



**ACTUARIAL VALUATION REPORT**  
*for the*  
**City of Pittsburgh**  
**Policemen's Relief and Pension Fund**  
*as of*  
**January 1, 2017**

**Report Date: March 28, 2018**

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## Section One: Commentary and Actuarial Disclosures

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At the request of the City of Pittsburgh, we have completed an actuarial valuation report (AVR) for the City of Pittsburgh Policemen's Relief and Pension Fund as of January 1, 2017. This AVR is based upon participant data as of January 1, 2017 furnished to us by the City and upon asset information as of December 31, 2016 as provided by the City, Maher Duessel, CPAs and GTM Lender Advisors, LLC. The data has been reviewed and determined to be reasonable and consistent. An audit of the data was beyond the scope of the assignment. The completeness and accuracy of the valuation results are dependent upon the completeness and accuracy of the data.

Unless otherwise noted herein, this report has been completed in accordance with generally accepted actuarial principles and practices, and reflects our current understanding of applicable laws and regulatory requirements. This valuation was prepared to satisfy the funding and disclosure requirements of Act 205 of 1984. It also contains the cost components that may be used to compute the Plan's Minimum Municipal Obligation (MMO) in accordance with that law. The funded status measures in this AVR 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. This valuation should be used for no other purpose than those outlined herein.

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 payment 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, this report also presents 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. (See page 7 for further explanation.)

The City’s pension plan assets are aggregated into a single trust. An annual calculation is made to determine each Plan’s portion of the assets. The receipts and disbursements for each Plan are added to the Plan’s allocated value from the prior year. Then, the year’s investment income is allocated proportionately to each Plan in accordance with procedures set forth in Act 205. As of December 31, 2016 the calculated market value of assets in the Policemen’s Relief and Pension Fund is \$256,004,618. Section Nine contains exhibits illustrating the calculation of this amount.

Section Nine also shows the development of the actuarial value of assets (AVA), which is determined by using the optional alternative asset smoothing method established in Act 44 of 2009. This method sets the actuarial value of assets equal to the greater of the prior asset value (adjusted for contributions and disbursements) increased at the assumed rate of interest less 1% and market value. This gives results that are biased relative to the market value. Due to this bias, this method does not comply with actuarial standards of practice. However, by the passage of Act 44 of 2009, this method is allowable for the determination of the Minimum Municipal Obligation. We have treated this method as a prescribed method selected by the Plan Sponsor. As of January 1, 2017, the AVA is 102% of the market value of assets.

The City Controller obtained third-party advice from which he 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 report under Act 205 and 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, Gleason & Associates. 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 (PERC) accepted the Revised Actuarial Valuation Report 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 dedicated future parking revenues does not imply that it necessarily qualifies as a pension plan asset under GAS accounting or for any other purpose.

## **2017 Results**

Certain highlights of this actuarial valuation compared with the prior AVR are shown in Section Three. The use of pension bond proceeds to reduce the Unfunded Actuarial Accrued Liability has split

the funding of the pension plan into actuarial costs and debt service. The actuarial costs consist of normal cost, administrative expense contributions and amortization payments to eliminate the remainder of the Unfunded Actuarial Accrued Liability. The actuarial information used to develop contribution requirements according to the rules of Act 205 is shown in Section Five. Debt service payments repay the money borrowed and subsequently deposited into the plan. Information concerning the annual debt service is contained in Section Ten. The demographics of the Plan population are summarized in Section Eight.

The actuarial cost components as of January 1, 2017 compared to the prior year are as follows:

	Prior Year 2015	Current Year 2017
<i>Normal Cost</i> as a Percentage of Total W-2 Payroll	10.751%	10.577%
<i>Expenses</i> as a Percentage of Total W-2 Payroll	1.100%	1.000%
<i>Minimum Amortization</i> Payment	\$11,522,196	\$10,724,872
<i>Actuarially Recommended Amortization</i> Payment	\$17,784,199	\$20,562,701

The change in actuarial costs from valuation to valuation can be affected by changes in Plan provisions, assumption changes, and experience changes. Pension bonds were issued in March 1998. The debt service payment for 2017 is approximately \$13.7 million, based on the original debt service schedule.

The decrease in the Minimum Amortization Payment was due to the amortization payment of expiring experience loss bases being greater than that of the assumption change (explained in Assumption Changes below) being added.

### **Assumption Changes**

This valuation reflects several changes in the actuarial assumptions since the January 1, 2015 AVR. The most significant is the change in the interest rate assumption. The interest rate assumption represents the expected long-term rate of return on plan assets, including inflation. The City decided to lower the assumed interest rate from 7.50% to 7.25% per year. We believe this to be a reasonable and more conservative assumption.

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. This

comparison can indicate that actuarial assumptions should be changed. Based on the January 1, 2017 experience study, the mortality, rates of employee turnover (rates increased by 25%), rates of disability (decreased at most ages) and retirement (increased rates at ages 60, 62 and 64) assumptions have been changed for this valuation. Refer to the 2017 Experience Study for a more detailed analysis of these changes.

The mortality assumptions are all based on the RP-2000 mortality tables with various adjustments. The mortality rates for inactive participants all had one year setforward removed (setforward is essentially assuming that a person is older than they actually are) and the mortality improvement assumption was changed from scale AA to mortality improvement rates based on the Social Security Administration’s 2015 Long-Range Demographic Assumptions. The changes in the mortality assumptions are summarized in the following chart:

	Prior	Current
Active Participants	Employee Rates projected with Scale AA	Employee Rates projected with “SSA 2015”
Retired Participants	Healthy Annuitant rates adjusted by blue collar ratios and set forward one year and projected from 2005 with Scale AA	Healthy Annuitant rates adjusted by blue collar ratios and projected from 2000 with “SSA 2015”
Disabled Participants	Same as Retired, but with four year set forward	Same as Retired, but with three year set forward
Surviving Beneficiary	Healthy Annuitant rates set forward one year, adjusted by ratio of female beneficiary experience to overall female mortality and projected from 2005 with Scale AA	Healthy Annuitant rates, adjusted by ratio of female beneficiary experience to overall female mortality and projected from 2000 with “SSA 2015”

A summary of the actuarial assumptions used for this valuation can be found in Section Seven. The actuarial assumption changes increased the actuarial accrued liability (AAL) by \$21,067,579. This amount will be amortized over 15 years.

### Benefit Changes

There were no benefit changes during the period from January 1, 2015 through January 1, 2017. The benefits provided are summarized in Section Four of this report.

## Experience Changes

Plan experience during the period between valuations affects the Plan costs recognized in a valuation report. Both the normal cost and the amortization payment can change.

Normal cost is the portion of the cost for active members allocated to the current year by the actuarial cost method. Unless Plan provisions or assumptions change, normal cost usually remains fairly stable, changing only moderately from year to year. The changes that do occur relate to changes in the age and service distribution of the participant group.

As you can see from the chart on page 3, the normal cost as a percentage of W-2 payroll decreased slightly from 10.751% in the 2015 AVR to 10.577% for 2017. This decrease was due to the difference between W-2 pay and pensionable earnings changing between valuations. The state requires the normal cost to be expressed as a percentage of total pay. Pensions for this plan are based on base wages plus longevity, which grew at a lesser rate than total wages. The normal cost was about 14.4% of pensionable earnings in both 2015 and 2017.

The actuarial experience gain or loss computed in the current valuation reflects differences since the prior valuation between actual experience and the experience anticipated by the actuarial assumptions. For bases established in 2009 and later, Act 205 requires the amortization of experience gains or losses over a 20-year period. An experience gain will reduce the total amortization payment and an experience loss will increase the payment.

