PENSION PLAN PROJECTIONS

May 6, 2014

CITY OF MEMPHIS

Segal Consulting

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Introduction and Purpose

- Segal Consulting was retained by the City of Memphis City Council in March 2014 to provide advice and guidance as the City evaluates its retirement plans.
- The City Council Budget Committee held a meeting on March 4, 2014 to discuss areas of disagreement between the current assumptions and issues raised by the Fire actuary. The primary points of disagreement centered around the discount rate, actuarial value of assets methodology and salary growth assumption.
- Segal requested eight items on March 7, 2014 to analyze plan experience, provide recommendations on assumptions and help the City quantify its Unfunded Liability. The majority of the items were received by late March 2014, with the full experience study provided May 1, 2014.
- Note that the project scope did not include Segal producing a full replication of the City's valuation results. Segal used the age/service charts provided in the most recent valuation report to match the current actuary's results to within reason.
- Segal used the information provided by PriceWaterhouseCoopers (PwC), the Plan's actuary, to estimate the impact of the City's future pension cost under various scenarios.
  - The projections provided by PwC broke down the plan's future cost into the cost for current participants and the cost for new hires based valuation assumptions.
  - Segal analyzed the current assumptions and provided its proposed assumptions based on professional experience and expertise. The impact of the proposed assumptions were estimated by Segal using various actuarial techniques.
- Segal estimated the impact of assumption changes in future years by adjusting the Normal Cost and Actuarial Accrued Liability provided by PwC based on a factor. Therefore, the results may vary from projections produced by the current actuary using the same assumptions.

Assumptions and Methods Summary

- Overall, the assumptions used by PwC in the valuation and projections do not appear to be conservative as evidenced by the approximate 1.5% average loss over the period 2008 through 2013. However, Segal's analysis of the actual experience suggest that actual losses are lower. Further inspection of each assumption lead one to conclude adjustments are appropriate.
- Specifically, we reviewed all plan assumptions and suggest the following modifications:
  - **Salary scale—**change from flat 5.0% increase for all participants to a table with higher increases early in an employee's career, declining over time until reaching the inflation assumption
  - **Payroll growth rate—**change from average 4.0% growth rate implied in projections to payroll growth rate of exactly 3.5%
  - **Mortality assumption—**change from table that reflects mortality improvements fully projected into the future to a table that projects mortality improvements in the future but adjusted for Memphis-area mortality data
  - **Retirement assumption—**change from assuming all participants retire at normal retirement date to table of rates
  - **Percentage married—**change from assuming 90% of Fire/Police are married to assume 80% married like General employees
  - **Actuarial value of assets—**change from method that does not directly recognize investment gains/losses to a method with direct recognition of investment gains/losses
- Note that PwC completed an experience study with recommended assumption changes May 1, 2014. Those changes lowered the Unfunded Actuarial Accrued Liability (UAAL) about $82.0 million and Annual Required Contribution (ARC) about $8.2 million or about 2.7% of pay.
- Segal has suggested some additional assumption changes that we estimate will lower the UAAL about an additional $160.2 million and ARC about an additional $18.5 million. The support for each suggested assumption change is provided on the following pages.

Salary and Payroll Growth

Assumption	Current	Recommended	Commentary
Salary scale	5.00% for all ages and years of service	Rates based on service and age with "ultimate" rate after 5 years (i.e., Select-and-ultimate salary scale proposed in March 5, 2014 PwC study, with ultimate rate equal 3.50%)	• Current assumption underestimates pay increases for younger/more recently hired employees and overestimates pay increases for older/tenured employees, with a net tendency to overstate liabilities • **Recommendation:** Adopt Select-and-ultimate salary scale proposed in March 5, 2014 PwC study • Impact of adopting proposed tables results in a decrease in liability of about $67.5 million and annual cost of about $10.8 million or about 3.5% of pay*
Payroll growth	Approximately 4% • Resulting from the following sub-assumptions: – 5.00%, reduced by turnover for *current employees* – 5.00%, without reduction for turnover for *future hires*	3.50% (equal to ~Segal inflation assumption)	• The contribution requirements calculated using the current assumption are based on a payroll growth rate which implies that the City's pay rates will grow faster than salaries of Memphis area private employees. • Additionally, this also implies that the City's tax revenues would need to grow faster than inflation to cover payroll expenditures. • **Recommendation:** ~3.5% • Impact of adopting proposed assumption does not impact immediate cost but rather projected cost. Impact primarily felt after about 10 years

* Estimated impact based on all assumption changes; Includes about $51.9 million in liability savings and about $10.7 million in annual cost savings estimated per PwC March 5, 2014 before demographic assumptions changed.

Mortality

Assumption	Current	PwC Proposed	Commentary
Mortality	*General:* Fully Generational RP-2000 Combined Mortality table with Scale AA *F&P*: Fully Generational RP-2000 Combined Mortality table with Blue Collar adjustment Scale AA • RP-2000 with Scale AA life expectancy from age 65 = 20.5 years (or age 85.5)	*General:* Fully Generational RP-2014 Combined Mortality table with Scale MP-2014 *F&P*: Fully Generational RP-2014 Combined Mortality table with Blue Collar adjustment Scale MP-2014 • RP-2014 with Scale MP-2014 life expectancy from age 65 = 22.7 years (or age 87.7) • Proposed table increases overall liability about $66.9 million or about 2.5% and annual cost about $6.5 million or about 2.0%.	• Current assumption within acceptable actuarial standards of practice, but potentially establishes higher than necessary funding/cost based on gap in life expectancy (i.e., longevity) between the City and nationally. • Life expectancy* gap of about 3 years for Memphis-area compared to national average • Memphis-area improvements in life expectancy have lagged national increases** • National life expectancy*: 78.9; ~Memphis-area life expectancy: ~75.8 ❖ State of Mississippi life expectancy*: 75.0; ❖ State of Arkansas life expectancy*: 76.0; ❖ State of Tennessee life expectancy*: 76.3; • **Recommendation:** Adopt recent mortality tables but adjust to fit Plan experience • Impact of adopting proposed tables, but adjusting to reflect experience, results in a decrease in liability of about $92.7 million and annual cost of about $7.7 million from the current table

* Based on life expectancy from birth
** Source: Institute for Health Metrics and Evaluation, 2013

Retirement and Percentage Married

Assumption	Current	PwC Proposed	Commentary
Retirement	*General:* Assumes 100% retire at earliest eligibility (i.e., earliest of age/service: 60/10 or 65/5 or 0/25) *F&P*: Assumes 100% retire at earliest of age 65 with 5 years of service or 25 years)	*General:* rates gender specific, varying by age *F&P*: rates varying by age	• Recently updated Actuarial Standards Of Practice (ASOPs) do not recommended use of single rate • The current contribution requirements are based on every participant retiring at a single point (i.e., ~Normal Retirement date). However, the age-service chart provided in the 2013 valuation report shows that nearly 80% of retirees have 30 or more years of service upon retiring. This suggest that not nearly 100% of participants are retiring at earliest eligibility • **Recommendation:** Adopt suggested changes • The impact of proposed change decreases liability about $99.0 million or about 4.0% and annual cost of about $8.7 million or about 2.8% of pay
Percentage Married and Spousal age difference	*General:* Assumes 80% of males and 50% of females are married *F&P*: Assumes 90% of males and 90% of females are married *Spousal age difference*: Males assumed to be 5 years older than spouses	*General:* Assumes 80% of males and 50% of females are married *F&P*: Assumes 80% of males and 80% of females are married *Spousal age difference*: Males assumed to be 3 years older than spouses	• The contribution requirements are based on a married participant receiving an annuity for their lifetime and 75% continuation to his spouse upon his death. Therefore, the current assumption assumes that 90% of Fire/Police will have a surviving spouse five years younger who receives 75% of their pension. • Typical percentage married assumption is 50% for females and 80% for males. Males typically assumed to be 3 years older than spouses. • **Recommendation:** Adopt suggested changes • The impact of proposed change decreases liability about $8.6 million or about 0.3% and annual cost of about $1.4 million or about 0.5% of pay

Asset Smoothing and Discount Rate

Assumption	Current	PwC Proposed	Commentary
Actuarial Value of Assets	Current method increases actuarial value of assets 7.5% annually as long as within 90% and 110% of market value of assets (i.e., No direct recognition or smoothing of market gains and losses)	Adopt smoothing method that recognizes market value gains and losses over five years Actuarial value of assets is adjusted to not be less than 80% of Market Value of Assets and not more than 120% of Market Value of Assets.	• The current combination of asset method and corridor results in no adjustment of funding requirements based on actual market performance until the difference between actual and expected performance becomes sufficiently large. • The proposed method is one of the most commonly used smoothing methods and recognizes differences between actual and expected (i.e., gains/losses) over a five year schedule • **Recommendation:** Adopt proposed smoothing method that recognized gains/losses over 5 years retroactively • Impact of adopting proposed smoothing method retroactively results in a decrease in Unfunded of about $40.0 million and annual cost of about $3.4 million or about 1.1% of pay
Discount Rate	7.50%	7.50%	• Segal estimates reasonable range of about 7.25% to 8.00% based on capital market assumptions and ~75/25 equity/bond portfolio. • The lower end of the range (7.25%) assumes the plan will have about a 55% chance of meeting or exceeding the return. • NASRA 2014 survey average = 7.72% • **Recommendation:** Remain at 7.50%; 7.75% acceptable

Impact of PwC Proposed Assumptions

The following compares key funding elements as of July 1, 2013 of the City of Memphis's plan under the current and proposed PwC assumptions.

