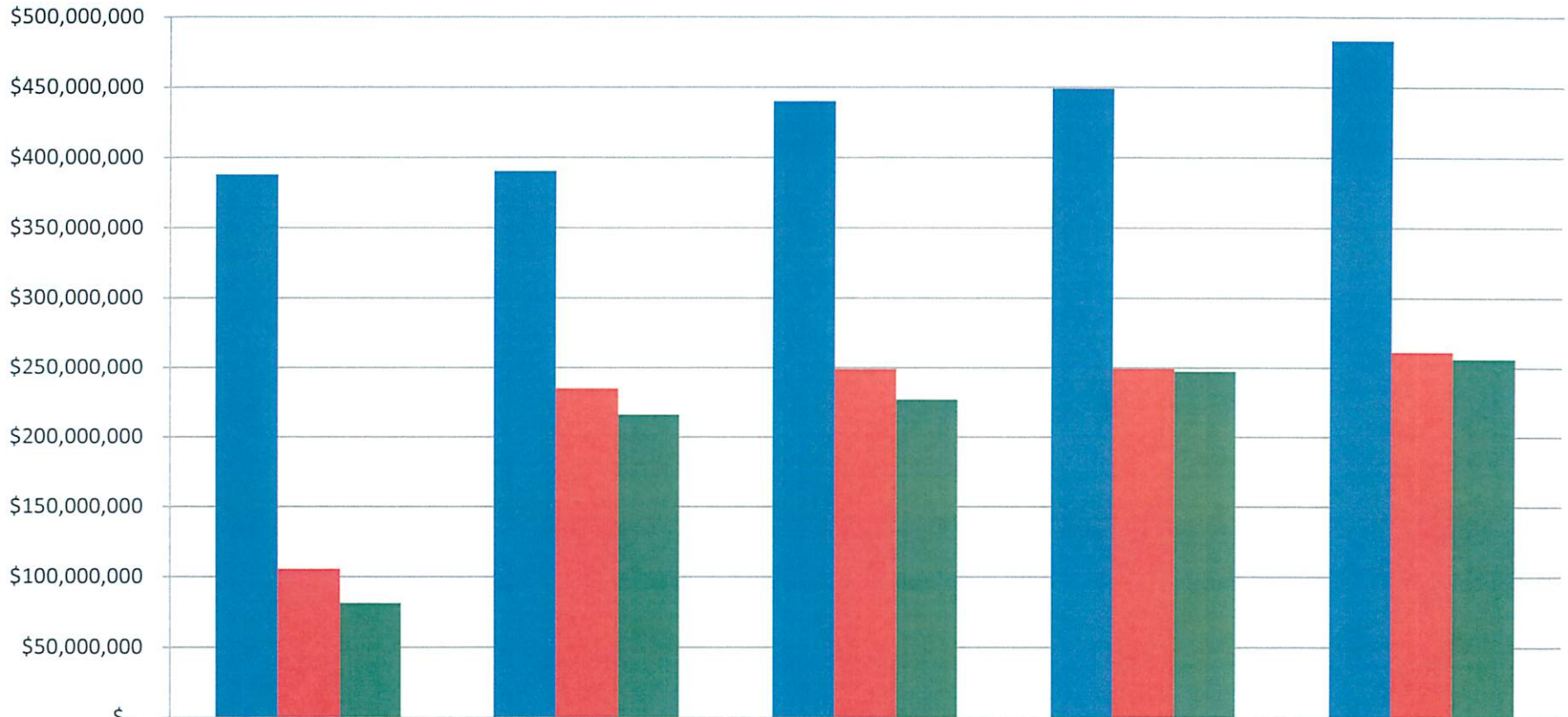
■ City Contribution	8.0%	5.9%	6.3%	7.8%	9.5%
■ Debt Service	10.0%	10.8%	10.5%	10.2%	9.7%
■ Employees	4.0%	4.0%	4.1%	3.6%	3.7%
■ State Aid	5.3%	5.8%	5.7%	7.6%	8.2%

Chart No. 7
City of Pittsburgh - All Pension Funds
Pension Contributions as a Percentage of Actual W-2 Pay



