

PENNSYLVANIA SERS



**REAL ESTATE SEMI-ANNUAL
PERFORMANCE REVIEW (6.30.17)**

January 31, 2018



BOSTON | ATLANTA | CHARLOTTE | CHICAGO | DETROIT | LAS VEGAS | PORTLAND | SAN FRANCISCO

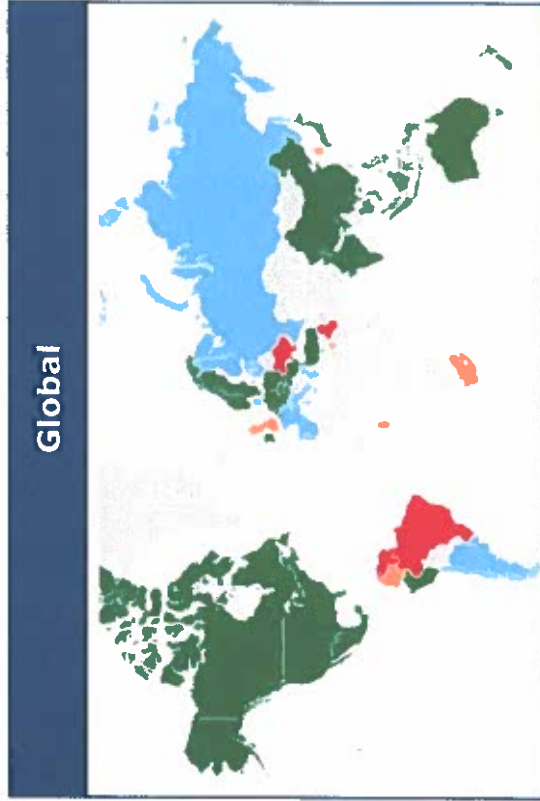
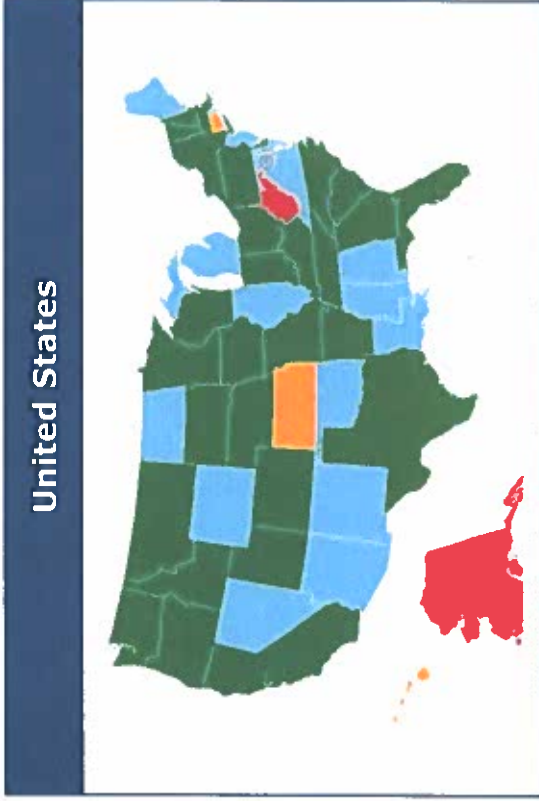
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1. REAL ESTATE MARKET UPDATE

NEPC, LLC

STATUS OF GLOBAL ECONOMIES



Encouraging Fundamentals for Real Estate

- **Healthy domestic and international economic conditions**
- **Most states in US experiencing growth**
 - Recovery underway in energy-based states
- **Global economies are generally healthy**
 - Asia, Europe and North America broadly in expansion
- **Strong economic conditions are a positive signal for real estate**
- **Certain areas remain challenged**
 - Distressed opportunities may form
- **Geopolitical risk gives pause**



Source: Moody's Analytics, AEW

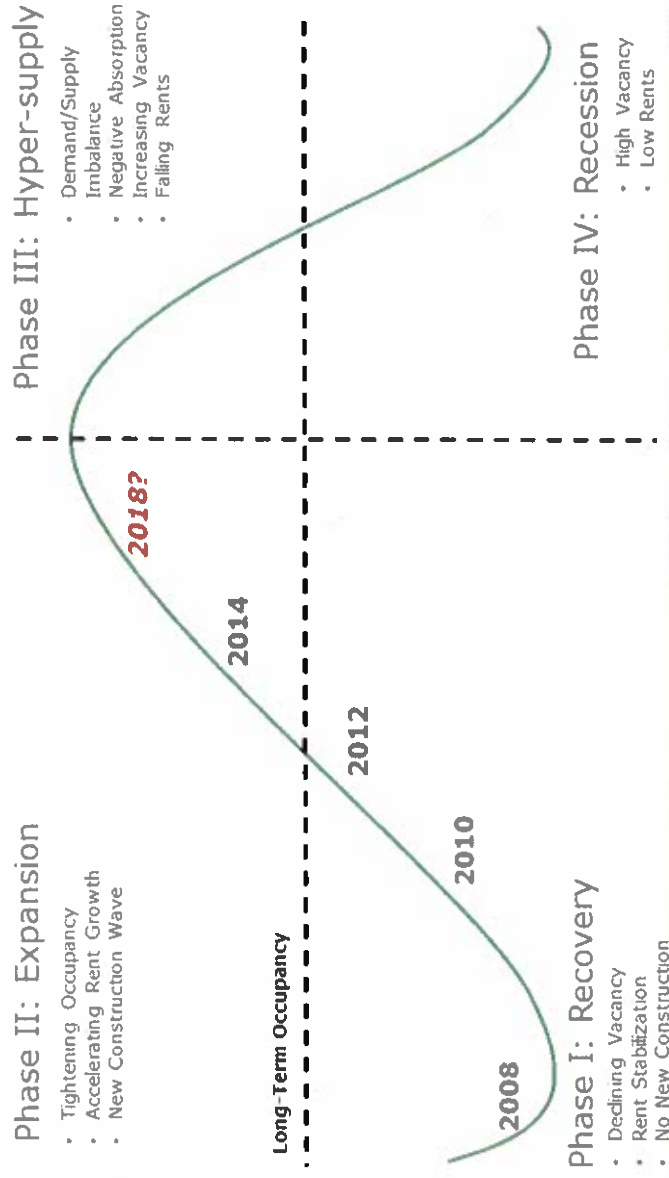


US REAL ESTATE MARKET CYCLE REVIEW

Strong Fundamentals Persist

- Expansion phase continues...2018 likely closer to peak than trough
- Over-supply not yet evident
- Income and capital markets will drive valuations in the near-term