Table 2 shows the development of the experience gain/loss under the minimum funding rules of Act 205 utilizing the methodology prescribed under Act 82 of 1998 (described later in this Section). Table 2b shows the development of the same unfunded actuarial accrued liability without regard to Act 82 of 1998.

For 2017, a new experience gain base of \$2,118,853 has been established under the minimum funding rules of Act 205; a new experience loss base of \$9,830,314 was established for the actuarially recommended contribution. The primary components of the experience gain/loss are as follows:

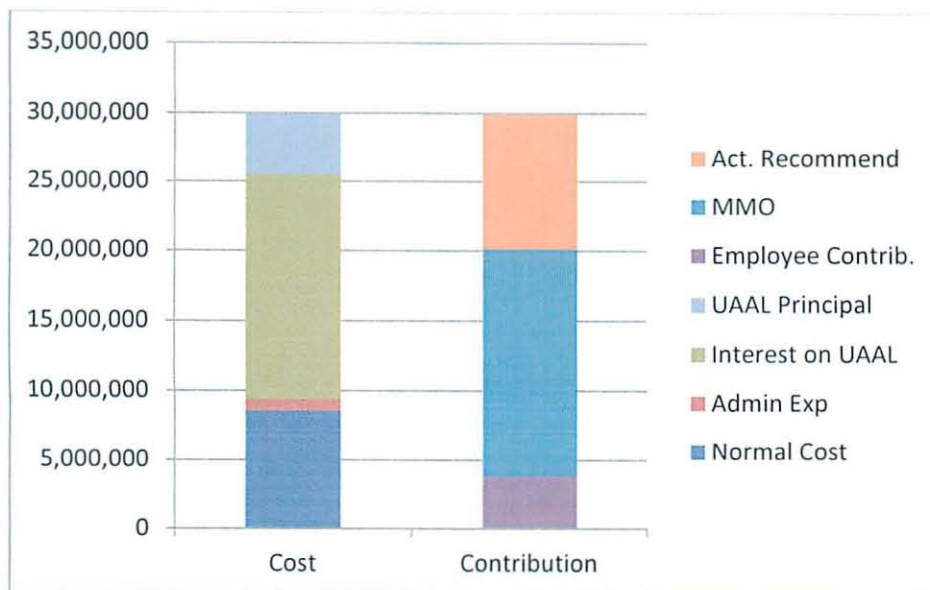
There was a loss of \$5,037,982 due to return on the actuarial value of assets (AVA) that was less than the previously assumed 7.5% annual rate (under the Act 44 of 2009 smoothing method interest is credited on the AVA each year at a rate that is one percent less than the assumed interest rate of the plan). There was a demographic experience gain of \$4,136,490. The primary source of the demographic gain was salary increases that were, on average, less than the assumed 4.5% annual rate.

There was also a loss from contributions that were less than required based on the January 1, 2015 AVR when not taking into account Act 82 (under the actuarially required contribution). The City contributed more than the MMO in both 2015 and 2016, which resulted in contribution gains being recognized under the minimum funding rules of Act 205.



## Cost / Contribution Comparison

The following chart shows the annual cost components of the plan on the left (starting at the bottom: 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 (starting at the bottom): employee contributions, MMO, actuarially recommended contribution (in excess of the MMO). 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.

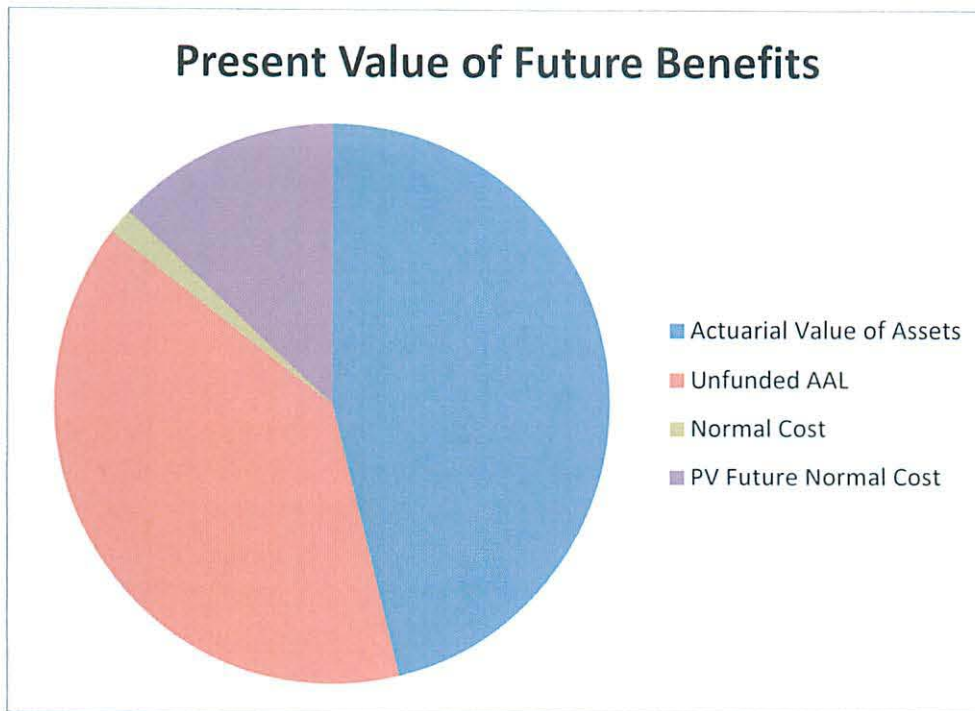


## Funded Status

Another measure of comparison between valuations is the plan's funded ratio, the actuarial value of assets divided by the actuarial accrued liability. This ratio is currently 54.0% (refer to Table 1). As of January 1, 2015, the corresponding ratio was 55.5% so the current valuation shows a decrease of 1.5%. The funded ratio based on the market value of assets is 53.0%.

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 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, this is a very mature plan.





#### 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 in this report is highly recommended.

Act 82 allowed the City to change the minimum funding amortization schedule for its Unfunded Actuarial Accrued Liability because pension bond proceeds were deposited by the City into the pension plan during 1998 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 the 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 a statutory interest rate of 8.75 percent. 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. For example, the Unfunded Actuarial Accrued Liability for this special base has increased from \$131,617,548 as of January 1, 1998 to \$211,926,787 as of January 1, 2017 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 valuations 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 actuarial experience gain. If the fund earns less than 10 percent, there will be an actuarial experience loss on the comparative interest rate balance. When this legislation was enacted in 1998, investment conditions were different, and 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, is now larger than the total market value of assets. This will likely lead to significant experience losses, an increasing pattern of amortization payments and a funding ratio which will still be well below 100% at the end of the 40-year period due to remaining balances on these losses.

By contrast, funding the plan 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 funding ratio much closer to 100% by the fixed target year.

## **Other Measurements**

This report was prepared in order to satisfy the funding and disclosure requirements of Act 205 of 1984. The liabilities shown in this valuation are calculated on the basis that the pension plan is an ongoing concern. As such, the entry age actuarial cost method is utilized, and the interest rate used represents the expected long-term investment return assumption on plan assets. The actuarial assumptions used in this valuation may not be appropriate for other purposes. Therefore, Section Six presents alternative liability measurements for informational purposes only.

## Section Two: Certification

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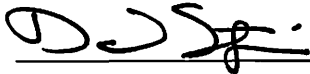
In the actuary's opinion, the actuarial assumptions used in the valuation are reasonably related to the experience of the Plan and to reasonable expectations. They represent the actuary's best estimate of anticipated experience under the Plan. To the best of our knowledge, the report is complete and accurate, based on the data herein and the disclosures in Section One.