	Valuation Assumptions*	PwC Proposed Assumptions**	Impact of PwC Changes
A. Actuarial Accrued Liability			
1. Inactive Participants	$1,569,000,000	$1,624,900,000	$55,900,000
2. Active Participants	1,024,000,000	926,000,000	(98,000,000)
3. Total	**$2,593,000,000**	**$2,550,900,000**	**($42,100,000)**
B. Unfunded Actuarial Accrued Liability (UAAL)			
4. Actuarial Accrued Liability (AAL)	$2,593,000,000	$2,550,900,000	($42,100,000)
5. Actuarial Value of Assets (AVA)	1,883,800,000	1,923,700,000	(39,900,000)
6. Unfunded Actuarial Accrued Liability	**$709,200,000**	**$627,200,000**	**($82,000,000)**
7a. Funded Ratio – Actuarial Basis [(5) ÷ (4)]	72.6%	75.4%	2.8%
7b. Funded Ratio – Market Value Basis	**78.7%**	**80.0%**	**1.3%**
C. Annual Required Contribution (ARC)			
8. Net Normal Cost	$33,500,000	$32,200,000	($1,300,000)
9. Payment to amortize Unfunded (UAAL)	55,900,000	49,400,000	(6,500,000)
10. Total ARC [(8) + (9), adjusted for timing]	**$96,000,000**	**$87,800,000**	**($8,200,000)**
11. Employer Contribution as % of Payroll	**31.5%**	**28.8%**	**(2.7%)**

* Based on July 1, 2013 valuation report
** Based on PwC May 1, 2014 experience study report

Impact of Segal Suggested Assumption Changes

The following compares key funding elements as of July 1, 2013 of the City of Memphis's plan under the proposed PwC and recommended Segal assumptions.

	PwC Proposed Assumptions**	Segal Recommended Assumptions**	Impact of Changes
A. Actuarial Accrued Liability			
1. Inactive Participants	$1,624,900,000	$1,552,400,000	($72,500,000)
2. Active Participants	926,000,000	838,300,000	(87,700,000)
3. Total	**$2,550,900,000**	**$2,390,700,000**	**($160,200,000)**
B. Unfunded Actuarial Accrued Liability (UAAL)			
4. Actuarial Accrued Liability (AAL)	$2,550,900,000	$2,390,700,000	($160,200,000)
5. Actuarial Value of Assets (AVA)	1,923,700,000	1,923,700,000	----
6. Unfunded Actuarial Accrued Liability	**$627,200,000**	**$467,000,000**	**($160,200,000)**
7a. Funded Ratio – Actuarial Basis [(5) ÷ (4)]	75.4%	80.5%	5.1%
7b. Funded Ratio – Market Value Basis	**80.0%**	**85.3%**	**5.3%**
C. Annual Required Contribution (ARC)			
8. Net Normal Cost	$32,200,000	$29,900,000	($2,300,000)
9. Payment to amortize Unfunded (UAAL)	49,400,000	34,600,000	(14,800,000)
10. Total ARC [(8) + (9), adjusted for timing]	**$87,800,000**	**$69,300,000**	**($18,500,000)**
11. Employer Contribution as % of Payroll	**28.8%**	**22.7%**	**(6.1%)**

* Based on PwC May 1, 2014 experience study report
** Estimated based on approximate changes in liability

Projections Disclosure

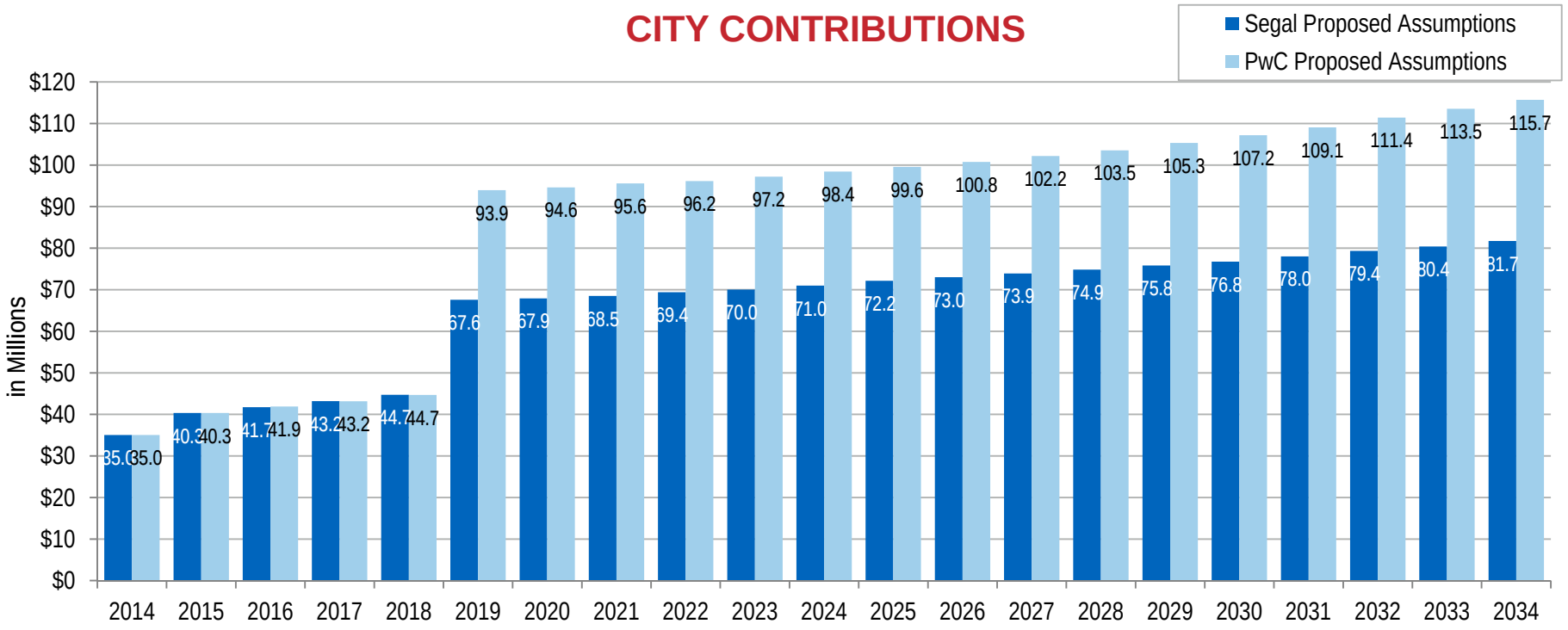
These projections shown in this report are to be used solely for the purpose of comparing alternative designs. These projections are not applicable for other purposes:

- Projections, by their nature, are not a guarantee of future results.
- The modeling of alternatives are intended to serve as estimates of future financial outcomes that are based on the information available at the time the modeling is undertaken, and the agreed-upon assumptions and methodologies described herein.
- Emerging results may differ significantly if the actual experience proves to be different from these assumptions or if alternative methodologies are used.
- Actual experience may differ due to such variables as demographic experience, the economy, stock market performance and the regulatory environment.
- Note that the project scope did not include Segal producing a full replication of the City's valuation results. Segal used the age/service charts provided in the most recent valuation report to match the current actuary's results to within reason.
- Segal used the information provided by PriceWaterhouseCoopers (PwC), the Plan's actuary, to estimate the impact of the City's future pension cost under various scenarios.
- Segal estimated the impact of assumption changes in future years by adjusting the Normal Cost and Actuarial Accrued Liability provided by PwC based on a factor. Therefore, the results may vary from projections produced by the current actuary using the same assumptions.