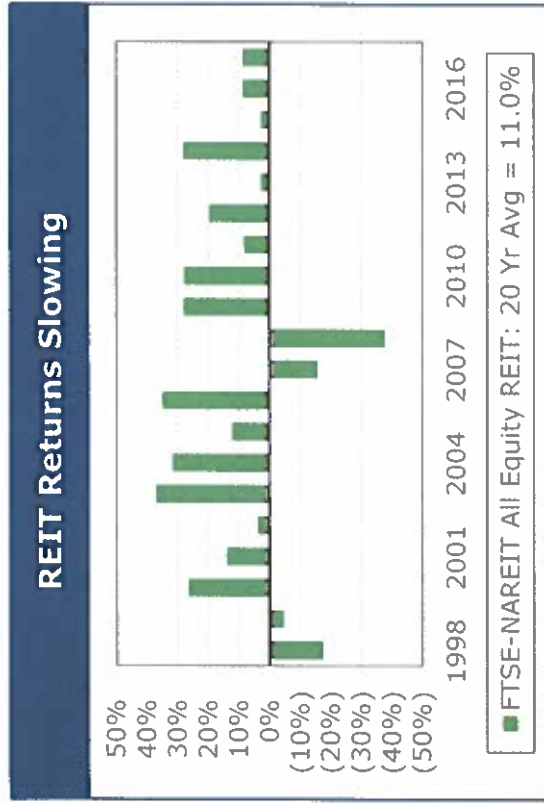
Real Estate Cycle Will Eventually Impact Future Returns



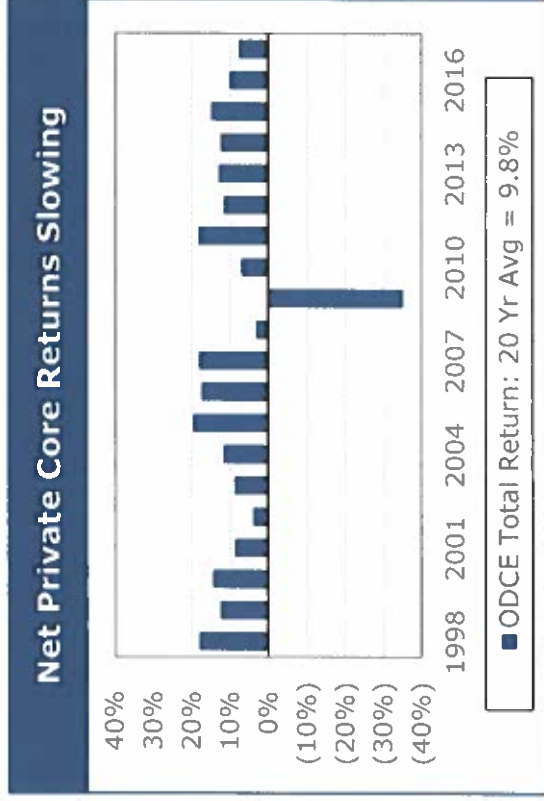
US CORE REAL ESTATE SNAPSHOT

Core/REIT Returns Normalizing

- **Trailing returns robust but normalizing**
 - Trailing 5-year average returns of 11.6% for the ODCE and 10% for the FTSE NAREIT Index
 - Trailing 1-year trailing gross returns of 7.7% for private core and 2.6% gross for REITS
- **5-7 year core returns expectations below historical averages**
 - Property fundamentals and healthy capital markets are positive for market going forward
 - Highly competitive market coupled with high valuations creates concerns regarding cap rate expansion should rates rise quickly, placing downward pressure on valuations
- **Areas for incremental income growth to outpace market going forward**



Source: Bloomberg/FTSE; data as of December 31, 2017.



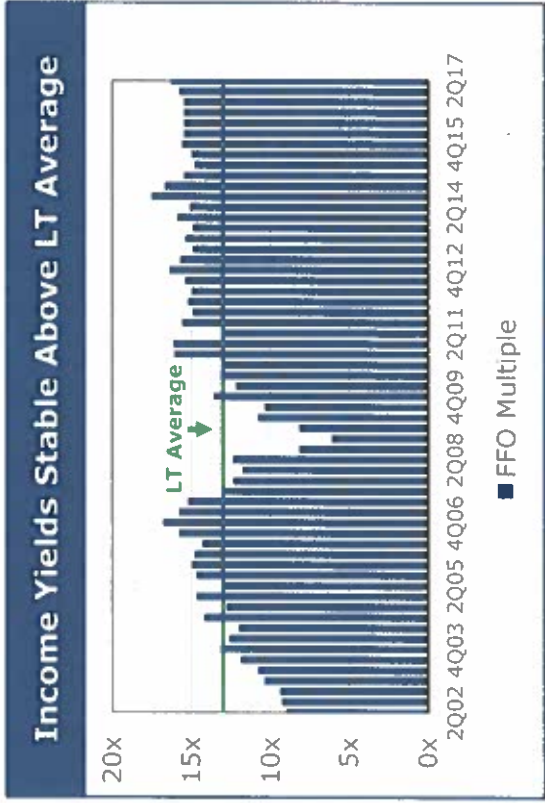
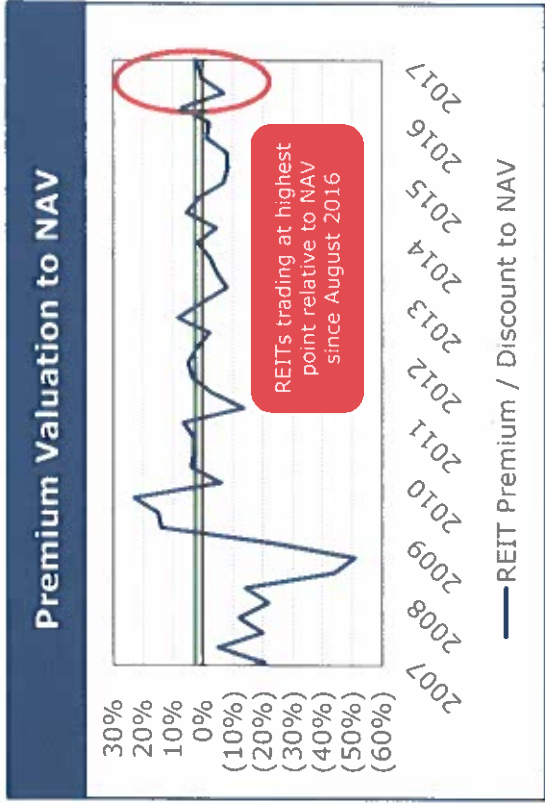
Source: NCREIF; data as of September 30, 2017.



