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Memorandum:
Dependable Yield for Coyote Valley Dam (Lake Mendocino)

Prepared for: U.S. Army Corps of Engineers, San Francisco District; and Russian River Flood Control and Water Conservation Improvement District

By: Pablo T. Silva-Jordan, and Samuel Sandoval-Solis, Ph.D.

The objective of this document is to provide a list of the dependable yield of Coyote Valley Dam (CVD) for two different storage capacities (current and augmented capacity). The *dependable yield* is the expected reservoir releases from CVD under drought conditions. In other words, what is the maximum amount of water that CVD can release under drought conditions to meet downstream water demands and system requirements without any deficit.

For this purpose, the Lake Mendocino water allocation model (LM-WAM) was used to estimate the dependable yield. This model was developed by the Water Management Research Laboratory at University of California Davis (UC Davis). The LM-WAM is a one-dimension water routing model governed by the continuity equation for the upper Russian River basin, which is the area extent of the Russian River basin above the confluence of the Russian River and Dry Creek. The model calculates a monthly mass balance over a 103-year period of record (Oct. 1910 to Sep. 2013) of inflows, outflows, changes in reservoir storage, water demands, and returns flows. Inflows for the model are unimpaired flows calculated by Flint et. al (2015).Three types of water demands are considered in the model: Agriculture, Municipal and Industrial (M&I) and Riparian. For agriculture, its water demand is estimated considering the type of crop (vineyard, orchard, pear, row crops, pasture and other), acreage and evapotranspiration for each crop as well as beneficial agricultural practices of frost protection and postharvest. For M&I, it is based on population growth. For riparian water use, it is estimated considering water uptake from riparian vegetation and groundwater recharge throughout the Russian River mainstem. The model accurately represents the current water distribution among users and system requirements in the upper Russian River. A water distribution algorithm defines the water allocation for water demands as well as the *compliance release* from CVD to meet the minimum streamflow requirements due to a biological opinion and decision 1610 (NMFS 2002); and a buffer flow of 20 cfs downstream of CVD. In addition, the guide rule curve for flood control protection determined by the U.S. Army Corps of Engineers is considered in its operation (USACE 1986). This model has been used in other applications, such as estimating CVD storage reliability under different infrastructure conditions (Silva-Jordan and Sandoval-Solis 2015) and to estimate the long term reliability of the Lake Mendocino (SCWA 2015).

This paragraph describes the method and procedure used to calculate the dependable yield. The maximum amount of water releases from CVD (*dependable yield*) depends on its inflows, storage capacity and outflows. For this reason, inflows, outflows and storage capacity are described in detail. For inflows to CVD and upper Russian River, unimpaired flows in the Russian river (East and West fork) headwaters, incremental flows throughout five control points (Calpella, Mendocino Lake, Hopland, Cloverdale and Healdsburg) and inflows from the Eel River through the Potter Valley Project (PVP) remained the same for every calculation in the present analysis. The storage capacity of CVD was tested in two different conditions, considering the current top of conservation storage (111 TAF) and augmented storage (186 TAF). Finally, water demands were increased or decreased (scaled up or down) to determine the maximum amount of water that could be withdrawn from CVD without any deficit in water demands and compliance release.

Two water management strategies were tested considering the current and augmented top of conservation capacity. Table 1 shows the results of the dependable yield for these two scenarios.

PVP	Storage Conditions	Dependable Yield (AF)	Critical Year
On	Current	57,807	1977
On	Augmented	84,368	1977

Considering that water imports remain at the same volume as of today (PVP-On), the dependable yield for the current storage capacity is 57,807 AF compared to 84,368 AF with the augmented storage capacity. The increase in dependable yield is 26,561 AF during drought. In both cases, reservoir releases were able to meet scaled water demands and reservoir compliance releases without any deficit.

References

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