Projected Cost (in Dollars)
Current Plan

The following are the projected City pension contributions under the current plan.

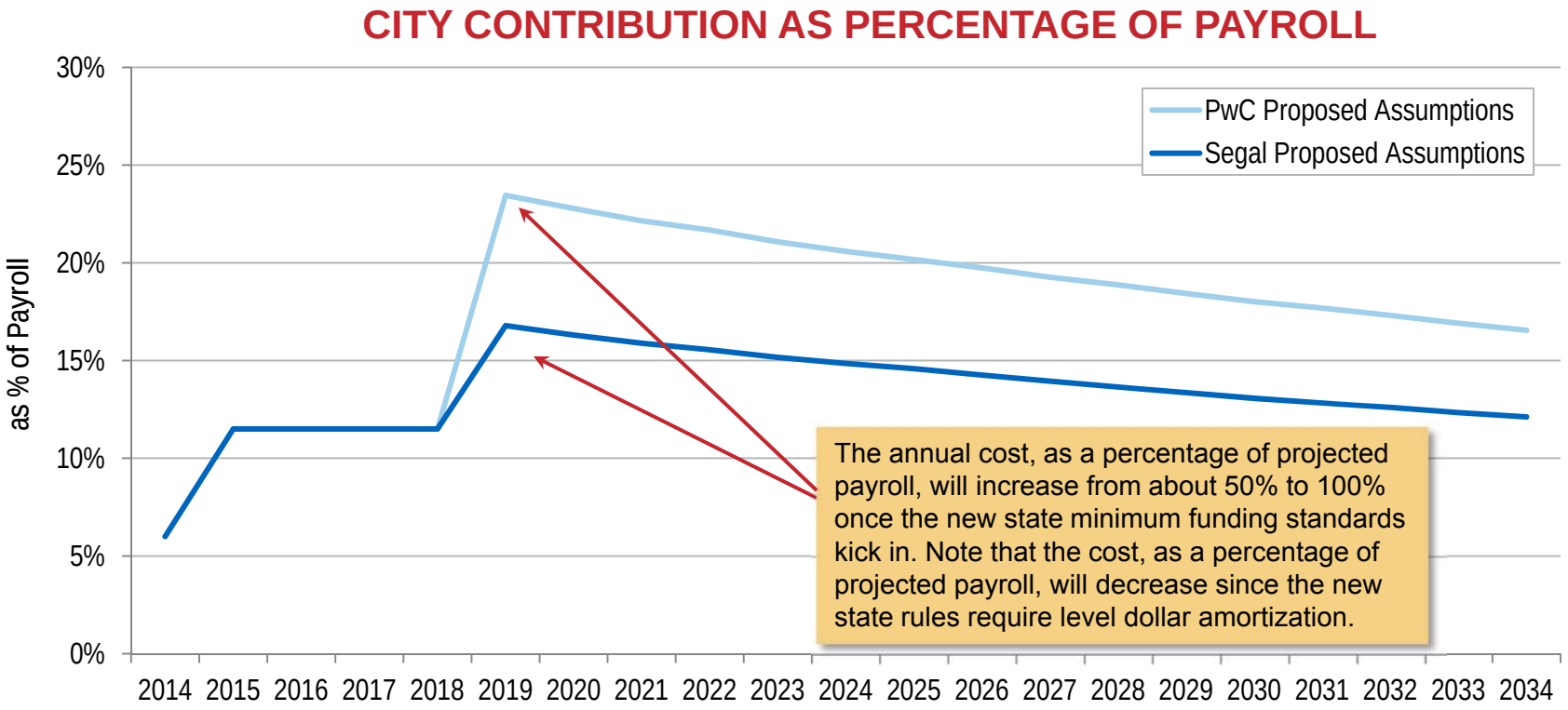
- The projected cost is shown under 2 assumption scenarios ("PwC Proposed" and "Segal Proposed") to highlight the impact of the proposed assumption changes.
- Note that the contributions shown below are based on the current funding policy (i.e., City contributing about 11.5% of pay) for the next 5 years and then contributing the ARC, based on closed 30-year amortization, thereafter.



Projected Cost (as Percentage of Pay)
Current Plan

The following are the projected City pension contributions, as a percentage of payroll, under the current plan.

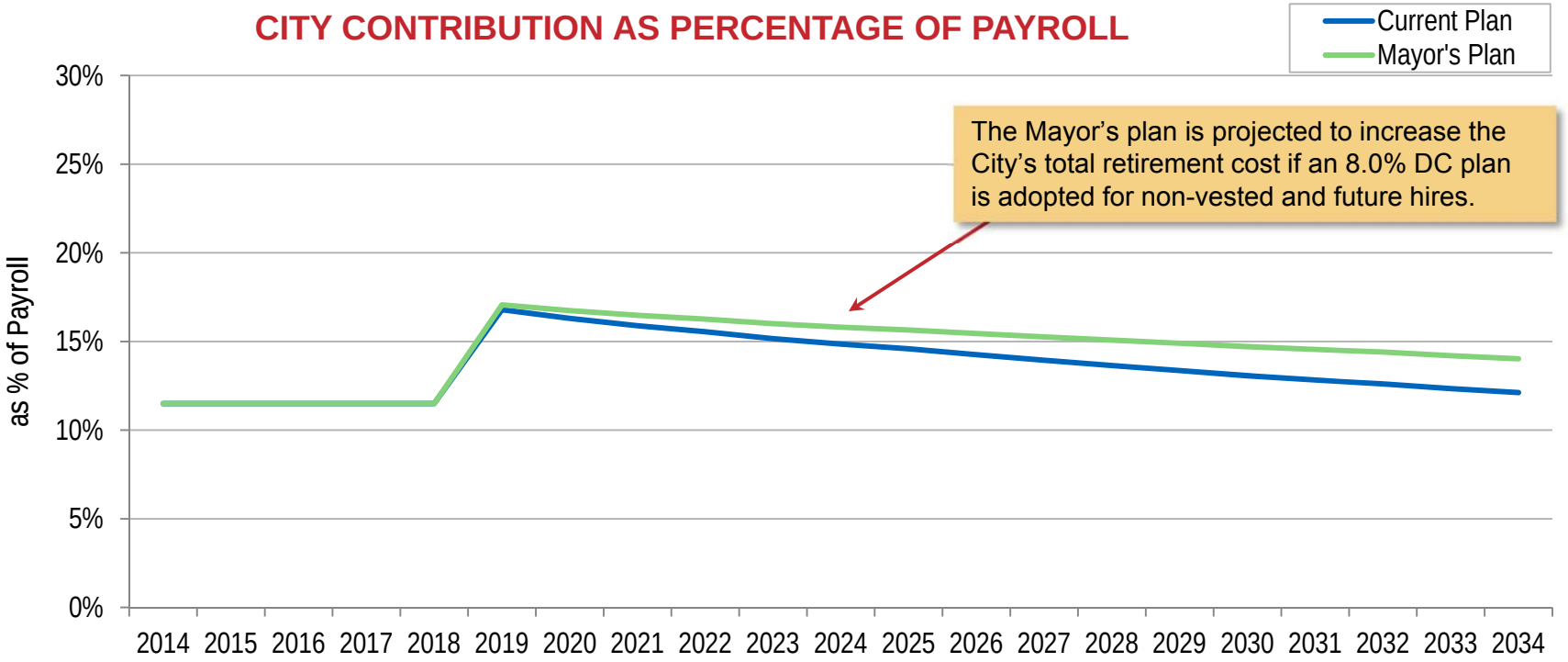
- The projected cost is shown under 2 assumption scenarios ("PwC Proposed" and "Segal Proposed") to highlight the impact of the proposed assumption changes.
- Note that the contributions shown below are based on the current funding policy (i.e., City contributing about 11.5% of pay) for the next 5 years and then contributing the ARC, based on closed 30-year amortization, thereafter.



Projected Cost (as Percentage of Pay)
Mayor's Plan

The following compares the projected City pension contributions, as a percentage of pay, under the proposed assumptions for the current plan against the Mayor's plan.

- The Mayor's plan is based on closing and freezing the Defined Benefit (DB) plan for all future hires and current non-vested participants. Those participants are provided with a 8.0% DC plan going forward.
- Note that the contributions shown below are based on the current funding policy (i.e., City contributing about 11.5% of pay) for the next 5 years and then contributing the ARC, based on closed 30-year amortization, thereafter.



