Orange County Employees Retirement System

Governmental Accounting Standards Board (GASB) Statement 67
Actuarial Valuation as of December 31, 2018

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May 10, 2019

Board of Retirement
Orange County Employees Retirement System
2223 Wellington Avenue
Santa Ana, CA 92701

Dear Board Members:

We are pleased to submit this Governmental Accounting Standards Board (GASB) Statement 67 Actuarial Valuation as of December 31, 2018. It contains various information that will need to be disclosed in order to comply with GASB Statement 67.

This report was prepared in accordance with generally accepted actuarial principles and practices at the request of the Board to assist in administering the System. The census and financial information on which our calculations were based was prepared by Orange County Employees Retirement System (OCERS). That assistance is gratefully acknowledged.

The measurements shown in this actuarial valuation may not be applicable for other purposes. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period); and changes in plan provisions or applicable law.

The actuarial calculations were completed under the supervision of Andy Yeung, ASA, MAAA, FCA, Enrolled Actuary. We are members of the American Academy of Actuaries and we meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein. To the best of our knowledge, the information supplied in the actuarial valuation is complete and accurate. Further, in our opinion, the assumptions as approved by the Board are reasonably related to the experience of and expectations for the System.

We look forward to reviewing this report with you and to answering any questions.

Sincerely,

Segal Consulting, a Member of The Segal Group, Inc.

By:

Paul Angelo, FSA, MAAA, FCA, EA	*Andy Yeung, ASA, MAAA, FCA, EA*
Senior Vice President and Actuary	*Vice President and Actuary*

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SECTION 1

VALUATION SUMMARY

SECTION 2

GASB STATEMENT 67 INFORMATION

Purpose

This report has been prepared by Segal Consulting to present certain disclosure information required by Governmental Accounting Standards Board (GASB) Statement 67 as of December 31, 2018. This valuation is based on:

- The benefit provisions of OCERS, as administered by the Board of Retirement;
- The characteristics of covered active members, inactive vested members, and retired members and beneficiaries as of December 31, 2017, provided by OCERS;
- The assets of the Plan as of December 31, 2018, provided by OCERS;
- Economic assumptions regarding future salary increases and investment earnings adopted by the Board for the December 31, 2018 valuation; and
- Other actuarial assumptions, regarding employee terminations, retirement, death, etc. adopted by the Board for the December 31, 2018 valuation.

General Observations on GASB 67 Actuarial Valuation

The following points should be considered when reviewing this GASB 67 report:

- The Governmental Accounting Standards Board (GASB) rules only define pension liability and expense for financial reporting purposes, and do not apply to contribution amounts for pension funding purposes. Employers and plans still develop and adopt funding policies under current practices.
- When measuring pension liability GASB uses the same actuarial cost method (Entry Age method) and the same type of discount rate (expected return on assets) as OCERS uses for funding. This means that the Total Pension Liability (TPL) measure for financial reporting shown in this report is determined on generally the same basis as OCERS' Actuarial Accrued Liability (AAL) measure for funding. We note that the same is generally true for the Normal Cost component of the annual plan cost for funding and financial reporting.
- The Net Pension Liability (NPL) is equal to the difference between the TPL and the Plan's Fiduciary Net Position. The Plan's Fiduciary Net Position is equal to the market value of assets and therefore, the NPL measure is very similar to an Unfunded Actuarial Accrued Liability (UAAL) calculated on a market value basis.

- For this report, the reporting dates for the Plan are December 31, 2018 and 2017. The NPL's measured as of December 31, 2018 and 2017 have been determined by rolling forward the TPL as of December 31, 2017 and 2016, respectively. The Plan Fiduciary Net Positions were valued as of the measurement dates. In addition, any changes in actuarial assumptions or plan provisions that occurred between the valuation date and the measurement date have been reflected.

Significant Issues in Valuation Year

The following key findings were the result of this actuarial valuation:

- The NPL increased from $4,952.1 million as of December 31, 2017 to $6,197.2 million as of December 31, 2018 primarily as a result a -2.46%[1] return on the market value of assets during 2018 that was lower than the assumed return of 7.00% of approximately $1,388 million. This loss was offset to some extent by the gains from lower than expected active salary increases and lower than expected retiree COLA increases during 2017 (because liabilities are rolled forward from December 31, 2017 to December 31, 2018, these changes are not reflected until this valuation as of December 31, 2018)[2]. Changes in these values during the last two fiscal years ending December 31, 2018 and December 31, 2017 can be found in Exhibit 3.
- The discount rate used to determine the TPL and NPL as of both December 31, 2018 and 2017 was 7.00% following the same assumption used by the System in the pension funding valuations as of the same dates. The detailed calculation of the discount rate of 7.00% used in the calculation of the TPL and NPL as of December 31, 2018 can be found in Exhibit 5 of Section 2. Various other information that is required to be disclosed can be found throughout Exhibits 1 through 4 in Section 2.
- The Plan's Fiduciary Net Position of $14,801,895,000 as of December 31, 2017 is equal to the final market value of assets in the Pension Trust Fund as of December 31, 2017. This differs from the $14,652,607,000 market value of assets used in our December 31, 2017 funding valuation because the funding valuation excludes $134,417,000 in the

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[1] *As documented in the funding valuation report, return on market value was calculated using a modified dollar-weighted approach based on pension plan assets net of accounting liabilities. Actual investment loss on net pension plan assets was $361,321,000 during 2018 after including both the administrative expenses and discount for prepaid contributions while excluding the losses credited to County Investment Account and O.C. Sanitation District UAAL Deferred Account. Without these adjustments, the actual investment loss was $324,628,000.*

[2] *It should be noted that because of the use of roll forward, any difference between actual and expected COLA increases during 2018 would not be reflected until the next valuation as of December 31, 2019.*

County Investment Account and $14,871,000 in O.C. Sanitation District UAAL Deferred Account (after transfer of $24,042,000 required for O.C. Sanitation District to offset UAAL increase for assumption changes).

The Plan's Fiduciary Net Position of $14,481,680,000 as of December 31, 2018 is equal to the final market value of assets in the Pension Trust Fund as of December 31, 2018. This differs from the $14,349,790,000 market value of assets used in our December 31, 2018 funding valuation because the funding valuation excludes $131,890,000 in the County Investment Account. (The balance in the O.C. Sanitation District UAAL Deferred Account as of December 31, 2018 is $0 after transfer of $14,589,000 to offset a portion of the District's UAAL as of December 31, 2018.)

Summary of Key Valuation Results

	December 31, 2018	December 31, 2017
Disclosure elements for plan year ending December 31:		
Service cost[1]	$491,372,822	$452,412,003
Total Pension Liability	20,678,882,089	19,753,994,401
Plan's Fiduciary Net Position	14,481,680,000	14,801,895,000
Net Pension Liability	6,197,202,089	4,952,099,401
Schedule of contributions for plan year ending December 31:		
Actuarially determined contributions[2],[3]	$556,728,000	$536,726,000
Actual contributions[2],[3]	580,905,000	572,104,000
Contribution deficiency (excess)[4]	(24,177,000)	(35,378,000)
Demographic data for plan year ending December 31:		
Number of retired members and beneficiaries	17,674	16,947
Number of vested terminated members	6,026	5,803
Number of active members	21,929	21,721
Key assumptions as of December 31:		
Investment rate of return	7.00%	7.00%
Inflation rate	2.75%	2.75%
Projected salary increases[5]	General: 4.25% to 12.25% and Safety: 4.75% to 17.25%	General: 4.25% to 12.25% and Safety: 4.75% to 17.25%

[1] *The service cost is based on the previous year's valuation, meaning the 2018 and 2017 values are based on the valuations as of December 31, 2017 and December 31, 2016, respectively. The 2018 service cost has been calculated using the assumptions shown in the December 31, 2017 column and the 2017 service cost has been calculated using the assumptions used in the December 31, 2016 valuation. The key assumptions as of December 31, 2016 are as follows:*

Key assumptions as of December 31, 2016:	
Investment rate of return	7.25%
Inflation rate	3.00%
Projected salary increases*	General: 4.25% to 13.50% and Safety: 5.00% to 17.50%

* Includes inflation at 3.00% plus real across-the-board salary increases of 0.50% plus merit and promotional increases.

[2] *Reduced by discount for prepaid contributions and transfer from County Investment Account, if any.*

[3] *Exclude transfers of $14,589,000 and $24,042,000 from O.C. Sanitation District Deferred UAAL Account required to offset UAAL increase as of December 31, 2018 and December 31, 2017, respectively.*

[4] *Includes additional contributions made by employers toward the reduction of their UAAL. Details are shown in Exhibit 4 of this report.*

[5] *Includes inflation at 2.75% plus real across-the-board salary increases of 0.50% plus merit and promotional increases.*

Important Information about Actuarial Valuations

An actuarial valuation is a budgeting tool with respect to the financing of future projected obligations of a pension plan. It is an estimated forecast – the actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.