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 and Certified by:



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

## Section Three: Valuation Highlights

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Participant Count	01/01/17	01/01/15	Change
Total Active	929	856	73
Vested	299	335	(36)
Not Vested	630	521	109

Total In Payment Status	1,470	1,466	4
Retirement Benefits	683	654	29
Disability Benefits	317	340	(23)
Survivor Benefits	470	472	(2)
Deferred	40	35	5
<b>Total</b>	<b>2,439</b>	<b>2,357</b>	<b>82</b>

### Average Monthly Benefit

#### *In Payment Status*

Retirement Benefits	\$ 2,550	\$ 2,409	\$ 141
Disability Benefits	\$ 2,115	\$ 2,087	\$ 28
Survivor Benefits	\$ 786	\$ 760	\$ 26
Deferred	\$ 2,809	\$ 2,789	\$ 20

### Active Participant Averages

Hire Age	28.5	28.7	(0.2)
Attained Age	41.9	43.8	(2.0)
Normal Retirement Age	52.3	52.3	0.0
Assumed Future Service	16.0	14.0	2.0
Monthly Compensation	\$5,324	\$5,393	\$(69)

### Financial Data

Market Value of Assets	\$ 256,004,618	\$247,240,380	\$ 8,764,237
Accumulated Employee Contributions	\$ 43,827,158	\$ 45,208,957	\$ (1,381,799)

### Cost Components

Normal Cost as a percentage of total payroll	10.577%	10.751%	-0.174%
Expenses as a percentage of total payroll	1.000%	1.100%	-0.100%
Total	11.577%	11.851%	-0.274%
Minimum Amortization Payment	\$10,724,872	\$11,522,196	\$(797,324)
Actuarially Recommended Amortization Payment	\$20,562,701	\$17,784,199	\$2,778,502

## Section Four: Summary of Plan Provisions

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The Summary of Plan Provisions below is included to clarify the basis of our actuarial valuation and is not meant to govern the operation of the Plan. The summary represents our understanding of the benefits provided by the Plan, based upon documentation provided by the Plan Sponsor and our understanding of the way in which the Plan Sponsor operates the Plan.

*Plan Year*

- ▼ Twelve-month period beginning January 1 and ending December 31

*Plan Established*

- ▼ September 1, 1935

**Principal Definitions**

*Employee*

- ▼ Any person employed by the City of Pittsburgh Bureau of Police, including all substitute uniformed employees of the Bureau.

*Retirement Benefit Commencement Date*

- ▼ Assumed to be the first day of the month coincident with or next following eligibility-for and election to retire

*Service Increment*

- ▼ An additional monthly benefit of \$20 for each completed year of service between 20 and 25 years, plus \$25 for each year of service in excess of 25 years

*Service*

- ▼ Assumed to be completed years of service calculated from date of hire through date of retirement or severance, plus periods of service purchased

*Normal Form of Payment*

- ▼ Monthly pension benefit payable for life

**Participation Requirements**

*Entry Date*

- ▼ Date of hire

**Compensation**

- ▼ Base wages and longevity pay

*Average Compensation*

- ▼ Compensation averaged over the 12-month period prior to retirement or severance.

*Members hired after December 31, 1991*

- ▼ Compensation averaged over 36 months prior to retirement or severance.

**Normal Retirement**

*Eligibility*

- ▼ Later of age 50 or Completion of 20 years of service

*Monthly Benefit*

- ▼ Equal to 50% of average compensation plus service increment if any

## **Disability**

### *Eligibility*

- ▼ Permanent disablement in line of duty *or*
- ▼ Permanent disablement (not in line of duty) after completing 10 years of service

### *Benefit Amount*

- ▼ 50% of earnings in year prior to disablement

### *Members Hired after December 31, 1991*

- ▼ Sum of this benefit and member's workers' compensation benefit shall not exceed member's regular salary at time of disablement

### *Benefit Commencement Date*

- ▼ First day of calendar month following determination of disablement *and*
- ▼ Continuing for the duration of disability prior to normal retirement date and life thereafter

## **Vesting**

- ▼ If member completed 20 years of service, may collect normal retirement benefit based on average compensation at termination (providing terminated member continues contributions at rate in effect at termination)
- ▼ Benefit deferred to age 50

### *Terminated Participants*

- ▼ If contributions continue at same rate in effect at termination and continue to age 50, member may receive monthly benefit based on rate of pay in effect had officer worked until age 50

## **Death Benefits**

### *Accidental Death*

- ▼ Benefit plus return of member's accumulated contributions
- ▼ Benefit plus workers' compensation or other payments equal to 50% of member's wages at death
- ▼ Payable for 500 weeks or until surviving spouse dies
- ▼ If no surviving spouse or unmarried children, dependent parents receive payments

### *- Children Benefits*

*(No surviving spouse/ or discontinued payment to surviving spouse)*

- ▼ Unmarried child under age 18 receives payments equal to 25% of payments to spouse

- *Children Benefits (Cont'd)*

- ▼ Total payments to one family may not exceed 50% of member's wages at time of death
- ▼ \$60 minimum monthly payment if only one child
- ▼ If maximum amount payable, divide equally among entitled children
- ▼ Payments terminate when child reaches age 18, dies, marries
- ▼ Payments may continue indefinitely to incompetent child

*Death Prior to Retirement*  
*Active service/ not accidental*

- ▼ If so elected, spouse paid benefit equal to 50% of pension member would have received if retired on date of death
- ▼ No election, accumulated contributions without interest paid to beneficiary or estate

*Death After Retirement*

- ▼ If so elected, spouse paid benefit equal to 50% of pension member was receiving
- ▼ No surviving spouse, benefit may be paid to surviving children or dependent parents

**Employee Contributions**

- ▼ Participants will contribute 6.0 percent of their compensation plus \$1 per month. Members who elect the surviving spouse benefit contribute an additional 1/2 percent of compensation. The \$1 per month contribution will cease at age 65.

*Refund*

- ▼ Accumulated contributions without interest



## Section Five: Development of Contribution Requirements

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**Table 1: Normal Cost and Actuarial Accrued Liability**

<b>Normal Cost</b>	
Retirement Benefits	\$5,963,947
Disability Benefits	1,938,436
Preretirement Death Benefits	152,088
Refunds of Contributions	386,790
Vested Withdrawal Benefits	<u>120,977</u>
<b>Total</b>	<b>\$8,562,238</b>

**Actuarial Accrued Liability**

*Actuarial Present Value of Benefits at Attained Age*

	<u>Deferred</u>	<u>In Payment</u>	<u>Active</u>	<u>All</u>
Retirement Benefits	\$14,922,240	\$199,701,534	\$197,178,605	\$411,802,379
Disability Benefits	0	78,775,204	35,250,694	114,025,898
Survivor Benefits	0	33,189,722	0	33,189,722
Preretirement Death Benefits	0	0	2,217,621	2,217,621
Refunds of Contributions	0	0	2,576,476	2,576,476
Vested Withdrawal Benefits	<u>0</u>	<u>0</u>	<u>2,119,575</u>	<u>2,119,575</u>
<b>Total</b>	<b>\$14,922,240</b>	<b>\$311,666,460</b>	<b>\$239,342,971</b>	<b>\$565,931,671</b>

*Actuarial Present Value of Future Normal Costs*

Retirement Benefits	\$57,738,699
Disability Benefits	18,632,423
Preretirement Death Benefits	1,406,422
Refunds of Contributions	3,674,607
Vested Withdrawal Benefits	<u>1,270,692</u>
	<b>\$82,723,113</b>

**Actuarial Accrued Liability** **\$483,208,558**

**Unfunded Actuarial Accrued Liability**

Actuarial Accrued Liability	\$483,208,558
Actuarial Value of Assets	<u>(261,080,152)</u>
<b>Unfunded Actuarial Accrued Liability</b>	<b>\$222,128,406 *</b>

**Funded Ratio** **54.0% \***

\* The unfunded actuarial accrued liability based on the market value of assets is \$227,203,940 and the funded ratio based on the market value of assets is 53.0%.