I. Assumptions and Methods Review

II. Projected Impact—City

III. Projected Impact—Employees

IV. Path Forward

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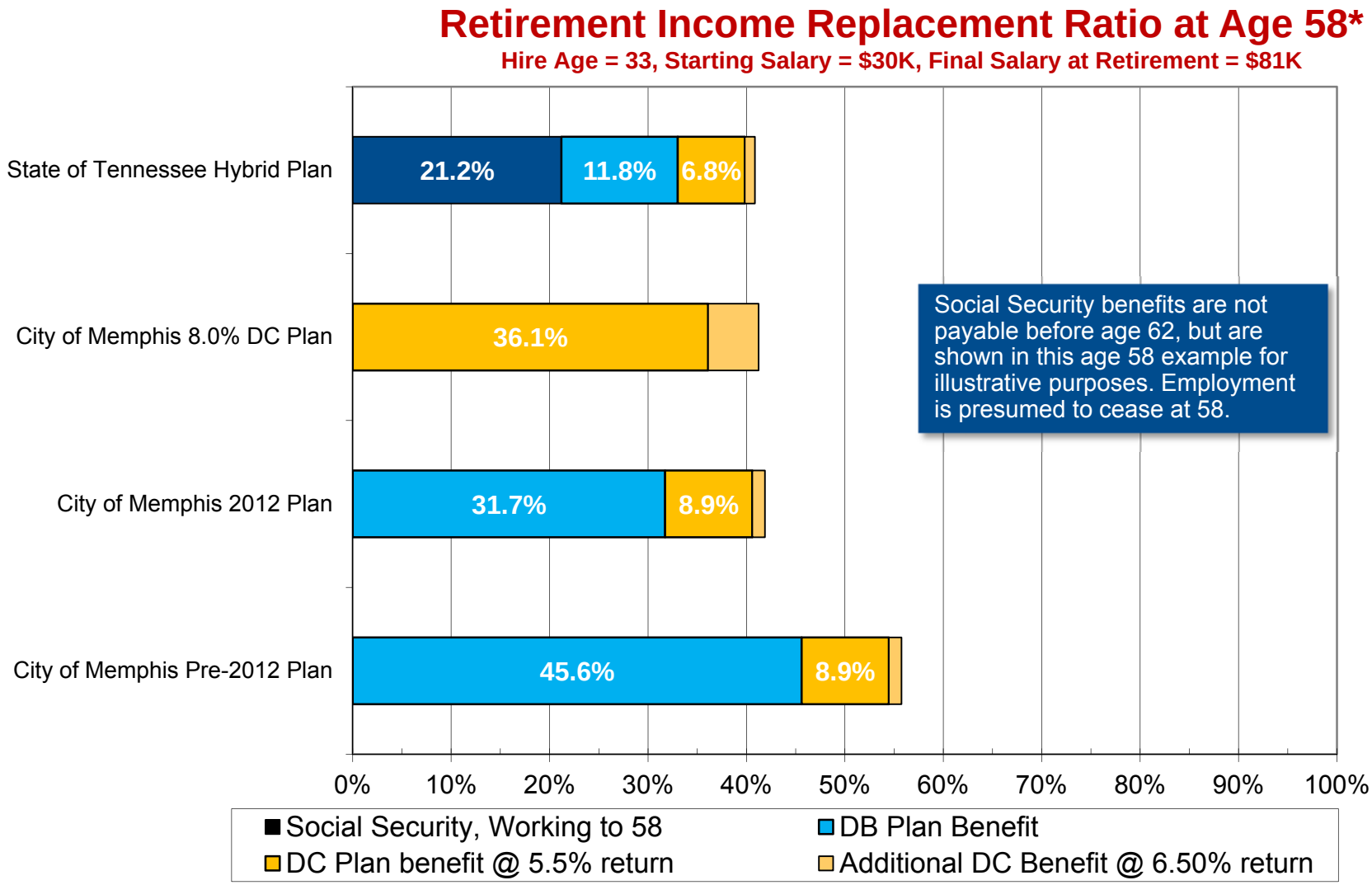
B. Glossary of Terms

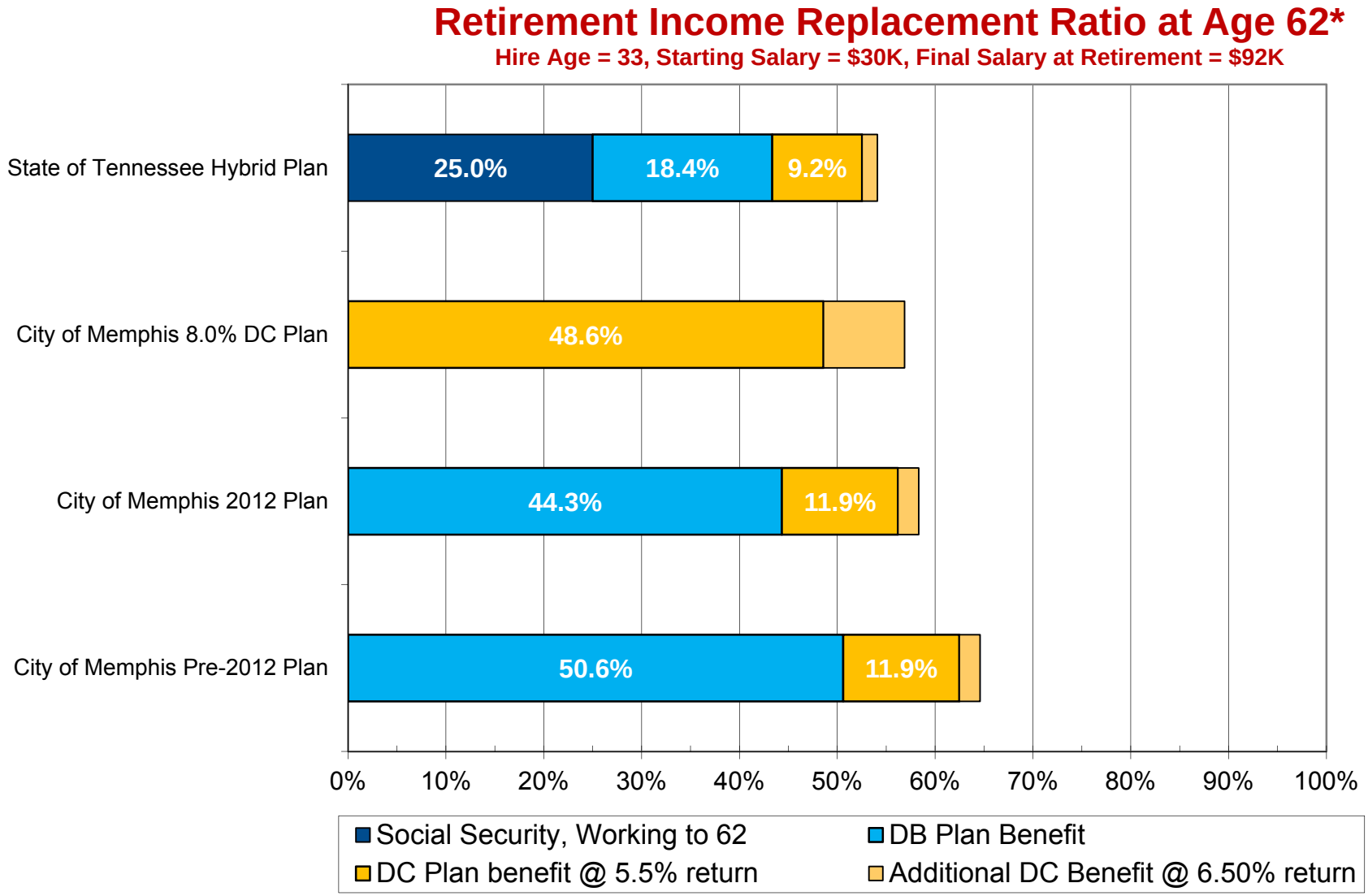
C. Actuarial Assumptions and Methods Overview

Retirement Income Replacement Ratio
Career Employee Retiring at Age 58 after 25 years



* As percentage of final 3-year average salary (~$78K at Age 58)

Retirement Income Replacement Ratio
Career Employee Retiring at Age 62 after 29 years



* As percentage of final 3-year average salary (~$89K at Age 62)

