MEMORANDUM

Date: August 13, 2018

To: Members of the Investment Committee
California Public Employees' Retirement System ("CalPERS")

From: Meketa Investment Group ("Meketa")

Re: Semi-Annual Infrastructure Performance Review
as of June 30, 2018

In our role as the Board Infrastructure Consultant, Meketa conducted a Semi-Annual Performance Review of the Infrastructure Program ("the Program") based on data provided in Wilshire's CalPERS Real Assets Performance Analysis Review for the period ended June 30, 2018, and selected CalPERS reports as cited. This memorandum presents the Program performance data with our observations, evaluation of key policy parameters, and infrastructure market commentary. There are no follow-up items from the last semi-annual review.

Program Performance[1]

CalPERS' Infrastructure Program continues to significantly outperform its policy benchmark for the reporting period, and over all other trailing periods shown below. Absolute returns for each of the 1 Year and longer trailing periods reflect an increase over the marks as at the last semi-annual reporting period by between 60 and 240 basis points. Benchmark-relative returns, measured as Over (Under) Performance, for 1, 5, and 10 Year periods also reflect an improvement over the last reporting period by between 50 and 230 basis points, with the 3 Year over-performance unchanged.

Net Returns %	Qtr.	6 Mos.	1 Year	3 Year	5 Year	10 Year
Infrastructure Program	4.1	7.2	20.6	13.0	15.0	14.4
Benchmark CPI+ 400	2.2	3.1	6.4	5.9	5.5	5.9
Over (Under) Performance	1.9	4.1	14.2	7.1	9.5	8.5

[1] Per Wilshire's CalPERS Real Assets Performance Analysis Review for the period ended June 30, 2018, reported with a 1-quarter lag for private market Real Assets investments, so effectively as of March 31, 2018.

Performance Highlights

The Real Assets Quarterly Performance Report for Q1 2018 provides summary level performance attribution for the Program-level results presented above. To best match the reporting period for this Review, we focus on the 1 Year period and note other periods as relevant to trends or changes.[1]

- **Income v. Appreciation:** Approximately 6%, or one-third of the return came from income, with the rest from appreciation. The balance is consistent with the purpose and positioning of the portfolio. This is an increase over recent 3 and 5 Year periods that delivered around 4% from income. The upward trend over the total period is consistent with the maturation of the portfolio.
- **Risk & Return:** Core continues to deliver the strongest returns, at 25%, followed by Value Add at 10%, and Opportunistic at essentially 0%. This relative performance has been consistent across all trailing periods. As noted in prior reviews, this is the inverse of what would be expected by definition, as a combination of vintage year effects and manager selection continues to influence absolute and relative performance. International Core is a key component of Core's impressive returns, posting 40% versus between 10% and 17% for other Core segments.
- **Segments:** As noted above, International (which is all Core) has delivered very strong returns for the Review period, and has consistently been the top performing segment. The Commercial (transportation) and Essential (energy) segments have delivered in their expected range at 17% and 14%, respectively, while Specialized (opportunistic infrastructure including both formally Value Add and Opportunistic risk-return profiles) has lagged at 6%.

Key Program Parameters[2]

Meketa evaluated the Program across six key parameters, with the following conclusions.

- **Implementation:** The Program's Net Asset Value ("NAV") as at March 31, 2018, was $4.28 billion, an increase of $250 million, or 6%, compared to the September 30, 2017 NAV of $4.03 billion. The current NAV represents 1.2% of the Total Fund,[3] compared to the 1% Interim Target.[4]
- **Risk:** NAVs are distributed across the Core, Value Add, and Opportunistic risk classifications at 81%, 8%, and 11%, respectively, which are compliant with policy ranges of 60-100%, 0-25%, and 0-25%, respectively.

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[1] Nominal returns net of fees, unless otherwise stated.
[2] As of March 31, 2018, per the Infrastructure Characteristics Datasheet provided by the Real Assets Unit for Risk, Region, and Segments/Sectors, and per the Real Assets Leverage Report for Leverage. Data may not total 100% due to rounding.
[3] The Total Fund NAV was $348.66 billion as of March 31, 2018, per Staff.
[4] Target per Staff 2017 Annual Program Review.