In order to prepare an actuarial valuation, Segal Consulting ("Segal") relies on a number of input items. These include:

- **Plan of benefits** Plan provisions define the rules that will be used to determine benefit payments, and those rules, or the interpretation of them, may change over time. It is important to keep Segal informed with respect to plan provisions and administrative procedures, and to review the plan description in this report (as well as the plan summary included in our funding valuation report) to confirm that Segal has correctly interpreted the plan of benefits.
- **Participant data** An actuarial valuation for a plan is based on data provided to the actuary by OCERS. Segal does not audit such data for completeness or accuracy, other than reviewing it for obvious inconsistencies compared to prior data and other information that appears unreasonable. It is important for Segal to receive the best possible data and to be informed about any known incomplete or inaccurate data.
- **Assets** This valuation is based on the market value of assets as of the measurement date, as provided by OCERS.
- **Actuarial assumptions** In preparing an actuarial valuation, Segal projects the benefits to be paid to existing plan participants for the rest of their lives and the lives of their beneficiaries. This projection requires actuarial assumptions as to the probability of death, disability, withdrawal, and retirement of each participant for each year. In addition, the benefits projected to be paid for each of those events in each future year reflect actuarial assumptions as to salary increases and cost-of-living adjustments. The projected benefits are then discounted to a present value, based on the assumed rate of return that is expected to be achieved on the plan's assets. There is a reasonable range for each assumption used in the projection and the results may vary materially based on which assumptions are selected. It is important for any user of an actuarial valuation to understand this concept. Actuarial assumptions are periodically reviewed to ensure that future valuations reflect emerging plan experience. While future changes in actuarial assumptions may have a significant impact on the reported results, that does not mean that the previous assumptions were unreasonable.

The user of Segal's actuarial valuation (or other actuarial calculations) should keep the following in mind:

- The valuation is prepared at the request of the Board to assist OCERS in preparing items related to the pension plan in their financial reports. Segal is not responsible for the use or misuse of its report, particularly by any other party.
- An actuarial valuation is a measurement of the plan's assets and liabilities at a specific date. Accordingly, except where otherwise noted, Segal did not perform an analysis of the potential range of future financial measures. The actual long-term

cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.

- If OCERS is aware of any event or trend that was not considered in this valuation that may materially change the results of the valuation, Segal should be advised, so that we can evaluate it.
- Segal does not provide investment, legal, accounting, or tax advice. Segal’s valuation is based on our understanding of applicable guidance in these areas and of the plan’s provisions, but they may be subject to alternative interpretations. The Board should look to their other advisors for expertise in these areas.

As Segal Consulting has no discretionary authority with respect to the management or assets of OCERS, it is not a fiduciary in its capacity as actuaries and consultants with respect to OCERS.

EXHIBIT 1

General Information – "Financial Statements", Note Disclosures and Required Supplementary Information for a Cost-Sharing Pension Plan

Plan Description

Plan administration. The Orange County Employees Retirement System (OCERS) was established by the County of Orange in 1945. OCERS is administered by the Board of Retirement and governed by the County Employees' Retirement Law of 1937 (California Government Code Section 31450 et. seq.). OCERS is a cost-sharing multiple employer public employee retirement system whose main function is to provide service retirement, disability, death and survivor benefits to the Safety and General members employed by the County of Orange. OCERS also provides retirement benefits to the employee members of the Orange County Courts, the Orange County Retirement System, two cities and thirteen special districts.

The management of OCERS is vested with the Orange County Board of Retirement. The Board consists of nine members and one alternate. The County Treasurer is a member of the Board of Retirement by law. Four members are appointed by the Board of Supervisors, one of whom may be a County Supervisor. Two members are elected by the General membership; one member and one alternate are elected by the Safety membership, one member is elected by the retired members of the System. All members of the Board of Retirement serve terms of three years except for the County Treasurer whose term runs concurrent with the County Treasurer term.

Plan membership. At December 31, 2018, pension plan membership consisted of the following:

Retired members or beneficiaries currently receiving benefits	17,674
Vested terminated members entitled to, but not yet receiving benefits	6,026
Active members	21,929
Total	45,629

Note: Data as of December 31, 2018 is not used in the measurement of the TPL as of December 31, 2018.

