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[November 13, 2015]

Joseph Byrne, Chair
California Water Commission
Department of Water Resources
1416 Ninth St.
Sacramento, CA 95814

Re: Comments on draft regulations for Proposition 1, Chapter 8

[Dear Chair Byrne,]

Thank you for the opportunity to comment on the Water Storage Investment Program regulations (pursuant to Chapter 8 of Proposition 1). As scientists who have worked extensively on water issues in California, we want to help ensure that the best available science informs large public investments. In particular, we encourage the Commission to require, rather than just encourage, that credible, climate scenarios and adaptation measures are incorporated in proposals for projects that are seeking public funds under Proposition 1.

We are writing to provide information about the widespread availability and use of climate science and data in water infrastructure planning. We hope that our comments will be useful in terms of identifying where existing public data can be found, how data have been used by multiple state and local agencies to improve water infrastructure planning, and how data may be incorporated into your assessment of public benefit in a way that ensures that you are taking the best available science into account when making important decisions about public investments in long-lived infrastructure.

Summary: Climate Science Critical to Assess Large Public Investments in Long-Lived Water Infrastructure Proposals

It is clear, and widely accepted, that the past is no longer a predictor of the future when it comes to water management. For example, while instrumental and paleoclimate records show that over the past millennium the Sacramento and San Joaquin rivers have experienced 1-5 multi-year dry periods per century, rising global temperatures are projected to increase the severity of future droughts. Thus, solely relying on historical data is inappropriate given the already observable impacts of climate change on California's water resources, including record low snowpack and reservoir levels.

California has invested considerable resources in state-sponsored studies of climate impacts and adaptation, including the California Climate Assessments and the Cal-Adapt website, which provide user-friendly interfaces for understanding and downloading climate data at state, regional, and local scales to improve decision making. In addition, the current unprecedented climate warming and ongoing drought have stimulated many studies that every year add to our knowledge base on climate impacts.

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It is also clear that state and local agencies are already using climate data and projections to evaluate and prioritize management options. Although the draft regulations encourage (but do not require) applicants to perform a sensitivity analysis of the impacts of climate change, that sensitivity analysis is not incorporated into the quantification of public benefits. It will be critical to understand climate impacts on sea levels, snowpack, runoff and recharge rates, along with evaporative demand when evaluating the possible benefits of projects that are expected to operate through the mid- to end- of the twenty-first century when water resources will be profoundly affected by climate change, even if we assume lower emissions then the current global trajectory.

In summary, responsible allocation of public funds for investments in critical, long-lived water infrastructure in California can and should require project proponents to use the best available data and incorporate credible climate-warming scenarios.

We have provided more detail about the points made in this summary below. We would be happy to provide more detailed recommendations of how to access and incorporate climate science in water infrastructure evaluation. Thank you again for the opportunity to comment.

The Past is No Longer a Predictor of the Future

In 2008, a number of preeminent scientists wrote a foundational paper that has since been cited almost 2,000 times in the academic literature that summarized a simple, but very perplexing problem: the past is no longer a predictor of the future when it comes to water management. The paper reads in part:

> Stationarity—the idea that natural systems fluctuate within an unchanging envelope of variability—is a foundational concept that permeates training and practice in water-resource engineering… In view of the magnitude and ubiquity of the hydroclimatic change apparently now under way, however, we assert that stationarity is dead and should no longer serve as a central, default assumption in water-resource risk assessment and planning. Finding a suitable successor is crucial for human adaptation to changing climate (Milly et al. 2008).

Indeed, climate change is affecting water resources with California currently experiencing record low snowpack and record low reservoir levels. Both wetter wet periods and drier dry periods are expected. Therefore, it will be important for water resources planning and infrastructure to be designed for a wider range of climatic extremes. This and other research has provided a basis for resources that the State of California has developed, detailed below. For a summary of the impacts of climate change on water resources in California see *The Big Water Supply Shift: Groundwater Key to Water Security in California's Changing Climate* at (www.ucsusa.org/watersupplyshift). Fortunately, California is a state that has invested substantial resources into climate science, and has developed tools to help make climate data widely accessible.

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California has Made Considerable Investments in Climate Science

Beginning over a decade ago, California began supporting periodic scientific assessments on the impacts of climate change in California and potential adaptation responses. Initiated by Governor Schwarzenegger's Executive Order S-3-05, the Secretary of the California Environmental Protection Agency must "report to the Governor and the State Legislature by January 2006 and biannually thereafter on the impacts to California of global warming." The most recent Third Climate Change Assessment funded several studies on water resource management summarized here: www.energy.ca.gov/2012publications/CEC-500-2012-007/CEC-500-2012-007.pdf, including a study showing how water year classifications need to be updated in order to reflect longer and more severe droughts.

In addition to funding cutting-edge science, the state has also developed the Cal-Adapt website at www.cal-adapt.org to share all of the data that is produced by the state-funded climate change assessments. The Cal-Adapt website makes it easy to visualize, manipulate, and download climate data, including changes in snowpack, precipitation, sea levels, and temperature, which are all important for water management.

On September 2, 2015, California's State Legislature approved SB 379, which explicitly names Cal-Adapt as a resource for helping counties and cities across California understand and plan for local vulnerabilities related to climate change. SB 379 requires that local hazard mitigation plans address climate change adaptation and resilience. Cal-Adapt will continue to add new features, enhancements, and data sets to help with this and other efforts.

State and Local Agencies are Already Using Climate Science

In 2008, DWR published *Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water* (www.water.ca.gov/climatechange/docs/ClimateChangeWhitePaper.pdf), which clearly stated:

> Use of historical hydrologic data has long been the standard of practice for designing and operating water supply and flood protection projects…Paleoclimatology (which relies upon records from ice sheets, tree rings, sediment, and rocks to determine the past state of Earth's climate system), as well as other research revealing expected impacts of climate change, indicate that our traditional hydrologic approach can no longer be solely relied upon. ***That is, the hydrologic record cannot be used to predict expected increases in frequency and severity of extreme events such as floods and droughts. Going forward, model calibration or statistical relation development must happen more frequently, new forecast-based tools must be developed, and a standard of practice that explicitly considers climate change must be adopted.*** (emphasis added)

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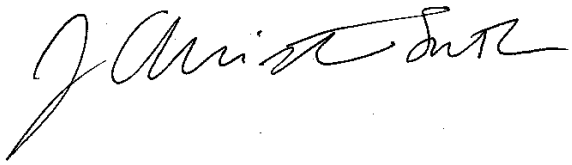
Then in 2011, DWR published the *Climate Change Handbook for Regional Water Planning* (www.water.ca.gov/climatechange/docs/Climate_Change_Handbook_Regional_Water_Planning.pdf), which lays out specific steps for water projects and water suppliers to use climate science to assess vulnerability, measure impacts, and evaluate projects and resource management strategies. There are a number of case studies included that show how local agencies are using climate projections to improve their planning, including the Metropolitan Water District of Southern California which has conducted a reliability analysis addressing potential climate change impacts along with other uncertainties, and used the results of their reliability study to evaluate and prioritize management programs (see Section 7: Implementation Under Uncertainty).

Sincerely,



Dr. Juliet Christian-Smith,

California Climate Scientist

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