**Table 2: Actuarial Experience (Gain) Loss Determination**

**Reconciliation of Funded Status**

Unfunded Actuarial Accrued Liability as of January 1, 2015			\$199,805,635
	<b>2015</b>	<b>2016</b>	
Normal Cost Assumed	\$7,954,865	\$8,250,448	16,205,313
Assumed Admin Expenses	813,906	850,532	1,664,438
Interest Charged at Valuation Rate			33,141,965
Contributions Made			
- Municipality	\$11,830,762	\$14,602,451	
- State Aid Allocated	6,845,778	7,340,656	
- Employees	<u>3,522,891</u>	<u>3,609,255</u>	\$(47,751,792)
Interest Credited at Valuation Rate			(2,906,223)
Special Adjustment Because of Higher Act 82 Interest Rate			<u>(31,453,124)</u>
Expected Unfunded Actuarial Accrued Liability Before Adjustments			\$168,706,212
Experience from Investment Return			
- Comparative Interest Rate Amortization Tab. (Gain) Loss		\$31,453,124	
- Other Investment Return (Gain) Loss		<u>5,037,981</u>	36,491,105
Experience (Gain) Loss from all Other Sources			(4,136,490)
Increase (Decrease) in Unfunded Actuarial Accrued Liability			
- Benefit Modifications for Actives		\$ 0	
- Benefit Modifications for Retirees		0	
- Changes in Actuarial Asset Valuation Method		0	
- Changes in Actuarial Assumptions		<u>21,067,579</u>	<u>21,067,579</u>
Actual Unfunded Actuarial Accrued Liability			<u>\$222,128,406</u>

**Loss (Gain) to be Amortized**

Experience (Gain) Loss from January 1, 2015		\$ 32,354,615
Actuarially Required Contributions with Interest	\$16,184,547	
Actual Contributions with Interest	<u>(50,658,015)</u>	
Contribution (Gain) Loss		<u>(34,473,468)</u>
Loss (Gain) to be Amortized		\$ (2,118,853)

**Comparative Interest Rate Amortization Tabulation**

<i>Balance Calculated Using Actual Investment Return</i>	<b>2015</b>	<b>2016</b>	
Act 82 Amortization Balance at January 1	\$345,473,260	\$366,864,308	
Act 82 Amortization Payment	<u>7,746,181</u>	<u>7,746,181</u>	
Comparative Interest Rate Balance at January 1	\$353,219,441	\$374,610,489	
Actual Investment Return on Balance	<u>13,644,867</u>	<u>29,852,710</u>	
Actual Act 82 Amort. Balance at December 31	\$366,864,308	\$404,463,199	\$404,463,199

<i>Balance Calculated Using 10 Percent Investment Return</i>			
Comparative Interest Rate Balance at January 1	\$353,219,441	\$396,287,566	
Interest at 10 Percent	<u>35,321,944</u>	<u>39,628,757</u>	
Comparative Act 82 Amort. Bal. at December 31	\$388,541,385	\$435,916,323	\$435,916,323

*Comparative Interest Rate Amortization Tabulation (Gain) Loss* \$ 31,453,124

**Table 2b: Analysis of Change in Unfunded Actuarial Accrued Liability**

**Reconciliation of Funded Status – Without Regard to Act 82**

Unfunded Actuarial Accrued Liability as of January 1, 2015			\$199,805,635
	<b>2015</b>	<b>2016</b>	
Normal Cost Assumed	\$7,954,865	\$8,250,448	16,205,313
Assumed Admin Expenses	813,906	850,532	1,664,438
Interest Charged at Valuation Rate			33,141,965
Contributions Made			
- Municipality	\$11,830,762	\$14,602,451	
- State Aid Allocated	6,845,778	7,340,656	
- Employees	<u>3,522,891</u>	<u>3,609,255</u>	
			\$(47,751,792)
Interest Credited at Valuation Rate			<u>(2,906,223)</u>
Expected Unfunded Actuarial Accrued Liability Before Adjustments			\$200,159,336
Change in Unfunded Actuarial Accrued Liability due to			
Experience (Gain) Loss			
- from Investment Return		\$5,037,981	
- from all Other Sources		<u>(4,136,490)</u>	901,491
Benefit Modifications for Actives			0
Benefit Modifications for Retirees			0
Changes in Actuarial Assumptions			<u>21,067,579</u>
Actual Unfunded Actuarial Accrued Liability			<u>\$222,128,406</u>
<b>Loss (Gain) to be Amortized</b>			
Experience Loss (Gain)			\$ 901,491
Actuarially Required Contributions with Interest		\$59,586,838	
Actual Contributions with Interest		<u>(50,658,015)</u>	
Contribution (Gain) Loss			<u>8,928,823</u>
Loss (Gain) to be Amortized			\$ 9,830,314

**Table 3: Amortization of Unfunded Actuarial Accrued Liability**

Source	Original Amount	Year Est.	Target Year	Remaining Balance	Remaining Payments	Annual Amount
<b>Initial</b>	\$131,617,548	1998	2037	\$211,926,787	21	\$7,746,181
<b>Assumption Change</b>	\$(2,912,234)	1998	2017	\$(279,771)	1	\$(279,771)
<b>Assumption Change</b>	597,864	2002	2021	244,841	5	56,050
<b>Investment Loss</b>	18,838,751	2002	2032	14,341,916	16	1,439,110
<b>Assumption Change</b>	(4,706,925)	2003	2022	(2,226,056)	6	(438,814)
<b>Experience Loss</b>	7,363,935	2003	2017	801,155	1	801,155
<b>Investment Loss</b>	26,217,850	2003	2032	20,663,385	16	2,073,425
<b>Assumption Change</b>	(369,251)	2005	2024	(216,252)	8	(34,095)
<b>Experience Loss</b>	14,390,731	2005	2019	4,337,364	3	1,548,079
<b>Experience Gain</b>	(542,011)	2007	2021	(252,010)	5	(57,692)
<b>Assumption Change</b>	(544,220)	2009	2028	(415,159)	12	(49,387)
<b>Experience Loss</b>	40,957,810	2009	2028	31,244,659	12	3,716,868
<b>Assumption Change</b>	(3,468,835)	2011	2025	(2,514,476)	9	(363,685)
<b>Experience Gain</b>	(124,186,299)	2011	2030	(103,679,977)	14	(11,220,176)
<b>Assumption Change</b>	41,759,441	2013	2027	34,607,894	11	4,356,960
<b>Experience Gain</b>	(11,222,672)	2013	2032	(10,063,487)	16	(1,009,800)
<b>Experience Loss</b>	4,893,338	2015	2034	4,658,867	18	439,665
<b>Agg. Changes through Last Valuation</b>	N/A	N/A	N/A	\$(8,747,107)	N/A	\$977,892
<b>Assumption Change</b>	21,067,579	2017	2031	\$21,067,579	15	\$2,190,923
<b>Ben. Mod. - Actives</b>	N/A					
<b>Ben. Mod. - Retired</b>	N/A					
<b>Experience Gain</b>	\$(2,118,853)	2017	2036	\$(2,118,853)	20	\$(190,124)
<b>Agg. Change-2017</b>	N/A	N/A	2031	\$18,948,726	15	\$2,000,799
<b>Aggregate Changes</b>	N/A	N/A	2020	\$10,201,619	4	\$2,978,691
<b>Aggregate</b>	N/A	N/A		\$222,128,406		\$10,724,872

**Details of the Calculation of Act 82 Payment**

Act 82 Unfunded Actuarial Accrued Liability	\$ 131,617,548
40-Year Amortization Payment	\$ 10,972,874
Future Value at end of 40-Year period	\$ 3,771,242,164
Payment to provide the same future value with 10% annual earnings	\$ 7,746,181

**Table 4: Municipal Contributions**

**Required Municipal Contributions (Reflecting Act 82 of 1998)**

The Financial Requirement of the Plan is based on the Normal Cost Percentage and other components shown below. The Normal Cost Percentage is applied to the payroll of the members for the applicable fiscal year.