Benefits provided. OCERS provides service retirement, disability, death and survivor benefits to eligible employees. All regular full-time employees of the County of Orange or contracting agencies who work a minimum of 20 hours per week become members of OCERS effective on the first day of employment in an eligible position. There are separate retirement plans for General and Safety member employees. Safety membership is extended to those involved in active law enforcement, fire suppression, and certain probation officers. Any new Safety member who becomes a member on or after January 1, 2013 is designated PEPRA Safety and is subject to the provisions of California Public Employees' Pension Reform Act of 2013 (PEPRA), California Government Code 7522 et seq. All other employees are classified as General members. New General members employed on or after January 1, 2013 are designated as PEPRA General subject to the provisions of California Government Code 7522 et. seq.

General members hired prior to January 1, 2013, including all members of Plan T and Plan W hired on or after January 1, 2013, are eligible to retire once they attain the age of 50 and have acquired ten or more years of retirement service credit. A member with thirty years of service is eligible to retire regardless of age. General members who are first hired on or after January 1, 2013, excluding members of Plan T and Plan W, are eligible to retire once they have attained the age of 52, and have acquired five years of retirement service credit.

Safety members hired prior to January 1, 2013, are eligible to retire once they attain the age of 50 and have acquired ten or more years of retirement service credit. A member with twenty years of service is eligible to retire regardless of age. Safety members who are first hired on or after January 1, 2013, are eligible to retire once they have attained the age of 50, and have acquired five years of retirement service credit.

All General and Safety members can also retire at the age of 70 regardless of service.

The retirement benefit the member will receive is based upon age at retirement, final average compensation, years of retirement service credit and retirement plan and tier.

General member benefits are calculated pursuant to the provisions of Sections 31676.01, 31676.1, 31676.12, 31676.16, 31676.18 or 31676.19. For Section 31676.01, the monthly allowance is equal to 1/90th of final compensation times years of accrued retirement service credit times age factor from that Section. For Section 31676.1, the monthly allowance is equal to 1/60th of final compensation times years of accrued retirement service credit times age factor from that Section. For Sections 31676.12, 31676.16, 31676.18 or 31676.19, the monthly allowance is equal to 1/50th of final compensation times years of accrued retirement service credit times age factor from the corresponding Section. General member benefits for those who are first hired on or after January 1, 2013, excluding members of Plan T and Plan W, are calculated pursuant to the provision of California Government Code Section 7522.20(a). The monthly allowance is equal to the final compensation multiplied by years of accrued retirement credit multiplied by the age factor from Section 7522.20(a).

Safety member benefits are calculated pursuant to the provisions of California Government Code Sections 31664.1 and 31664.2. The monthly allowance is equal to 3% of final compensation times years of accrued retirement service credit times age factor from the corresponding Section. Safety member benefits for those who are first hired on or after January 1, 2013, are calculated pursuant to the provision of California Government Code Section 7522.25(d). The monthly allowance is equal to the final compensation multiplied by years of accrued retirement credit multiplied by the age factor from Section 7522.25(d).

For members with membership dates before January 1, 2013, including all members of Plan T and Plan W hired on or after January 1, 2013, the maximum monthly retirement allowance is 100% of final compensation. There is no maximum for members with membership dates on or after January 1, 2013, excluding members of Plan T and Plan W.

Final average compensation consists of the highest 12 consecutive months for a General Tier 1 or Safety Tier 1 member and the highest 36 consecutive months for a General Tier 2, General PEPRA, Safety Tier 2 or Safety PEPRA member.

The member may elect an unmodified retirement allowance, or choose an optional retirement allowance. The unmodified retirement allowance provides the highest monthly benefit and a 60% continuance to an eligible surviving spouse or domestic partner. An eligible surviving spouse or domestic partner is one married to or registered with the member one year prior to the effective retirement date. Certain surviving spouses or domestic partners may also be eligible if marriage or domestic partnership was at least two years prior to the date of death and the surviving spouse or domestic partner has attained age 55. There are four optional retirement allowances the member may choose. Each of the optional retirement allowances requires a reduction in the unmodified retirement allowance in order to allow the member the ability to provide certain benefits to a surviving spouse, domestic partner, or named beneficiary having an insurable interest in the life of the member.

OCERS provides an annual cost-of-living benefit to all retirees. The cost-of-living adjustment, based upon the Consumer Price Index for All Urban Consumers for the Los Angeles-Long Beach-Anaheim Area, is capped at 3.0%.

The County of Orange and contracting agencies contribute to the retirement plan based upon actuarially determined contribution rates adopted by the Board of Retirement. Employer contribution rates are adopted annually based upon recommendations received from OCERS' actuary after the completion of the annual actuarial valuation. The average employer contribution rate for the first six months of calendar year 2018 or the second half of fiscal year 2017-2018 (based on the December 31, 2015 valuation) was 37.25%[3] of compensation. The average employer contribution rate for the last six months of calendar year 2018 or the first half of fiscal year 2018-2019 (based on the December 31, 2016 valuation) was 36.56%[3] of compensation.