■ City Contribution	12.6%	8.8%	9.6%	14.8%	17.2%
■ Debt Service	12.7%	13.6%	13.4%	13.2%	12.5%
■ Employees	5.2%	5.3%	5.1%	5.0%	4.8%
■ State Aid	8.3%	8.7%	8.6%	8.4%	9.0%

Chart No. 8
City of Pittsburgh Police Relief and Pension Fund
Comparison of Actuarial Accrued Liability with Actuarial Value of Assets and Market Value of Assets



	2009	2011	2013	2015	2017
■ AAL	\$387,857,613	\$390,253,799	\$440,021,893	\$449,093,877	\$483,208,558
■ Actuarial Value	\$105,564,988	\$235,012,542	\$248,871,901	\$249,288,242	\$261,080,152
■ Market Value	\$81,203,837	\$216,050,208	\$227,007,765	\$247,240,380	\$256,004,618

Chart No. 9
City of Pittsburgh Firemen's Relief and Pension Fund
Comparison of Actuarial Accrued Liability with Actuarial Value of Assets and Market Value of Assets

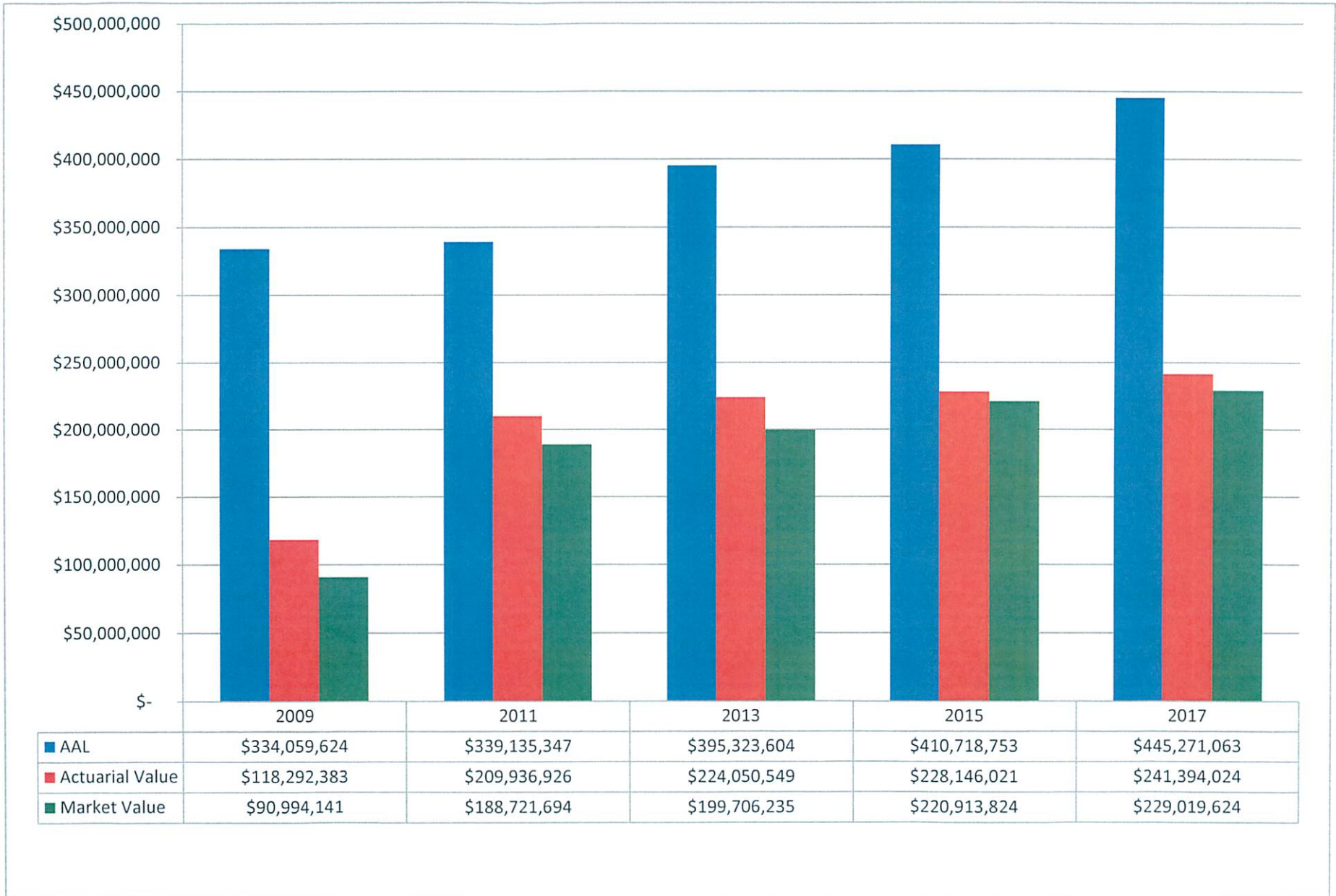
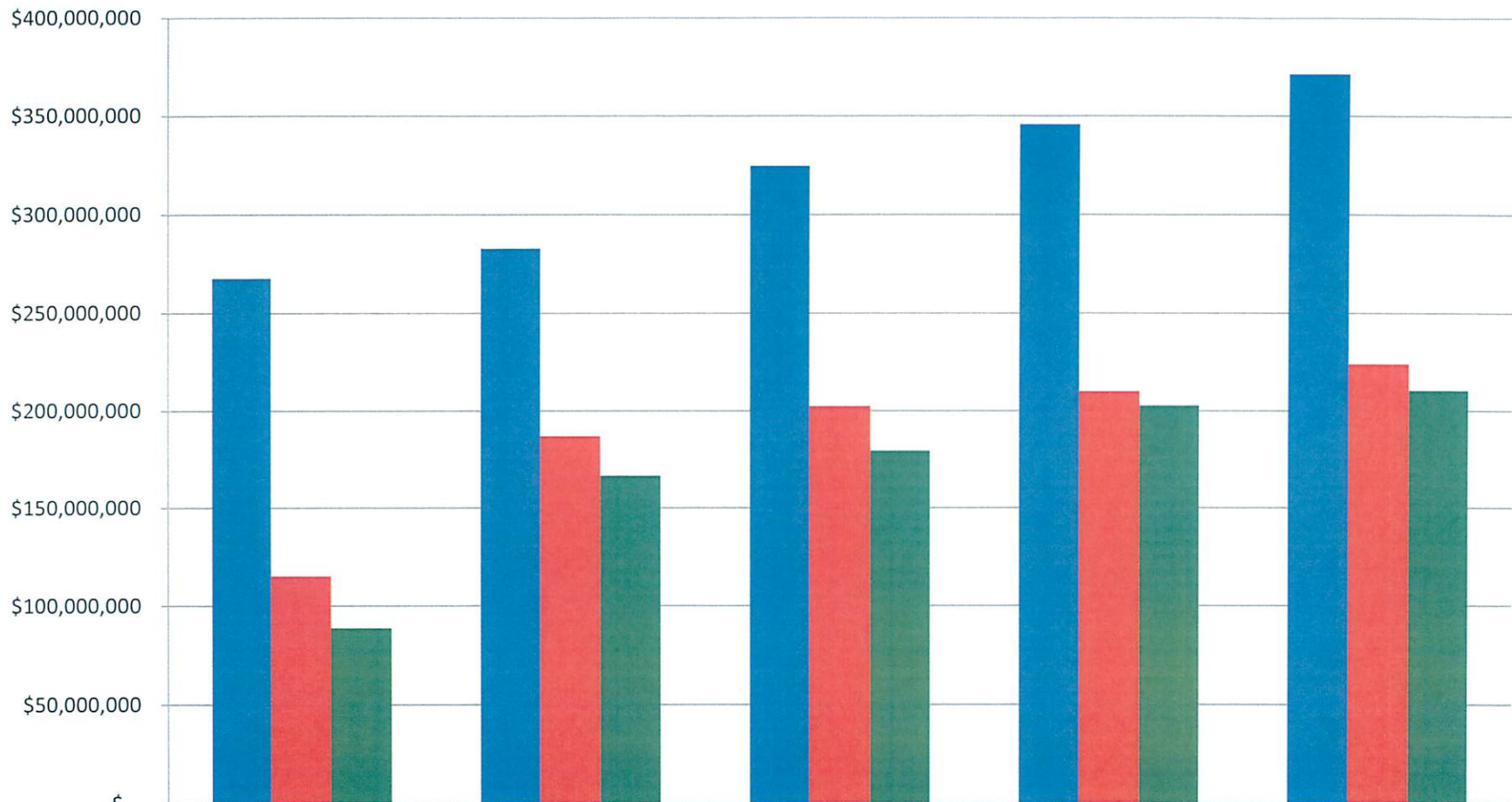
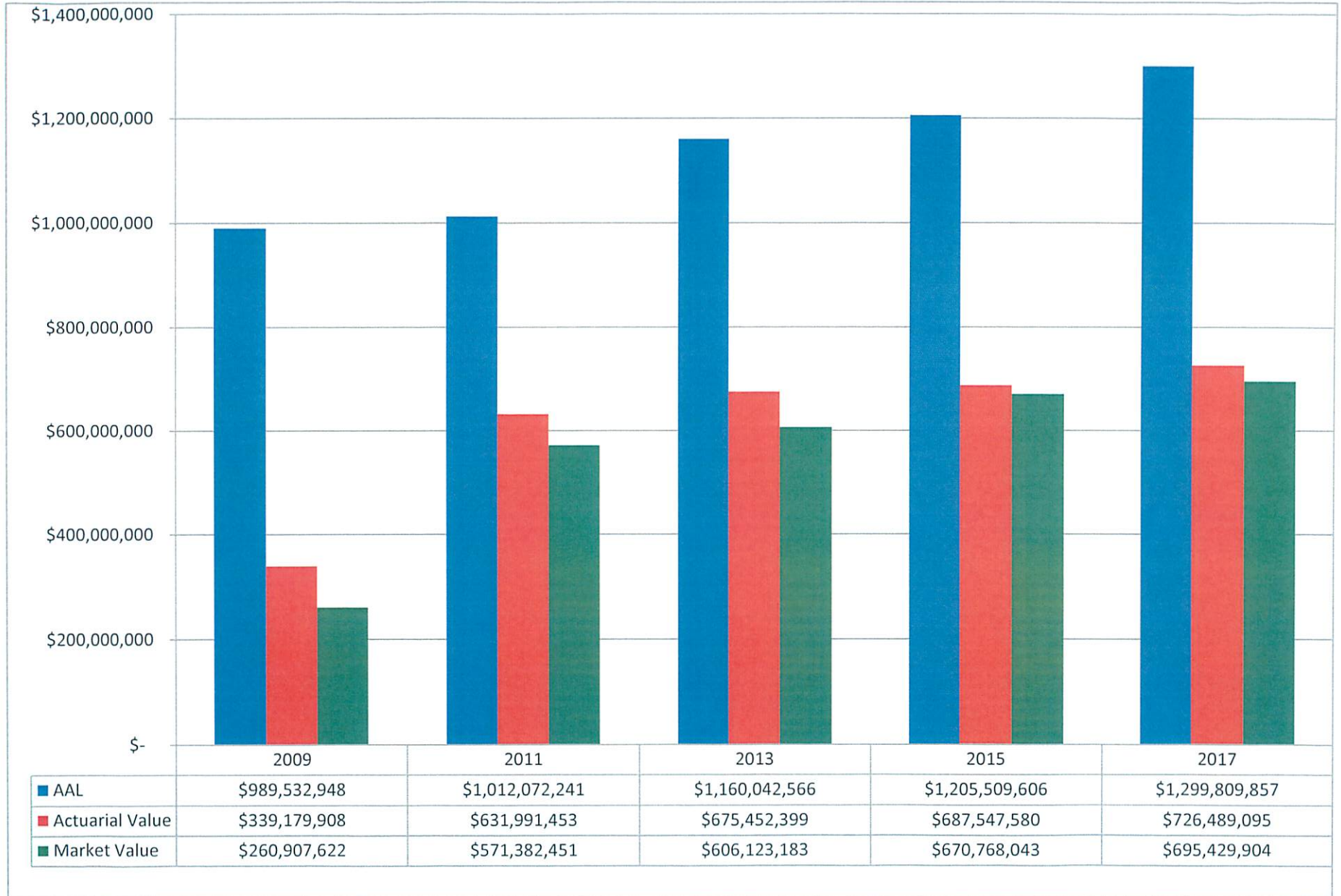