Normal Cost (Table 1)	\$ 8,562,238
Total Annual Payroll	\$80,950,212
Percentages for Budget	
• Normal Cost (Normal Cost divided by Total Annual Payroll)	10.577%
• Administrative Expense (as a % of Payroll)	1.100%
• Gross Normal Cost	11.577%
Net Amortization Payment (Table 3)	\$10,724,872
Funding Adjustment	\$ 0

**Amortization Payment for Actuarially Recommended Contribution**

See Section One for further explanation of the basis of this recommendation.

Source	Original Amount	Year Est.	Target Year	Remaining Balance	Remaining Payments	Annual Amount
<b>Initial</b>	\$155,241,257	2011	2040	\$144,616,713	24	\$12,015,797
<b>Experience Gain</b>	(3,000,313)	2013	2032	(2,690,410)	16	(269,964)
<b>Assumption Change</b>	41,759,441	2013	2027	34,607,894	11	4,356,960
<b>Experience Loss</b>	15,435,952	2015	2034	14,696,316	18	1,386,915
<b>Experience Loss</b>	9,830,314	2017	2036	9,830,314	20	882,069
<b>Assumption Change</b>	21,067,579	2017	2031	21,067,579	15	2,190,923
<b>Aggregate</b>			2035	\$ 222,128,406	19	\$ 20,562,701

**Table 5: Analysis of Sensitivity to Key Assumptions**

The actual costs of the plan 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 plan.

To highlight the effect of these assumptions, we have calculated the impact on the calculated liabilities and actuarially recommended contribution of a change of 1% 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	\$533,380,081	\$483,208,558	\$440,598,557
Actuarial Value of Assets	<u>(261,080,152)</u>	<u>(261,080,152)</u>	<u>(261,080,152)</u>
Unfunded Actuarial Accrued Liability	\$272,294,929	\$222,128,406	\$179,518,405
Funded Ratio	48.9%	54.0%	59.3%
Normal Cost	\$10,657,854	\$8,562,238	\$6,940,638
Actuarially Recommended Amortization Payment	\$24,166,262	\$20,562,701	\$17,256,993
Estimated Impact on Actuarially Recommended Contribution	\$5,699,177	N/A	(\$4,927,308)

**Retirement Assumption Sensitivity**

	<u>Current Retirement Rates</u>	<u>Double the Current Retirement Rates</u>
Actuarially Accrued Liability	\$ 483,208,558	\$ 504,374,481
Actuarial Value of Assets	<u>(261,080,152)</u>	<u>(261,080,152)</u>
Unfunded Actuarial Accrued Liability	\$ 222,128,406	\$ 243,294,329
Funded Ratio	54.0%	51.8%
Normal Cost	\$8,562,238	\$9,593,952
Actuarially Recommended Amortization Payment	\$20,562,701	\$22,763,851
Estimated Impact on Actuarially Recommended Contribution	N/A	\$3,232,864

## Section Six: Other Measurements

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The Actuarial Accrued Liability (AAL) shown in this valuation is the target asset level based on the Entry Age Normal (EAN) actuarial cost method, which is used for pension funding. The AAL under the EAN cost method is the portion of the liability of projected future benefit payments, which includes future pay increases, attributable to past service. The AAL is typically greater than the present value of accrued benefits (which do not include future pay or service). While the assets are compared against the AAL to measure plan funding progress, it is also worth knowing how your assets compare against accrued benefits.

	<u>01/01/17</u>	<u>01/01/15</u>
<b>Assets at Market Value</b>	<b><u>\$ 256,004,618</u></b>	<b><u>\$ 247,240,380</u></b>
<b>Actuarial Present Value of Vested Benefits</b>		
Retired	\$311,666,460	
Deferred	14,922,240	
Employee Contributions	7,212,168	
Active	<u>98,256,308</u>	
<b>Total</b>	<b><u>\$432,057,176</u></b>	<b><u>\$407,153,245</u></b>
<b>Unfunded Actuarial Present Value of Vested Benefits</b>	<b><u>\$176,052,558</u></b>	<b><u>\$159,912,865</u></b>
<b>Actuarial Present Value of Accrued Benefits</b>		
Retired	\$311,666,460	
Deferred	14,922,240	
Employee Contributions	1,183,752	
Active	<u>133,028,673</u>	
<b>Total</b>	<b><u>\$460,801,125</u></b>	<b><u>\$428,581,448</u></b>
<b>Unfunded Actuarial Present Value of Accrued Benefits</b>	<b><u>\$204,796,507</u></b>	<b><u>\$181,341,068</u></b>



## Alternate Liability Measurement

As mentioned in Section 1, this report was prepared to satisfy the funding and disclosure requirements of Act 205 of 1984. The liabilities shown in this valuation are calculated on a going concern basis, meaning that the pension plan is presumed to continue to operate indefinitely. As such, the interest rate assumption used to value plan liabilities was selected to represent the expected long-term investment return on plan assets.

The results disclosed on this page are provided for informational purposes only and illustrate the liabilities and funding status measured on a terminal basis (rather than going concern basis), which is believed to be more closely associated with a “settlement value” of the plan. However, this is not based on any specific annuity quote and should not be construed as such. The primary differences between this measurement and those made for funding and state reporting purposes are that the benefits valued are only those earned as of the valuation date (accrued and vested benefits) and the interest rate of 3% was selected to approximate a low-risk bond rate which may be representative of annuity pricing as of the valuation date.

<b>Assets at Market Value</b>		<b><u>\$ 256,004,618</u></b>
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<b>Present Value of Vested Benefits (3%)</b>		
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Retired	\$455,808,005	
Deferred	27,354,335	
Active	<u>196,280,168</u>	

<b>Total</b>		<b><u>\$679,442,508</u></b>
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<b>Present Value of Accrued Benefits (3%)</b>		
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Retired	\$455,808,005	
Deferred	27,354,335	
Active	<u>275,137,916</u>	

<b>Total</b>		<b><u>\$758,300,256</u></b>
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## Section Seven: Actuarial Basis of Valuation

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### Actuarial Assumptions: January 1, 2017

#### Economic

Interest Rate 7.25% increase per year

This assumption represents the expected long-term rate of return, including inflation at 3.0%. It is based on the current investment policy of the plan and expected returns for the asset classes. This assumption was first adopted for the January 1, 2017 actuarial valuation report.