- **Region:** NAVs are distributed across the U.S., International-Developed, and International-Developing geographies at 54%, 45%, and 1%, respectively, which are compliant with policy ranges of 50-100%, 0-50%, and 0-15%, respectively.
- **Leverage:** The Program's Loan to Value ("LTV") metric and Debt Service Coverage Ratio ("DSCR") are 45.8% and 2.13, respectively, which are compliant with policy limits of 65% and 1.25, respectively.
- **Segments:** NAVs are distributed across applicable segments and sectors—Commercial (transportation), Essential (energy), International, and Specialized (opportunistic)—at 11%, 33%, 29%, and 28%, respectively. These data are informational only, as segment diversification compliance is measured at the Real Assets portfolio level.[1]
- **External Manager:** As of March 31, 2018, the maximum Infrastructure Partner Relationship Exposure for the Program was approximately 3.5% (Harbert), and the maximum exposure to investments with no External Manager was 1% (Concession Holdings), which are both compliant with policy limits, which place a cap of 20% on each.[2]

Market Commentary[3]

Market Activity

Preqin reports 1,277 deals with a transaction date in the first half of 2018, compared to 1,406 for the same prior-year period, with 2018 on track to post 2,500 to 3,000 deals by year end if the pace continues. Deal volume in H1 has been fairly consistent over the last five years, between 1,100 and 1,400, posting annual totals between 2,000 and 3,000, with an upward trend over this period. The average deal value into July was $390 million, up slightly over 2017's average of $340 million, continuing the upward trend from 2013 when it was $288 million.

Total deal size in H1 2018 (including equity and debt) is only available for 305 transactions, or about 24% of total number of deals, representing $152 billion in deal value. Among these, Europe accounted for $82 billion (54%) and North America $28 billion (18%). Asia reported $22 billion (15%), and Australasia, South America, and Africa were each less than $10 billion (6% or less). Across sectors, Energy represented 21% of the deal value at $33 billion, followed by Renewables at $28 billion (18%), Transportation at $26 billion (17%), Power at $20 billion (13%), Midstream at $18 billion (12%), and Telecommunications at $12 billion (8%). Social, Waste, and Water each reported $6 billion or less (4% or less).

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1 Segment diversification limits are prescribed in the Investment Policy Procedures & Guidelines for the Real Assets Program.

2 Calculated as NAV plus total unfunded commitments relative to a total Real Assets Program base (NAV plus unfunded commitments) of $46.4 billion.

3 Commentary based on analysis of aggregated and deal-level data from Preqin, and other Preqin data, unless otherwise cited.

Risk – Return Profile

As reported in the H2 2017 Review, Preqin's asset stage definitions and categorization provides some indication of risk profile at the deal level, with definitions as follows: Secondary stage is a fully operational asset or structure that requires no investment for development; Brownfield is an existing, typically operating asset needing improvements, repairs, or expansion; and a Greenfield asset does not currently exist. These categories can very roughly be mapped to Core, Value Add, and Opportunistic, respectively, ignoring other risk attributes such as geography and sector.

In H1 2018, 64% of the total deals by count were Secondary (Core), followed by 33% Greenfield (Opportunistic), and 4% Brownfield (Value Add). Among the 305 deals with reported values, Secondary deals accounted for 73% of the reported total deal size at $110 billion, Greenfield with 23% at $35 billion, and Brownfield with 5% at $7 billion. Secondary assets account for 96% of the total equity reported, and only 34% of the debt, compared to Greenfield and Brownfield which account for 2% each of the equity and 55% and 11% of the debt, respectively. While these data represent only 24% of the total number of deals reported, the relative relationships are consistent with our observations that Core is the most targeted category on a global basis. The leverage data can be interpreted as being consistent with our seeing moderate debt on Core and Value Add, and reflecting greenfield projects using higher levels of construction debt.

North America

Preqin reports 471 North American deals completed in H1 2018, including 382 in the U.S., 62 in Canada, and 16 in Mexico. Among these, only 78 have deal values, representing $28 billion in total deal size, with the 53 Secondary (Core) deals accounting for 74% of the value. North American H1 2018 sector data are provided below, excluding two "Other" deals, organized according to total deal size. The number and value of deals is consistent with what we are seeing, including the prevalence of midstream-related infrastructure, continuing rise of renewables, importance of conventional power, and focus on transportation. The number of social infrastructure deals is notable and indicative of increasing opportunities for private equity participation in governmental assets and services. Waste and water deals, two sectors of interest to many institutional investors, continue to be scarce and relatively small.