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[3] *These employer contribution rates are higher than the composite rate for 2018 as shown on page 9 of this report because these rates have not been adjusted to reflect any pick-ups or reverse pick-ups. These employer contribution rates also do not reflect the shift in payroll to the lower cost plans from the valuation date to the date of rate implementation.*

All members are required to make contributions to OCERS regardless of the retirement plan or tier in which they are included. The average member contribution rate for the first six months of calendar year 2018 or the second half of fiscal year 2017-2018 (based on the December 31, 2015 valuation) was 12.21%[4] of compensation. The average member contribution rate for the last six months of calendar year 2018 or the first half of fiscal year 2018-2019 (based on the December 31, 2016 valuation) was 12.01%[2] of compensation.

[4] *It should be noted that these member contribution rates provided above have not been adjusted to reflect any pick-ups or reverse pick-ups.*

EXHIBIT 2

Net Pension Liability

The components of the Net Pension Liability as follows:	December 31, 2018	December 31, 2017
Total Pension Liability	$20,678,882,089	$19,753,994,401
Plan's Fiduciary Net Position	(14,481,680,000)	(14,801,895,000)
Net Pension Liability	$6,197,202,089	$4,952,099,401
Plan's Fiduciary Net Position as a percentage of the Total Pension Liability	70.03%	74.93%

The Net Pension Liability (NPL) was measured as of December 31, 2018 and 2017. The Plan's Fiduciary Net Position (plan assets) was valued as of the measurement date while the Total Pension Liability (TPL) was determined based upon rolling forward the TPL from actuarial valuations as of December 31, 2017 and 2016, respectively.

Plan provisions. The plan provisions used in the measurement of the NPL as of December 31, 2018 and 2017 are the same as those used in the OCERS actuarial valuations as of December 31, 2018 and 2017, respectively.

Actuarial assumptions. The TPLs as of December 31, 2018 and 2017 were determined by actuarial valuations as of December 31, 2017 and 2016, respectively. The actuarial assumptions used were based on the results of an experience study for the period from January 1, 2014 through December 31, 2016 and they are the same assumptions used in the December 31, 2018 and 2017 funding valuations for OCERS. In particular, the following actuarial assumptions were applied to all periods included in the measurement:

Inflation	2.75%
Salary increases	General: 4.25% to 12.25% and Safety: 4.75% to 17.25%, vary by service, including inflation
Investment rate of return	7.00%, net of pension plan investment expense, including inflation
Other assumptions	See analysis of actuarial experience during the period January 1, 2014 through December 31, 2016

The long-term expected rate of return on pension plan investments was determined using a building-block method in which expected future real rates of return (expected returns, net of inflation) are developed for each major asset class. These returns are combined to produce the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage, adding expected inflation and subtracting expected investment expenses and a risk margin. The target allocation and projected arithmetic real rates of return for each major asset class, after deducting inflation but before deducting investment expenses are shown in the following table. This information was used in the derivation of the long-term expected investment rate of return assumption for the December 31, 2018 and 2017 actuarial valuations. This information will change every three years based on the actuarial experience study.

Asset Class	Target Allocation	Long-Term Expected Arithmetic Real Rate of Return
Global Equity	35.0%	6.38%
Core Bonds	13.0%	1.03%
High Yield Bonds	4.0%	3.52%
Bank Loan	2.0%	2.86%
TIPS	4.0%	0.96%
Emerging Market Debt	4.0%	3.78%
Real Estate	10.0%	4.33%
Core Infrastructure	2.0%	5.48%
Natural Resources	10.0%	7.86%
Risk Mitigation	5.0%	4.66%
Mezzanine/Distressed Debts	3.0%	6.53%
Private Equity	8.0%	9.48%
Total	100.0%	

Discount rate: The discount rate used to measure the TPL was 7.00% as of December 31, 2018 and 2017. The projection of cash flows used to determine the discount rate assumed plan member contributions will be made at the current contribution rate and that employer contributions will be made at rates equal to the actuarially determined contribution rates. For this purpose, only employer contributions that are intended to fund benefits for current plan members and their beneficiaries are included. Projected employer contributions that are intended to fund the service costs for future plan members and their beneficiaries, as well as projected contributions from future plan members, are not included. Based on those assumptions, the Plan's Fiduciary Net Position was projected to be available to make all projected future benefit payments for current plan members. Therefore, the long-term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the TPL as of both December 31, 2018 and 2017.