US REIT MARKET VALUATION UPDATE

REITs Fully Priced By Yield and Valuation

- **REITs trading at slight premiums relative to NAV**
 - Highest since August 2016 but in-line with long-term average
 - Wide dispersion among underlying sectors
- **FFO multiples elevated but relatively stable**
 - FFO multiple analogous to P/E multiples
 - May indicate high future return expectations... or relative attractiveness to other assets
 - Non-core sectors may have more multiple expansion remaining
- **Higher short-term volatility possible**
 - REITs perform like private core over longer periods of time but will exhibit more volatility should equity market volatility increase



Source: Wells Fargo Securities; data as of November 10, 2017.

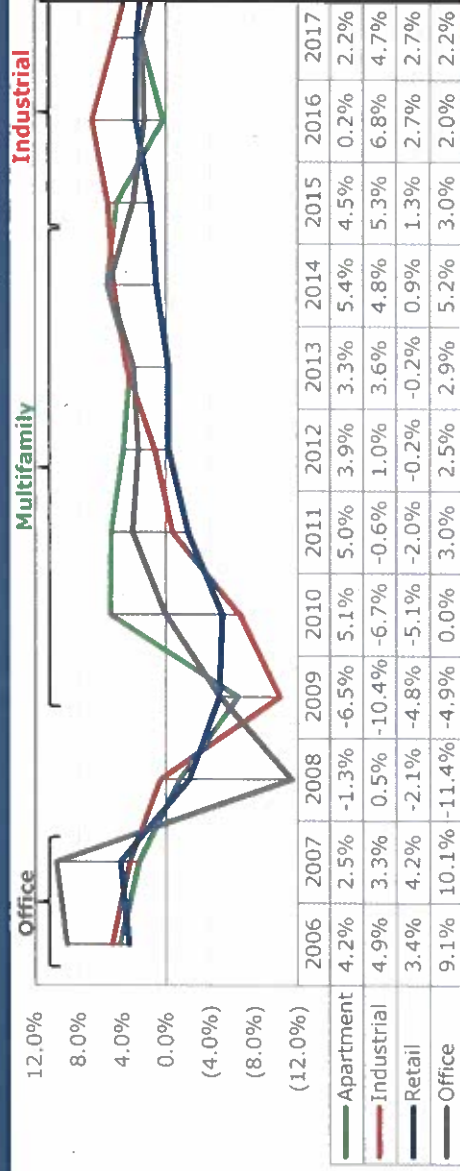


DIVERSIFICATION RECOMMENDED

Sector Performance Varies During Cycle

- **Diversified approach towards cyclical asset class**
 - Allows portfolio to benefit from opportunities presented in different parts of market as cycle shifts
- **Apartment returns may moderate**
 - Robust rental income growth in recent years to moderate due to new supply
- **Retail steady with potential for repositioning**
 - Lagging trailing returns but strong rent growth projected as economy improves and less supply comes online while existing assets are repositioned
- **Industrial is highly sought after**
 - Last mile industrial highly sought after in new economy (Amazon effect)

Rental Growth Rates Vary by Sub-Sector



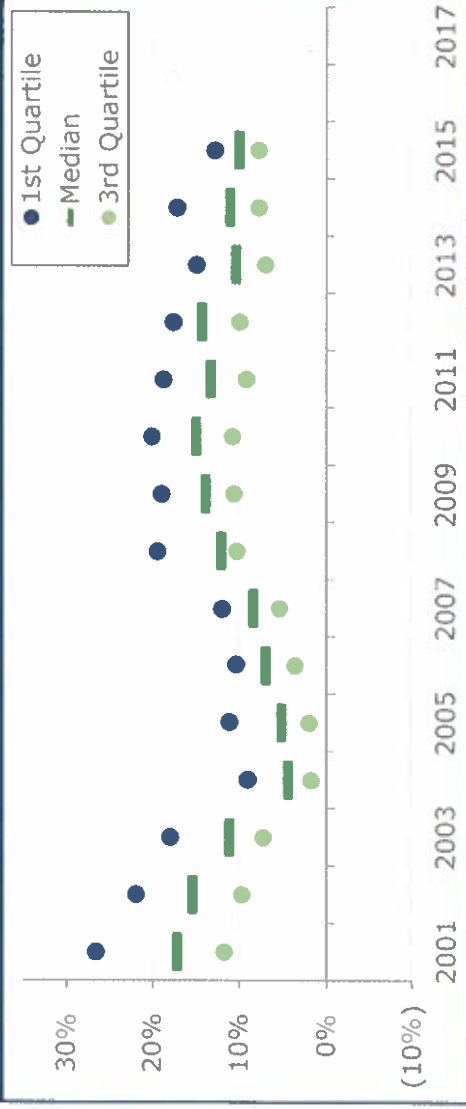
Source: CBRE Econometrics, NEPC Analysis; as of June 30, 2017.

FUNDRAISING AND PERFORMANCE SNAPSHOT

Strong Investor Demand

- **Post-GFC funds generating strong performance**
- **Recovery in Pre-GFC Funds**
 - 2005-2007 median funds returning capital to investors, in excess of cost

