Technical Guidance
Delta Watershed Water Availability Analysis
Climate Scenario Analysis

This document provides technical guidance on climate scenario analysis when conducting a water availability analysis (WAA) to demonstrate water availability for applications within the Sacramento-San Joaquin Delta (Delta) watershed to support findings required by Water Code Section 1260, subdivision (k); Section 1375, subdivision (d); Section 1243, subdivision (a); and Section 1243.5. WAA methods vary on a case-by-case basis depending on project specifics. The intent of this document is to provide generalized guidance, not to preclude an applicant from conducting an independent analysis using an alternative approach. Applicants are strongly encouraged to consult with State Water Board Division of Water Rights (Division) staff before preparing a WAA.

Water Availability Analysis in the Delta Watershed

WAAs provide information to support California Water Code findings demonstrating the availability of water for a new appropriation, including consideration of the amount of water to remain instream for public trust resources (e.g. fisheries, recreation) and compliance with water quality objectives. WAAs are generally comprised of two major steps: estimating unimpaired flow, and accounting for demand from senior diverters and instream flow / water quality objectives. General resources for performing WAAs for water rights permitting are available on the Division's website.[1] However, there are specific supply-side considerations that are unique to the Delta watershed that are addressed in this document. Demand-side considerations are addressed in additional technical guidance, linked at the bottom of this document. The Division has also developed a tool to assist applicants with WAAs in the Delta watershed, described in additional guidance linked at the bottom of this document (Technical Guidance on the Delta Watershed Spreadsheet Water Availability Analysis Tool).

California's climate is changing rapidly, including within the Delta watershed where studies have shown that historical precipitation and streamflow records no longer accurately represent current conditions.[2] The Division's recommended climate scenario analysis approach for permitting WAAs in the Delta watershed builds off of the analyses and data products developed by the California Department of Water Resources (DWR) as part of the 2023 State Water Project (SWP) Delivery Capability Report (DCR).[3] In this effort, DWR developed five hydrology datasets representative of distinct climate scenarios which can be applied in water supply analyses for the Delta watershed. These datasets include historical hydrology for WY 1922 – WY 2021, an

[1] https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_availability/
[2] https://data.cnra.ca.gov/dataset/state-water-project-delivery-capability-report-dcr-2023/resource/ad861b0b-c0aa-4578-8af0-54485e751ca8
[3] https://data.cnra.ca.gov/dataset/finaldcr2023

"adjusted historical" dataset which alters the historical hydrology to be representative of the WY 1992 – WY 2021 climate period (i.e. current conditions), and three future climate scenarios which alter the historical hydrology to be representative of possible 2043 conditions.[4]

In order to account for the impacts of climate change on water availability in the Delta watershed, Division staff recommend assessing water availability using unimpaired flow data that represents hydrologic conditions under current and future climate scenarios, rather than historical conditions.

Representing Current Hydrologic Conditions

In developing the 2023 DCR, DWR analyzed whether hydrologic conditions in the Central Valley have shifted far enough from the historical baseline over the past century to warrant replacing the use of historical hydrology in planning models with a dataset more representative of current conditions. They found that interannual variability of unimpaired runoff has increased and that seasonal shifts in runoff timing have occurred to such an extent that historical hydrologic data are no longer representative of the current hydrologic regime.[2] This ultimately led to the creation of the adjusted historical hydrology dataset, which represents the observed interannual variability for the entire WY 1922 – WY 2021 period as if it occurred under current hydrologic conditions.

Precipitation and streamflow data from the historical hydrology dataset for the current climate period of WY 1992 – WY 2021 were used as the basis for modifying the data for WY 1922 – WY 1991 via a combination of statistical scaling methods. The resulting adjusted historical hydrology dataset is identical to the historical hydrology dataset for water years 1992 through 2021, with adjustments to the standard deviation and monthly distribution of historical streamflow for WY 1922 – WY 1991 (i.e. wetter wet years, drier dry years, and seasonal shifts in flows).

The purpose of a water availability analysis is to use available data to determine how much water might currently be available for a new appropriation. With the availability of the adjusted historical hydrology dataset, it is possible to simulate current hydrologic conditions while also capturing the interannual variability expected to occur over a 100-year period of record. Given that the historical hydrologic record is no longer representative of current hydrologic conditions within the Delta Watershed, Division staff recommend basing water availability findings for current conditions on the adjusted historical hydrology dataset rather than on observed historical hydrology.

Representing Future Hydrologic Conditions

The 2023 DCR analyzes SWP system performance under three risk-informed future climate scenarios. DWR used a novel risk-based analysis to develop hydrology datasets

[4] https://data.cnra.ca.gov/dataset/finaldcr2023/resource/e41f531d-dace-4d37-b52e-35a6ddd2224e

for 2043 climate scenarios representing 50th, 75th, and 95th percentile levels-of-concern, each representative of a different magnitude of change to the Eight River Index April – July runoff. The risk-based analysis differs from approaches previously applied by DWR and others that use the average of projected climate conditions from an ensemble of GCMs. In the risk-based analysis approach, DWR applied a bottom-up stress test paired with a probability density function representative of likely climate conditions based on an ensemble of GCMs to develop scenarios representing climate-informed levels-of-concern.

Due to its reliance on Eight River Index April – July runoff, the "level-of-concern" framing that DWR has attached to the three future climate scenarios does not fit neatly into the context of WAAs for new water right applications. However, the future climate scenarios themselves and the associated hydrologic data that was generated for each scenario can still be applied in WAAs. The 1.5 °C (2.7 °F) increase in average temperature, 1.5-percent increase in average precipitation, and 10.5-percent increase in the 99th percentile daily precipitation event that characterizes the 50th percentile level-of-concern scenario is the most likely 2043 climate future based on DWR's analysis. Dispensing with the "risk-based" framing while still making use of the hydrologic data generated for this scenario allows for assessing water availability under probable 2043 conditions.

Additional Resources

Delta Watershed Water Availability Analysis Tool Climate Scenario Analysis Staff Report

Technical Guidance on Delta Watershed Water Availability Analysis Demand Considerations

Technical Guidance on Delta Watershed Water Availability Analysis Analytical Framework

Technical Guidance on the Delta Watershed Spreadsheet Water Availability Analysis Tool

(*This Technical Guidance was last updated on June 20, 2025*)