Sensitivity of the Net Pension Liability to changes in the discount rate. The following presents the NPL as of December 31, 2018, calculated using the discount rate of 7.00%, as well as what the NPL would be if it were calculated using a discount rate that is 1-percentage-point lower (6.00%) or 1-percentage-point higher (8.00%) than the current rate:

	1% Decrease (6.00%)	Current Discount Rate (7.00%)	1% Increase (8.00%)
Net Pension Liability as of December 31, 2018	$9,210,629,685	$6,197,202,089	$3,747,612,367

EXHIBIT 3

Schedule of Changes in OCERS Net Pension Liability – Last Two Plan Years

		2018	2017
Total Pension Liability			
1.	Service cost	$491,372,822	$452,412,003
2.	Interest	1,379,917,267	1,305,268,322
3.	Change of benefit terms	0	0
4.	Differences between expected and actual experience	(118,124,401)	(66,963,603)
5.	Changes of assumptions	0	827,197,076
6.	Benefit payments, including refunds of member contributions	(828,278,000)	(764,344,000)
7.	Transfer of members among Rate Groups	0	0
8.	Other	0	0
9.	Net change in Total Pension Liability	$924,887,688	$1,753,569,798
10.	Total Pension Liability – beginning	19,753,994,401	18,000,424,603
11.	Total Pension Liability – ending	$20,678,882,089	$19,753,994,401
Plan Fiduciary Net Position			
12.	Contributions – employer[(1)]	$580,905,000[(2)]	$572,104,000[(3)]
13.	Contributions – plan members	270,070,000	262,294,000
14.	Net investment income/(loss)	(324,628,000)	1,939,635,000
15.	Benefit payments, including refunds of member contributions	(828,278,000)	(764,344,000)
16.	Transfer of members among Rate Groups	0	0
17.	Administrative expense	(18,284,000)	(17,002,000)
18.	Other	0	0
19.	Net change in Plan Fiduciary Net Position	$(320,215,000)	$1,992,687,000
20.	Plan Fiduciary Net Position – beginning	14,801,895,000	12,809,208,000
21.	Plan Fiduciary Net Position – ending	$14,481,680,000	$14,801,895,000
22.	Net Pension Liability – ending (11) – (21)	$6,197,202,089	$4,952,099,401
23.	Plan Fiduciary Net Position as a percentage of the Total Pension Liability	70.03%	74.93%
24.	Covered payroll[(4)]	$1,718,798,000	$1,678,322,000
25.	Plan Net Pension Liability as percentage of covered payroll	360.55%	295.06%

(1) *Reduced by discount for prepaid contributions and transfer from County Investment Account, if any.*

(2) *$14,589,000 transfer from O.C. Sanitation District Deferred UAAL Account required to offset UAAL increase for the actuarial losses as of December 31, 2018 has been excluded from this amount.*

(3) *$24,042,000 transfer from O.C. Sanitation District Deferred UAAL Account required to offset UAAL increase for the assumption changes has been excluded from this amount.*

(4) *Covered payroll represents payroll on which contributions to the pension plan are based.*

EXHIBIT 4

Schedule of Employer Contributions – Last Ten Plan Years

Year Ended December 31	Actuarially Determined Contributions(1),(2)	Contributions in Relation to the Actuarially Determined Contributions(1),(2)	Contribution Deficiency (Excess)	Covered Payroll(3)	Contributions as a Percentage of Covered Payroll(1),(2)
2009	$337,496,000	$338,387,000(4)	$(891,000)	$1,598,888,000	21.16%
2010	372,437,000	372,437,000	0	1,511,569,000	24.64%
2011	387,585,000	387,585,000	0	1,498,914,000	25.86%
2012	406,521,000	406,521,000	0	1,497,475,000	27.15%
2013	426,020,000	427,095,000(5)	(1,075,000)	1,494,745,000	28.57%
2014	476,320,000	625,520,000(6)	(149,200,000)	1,513,206,000	41.34%
2015	502,886,000	571,298,000(7)	(68,412,000)	1,521,036,000	37.56%
2016	521,447,000	567,196,000(8)	(45,749,000)	1,602,675,000	35.40%
2017	536,726,000(9)	572,104,000(9),(10)	(35,378,000)	1,678,322,000	34.09%
2018	556,728,000(11)	580,905,000(11),(12)	(24,177,000)	1,718,798,000	33.80%