Salary Projection 4.50% increase per year  
Merit and Longevity Increases: 1.75% per year  
Inflation: 2.75% increase per year

This assumption represents expectations of future salary increases. Allowance is made not only for base rate changes but also for such factors as merit increases, longevity increases, and promotions, which may occur over a participant's career. This assumption is based on an analysis of past salary increases and expectations of future wage increases and inflation. This assumption is based on recommendations from the January 1, 2017 experience study.

#### Employee Characteristics

Mortality: RP-2000 Mortality Tables, with adjustments to reflect Pension Plan mortality experience as confirmed by experience studies. The adjusted rates are based upon the following:

*Active Participants* RP-2000 Employee Mortality Rates projected with rates derived from the long-range demographic assumptions from the 2015 Social Security Administration's Trustee Report.

*Retired/Term Vested Participants* RP-2000 Healthy Annuitant Mortality rates adjusted by blue collar ratios, projected from 2000 with rates derived from the long-range demographic assumptions from the 2015 Social Security Administration's Trustee Report.

*Disability Retirees* Same as Retired, but with ages set forward three years.

*Surviving Beneficiaries* RP-2000 Healthy Annuitant Rates adjusted by ratios of female beneficiary experience to overall female RP-2000 Healthy Annuitant Mortality Rates (Appendix D of *RP-2000 Mortality Tables Report*), projected from 2000 with rates derived from the long-range demographic assumptions from the 2015 Social Security Administration's Trustee Report.

Sample Base Rates (Rounded):

Age	Active Male Participant	Male Regular Retiree	Male Disabled Retiree	Male Beneficiary
45	0.15%	0.18%	0.21%	0.19%
55	0.30%	0.72%	0.89%	0.82%
65	0.76%	1.66%	2.21%	1.75%
75	N/A	4.31%	5.81%	4.08%
85	N/A	11.51%	15.19%	11.62%

Age	Active Female Participant	Female Regular Retiree	Female Disabled Retiree	Female Beneficiary
45	0.11%	0.14%	0.17%	0.14%
55	0.25%	0.28%	0.44%	0.49%
65	0.58%	1.13%	1.51%	1.35%
75	N/A	3.09%	4.04%	3.03%
85	N/A	8.31%	11.33%	8.12%

Withdrawal

Rates at Sample Ages:

Age	Years of Service				
	0-2	3	4	5	6+
20	5.10%	4.46%	3.82%	3.19%	2.55%
25	4.96%	4.34%	3.72%	3.10%	2.48%
30	4.75%	4.16%	3.56%	2.97%	2.38%
35	4.40%	3.85%	3.30%	2.75%	2.20%
40	3.28%	2.87%	2.46%	2.05%	1.64%
45	1.66%	1.45%	1.24%	1.04%	0.83%
50	0.38%	0.33%	0.28%	0.24%	0.19%
55	0.00%	0.00%	0.00%	0.00%	0.00%

Disablement

Sample rates:

Age	Male	Female
25	0.23%	0.18%
30	0.27%	0.25%
35	0.32%	0.36%
40	0.44%	0.59%
45	0.63%	0.87%
50	1.01%	1.17%
55	1.70%	1.50%
60	2.74%	2.10%

Retirement Age

Percentage of employees eligible for retirement who retire at each age:

Age	Percentage
50	20
51	20
52	12
53	12
54	10
55	10
56	10
57	10
58	10
59	10
60	15
61	10
62	15
63	10
64	20
65	100

Duty Related Mortality

20% of deaths in active service are assumed to be duty related.

Duty Related Disability

50% of disabilities occurring during employment are assumed to occur in the line of duty.

Percentage Married

80% of male participants and 65% of female participants

Spouse Age

Female spouses are assumed to be two years younger than male spouses.

The demographic assumptions were based on the January 1, 2017 Experience Study. They are reasonably related to plan experience and represent best estimates of future plan experience.

## **Actuarial Basis of Valuation: Actuarial Cost Method**

The actuarial costs of this Plan are determined under the Entry Age Normal Actuarial Cost Method as described in Act 205 of 1984. The total contribution (the financial requirements of the Pension Plan) is made up of three components: normal cost, administrative expense and amortization payment or funding adjustment.

### **Normal Cost**

For each active participant covered by the Plan, normal cost is calculated to be the annual contribution necessary to completely fund the participant's pension by the participant's retirement age. Contributions are assumed to begin with the year of employment and to be a constant percentage of the participant's annual pay.

For the Plan, normal cost is expressed as a percentage of the total annual payroll of the participants used in budgeting of required contributions.

### **Administrative Expense**

Estimated annual expense to be incurred by the fund for the contribution year for which the financial requirements are determined.

### **Actuarial Accrued Liability**

Total actuarial present value of all future benefits less the actuarial present value of the future normal costs. The total Unfunded Actuarial Accrued Liability as of the valuation date is the Actuarial Accrued Liability less the total value of all assets owned by the Plan.

### **Amortization Payment**

Sum of the annual level amortization contribution requirements specified by the Act for the applicable portions of the unfunded actuarial accrued liability. The Plan's unfunded actuarial accrued liability was re-established in 1998. In the subsequent years, experience gains and losses, changes in benefit provisions, and changes in valuation assumptions would result in increases or decreases to the unfunded actuarial accrued liability. If the unfunded actuarial accrued liability is negative, the amortization payment is zero and a funding adjustment is created.

## Section Eight: Demographic Summaries

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### Distribution of Active Members by Age and Service

Years of Service											
Age	Number of People in Category										
	1	2	3	4-5	6-10	11-15	16-20	21-25	26-30	30+	Total by Age
<20	0	0	0	0	0	0	0	0	0	0	0
20-24	19	0	0	0	0	0	0	0	0	0	19
25-29	63	39	22	19	6	0	0	0	0	0	149
30-34	24	17	16	24	51	3	0	0	0	0	135
35-39	10	5	2	5	37	30	1	0	0	0	90
40-44	4	4	1	5	22	23	56	2	0	0	117
45-49	2	3	2	0	14	8	45	78	2	0	154
50-54	0	0	0	0	9	4	17	86	32	0	148
55-59	0	0	0	1	1	2	6	29	22	8	69
60-64	0	0	0	1	3	1	3	12	11	12	43
65+	0	0	0	0	0	0	0	1	1	3	5
<b>Total</b>	<b>122</b>	<b>68</b>	<b>43</b>	<b>55</b>	<b>143</b>	<b>71</b>	<b>128</b>	<b>208</b>	<b>68</b>	<b>23</b>	<b>929</b>

### Age Distribution of Deferred Vested Participants

Persons Entitled to Deferred Benefits			
Age Group	Number of People	Total Annual Benefit	Average Annual Benefit
< 30	0	\$ 0.00	\$ 0.00
30-34	0	0.00	0.00
35-39	0	0.00	0.00
40-44	1	33,671.28	33,671.28
45-49	27	921,882.84	34,143.81
50-54	12	392,897.52	32,741.46
55-59	0	0.00	0.00
60-64	0	0.00	0.00
65-69	0	0.00	0.00
70-74	0	0.00	0.00
75-79	0	0.00	0.00
80-84	0	0.00	0.00
85+	0	0.00	0.00
<b>Total</b>	<b>40</b>	<b>\$1,348,451.64</b>	<b>\$33,711.29</b>