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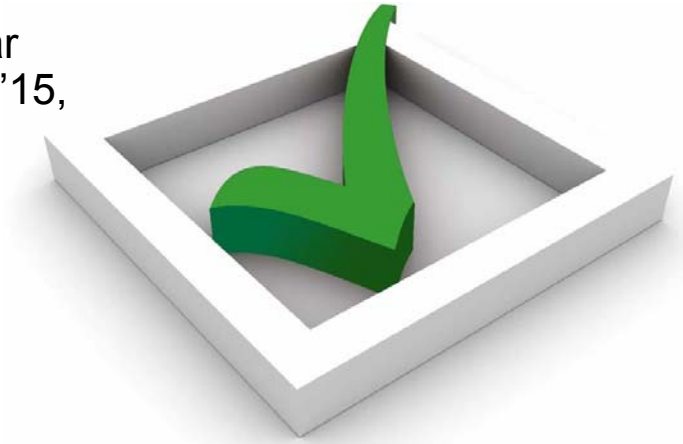
Path Forward

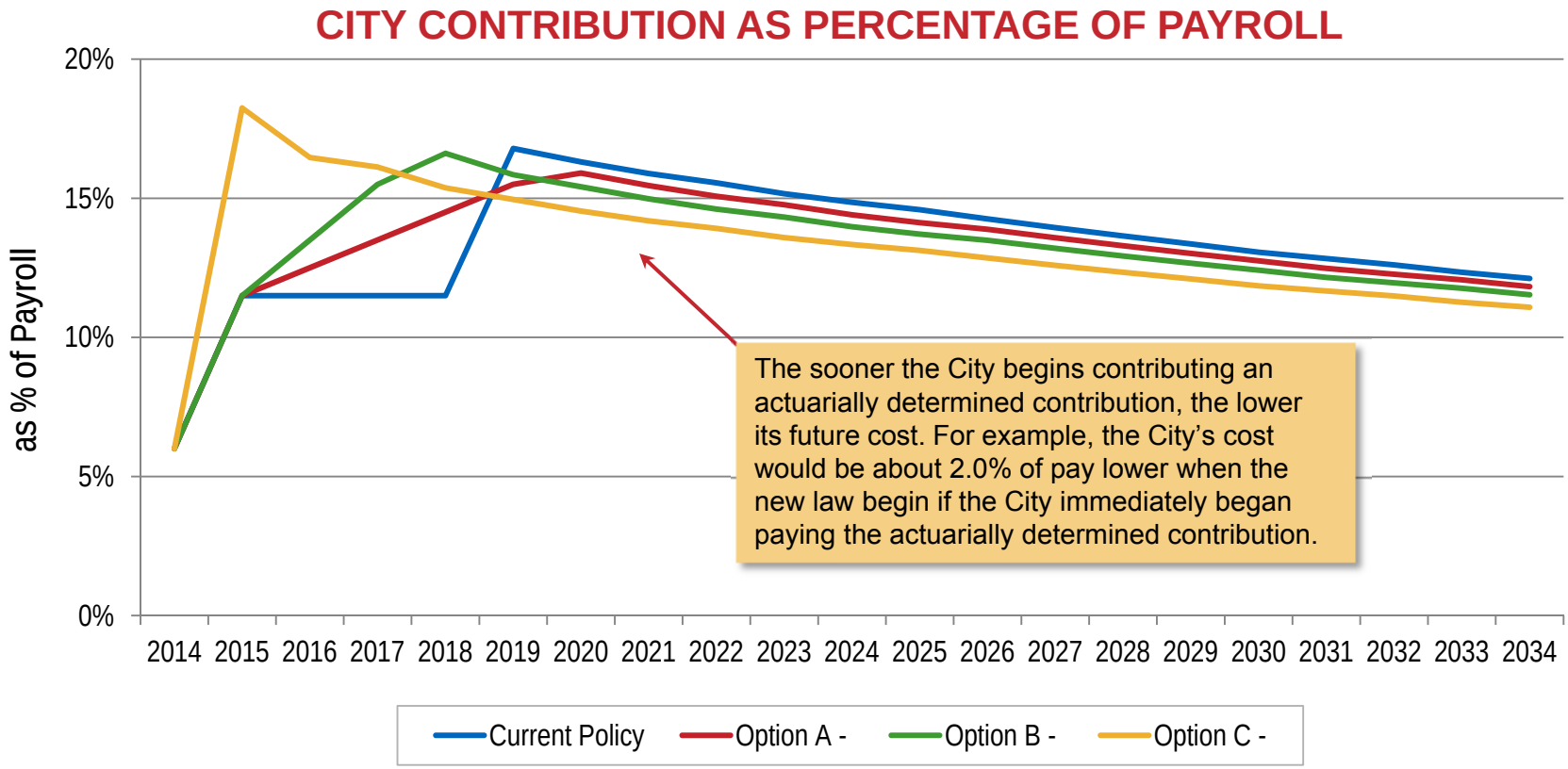
- The projected cost don't assume any changes in funding policy over the next 5 years. However, the City may amend its funding policy to mitigate the significant increase in contribution looming from the recent changes in state pension law.
- The ultimate funding level will depend on the new plan design adopted. However, the interim funding is not as impacted by the plan design. Therefore, we have analyzed the following options to increase the funding of the City.
  - **No Change** – continue to pay ~11.5% of pay for next 5 years, then begin paying ARC based on 30-year level dollar closed amortization
  - **Option A** – increase contribution 1.0% of payroll each year for the next 5 years (i.e., 12.5% of pay contribution for FY '15, 13.5% of pay contribution for FY '16, etc.), then begin paying ARC based on 30-year level dollar closed amortization
  - **Option B** – increase contribution 2.0% of payroll each year for the next 2 years (i.e., 13.5% of pay contribution for FY '15, 15.5% of pay contribution for FY '16), then begin paying ARC based on 32-year level dollar closed amortization (30 years by time new law in effect)
  - **Option C** – begin contributing ARC in FY '15 based on 34-year closed amortization
- The following pages compare the impact on the City



Projected Cost (as Percentage of Pay)
Path Forward

The following compares the projected City pension contributions, as a percentage of pay, under the various *Path Forward* options.

- **Option A** – increase contribution 1.0% of payroll each year for the next 5 years, then begin paying ARC based on 30-year level dollar closed amortization
- **Option B** – increase contribution 2.0% of payroll each year for the next 2 years, then begin paying ARC based on 32-year level dollar closed amortization (30 years by time new law in effect)
- **Option C** – begin contributing ARC in FY ’15 based on 34-year closed amortization



Thank you!

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Assumptions and Methodology
Projections

Projection Methodology:	Segal used the information provided by PriceWaterhouseCoopers (PwC), the Plan's actuary, to estimate the impact of the City's future pension cost under various scenarios. PwC provided a break down the plan's future cost into current participants and new hires based both proposed and valuation assumptions. Segal analyzed the current assumptions and provided its proposed assumptions based on professional experience and expertise. The impact of the proposed assumptions were estimated by Segal using various actuarial techniques. The estimated impact of Segal proposed assumption changes was estimated based on age/service tables provided in the PwC valuation reports
Data:	N/A (based on projections provided by PwC May 1, 2014)
Discount Rate:	7.50% (per July 1, 2013 valuation)
Salary Growth:	Modified PwC May 1, 2014 projections to reflect proposed select-and-ultimate salary table based on March 14, 2014 salary study. Future hires assumed to enter at pay levels needed to fill staffing vacancies, with total staffing costs growing at 3.50%, with salaries after entry determined by proposed Salary Scale.
Annual Investment Return:	7.50%
Market Value of Assets:	$2,040.1 million as of July 1, 2013
Actuarial Value of Assets:	5-year smoothing of investment gains/losses retroactively (currently $1,923.7 million)
Funding Method:	Entry Age Normal

Projections, by their nature, are not a guarantee of future results. They are intended to serve as estimates of future financial outcomes that are based on assumptions about future experience and the information available at the time the modeling is undertaken. The results included in this presentation show how the Plan would be affected if specific sets of assumptions are met. Actual results may differ due to such variables as demographic experience and stock market performance.