	Midstream	Renewable	Power	Transport	Energy	Social	Waste	Telecom	Water
# Deals	65	214	40	21	5	80	10	15	19
% of Total Deals	14%	45%	8%	4%	1%	17%	2%	3%	4%
# Deals w/$	17	25	5	8	1	13	3	3	3
Total Deal $M	9,500	6,400	4,500	4,100	1,700	700	500	300	100
Average $M	560	260	900	510	1,700	50	170	100	30
% of Total $	34%	23%	16%	15%	6%	3%	2%	1%	1%

Among the North American deals, Preqin identifies 37 with all or some assets in California, including, but not limited to: 19 separate solar power transactions, some of which were sold together as portfolios; five wind power assets; four midstream assets; three power plants; two airports; and two waste deals. Several are highlighted below.

- **Solar—**Global Atlantic Financial Group bought 11 assets from Southern Company. The Real Assets team actively pursued this opportunity, but it did not materialize. Additionally, Capital Dynamics and the Korea Electric Power Corporation were active buyers, with sellers including 8point3 Energy Partners and Recurrent Energy.
- **Wind—**ArcLight Capital Partners sold two assets to OMERS Infrastructure Management. Other deal partners include an infrastructure fund and renewable energy companies.
- **Power**—ECR Corporate Holdings, LP, a company backed by Ares Management-controlled funds, entered into a joint venture with California Resources Corporation ("CRC") that owns midstream and power infrastructure assets in the Elk Hills area near Bakersfield. The Ares-led group invested $750 million in the joint venture and bought $50 million of CRC common stock.
- **Transportation—**The Los Angeles Airport Automated People Mover, a $5 billion P3 project, was awarded to the "LINXS" consortia comprised of Fluor, Balfour Beatty, ACS Infrastructure Development, Dragados USA, HOCHTIEF PPP Solutions, Flatiron, and Bombardier Transportation, along with a design team of HDR and HNTB.

Fundraising and Dry Powder

As of July 2018, unlisted infrastructure funds had $173 billion in dry powder, an increase over $159 billion at 2017 end, and $151 billion at 2016 end. Even with this record amount, infrastructure managers' annual aggregate capital raises continue to increase. In H1 2018, 26 funds closed on $37 billion, tracking toward $75 billion for 2018, if past trends of equal or greater second halves hold, which would put 2018 over 2017 and 2016 capital raises of $71 billion and $66 billion, respectively. Industry participants and observers keep looking for these trends to plateau but so far that is not happening. For example, Global Infrastructure Partners only just closed its $15.8 billion Fund III in January 2017, and has deployed or committed enough capital that it has recently launched Fund IV, with a target of $17.5 billion. Brookfield Asset Management is also expected to launch its fourth infrastructure fund later this year, potentially seeking $18 billion, compared to its Fund III raise of $14 billion.

Market Outlook

Our outlook remains essentially the same as reported in February of this year, and in November 2017. We expect the forward outlook to continue recent trends, with robust deal flow coming from institutional fund exits, privatization of public assets, greenfield projects, and strategic sales. We still expect competition for core assets to remain fierce, driven by institutional allocations, managers' dry powder, and direct investors' appetite. And, we continue to believe that CalPERS' prestige as a partner for investment managers and other investors provides a competitive advantage in the marketplace that the Program can use to its benefit with existing and new managers and other prospective partners.

Conclusion

We believe the Program's performance for the reporting period and all other trailing periods has been impressive relative to the benchmark. The portfolio's development and its current position is appropriate and consistent with applicable policies and guidances. The market environment is challenging for core buyers, but healthy deal flow somewhat mitigates competition. Moreover, CalPERS is in a position to leverage its brand, resources, and strategic relationships with select managers to participate in a creative and disciplined manner.

Please do not hesitate to contact us if you have questions or require additional information.

Sincerely,

Stephen P. McCourt, CFA
Managing Principal

Lisa Bacon, CAIA
Senior Vice President

SPM/EFB/nca