## Age Distribution of Retired Participants

Regular Retirements			
Age Group	Number of People	Total Annual Benefit	Average Annual Benefit
< 30	0	\$ 0.00	\$ 0.00
30-34	0	0.00	0.00
35-39	0	0.00	0.00
40-44	0	0.00	0.00
45-49	0	0.00	0.00
50-54	53	1,866,081.00	35,209.08
55-59	79	2,745,403.08	34,751.94
60-64	84	2,966,750.64	35,318.46
65-69	98	3,267,027.84	33,337.02
70-74	125	3,904,262.28	31,234.10
75-79	94	2,742,776.28	29,178.47
80-84	74	1,979,842.44	26,754.63
85+	76	1,427,660.64	18,785.01
<b>Total</b>	<b>683</b>	<b>\$20,899,804.20</b>	<b>\$ 30,600.01</b>

## Age Distribution of Retired Participants

<b>Disability Retirements</b>			
<b>Age Group</b>	<b>Number of People</b>	<b>Total Annual Benefit</b>	<b>Average Annual Benefit</b>
< 30	0	\$ 0.00	\$ 0.00
30-34	0	0.00	0.00
35-39	0	0.00	0.00
40-44	0	0.00	0.00
45-49	23	654,463.92	28,454.95
50-54	42	1,143,363.36	27,222.94
55-59	31	862,201.08	27,812.94
60-64	57	1,455,475.92	25,534.67
65-69	37	935,818.20	25,292.38
70-74	41	1,010,917.92	24,656.53
75-79	45	1,124,754.36	24,994.54
80-84	21	462,027.24	22,001.30
85+	20	398,231.04	19,911.55
<b>Total</b>	<b>317</b>	<b>\$8,047,253.04</b>	<b>\$ 25,385.66</b>

## Age Distribution of Retired Participants

Survivors			
Age Group	Number of People	Total Annual Benefit	Average Annual Benefit
< 30	4	\$31,554.24	\$7,888.56
30-34	0	0.00	0.00
35-39	2	31,582.20	15,791.10
40-44	3	31,961.16	10,653.72
45-49	0	0.00	0.00
50-54	5	79,002.24	15,800.45
55-59	9	137,509.20	15,278.80
60-64	18	222,984.48	12,388.03
65-69	45	518,330.64	11,518.46
70-74	55	615,342.48	11,188.05
75-79	83	827,856.48	9,974.17
80-84	89	828,704.76	9,311.29
85+	157	1,105,891.20	7,043.89
<b>Total</b>	<b>470</b>	<b>\$4,430,719.08</b>	<b>\$ 9,427.06</b>

## Age Distribution of Retired Participants

All Persons Receiving Benefits			
Age Group	Number of People	Total Annual Benefit	Average Annual Benefit
< 30	4	\$31,554.24	\$7,888.56
30-34	0	0.00	0.00
35-39	2	31,582.20	15,791.10
40-44	3	31,961.16	10,653.72
45-49	23	654,463.92	28,454.95
50-54	100	3,088,446.60	30,884.47
55-59	119	3,745,113.36	31,471.54
60-64	159	4,645,211.04	29,215.16
65-69	180	4,721,176.68	26,228.76
70-74	221	5,530,522.68	25,024.99
75-79	222	4,695,387.12	21,150.39
80-84	184	3,270,574.44	17,774.86
85+	253	2,931,782.88	11,588.07
<b>Total</b>	<b>1,470</b>	<b>\$33,377,776.32</b>	<b>\$22,705.97</b>

## Demographic Data as of January 1, 2017

### Changes in Plan Participation for Active Members

Active Members	Number
As of January 1, 2015	856
New Entrants	200
Transfer from Municipal Plan	<u>2</u>
Total	1,058
<b>Separation from Active Service</b>	
Separation with a Deferred Benefit	(16)
Separation without a Deferred Benefit	(40)
Disability	0
Death	(1)
Retirement with a Service Retirement Benefit	<u>(72)</u>
Total Separations	(129)
<b>Data Adjustments</b>	<u>0</u>
Active Members as of January 1, 2017	929

### Changes in Plan Participants for Inactive Members and Survivors

	Deferred Vested Retirees	Regular Retirements	Disability Retirement	Survivors		Total
				Child	Other	
As of January 1, 2015	35	654	340	3	469	1,501
New Benefit Recipients	16	72	0	2	40	130
Death	0	(54)	(23)	0	(43)	(120)
Commencement of Deferred Benefits	(11)	11	0	0	0	0
Other Cessation of Benefits	0	0	0	(1)	0	(1)
Net Data Adjustments	0	0	0	0	0	0
As of January 1, 2017	40	683	317	4	466	1,510

## Section Nine: Plan Assets

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### 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>
<b>Balance as of December 31, 2015</b>		<b>\$663,659,056</b>

## 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

<b>Plan-Specific Contributions</b>	<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>
<b>Total Contributions</b>	<b>\$23,373,302</b>	<b>\$22,972,620</b>	<b>\$18,464,515</b>	<b>\$64,810,437</b>
<b>Plan-Specific Distributions</b>				
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>
<b>Total Distributions</b>	<b>\$34,533,416</b>	<b>\$31,250,876</b>	<b>\$25,630,426</b>	<b>\$91,414,718</b>



## 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>
<b>Balance as of December 31, 2016</b>		<b>\$ 695,429,904</b>

## 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>
<b>Plan-Specific Contributions</b>				
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>
<b>Total Contributions</b>	<b>\$26,710,287</b>	<b>\$25,874,981</b>	<b>\$21,301,906</b>	<b>\$73,887,174</b>
<b>Plan-Specific Distributions</b>				
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>
<b>Total Distributions</b>	<b>\$34,584,952</b>	<b>\$32,665,448</b>	<b>\$26,365,666</b>	<b>\$93,616,066</b>

## 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 one 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

Market Value of Assets at January 1, 2017	\$ 256,004,618
Actuarial Value of Assets at January 1, 2015	\$249,288,242
Contributions During 2015	23,373,302
Disbursements During 2015	(34,912,339)
Interest Credited During 2015	<u>15,603,508</u>
Tabular Smoothing Value of Assets at January 1, 2016	\$253,352,713
Tabular Smoothing Value of Assets at January 1, 2016	\$253,352,713
Contributions During 2016	26,710,287
Disbursements During 2016	(34,933,501)
Interest Credited During 2016	<u>15,950,652</u>
Tabular Smoothing Value of Assets at January 1, 2017	\$261,080,152
Low Limit: 80% of Market Value	\$204,803,694
High Limit: 120% of Market Value	\$307,205,541
Actuarial Value of Assets at January 1, 2017	\$261,080,152