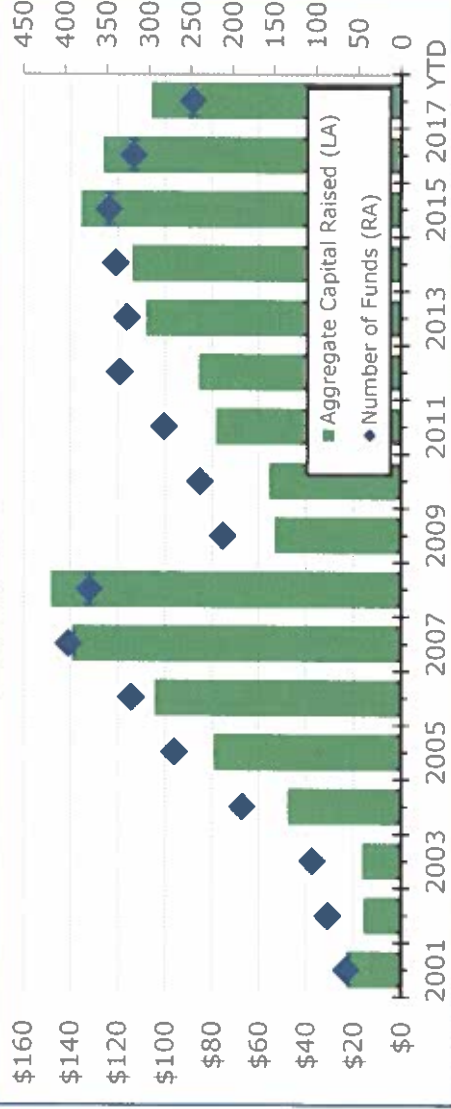
Private Fund Returns Remain Strong



- **Fundraising levels remain strong**

- 2017 on pace to be largest fundraising year since 2008

Global Value-Add/Opportunistic Fundraising Robust



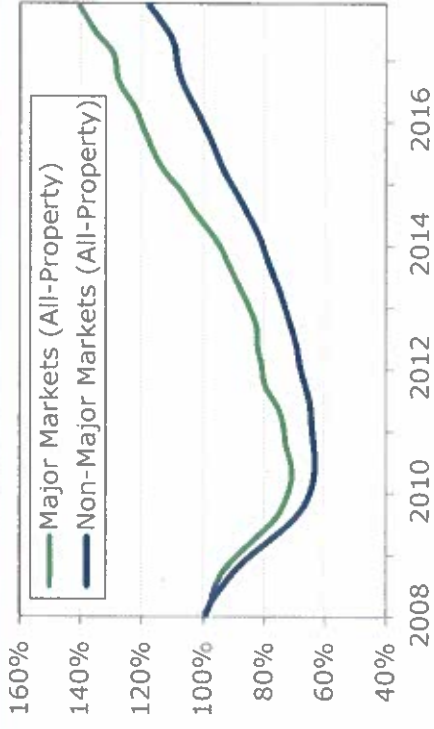
Source: Preqin and Thomson One. Data as of September 30, 2017.
 Note: Performance excluded for vintage years 2016-2017 as not meaningful.

PRIMARY VS SECONDARY MARKET SNAPSHOT

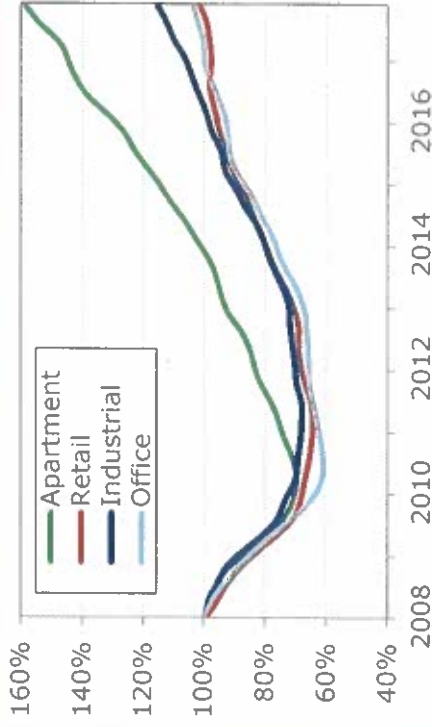
Non-Core Opportunities Remain

- **Institutional capital focus on major markets continues**
 - Major market asset prices approximately 40% above 2007 peak
- **Secondary market recovery trailing but still strong**
- **Non-core opportunities remain for managers that can reposition or renovate and sell stable yield**