(1) *Reduced by transfers from County Investment Account (funded by pension obligation proceeds held by OCERS). Those transfers are as follows:*

Plan Year Ended December 31	*Transfers from County Investment Account*	*Plan Year Ended December 31*	*Transfers from County Investment Account*
2009	*$34,900,000*	*2014*	*$5,000,000*
2010	*11,000,000*	*2015*	*0*
2011	*11,000,000*	*2016*	*0*
2012	*5,500,000*	*2017*	*0*
2013	*5,000,000*	*2018*	*0*

(2) *Reduced by discount for prepaid contributions.*

(3) *Covered payroll represents payroll on which contributions to the pension plan are based.*

(4) *Includes additional contributions of $891,000 made by O.C. Fire Authority towards the reduction of their UAAL.*

(5) *Includes additional contributions of $1,075,000 made by O.C. Fire Authority towards the reduction of their UAAL.*

(6) *Includes additional contributions of $1,663,000 made by O.C. Cemetery District, $22,537,000 made by O.C. Fire Authority and $125,000,000 made by O.C. Sanitation District towards the reduction of their UAAL.*

EXHIBIT 4 (continued)

Schedule of OCERS' Contributions – Last Ten Plan Years

(7) *Includes additional contributions of $18,412,000 made by O.C. Fire Authority and $50,000,000 made by O.C. Sanitation District towards the reduction of their UAAL.*

(8) *Includes additional contributions of $5,133,000 made by O.C. Fire Authority, $1,500,000 made by Law Library and $5,587,000 made by O.C. Sanitation District towards the reduction of their UAAL as well as $33,529,000 made by O.C. Sanitation District to their UAAL Deferred Account.*

(9) *$24,042,000 transfer from O.C. Sanitation District Deferred UAAL Account required to offset UAAL increase for the assumption changes has been excluded from both these amounts.*

(10) *Includes additional contributions of $32,096,000 made by O.C. Fire Authority, $1,538,000 made by Law Library and $1,744,000 made by O.C. Children and Families Commission towards the reduction of their UAAL.*

(11) *$14,589,000 transfer from O.C. Sanitation District Deferred UAAL Account required to offset UAAL increase for the actuarial losses as of December 31, 2018 has been excluded from both these amounts.*

(12) *Includes additional contributions of $23,437,000 made by O.C. Fire Authority and $740,000 made by Cypress Recreation and Parks District towards the reduction of their UAAL.*

Notes to Exhibit 4

Methods and assumptions used to establish "actuarially determined contribution" rates:	
Valuation date	Actuarially determined contribution rates for the first six months of calendar year 2018 or the second half of fiscal year 2017-2018 are calculated based on the December 31, 2015 valuation. Actuarially determined contribution rates for the last six months of calendar year 2018 or the first half of fiscal year 2018-2019 are calculated based on the December 31, 2016 valuation.
Actuarial cost method	Entry Age Actuarial Cost Method
Amortization method	Level percent of payroll for total unfunded actuarial accrued liability
Remaining amortization period	Effective December 31, 2013, the outstanding balance of the UAAL from the December 31, 2012 valuation was combined and re-amortized over a declining 20-year period. Any changes in UAAL due to actuarial gains or losses or due to changes in assumptions or methods will be amortized over separate 20-year periods. Any changes in UAAL due to plan amendments will be amortized over separate 15-year periods and any change in UAAL due to early retirement incentive programs will be amortized over a separate period of up to 5 years.
Asset valuation method	The Actuarial Value of Assets is determined by recognizing any difference between the actual and the expected market return over a five-year period. The Valuation Value of Assets is the Actuarial Value of Assets reduced by the value of the non-valuation reserves.

Notes to Exhibit 4 – continued

Actuarial assumptions:

December 31, 2015 valuation

Investment rate of return	7.25%, net of pension plan investment expense, including inflation
Inflation rate	3.00%
Real across-the-board salary increase	0.50%
Projected salary increases	General: 4.25% to 13.50% and Safety: 5.00% to 17.50%, vary by service, including inflation
Cost of living adjustments	3.00% of retirement income
Other assumptions	Same as those used in the December 31, 2015 funding actuarial valuation

December 31, 2016 valuation

Investment rate of return	7.25%, net of pension plan investment expense, including inflation
Inflation rate	3.00%
Real across-the-board salary increase	0.50%
Projected salary increases	General: 4.25% to 13.50% and Safety: 5.00% to 17.50%, vary by service, including inflation
Cost of living adjustments	3.00% of retirement income
Other assumptions	Same as those used in the December 31, 2016 funding actuarial valuation