Assumptions and Methodology
Replacement Ratios

Employee Contributions	All scenarios assume employees contribute a total of 13.2% of pay toward retirement
Salary Growth	Varies by age/service; per PwC March 18, 2014 proposed
Investment Return	5.50% and 6.50% annual investment return on Defined Contribution (DC) Plan and Personal Retirement Savings
Conversion of DC Balance/Personal Savings to Annual Annuity	Assumes employee balances in Defined Contribution and Savings plans converted to annuity at retirement based on RP-2000 mortality table (blended 50/50) at 1.94% rate
Social Security	An Early Retirement Social Security benefit at age 62 is worth between 25% and 40% of career-average earnings, based on the 2011 OASDI Trustees Report. For purposes of this presentation these numbers were converted from career average to final pay, yielding a range of 19% to 31%. The calculations shown assume 25% replacement.
Other	Replacement ratios are reduced for cost-of-living adjustment (COLA) below 3.0% and normal payment form not being 50% Joint-and-Survivor (J&S) annuity City of Memphis's DB replacement ratios are reduced about 25% for lack of COLA, and increased by about 2.5% for normal form being 75% J&S

Glossary of Terms

Actuarial Accrued Liability (AAL)	The portion of the Present Value of Projected Benefits (PVB) that has been accrued (or earned) to date. AAL is also expressed as difference between PVB and actuarial present value of future normal costs, or the accumulated normal costs attributable to the years before the valuation date.
Annual Required Contribution (ARC)	Sum of Normal Cost (NC) and amortization of Unfunded Actuarial Accrued Liability (UAAL). This is the amount actuarially determined to ensure that, if paid on an ongoing basis, there will be sufficient resources available for future benefit payments.
Normal Cost (NC)	Represents portion of PVB allocated to the current year by the funding method.
Present Value of Projected Benefits (PVB)	Present value of all future benefit payments for current retirees and active employees, taking into account actuarial assumptions including discount rate, Salary growth, turnover, mortality, disability, retirement and other experience.
Unfunded Actuarial Accrued Liability (UAAL)	The difference between the Actuarial Accrued Liability and the Actuarial Value of Assets.

Overview
Types of Actuarial Assumptions

Two types:

- **Demographic Assumptions**—When will benefits be payable? Who will be there to receive benefits? What amount will be payable?
- **Economic Assumptions**—How much will assets grow? How will salaries increase? What is the expectation for long-term inflation?

Economic	Demographic
• Discount rate (Investment rate of return) • Salary increases • Inflation • Payroll growth rate • Administrative expenses • Cost-of-Living Adjustment (COLA)	• Retirement • Withdrawal • Disability • Death in active service • Death after retirement • Percent married • Percentage electing refund of contributions • Percentage electing lump sums

Overview
Types of Actuarial Methods

Choice of these essentially determines funding policy:

Actuarial Cost Method	Amortization of Unfunded
• Entry Age Normal (EAN) • Projected Unit Credit (PUC) • Unit Credit (UC) • Aggregate • Frozen Initial Liability (FIL)	• Level Dollar or Level Percentage Amortization of the Unfunded • Open or Closed Amortization Period • Individual “Bases” or Consolidated Unfunded Liability

Demographic Assumptions
Retirement, Termination, Disability

Rates or Probabilities of "Decrement":

- **Retirement**—Rate at which current employees are expected to retire
  - Typically rates based on age, service or both, with increases around key dates
  - Consider early retirement age (especially if subsidized), any unreduced retirement age, availability of Social Security and retiree health benefits (OPEB)
  - Highest impact on active liability of all demographic assumptions
  - Determines, on average, about 80%–95% of active liability
- **Termination**—Rate at which current employees are expected to leave employment for reasons other than retirement, death or disability
  - Typically rates based on age, service or both
  - Common to see high turnover rates in early years (~20%–30%); lower turnover rates as employees approach vesting
  - Public safety personnel have significantly lower turnover than other positions
  - Determines, on average, about 5%–15% of active liability
- **Disability**—Rate at which current employees are expected to become disabled
  - Once disabled, retiree (or former employee) are typically assumed to have higher mortality rates, except for certain public safety situations
  - Typically one of lowest impacts of all assumptions (except for Public Safety)
  - Determines, on average, about 0%–5% of active liability (depending on definition of disability, rates of occurrence and benefit payable)

Demographic Assumptions
Mortality, Others

Rates or Probabilities of "Decrement":

- **Mortality**—Rate at which current employees and retirees are expected to die:
  - Consider marital status, service retirement versus disability retirement or beneficiary
  - Impacts current employees before and after retirement
  - Impacts both active and retiree liability
  - Typically has one of highest impacts if project generational mortality improvements
- **Percentage Married**—Percentage of current employees with spouses
  - Impacts liability if normal form of payment is not single life annuity (or if other forms are subsidized)
  - Impacts death liability for pre-retirement deaths
- **Percentage of Employees Electing Refund of Contributions**—Rate at which current employees are expected to leave/retire and elect refund of contributions
  - Impacts cash flow (liquidity requirements) primarily
  - May impact liability if employees forfeit future benefit when contributions are withdrawn; otherwise minimal impact
- **Percentage of Employees Electing Lump Sums**—Rate at which current employees are expected to leave/retire and elect lump sum of benefit
  - May impact liability depending on lump sum conversion rate
  - Impacts cash flow (liquidity requirements)
  - Higher assumed percentage leads to lower future deferred vested or retiree liability

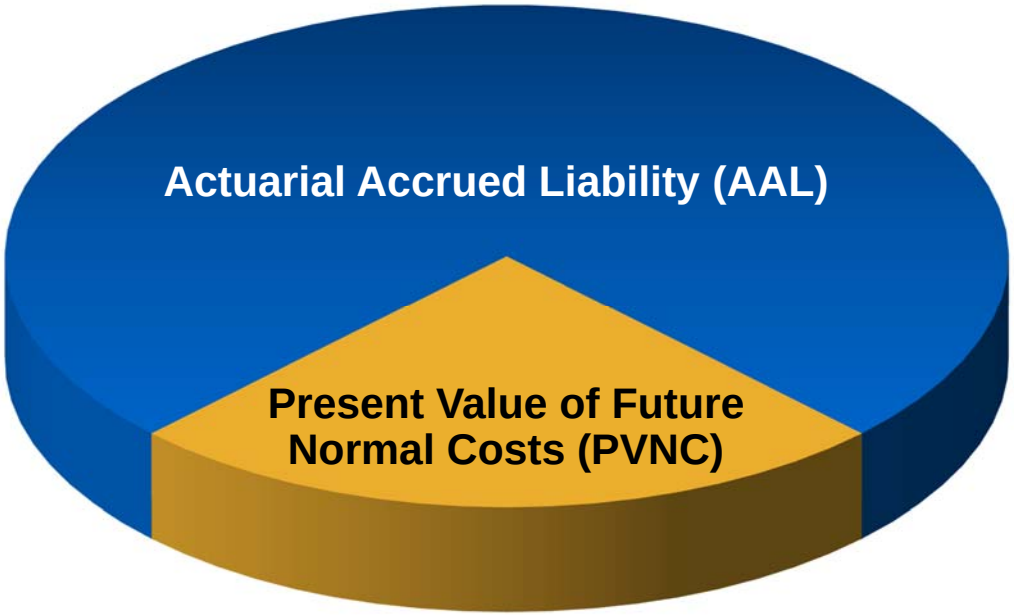
Economic Assumptions
Overview of Impact

- **Discount Rate** (or Investment rate of Return)—Rate used to discount projected cash flows to determine liability
  - Should be based on long-term expected rate of return
  - Impact depends on breakdown between active and retiree liability (greater the proportion of active liability the greater the impact; all things equal)
  - Typically changes active liability about 15%–20%, normal cost about 20%–25% and retiree liability about 8%–12% for a 1% change in discount rate
- **Cost-of-living-adjustment** (COLA)—Rate at which retirees' monthly benefits are expected to increase:
  - Should be based somewhat on long-term inflation expectation
  - Impact depends on breakdown between active and retiree liability (greater the proportion of active liability the greater the impact; all things equal)
  - Typically changes active liability about 7%-10%, normal cost about 10%–12% and retiree liability about 8%–12% for 1% change in COLA
- **Salary Increases or Salary Scale**—Rate at which current employees' salaries are expected to grow
  - Only impacts active liability
  - Impact very dependent on plan demographics
  - Rule of thumb: a 1% change in the long-term salary scale is approximately equivalent to about a 0.5% change in the discount rate on active liability