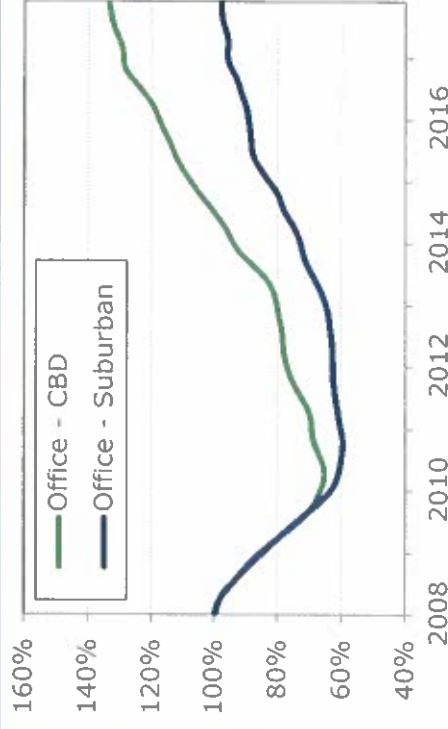
Broad Asset Price Recovery



Dispersion Among Property Types



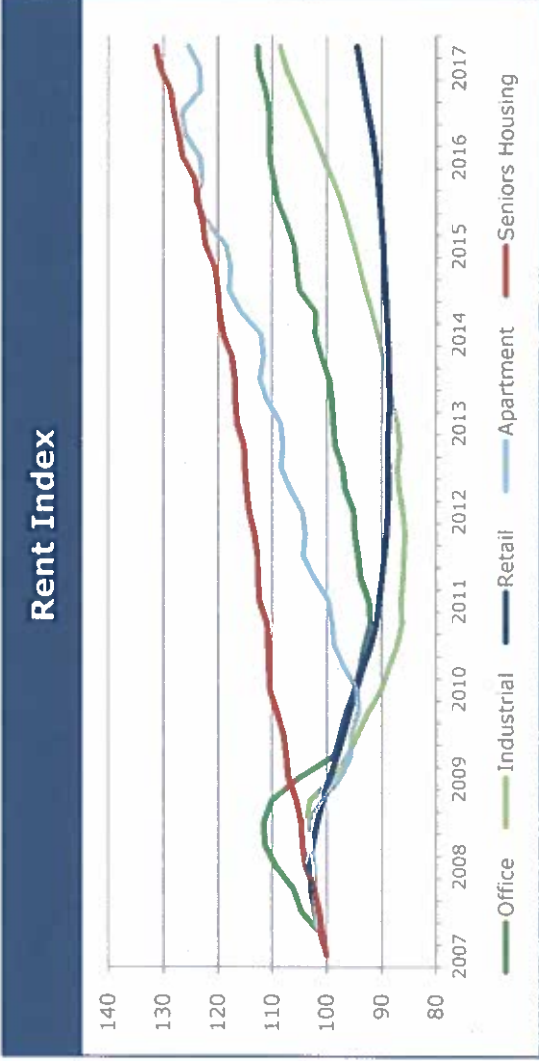
CBD Office vs Suburban Office



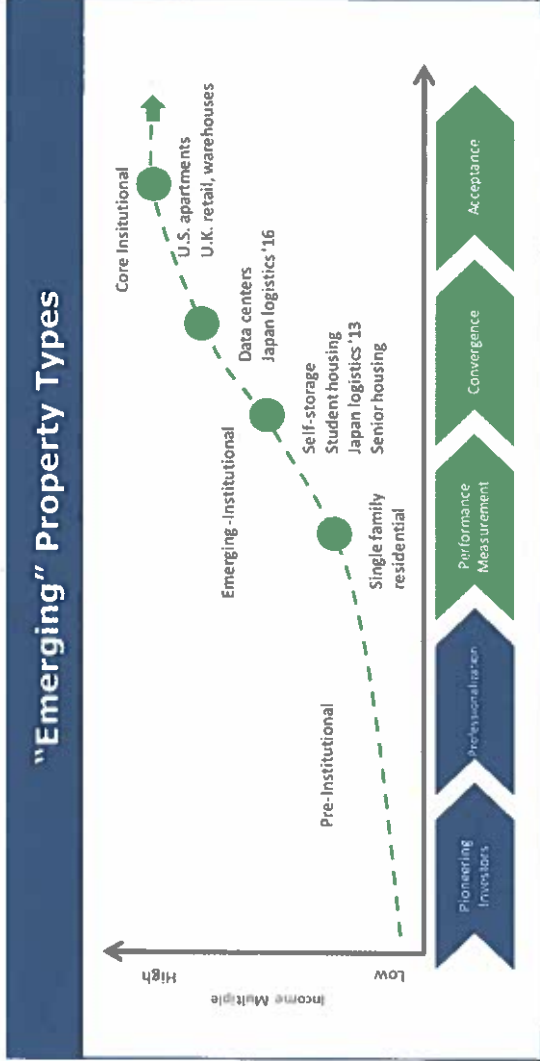
NON-CORE OPPORTUNITY OVERVIEW

Demographics Matter

- **Most sectors are cyclical**
- **Demographic-driven sectors are less GDP-sensitive**
 - Senior housing and multifamily tends to protect downside during market corrections better GDP-driven sectors (office, retail, industrial)



- **“Emerging” asset classes have higher return potential and diversification benefits**
 - Cap rate compression possible as institutional flows grow
 - Property types include: self storage, student housing, senior housing, and medical office



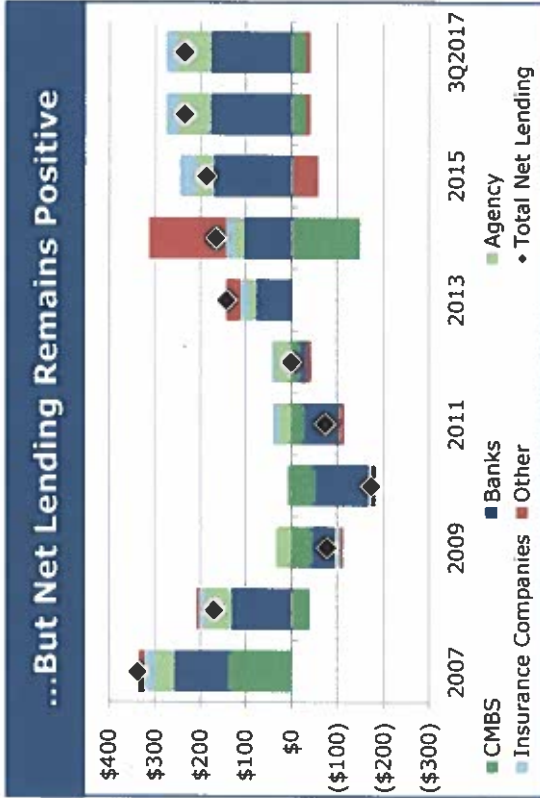
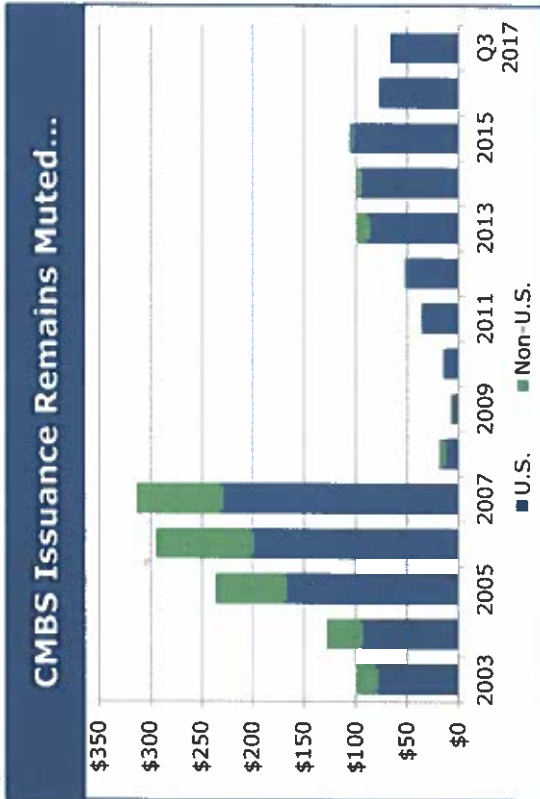
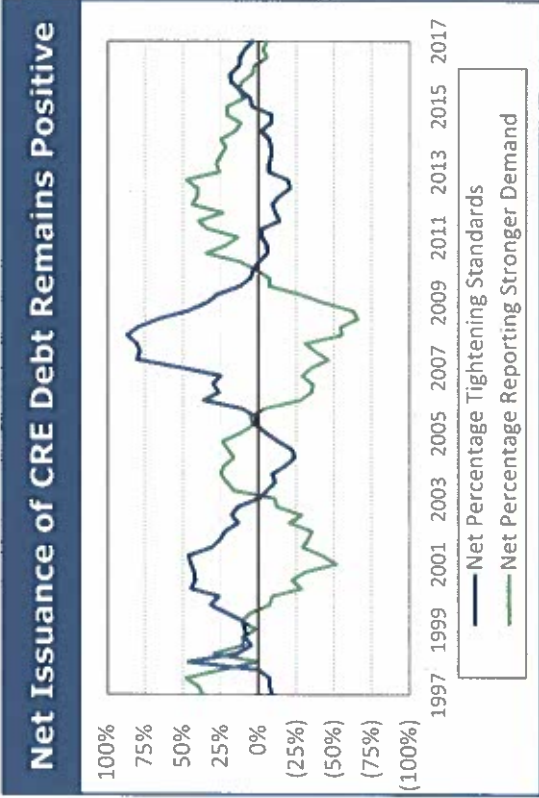
Source: Real Capital Analytics as of June 30, 2017.



REAL ESTATE LENDING SNAPSHOT

Lending Environment Healthy

- **Positive net lending to US real estate**
- **Private debt filling gap**
 - CMBS issuance 60% below 2007 peak
- **Credit standards remain healthy**
 - Especially for development projects
- **CRE loan maturities peaked**
 - Remains elevated (\$300B/year) to 2019



Source: Federal Reserve, CMBS Alert; data as of September 30, 2017.



**2. REAL ESTATE SEMI-ANNUAL
PERFORMANCE REPORT (AS OF
JUNE 30, 2017)**

NEPC, LLC

PORTFOLIO PERFORMANCE SUMMARY

The following table illustrates Pennsylvania State Employees Retirement System's Real Estate Portfolio Performance as of June 30, 2017.