## Section Ten: Supplementary Exhibits for Plans Funded With Pension Bond Proceeds

**Table 6: Unfunded Actuarial Accrued Liability Excluding Assets  
Arising from Pension Bond Proceeds**

<b>Assets Excluding Pension Bond Proceeds</b>		
Assets Excluding Bond Proceeds at January 1, 2015		\$ 119,810,815
<b>Receipts</b>	<b>2015</b>	<b>2016</b>
Employer Contributions	\$ 11,830,762	\$ 14,602,451
Employee Contributions	3,522,891	3,609,255
State Aid	6,845,778	7,340,656
Investment Income	620,008	551,441
Net Appreciation	3,664,614	7,923,904
Pass Through Contributions	<u>1,173,872</u>	<u>1,157,926</u>
Total Receipts		\$62,843,557
<b>Disbursements</b>		
Monthly Benefit Payments	\$32,507,464	\$ 32,652,835
Refund of Employee Contributions	360,726	405,503
Administrative Expenses	730,035	681,226
Pass Through Payments	<u>1,173,872</u>	<u>1,157,926</u>
Total Disbursements		(69,579,587)
<b>Assets Excluding Bond Proceeds at January 1, 2017</b>		<b>\$113,074,785</b>
<b>Development of Actuarial Value of Assets Excluding Bond Proceeds</b>		
Market Value of Assets Excluding Bond Proceeds at January 1, 2017		\$113,074,785
Actuarial Value of Assets Excluding Bond Proceeds at January 1, 2015		\$119,810,815
Contributions During 2015		23,373,302
Disbursements During 2015		(34,772,097)
Interest Credited During 2015		<u>7,191,961</u>
Tabular Smoothing Value of Assets at January 1, 2016		\$115,603,981
Tabular Smoothing Value of Assets at January 1, 2016		\$115,603,981
Contributions During 2016		26,710,287
Disbursements During 2016		(34,807,490)
Interest Credited During 2016		<u>7,001,015</u>
Tabular Smoothing Value of Assets at January 1, 2017		\$114,507,794
Low Limit	80 Percent of Market Value	\$90,459,828
High Limit	120 Percent of Market Value	\$135,689,742
<b>Actuarial Value of Assets Excluding Bond Proceeds at January 1, 2017</b>		<b>\$114,507,794</b>
<b>Unfunded Actuarial Accrued Liability Excluding Assets from Bond Proceeds</b>		
Actuarial Accrued Liability (Table 1)		\$483,208,558
Actuarial Value of Assets Excluding Bond Proceeds at January 1, 2017		<u>(114,507,794)</u>
Adjusted Unfunded Actuarial Accrued Liability		\$368,700,764

**Table 7: Amortization of Unfunded Actuarial Accrued Liability Excluding Assets Arising from Pension Bond Proceeds**

Source	Original Amount	Year Est.	Target Year	Remaining Balance	Remaining Payments	Annual Amount
<b>Initial</b>	\$251,025,283	1998	2037	\$404,193,683	21	\$14,773,769
<b>Assumption Change</b>	\$(2,912,234)	1998	2017	\$(279,771)	1	\$(279,771)
<b>Assumption Change</b>	597,864	2002	2021	244,841	5	56,051
<b>Investment Loss</b>	4,719,077	2002	2032	3,592,628	16	360,495
<b>Assumption Change</b>	(4,706,925)	2003	2022	(2,226,056)	6	(438,814)
<b>Experience Loss</b>	7,791,758	2003	2017	847,700	1	847,700
<b>Investment Loss</b>	5,247,684	2003	2032	4,135,921	16	415,010
<b>Assumption Change</b>	(369,251)	2005	2024	(216,252)	8	(34,095)
<b>Experience Loss</b>	32,464,355	2005	2019	9,784,751	3	3,492,343
<b>Experience Gain</b>	(10,320,889)	2007	2021	(4,798,721)	5	(1,098,563)
<b>Assumption Change</b>	23,816,931	2009	2028	18,168,743	12	2,161,355
<b>Experience Gain</b>	(2,009,753)	2009	2028	(1,533,140)	12	(182,382)
<b>Assumption Change</b>	(3,468,835)	2011	2025	(2,514,476)	9	(363,685)
<b>Experience Gain</b>	(131,931,824)	2011	2030	(110,146,518)	14	(11,919,981)
<b>Assumption Change</b>	41,759,441	2013	2027	34,607,894	11	4,356,960
<b>Experience Gain</b>	(7,566,281)	2013	2032	(6,784,763)	16	(680,803)
<b>Experience Gain</b>	(2,173,601)	2015	2034	(2,069,450)	18	(195,297)
<b>Agg. Changes through Last Valuation</b>	N/A	N/A	N/A	\$(59,186,669)	N/A	\$(3,503,477)
<b>Assumption Change</b>	\$21,067,579	2017	2031	\$21,067,579	15	\$2,190,923
<b>Ben. Mod.-Actives</b>	N/A					
<b>Ben. Mod.-Retired</b>	N/A					
<b>Experience Loss</b>	\$2,626,171	2017	2036	\$2,626,171	20	\$235,645
<b>Agg. Change - 2017</b>	N/A	N/A	2031	\$23,693,750	15	\$2,426,568
<b>Aggregate Changes</b>	N/A	N/A	N/A	\$(35,492,919)	N/A	\$(1,076,909)
<b>Aggregate</b>	N/A	N/A		\$368,700,764		\$13,696,860

**Details of the Calculation of Act 82 Payment**

Act 82 Unfunded Actuarial Accrued Liability	\$ 251,025,283
40-Year Amortization Payment	\$ 20,927,824
Future Value at End of 40-Year Period	\$ 7,192,636,133
Payment to Provide the Same Future Value with 10% Annual Earnings	\$ 14,773,769

**Debt Service Schedule by Plan Year**  
**Pension Bond Issue of March 10, 1998**

	Date of Original Borrowing	Total Principal Borrowed	Total Principal to this Plan	Percentage to this Plan	Date of Refinancing
	3/10/98	\$255,865,000	\$120,512,415.10	47.6%	N/A
Plan Year	Req. Prin.Pymt.	Req.Int.Pymt.	Annual Debt Service	Disc.Amort.	Prin.Balance at Val Date
1998		\$3,921,658.75	\$3,921,658.75	\$ 0	\$120,512,415.10
1999	\$471,000.00	7,830,011.75	8,301,011.75	0	120,512,415.10
2000	471,000.00	7,803,518.00	8,274,518.00	0	120,041,415.10
2001	471,000.00	7,776,882.95	8,247,882.95	0	119,570,415.10
2002	471,000.00	7,749,753.35	8,220,753.35	0	119,099,415.10
2003	471,000.00	7,722,411.80	8,193,411.80	0	118,628,415.10
2004	471,000.00	7,694,787.65	8,165,787.65	0	118,157,415.10
2005	1,179,855.01	7,645,426.83	8,825,281.84	0	117,686,415.10
2006	1,092,720.01	7,576,976.41	8,669,696.42	0	116,506,560.09
2007	1,158,660.01	7,508,582.50	8,667,242.51	0	115,413,840.08
2008	1,208,115.01	7,436,244.85	8,644,359.86	0	114,255,180.07
2009	1,304,670.00	7,353,582.89	8,658,252.89	0	113,047,065.06
2010	1,417,710.00	7,263,616.00	8,681,326.00	0	111,742,395.06
2011	1,521,330.00	7,171,771.00	8,693,101.00	0	110,324,685.06
2012	3,716,190.01	7,007,169.44	10,723,359.45	0	108,803,355.06
2013	5,173,935.00	6,725,837.03	11,899,772.03	0	105,087,165.05
2014	5,505,990.01	6,382,619.91	11,888,609.92	0	99,913,230.05
2015	5,988,765.01	6,009,040.37	11,997,805.38	0	94,407,240.04
2016	6,386,760.00	5,606,835.82	11,993,595.82	0	88,418,475.03
2017	8,593,395.01	5,119,980.78	13,713,375.79	0	82,031,715.03
2018	6,233,685.01	4,638,100.67	10,871,785.68	0	73,438,320.02
2019	9,434,130.01	4,124,179.63	13,558,309.64	0	67,204,635.01
2020	10,079,400.01	3,480,233.14	13,559,633.15	0	57,770,505.00
2021	10,767,060.01	2,792,299.96	13,559,359.97	0	47,691,104.99
2022	11,504,175.00	2,057,349.21	13,561,524.21	0	36,924,044.98
2023	12,290,744.99	1,272,116.86	13,562,861.85	0	25,419,869.98
2024	13,129,124.99	433,261.15	13,562,386.14	0	13,129,124.99

## Section Eleven: Glossary

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### **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 except for certain temporary periods for which an expanded corridor of between 70 and 130 percent of the fair market value applies.

**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 formula 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.