2023

Charge to the Delta Science Program Independent Review Panel for the State Water Project – Delivery Capability Report

Orientation and Focus

The goal of the review is to review and provide feedback to the Department of Water Resources (DWR) on data and methods used to model conditions that have changed and will continue to change as a result of climate change. Feedback from this review will be used in a range of water resource planning activities and is most immediately needed for producing the State Water Project (SWP) 2023 Delivery Capability Report (DCR). The DCR provides essential information about the current and projected future water supply reliability of the SWP and is used extensively by SWP contractors and others to plan their water uses, including Integrated Regional Water Management Plans, Urban Water Management Plans, Agricultural Water Management Plans, and Integrated Resource Plans.

The DCR is issued every two years, with the next report due in December of 2023. This review will examine two major changes to the 2023 report focused on the ways that DWR develops climate information for the DCR. DWR is requesting a review of these new techniques and recommendations to inform refinement of these techniques for future DCRs and other planning studies.

The review will focus on the climate adjusted hydrology datasets and CalSim3 model used for the DCR. However, many of the other models DWR uses rely on similar datasets; thus, the work being reviewed may also apply to other modeling tools and processes.

Product

Each reviewer will prepare an individual review letter for each part of the review. The review letters will be prepared according to the template provided by the Delta Science Program and the schedule outlined in the Scope of Work.

Review Panel Membership

- Jon Herman, PhD, University of California, Davis
- Dan Feldman, PhD, Lawrence Berkeley National Laboratory
- Ruby Leung, PhD, Pacific Northwest National Laboratory

Panel Format

The review panel will convene virtually for 1-4 teleconference meetings for each part of the review. The first kickoff meeting will be held with only staff from the Delta Science Program; this meeting will orient reviewers to the process and general topic, and review documents will be distributed. The second meeting will be held with both DSP and DWR staff, and

reviewers will have an opportunity to ask clarifying questions about the charge and background documents.

Reviewers may hold subsequent virtual meetings as needed during the review period. The DSP will coordinate all correspondence between the reviewers and DWR.

There will be no in-person or public meetings.

Scope of Part #1: Climate Adjusted Historical Hydrology

The DCR is developed with CalSim3, which uses a historical trace from 1922-2021 of natural hydrology as the key input forcing dataset. Simulations are run in a fixed level of development and fixed climate period approach. This means that during a 100-year simulation, land use patterns, sea level rise, and regulations and structures associated with water operations do not vary. Each year of the simulation represents stochastic weather and water management conditions at a point in time. For purposes of the DCR, modeling SWP reliability for future climate conditions assumes that hydrologic data reflect a stationary climate within historical and future conditions, though the future stationary condition may be offset from the past stationary condition.

Given the scientific consensus on climate change, questions are now arising as to whether the historical trace of natural hydrology is itself stationary and whether it is adequate for reliable modeling of what we consider to be current conditions. If hydrologic data are non-stationary, DWR needs a reliable and robust process for evaluating the significance of hydrologic changes and developing supplemental or replacement data that deal with the loss of stationarity.

Specifically, this part of the review will examine 1) DWR findings on hydrologic changes in key watersheds throughout California's Sierra Nevada and Central Valley, focusing on key parameters for water supply analysis (e.g., average annual flow, standard deviation of annual flow, timing of runoff, runoff efficiency); and 2) the process and dataset developed by DWR to translate identified statistical changes in historical hydrology to a useable adjusted hydrologic and meteorological timeseries that can be input to existing planning and operational models, including CalSim3.

Reviewers will address the following questions:

1. Is this method an improvement over the use of unadjusted historical data (i.e., an assumption that the historical timeseries is stationary) for representing current conditions? Why or why not?
2. How well does the new method account for statistically significant trends to represent a quasi-stationary current climate while avoiding bias or trends that are artifacts?

3. What specific investigations or improvements should be considered in future updates of this dataset?
4. How frequently should DWR consider updating this dataset?
5. The draft Climate Adjusted Historical Hydrology dataset presented for review is adjusted to a 1992-2021 climate condition. This period is entirely retrospective. With a goal of more accurately simulating the range of hydrologic variability under current climate conditions, what are the pros and cons of taking a more prospective approach in future iterations by, for example, including modeling of potential future conditions to capture a 30-year climate period *centered* on the current year rather than *concluding* with the current year?

Materials to be Reviewed

- Evaluation and Adjustment of Historical Hydroclimate Data: Improving representation of current hydroclimatic conditions in key California watersheds.

Background Information

- 2021 State Water Project Delivery Capability Report and Data

Supplemental Documents

- California Hydroclimate reports 2015-2021 documenting and tracking several hydroclimatic variables and their variation from year to year: https://water.ca.gov/Programs/Flood-Management/Flood-Data/Climatology-and-Meteorology
- Miley, P.C. D. et al. 2008. "Stationarity is Dead: Whither Water Management?" Science, 1 Feb 2008, Vol 319, Issue 5863, pp. 573-574. DOI: 10.1126/science.1151915

Scope of Part #2: Risk Informed Future Scenarios

To model future conditions, past versions of the DCR have generally included a single scenario of future delivery capability 20 years from the year of the report. In an effort to be more transparent and improve water management planning at the state and local levels, DWR/SWP have developed new risk-informed climate change scenarios to be provided in the 2023 SWP DCR. The risk-informed climate change scenarios have been developed by drawing on both bottom-up climate vulnerability analysis and top-down scenario analysis work done by DWR, its partners, and the academic community. The scenarios explore a range of 2043 climate and sea level rise conditions that pose increasing levels of concern to system performance starting at a 50% percent level of concern (central tendency of climate projections) to a 95% level of concern (in which only 5% of the climate model informed

projections of 2043 conditions would result in worse performance for the system than projected in the scenario).

Specifically, this part of the review will examine the process developed by DWR to construct risk-informed climate change scenarios for inclusion in the 2023 DCR.

Reviewers will address the following questions:

1. Is the procedure developed by DWR appropriately documented? Is there anything missing from the documentation?
2. Does the procedure apply rational and defensible evidence for the steps taken and techniques used to capture the probability of projected changes related to climate and sea level rise? Why or why not?
3. Do the new scenarios provide enhanced information for water users about potential future conditions and system reliability risks? If not, why?
4. Is this procedure an improvement over other previously used approaches to climate scenario selection/development? Why or why not?
5. Are there specific investigations or improvements that should be undertaken in future updates of this approach or use of this procedure to develop additional scenarios at time periods further into the future?

Materials to be Reviewed

TBD

Background Information

TBD

Supplemental Documents

TBD