- The Plan's real estate portfolio yielded total (net) return of 2.0% year-to-date and trailing one-year return of -0.1%.
- The Plan's Real Estate Performance is benchmarked against the NCREIF-ODCE Index (pool of open-end core funds) and ThomsonOne Benchmark (pool of closed-end value-add/opportunity funds), the two most widely used indices for real estate benchmarking.
- The S&P 500 Index reflects one measure of opportunity cost of investing in real estate versus publicly traded common stocks.
- Returns shown do not take into account risk/volatility of underlying strategies.

Portfolio Performance	YTD	1 Year	3 Year	5 Year	10 Year	Inception
Total: Pennsylvania State Employees Retirement System	2.0%	-0.1%	6.0%	8.9%	2.0%	7.2%
NFI-ODCE Index¹	3.0%	6.9%	10.3%	10.8%	4.3%	N/A
Thomson-One/Cambridge Real Estate Index²	6.7%	10.0%	10.6%	11.9%	4.0%	N/A
S&P 500 Index	9.3%	17.9%	9.6%	14.6%	7.2%	N/A

1. NFI-ODCE Index represents pooled returns of open-end comingled core funds in the ODCE Index as of June 30, 2017. Returns shown are time-weighted, net of fees.

2. Thomson-One/Cambridge Benchmark represents pooled horizon internal rate of return (IRR) calculations, net of fees, across 970 real estate funds (including value-add/opportunistic) from 1986 to 2017. The timing and magnitude of fund cash flows are integral to the IRR performance. Benchmark indices that are time weighted measures should not be directly compared to dollar-weighted IRR calculations.

Note: Index data is continuously updated and is therefore subject to change.



PERFORMANCE BY INVESTMENT STRATEGY

In aggregate, current (Active) investments in the portfolio, which are not fully liquidated, can be summarized in the following:



*Returns shown do not take into account risk/volatility of underlying strategies.

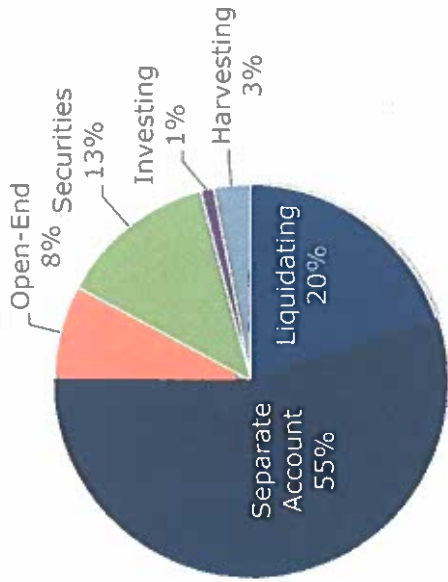
*Completed funds not shown on above graph.



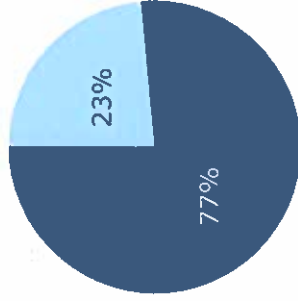
Source: Data provided by managers as of June 30, 2017

PORTFOLIO COMPOSITION

PA SERS has significant concentration in Separate Accounts (55%), which should be reduced over time (with an orderly disposition plan).



- Open-End
- Securities
- Investing
- Harvesting
- Liquidating
- Separate Account



- Core/Core-Plus/Securities
- Value-Add/Opportunistic

Stage	Commitment	Called Capital	Call Ratio	Uncalled Capital	Realized Value	Unrealized Value	Total Value	Gain / Loss	TVPI	DPI	RVPI
Total	4,313,458,381	4,092,858,774	95%	29,313,536	4,918,474,278	2,278,138,119	7,196,612,397	3,074,440,087	1.8x	1.2x	0.6x



Source: Data provided by managers as of June 30, 2017

HISTORICAL PERFORMANCE BY VINTAGE

The following graph illustrates investment performance (net IRR) by vintage year as of June 30, 2017.

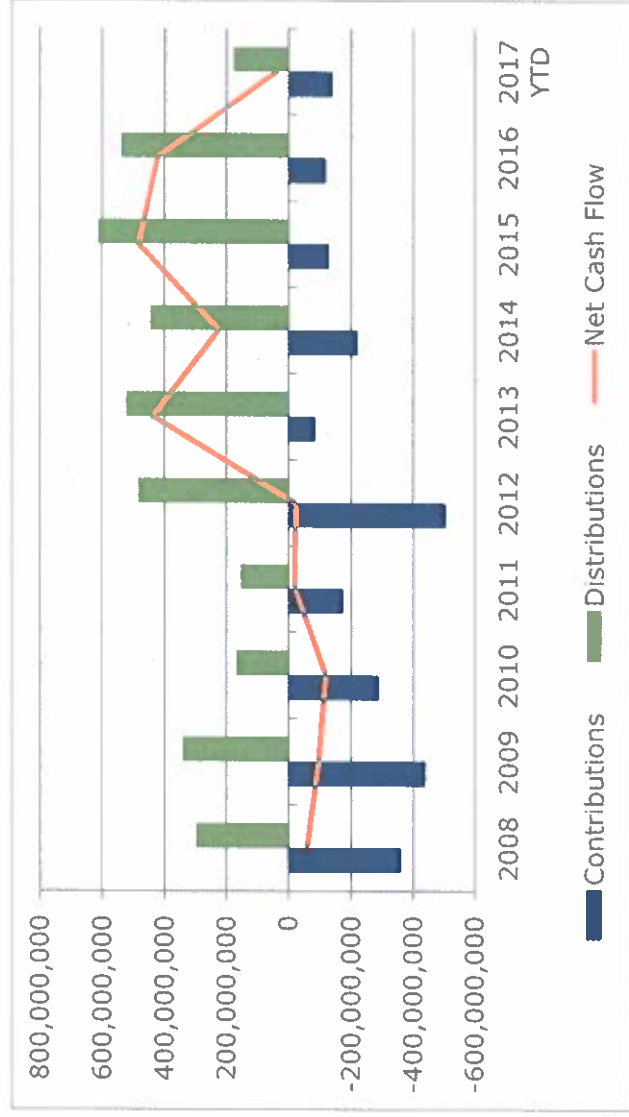
- Portfolio Performance has been negatively impacted by inconsistent pacing.
- Select years of strong (IRR) performance were mitigated by heavy capital investments in concentrated vintage years that yielded lower returns.



10-YEAR CASH FLOWS

The following graph illustrates PA SERS' cash flows over the past ten years as of June 30, 2017.

- Year-to-date as of June 30th, 2017, the Plan received approximately \$36 million in net distributions as mature investments are liquidating from both asset sales and income distributions.
- This has partially contributed to the SERS' current underfunded net asset exposure of approx. 8% to real estate relative to a target allocation of 12%.