Actuarial Methods
Actuarial Cost Methods

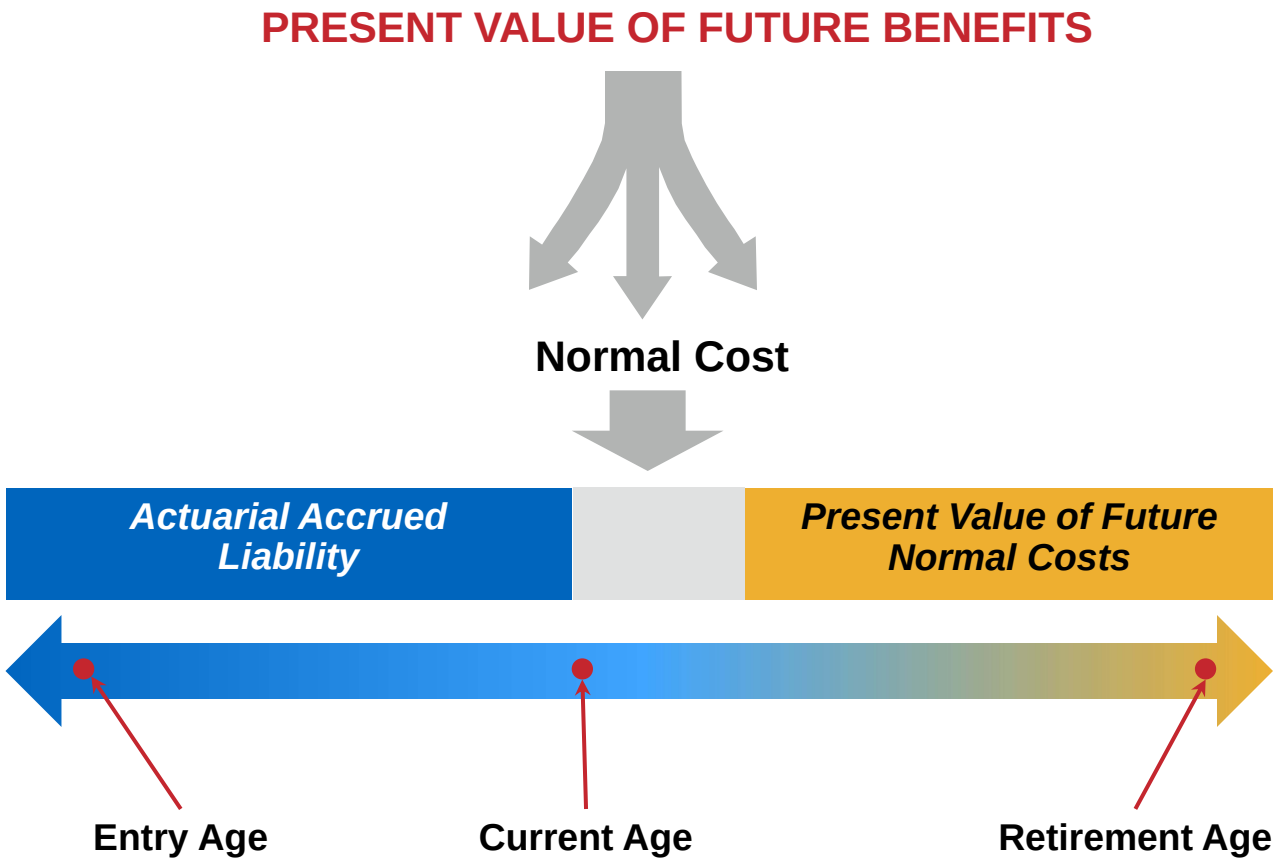
- The **actuarial cost method** is a mechanism to allocate the present value of future benefits (PVB) to time periods (i.e. benefits related to past service vs. future service).
  - The **Present Value of Future Normal Cost** (PVNC) is the portion of the present value of future benefits (PVB) attributable to future service
  - The **Actuarial Accrued Liability (AAL)** is the portion of present value of future benefits (PVB) attributable to past service

PRESENT VALUE OF FUTURE BENEFITS = AAL + PVNC



Actuarial Methods
Actuarial Cost Methods

The actuarial cost method determines the Normal Cost and Actuarial Accrued liability:

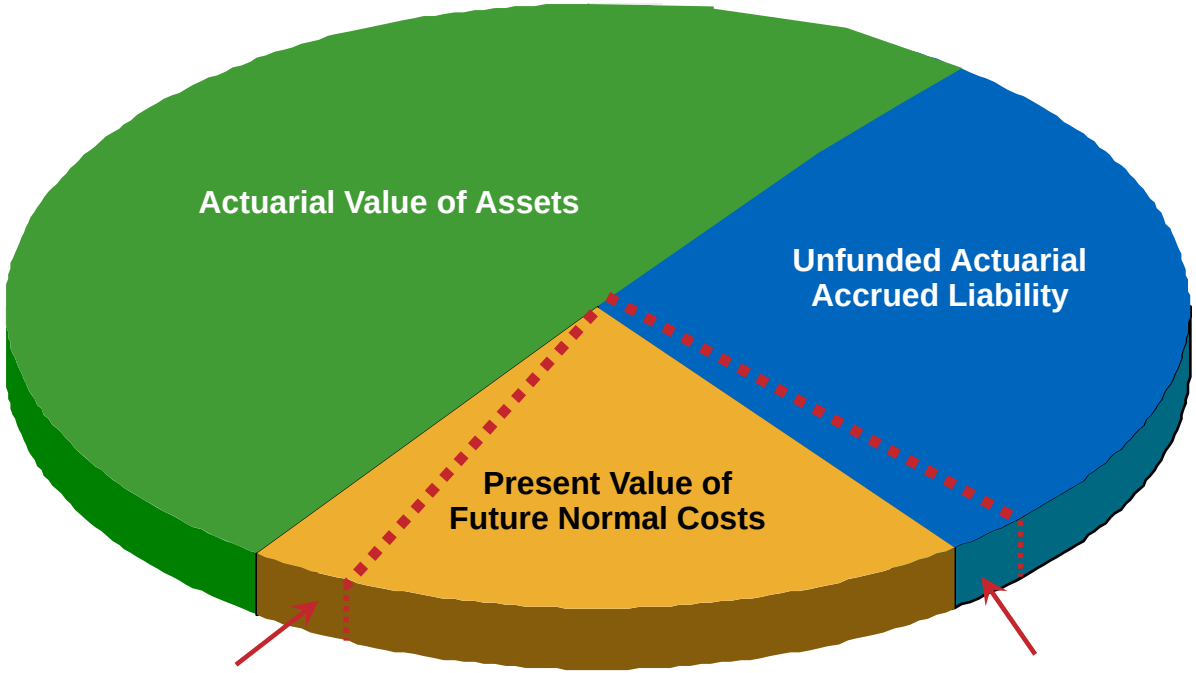


Actuarial Methods
Annual Contribution

Annual Required (Recommended) Contribution (ARC) = Normal Cost (NC) + Amortization of Unfunded Actuarial Accrued Liability (UAAL)

- Normal Cost (NC) = Cost attributable to benefits accruing during upcoming year.
- Unfunded Actuarial Accrued Liability (UAAL) = Assets – Actuarial Accrued Liability (AAL)