Chart No. 10
City of Pittsburgh Municipal Pension Fund
Comparison of Actuarial Accrued Liability with Actuarial Value of Assets and Market Value of Assets



	2009	2011	2013	2015	2017
■ AAL	\$267,615,711	\$282,683,095	\$324,697,069	\$345,696,976	\$371,330,236
■ Actuarial Value	\$115,322,537	\$187,041,985	\$202,529,949	\$210,113,317	\$224,014,919
■ Market Value	\$88,709,644	\$166,610,549	\$179,409,183	\$202,613,838	\$210,405,662

Chart No. 11
City of Pittsburgh - All Pension Funds
Comparison of Actuarial Accrued Liability with Actuarial Value of Assets and Market Value of Assets



Section Eight: Glossary

Accrued Benefit

The portion of the participant's retirement benefit that is attributable to service completed before the calculation date. The calculation typically uses actual service as of the calculation date and may involve other factors such as average pay at the determination date and projected service through the retirement eligibility date.

Act 205 of 1984

Municipal Pension Plan Funding Standard and Recovery Act of December 18, 1984, P.L. 1005, No. 205. The Act controls pension funding in Pennsylvania. This Act also provides for reporting of actuarial information and for a recovery program for qualifying municipalities.

Actuarial Accrued Liability

The portion of the actuarial cost assigned to prior years.

Actuarial Assumptions

Factors used by the actuary to forecast future events. These factors include items relating to future economic conditions, the survival of the participants and their beneficiaries, and the length of employment.

Actuarial Cost Method

A means of assigning costs to periods of employment. This method is used to determine a funding level that will provide sufficient assets to pay benefits for each participant upon retirement. Act 205 specifies that the entry age normal cost method, as described in the Act, should be used for this determination.

Actuarial Experience Gain or Loss

The effect on the actuarial accrued liability of differences between events as predicted by the actuarial assumptions and those that actually occurred. This difference can increase or decrease the contribution in future years.

Actuarial Present Value

The lump sum value that is equivalent to an expected series of future payments. This value is determined by using the actuarial assumptions. An actuarial present value, as of the valuation date, represents the amount of funds that would be sufficient to provide the series of payments, if experience precisely matches the actuarial assumptions.

Actuarial Value of Assets

The value of current plan assets which is used by the actuary to evaluate the current funding status and determine future funding requirements. Under Act 205, a corridor limitation requires that this value be between 80 and 120 percent of the fair market value of the assets.

Administrative Expenses

The average of expenses to administer the plan that is paid in the year preceding the most recent valuation and the anticipated expenses for the year following this valuation. The average is converted to a percentage of payroll and used as part of the Minimum Municipal Obligation calculation.

Amortization Payment

The annual payment required to eventually eliminate the unfunded actuarial accrued liability according to the schedule established in Act 205.

Funded Ratio

The actuarial value of assets divided by the actuarial accrued liability.

Funding Adjustment

Occurs when the actuarial value of assets exceeds the actuarial accrued liability; it is defined by Act 205 as 10 percent of the excess. This adjustment reduces the amount that must be contributed to the pension plan.

General Municipal Pension System State Aid

Annually municipalities receive a portion of the insurance premium tax levied on casualty insurance companies headquartered outside of Pennsylvania. If they have paid firefighters, they also receive a portion of the premium tax on out-of-state fire insurance companies. These taxes are distributed according to formulae contained in Act 205.

Minimum Municipal Obligation

The amount that must be contributed to a pension plan by a municipality for a given year. The calculation of this amount uses the normal cost, anticipated administrative expenses, amortization payment or funding adjustment, and anticipated employee contributions to determine a municipality's contribution requirement. General Municipal Pension System State Aid may be used to reduce the contribution.

Normal Cost

The actuarial cost assigned to a given year to pay for the portion of the anticipated benefit derived from service during that year.

Unfunded Actuarial Accrued Liability

The amount by which the actuarial accrued liability exceeds the actuarial value of assets. A valuation will identify the value of changes in the unfunded actuarial accrued liability that result from changes in plan benefits, actuarial assumptions, or actuarial gains and losses. A zero or negative unfunded actuarial accrued liability does not mean that no future contributions are required, only that the current accumulation of plan assets is deemed on or ahead of schedule.

Vesting

The participant's non-forfeitable right to receive a benefit, provided that the participant survives until benefit eligibility.