**APPENDIX 1: INVESTMENT LEVEL
PERFORMANCE (AS OF JUNE 30,
2017)**

NEPC, LLC

ACTIVE INVESTMENTS

Investment	Vintage Year	Commitment Amount	VTD	1 Year	3 Year	5 Year	7 Year	10 Year	Inception
1 AG Asia Realty Fund, L.P.	2007	25,000,000							
2 Apollo Real Estate Fund III	1998	50,000,000							
3 Blackstone Real Estate Partners IV	2003	25,000,000							
4 Blackstone Real Estate Partners V	2006	50,000,000							
5 Blackstone Real Estate Partners VI	2007	75,000,000							
6 Blackstone Real Estate Partners VII	2011	75,000,000							
7 BPG Investment Partnership IX	2012	25,000,000							
8 BPG Investment Partnership V	1999	25,000,000							
9 BPG Investment Partnership VI	2002	25,000,000							
10 BPG Investment Partnership VII	2005	25,000,000							
11 BPG Investment Partnership VIII	2007	15,588,238							
12 CBRE Clarion Securities	1996	210,848,120							
13 CenterSquare Real Estate Securities	2002	26,282,779							
14 Clerestory Small Cap Real Estate Fund I, LP	2010	18,000,000							
15 Colony Investors VIII	2007	22,500,000							
16 Fidelity Real Estate Opportunistic Income Fund	2007	35,000,000							
17 Fillmore West Fund	2008	30,000,000							
18 Forest Separate Account	1992	124,231,969							
19 Hawkeye Scout Fund I	2009	75,000,000							
20 Hawkeye Scout Fund II	2016	30,000,000							
21 Heltman America Real Estate Trust, L.P.	2007	100,000,000							
22 Heltman Separate Account	1988	798,335,039							
23 LaSalle Separate Account	1994	436,937,828							
24 LEM Real Estate High-Yield Debt Fund III	2013	25,000,000							
25 Lowe GTO Separate Account	2012	349,069,212							
26 Lowe Separate Account	1994	706,229,496							
27 Lubert-Adler Real Estate Fund III	2000	30,000,000							
28 Lubert-Adler Real Estate Fund IV	2004	25,000,000							
29 Lubert-Adler Real Estate Fund V	2006	30,000,000							
30 Lubert-Adler Real Estate Fund VI	2008	20,927,116							
31 Lubert-Adler Real Estate Fund VI-A	2010	3,054,663							
32 Lubert-Adler Real Estate Fund VII	2014	25,000,000							
33 OCM Real Estate Opportunities Fund III	2003	25,000,000							
34 Oxford GSA Strategy	2006	30,000,000							
35 Prudential Latin America Residential Fund III	2008	29,654,968							
36 Prudential Latin America Retail Fund	2006	25,000,000							
37 Prudential SHP IV	2011	25,000,000							
38 Prudential SHP V	2015	50,000,000							

Source: Data provided by managers as of June 30, 2017



ACTIVE INVESTMENTS CONT.

Investment	YTD	1 Year	3 Year	5 Year	7 Year	10 Year	Inception
Investment	Vintage Year	Commitment Amount					
39 Rockpoint Finance Fund I	2007	50,000,000					
40 Rockpoint Real Estate Fund II	2005	35,000,000					
41 Rockpoint Real Estate Fund III	2007	50,000,000					
42 Rockpoint Real Estate Fund V	2015	50,000,000					
43 Starwood Opportunity Fund IV	1997	37,750,000					
44 Starwood Opportunity Fund VI	2001	50,000,000					
45 Starwood Opportunity Fund VII	2006	35,000,000					
46 Starwood Opportunity Fund VIII	2009	50,000,000					
47 UBS Trumbull Property Fund	1988	25,558,525					
48 UBS Trumbull Property Income Fund	1988	33,332,027					
49 Valstone Opportunity Fund V	2014	15,158,402					
50 Westbrook Real Estate Fund V	2004	25,000,000					
51 Westbrook Real Estate Fund VI	2006	35,000,000					
52 Westbrook Real Estate Fund VII	2007	50,000,000					
53 Westbrook Real Estate Fund VIII	2009	50,000,000					
Total: Pennsylvania State Employees Retirement System		4,313,458,381					