EXHIBIT 5

Calculation of Discount Rate as of December 31, 2018

Projection of Pension Plan's Fiduciary Net Position ($ in millions)

Year Beginning January 1	Projected Beginning Plan's Fiduciary Net Position (a)	Projected Total Contributions * (b)	Projected Benefit Payments (c)	Projected Administrative Expenses (d)	Projected Investment Earnings (e)	Projected Ending Plan's Fiduciary Net Position (f) = (a) + (b) - (c) - (d) + (e)
2018	$14,802	$851	$828	$18	-$325	$14,482
2019	14,482	945	900	18	1,015	15,523
2020	15,523	967	960	19	1,086	16,598
2021	16,598	978	1,021	21	1,160	17,694
2022	17,694	994	1,084	22	1,235	18,818
2023	18,818	1,023	1,150	23	1,312	19,980
2024	19,980	1,030	1,219	25	1,391	21,157
2025	21,157	1,039	1,288	26	1,472	22,354
2026	22,354	1,049	1,359	28	1,553	23,569
2027	23,569	1,059	1,433	29	1,636	24,801
2043	36,099	176	2,645	45	2,441	36,027
2044	36,027	166	2,696	45	2,433	35,886
2045	35,886	156	2,743	44	2,421	35,677
2046	35,677	147	2,786	44	2,405	35,399
2047	35,399	138	2,824	44	2,384	35,054
2092	19,045	39	238	24	1,325	20,148
2093	20,148	39	196	25	1,404	21,369
2094	21,369	39	160	26	1,491	22,712
2095	22,712	39	129	28	1,586	24,180
2096	24,180	40	102	30	1,689	25,776
2131	255,087	315	0 **	315	17,856	272,944
2132	272,944					
2132 Discounted Value:	131 ***					

* Of all the projected total contributions, only the first year's (i.e., 2018) contribution has been reduced by discount for prepaid contributions and transfers from County Investment Account, if any.

** Less than $1 million, when rounded.

*** $272,944 million when discounted with interest at the rate of 7.00% per annum has a value of $131 million as of December 31, 2018, which is about the balance in the County Investment Account as of December 31, 2018.

Note: We have not utilized the balance in the County Investment Account to reduce the projected total contributions in column (b) even though those amounts have been used to reduce the NPL for the County as of December 31, 2018.

EXHIBIT 5

Calculation of Discount Rate as of December 31, 2018
Projection of Pension Plan's Fiduciary Net Position ($ in millions)

Notes:

(1) Amounts may not total exactly due to rounding.

(2) Amounts shown in the year beginning January 1, 2018 row are actual amounts, based on the financial statements provided by OCERS.

(3) Years 2028-2042, 2048-2091, and 2097-2130 have been omitted from this table.

(4) Column (a): Except for the "discounted value" shown for 2132, all of the projected beginning Plan's Fiduciary Net Position amounts shown have not been adjusted for the time value of money.

(5) Column (b): Projected total contributions include member and employer normal cost rates applied to closed group projected payroll (based on covered active members as of December 31, 2017), plus employer contributions to the Unfunded Actuarial Accrued Liability. Contributions are assumed to occur halfway through the year, on average.

(6) Column (c): Projected benefit payments have been determined in accordance with paragraph 39 of GASB Statement No. 67, and are based on the closed group of active, inactive vested, retired members, and beneficiaries as of December 31, 2017. The projected benefit payments reflect the cost of living increase assumptions used in the December 31, 2018 valuation report. The 2018 benefit payments have been increased by the balance of the Medicare Insurance Reserve as of December 31, 2018.

(7) Column (d): Projected administrative expenses are calculated as approximately 0.12% of the projected beginning Plan's Fiduciary Net Position amount. The 0.12% portion was based on the actual calendar year 2018 administrative expenses (unaudited) as a percentage of the actual beginning Plan's Fiduciary Net Position as of January 1, 2018. Administrative expenses are assumed to occur halfway through the year, on average.

(8) Column (e): Projected investment earnings are based on the assumed investment rate of return of 7.00% per annum.

(9) As illustrated in this Exhibit, the Plan's Fiduciary Net Position was projected to be available to make all projected future benefit payments for current Plan members. In other words, there is no projected "cross-over date" when projected benefits are not covered by projected assets. Therefore, the long-term expected rate of return on Plan investments of 7.00% per annum was applied to all periods of projected benefit payments to determine the total pension liability as of December 31, 2018 shown earlier in this report, pursuant to paragraph 44 of GASB Statement No. 67.