PRESENT VALUE OF FUTURE BENEFITS = AAL + PVNC



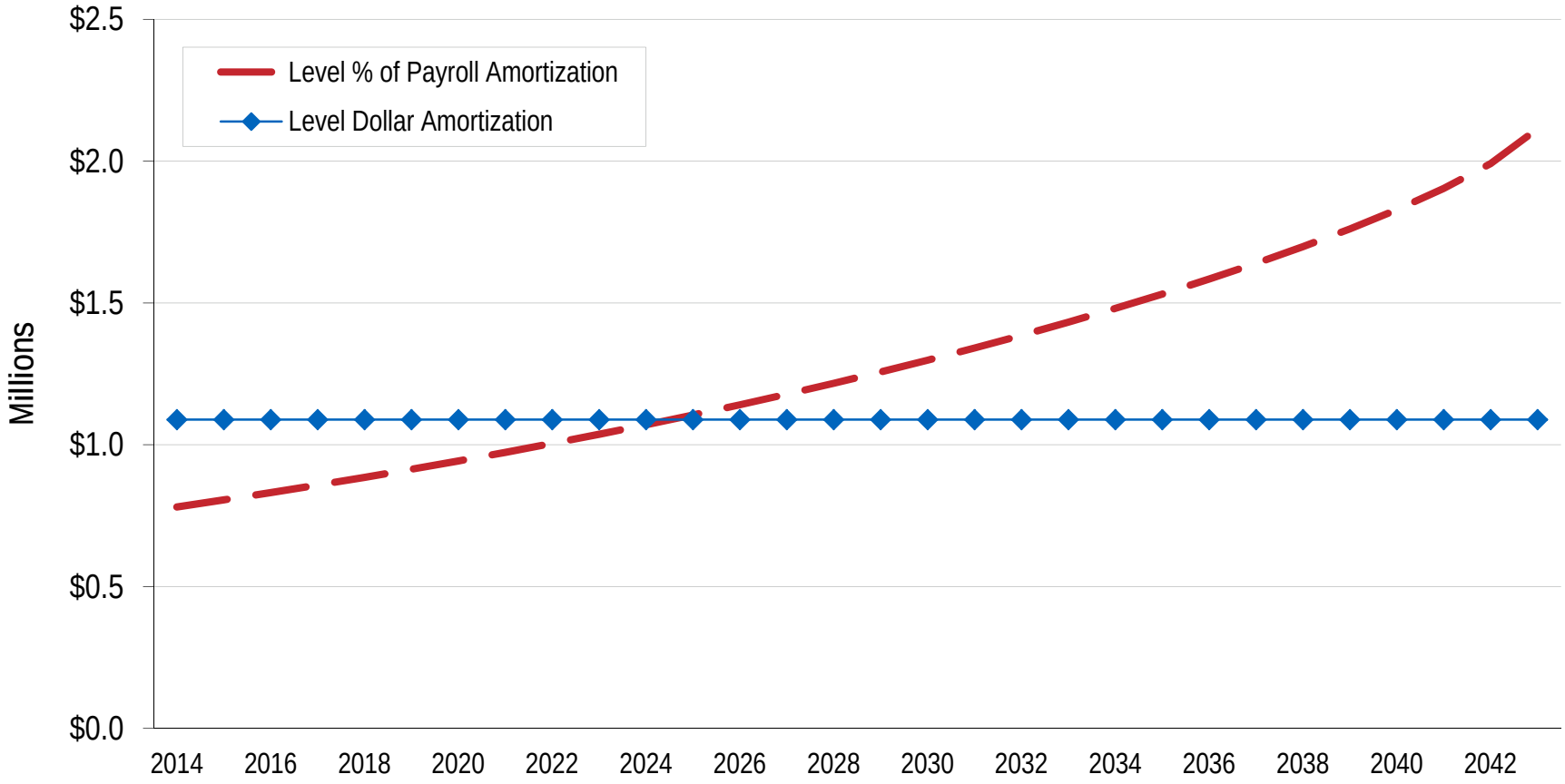
Actuarial Methods
Overview of Impact

- **Actuarial Cost Method**—method used to allocate present value of benefits (PVB) into Actuarial Accrued Liability (AAL) and Normal Cost (NC)
  - Only impacts determination of current employee liability (retiree liability same regardless method)
  - Variation in liability under various methods depends on age and tenure of group
  - May have minimal impact on actual cost but does impact funded percentage
- **Amortization Period**—period to pay down or "amortize" Unfunded Liability
  - Length of period impacts annual cost most significantly
  - Does NOT impact liability, immediate funded percentage or Unfunded liability
  - Period may be "Open" or "Closed"
    - "Open" period will result in lower annual cost (and funded percentage over time)
    - "Open" amortization refinances the Unfunded annually (i.e., never pays off Unfunded unless period is sufficiently short or investment returns higher than expected)
    - "Closed" amortization pays down Unfunded over X years
- **Amortization Method**—method to pay down or "amortize" Unfunded Liability
  - Either Level Dollar (i.e. constant over time if all assumptions met) or Level Percent (i.e., increasing over time such that remains level percentage of payroll)
    - Level Dollar results in higher initial annual cost (and funded percentage over time unless period closed)
    - Level Percent results in lower initial annual cost (and funded percentage over time unless period closed)
    - Level Dollar may result in annual cost that decline as a percentage of pay
  - Choice of methodology impacts annual cost significantly
  - Does NOT impact liability, immediate funded percentage or Unfunded liability

Actuarial Methods

Annual Cost—Level Dollar vs Level Percent Amortization

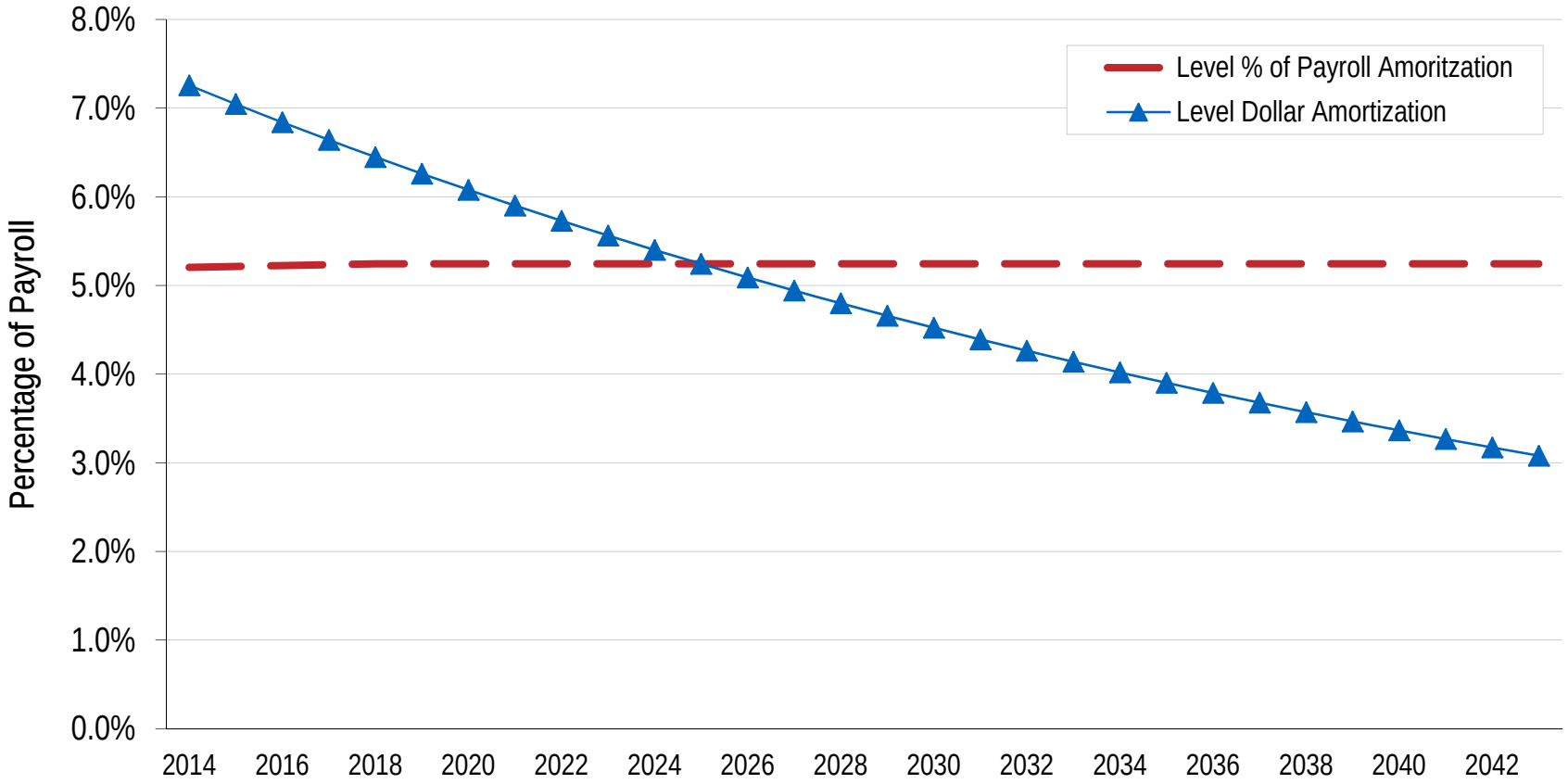
The following highlights the differences in projected Annual Cost, in dollars, between Level Dollar vs. Level Percent amortization.



Actuarial Methods

Annual Cost—Level Dollar vs. Level Percent Amortization

The following highlights the differences in projected Annual Cost, as percentage of payroll, between Level Dollar vs. Level Percent amortization



Actuarial Methods

Unfunded—Level Dollar vs. Level Percent Amortization

The following highlights the differences in projected Unfunded Liability between Level Dollar vs. Level Percent amortization.