Source: Data provided by managers as of June 30, 2017



PERFORMANCE BY INVESTMENT STRATEGY

Investment Name	Vintage Year	Commitment Amount	Paid in Capital	Capital to be Funded	Cumulative Distributions	Valuation	Net Benefit	Cap Ratio	DOI Ratio	TYPT Ratio	IRE
1 Helman Separate Account	1988	796,335,039	796,335,039	0	1,064,259,871	0	0	0	0	0	0
2 Lashelle Separate Account	1994	436,937,828	436,937,828	0	481,853,208	0	0	0	0	0	0
3 Lowe GTO Separate Account	2012	349,069,212	349,069,212	0	220,770,000	0	0	0	0	0	0
4 Lowe Separate Account	1994	706,328,495	706,328,495	0	830,181,978	0	0	0	0	0	0
Direct Investment / Sep. Acct.		2,290,571,575	2,290,571,575		2,596,065,059						
1 Heeman America Real Estate Trust, L.P.	2007	100,000,000	100,000,000	0	67,846,772	0	0	0	0	0	0
2 UBS Trumbull Property Fund	1988	25,356,525	25,356,525	0	87,606,592	0	0	0	0	0	0
3 UBS Trumbull Property, Income Fund	1988	33,132,027	33,132,027	0	154,872,784	0	0	0	0	0	0
Core/Core-Plus (Private)		158,890,552	158,890,552		669,514,323						
1 CBRE Claron Securities	1996	210,848,130	210,848,130	0	36,168,336	0	0	0	0	0	0
2 CentarSquare Real Estate Securities	2002	26,282,779	26,282,779	0	705,682,659	0	0	0	0	0	0
Core/Core-Plus (Public Securities)		237,130,899	237,130,899		17,700,999						
1 BPG Investment Partnership IX	2012	25,000,000	24,172,471	0	42,840,859	0	0	0	0	0	0
2 BPG Investment Partnership X	1999	25,000,000	24,136,564	0	40,949,892	0	0	0	0	0	0
3 BPG Investment Partnership VI	2002	25,000,000	24,543,712	0	3,052,750	0	0	0	0	0	0
4 BPG Investment Partnership VII	2005	25,000,000	25,000,000	0	9,914,073	0	0	0	0	0	0
5 BPG Investment Partnership VIII	2007	15,568,238	14,912,018	0	11,363,539	0	0	0	0	0	0
6 Lubert-Adler Real Estate Fund III	2000	30,000,000	30,000,000	0	5,565,870	0	0	0	0	0	0
7 Lubert-Adler Real Estate Fund IV	2004	25,000,000	23,820,755	0	11,757,647	0	0	0	0	0	0
8 Lubert-Adler Real Estate Fund V	2006	30,000,000	30,000,000	0	4,624,788	0	0	0	0	0	0
9 Lubert-Adler Real Estate Fund VI	2008	20,927,116	19,200,001	0	44,485,779	0	0	0	0	0	0
10 Lubert-Adler Real Estate Fund VII-A	2010	3,054,663	2,359,415	0	30,012,504	0	0	0	0	0	0
11 Lubert-Adler Real Estate Fund VII	2014	25,000,000	23,750,000	0	48,090,909	0	0	0	0	0	0
12 Westbrook Real Estate Fund V	2004	25,000,000	25,000,000	0	62,318,055	0	0	0	0	0	0
13 Westbrook Real Estate Fund VI	2006	35,000,000	35,000,000	0	379,929,752	0	0	0	0	0	0
14 Westbrook Real Estate Fund VII	2007	50,000,000	50,000,000	0	20,812,500	0	0	0	0	0	0
15 Westbrook Real Estate Fund VIII	2009	50,000,000	50,000,000	0	74,810,023	0	0	0	0	0	0
Value Add (Closed-End)		409,570,017	409,570,017		1,131,129,4						
1 AG Asia Realty Fund, L.P.	2007	25,000,000	23,500,000	0	81,034,875	0	0	0	0	0	0
2 Apollo Real Estate Fund III	1998	50,000,000	50,000,000	0	135,584,040	0	0	0	0	0	0
3 Blackstone Real Estate Partners IV	2001	25,000,000	25,000,000	0	13,411,294	0	0	0	0	0	0
4 Blackstone Real Estate Partners V	2006	50,000,000	47,912,974	0	6,507,285	0	0	0	0	0	0
5 Blackstone Real Estate Partners VI	2007	75,000,000	71,319,075	0	21,448,374	0	0	0	0	0	0
6 Blackstone Real Estate Partners VII	2011	75,000,000	62,895,228	0	116,323,890	0	0	0	0	0	0
7 Clerestory Small Cap Real Estate Fund I, LP	2010	18,000,000	15,228,956	0	13,411,294	0	0	0	0	0	0
8 Colony Investors VIII	2007	32,500,000	31,655,800	0	6,507,285	0	0	0	0	0	0
9 Filmore West Fund	2008	30,000,000	29,342,336	0	21,448,374	0	0	0	0	0	0
10 HawkEye Scout Fund I	2009	75,000,000	75,000,000	0	116,323,890	0	0	0	0	0	0
11 HawkEye Scout Fund II	2016	30,000,000	9,010,149	0	0	0	0	0	0	0	0
12 LPI Real Estate High-Yield Debt Fund III	2013	25,000,000	18,174,731	0	11,095,492	0	0	0	0	0	0
13 OC-M Real Estate Opportunities Fund III	2003	25,000,000	25,000,000	0	41,978,732	0	0	0	0	0	0
14 Oxford GSA Strategy	2006	30,000,000	21,368,827	0	18,384,738	0	0	0	0	0	0
15 Prudential Latin America Residential Fund III	2008	29,654,968	24,708,749	0	10,712,768	0	0	0	0	0	0
16 Prudential Latin America Retail Fund	2006	25,000,000	2,273,137	0	8,187,626	0	0	0	0	0	0
17 Prudential SHP IV	2011	25,000,000	20,799,516	0	7,880,073	0	0	0	0	0	0
18 Prudential SHP V	2015	50,000,000	21,798,638	0	0	0	0	0	0	0	0
19 Rockpoint Finance Fund I	2007	50,000,000	2,627,500	0	1,566,309	0	0	0	0	0	0
20 Rockpoint Real Estate Fund II	2005	30,000,000	34,136,784	0	29,091,713	0	0	0	0	0	0
21 Rockpoint Real Estate Fund III	2007	50,000,000	46,391,722	0	43,912,781	0	0	0	0	0	0
22 Rockpoint Real Estate Fund IV	2015	50,000,000	14,246,817	0	0	0	0	0	0	0	0
23 Starwood Opportunity Fund IV	1997	37,750,000	37,750,000	0	81,363,491	0	0	0	0	0	0
24 Starwood Opportunity Fund VI	2001	50,000,000	50,000,000	0	48,624,283	0	0	0	0	0	0
25 Starwood Opportunity Fund VII	2006	35,000,000	35,000,000	0	17,406,816	0	0	0	0	0	0
26 Starwood Opportunity Fund VIII	2009	50,000,000	45,356,381	0	65,097,009	0	0	0	0	0	0
27 Vantage Opportunity Fund V	2014	15,158,402	15,158,402	0	2,894,066	0	0	0	0	0	0
Opportunistic (Closed-End)		1,058,083,378	845,186,414		937,080,319						
1 Fidelity Real Estate Opportunistic Income Fund	2007	35,000,000	35,000,000	0	0	0	0	0	0	0	0
Opportunistic (Open-End)		35,000,000	35,000,000		0						
1 Forest Separate Account	1992	124,231,969	124,231,969	0	124,063,725	0	0	0	0	0	0
Timber		124,231,969	124,231,969		124,063,725						
Total: Pennsylvania State Employees' Retirement System		4,313,450,391	4,092,858,774		4,918,474,278						

Source: Data provided by managers as of June 30, 2017



**APPENDIX 2: ALTERNATIVE
INVESTMENT DISCLAIMER**

NEPC, LLC

DISCLAIMER

- Past performance is no guarantee of future results.
- The opinions presented herein represent the good faith views of NEPC as of the date of this report and are subject to change at any time.
- Information used to prepare this report was obtained directly from the investment managers or custodians, and market index data was provided by other external sources. While NEPC has exercised reasonable professional care in preparing this report, we cannot guarantee the accuracy of all source information contained within.
- This report may contain confidential or proprietary information and may not be copied or redistributed to any party not legally entitled to receive it.

ALTERNATIVE INVESTMENT DISCLOSURES

In addition, it is important that investors understand the following characteristics of non-traditional investment strategies including hedge funds, real estate and private equity:

1. Performance can be volatile and investors could lose all or a substantial portion of their investment
2. Leverage and other speculative practices may increase the risk of loss
3. Past performance may be revised due to the revaluation of investments
4. These investments can be illiquid, and investors may be subject to lock-ups or lengthy redemption terms
5. A secondary market may not be available for all funds, and any sales that occur may take place at a discount to value
6. These funds are not subject to the same regulatory requirements as registered investment vehicles
7. Managers may not be required to provide periodic pricing or valuation information to investors
8. These funds may have complex tax structures and delays in distributing important tax information
9. These funds often charge high fees
10. Investment agreements often give the manager authority to trade in securities, markets or currencies that are not within the manager's realm of expertise or contemplated investment strategy