MEMORANDUM

To:	Natalie Mast, AMA Director
From:	Casey Allman, Madison Moreno
Date:	11/5/2024
Re:	**Douglas Active Management Area (AMA) Crop Consumptive Use Calculation**

Comments: The Douglas AMA First Management Plan (1MP) includes consumptive use numbers to calculate water duties and allotments for Irrigation Grandfathered Right holders within the AMA. The details of the calculation of water duties are laid out in Chapter 4 of the management plan, and can be summarized as follows:

$$\frac{\textit{Consumptive Use + Other Needs + Leaching Allowance – Effective Precipitation}}{\textit{Assigned Irrigation Efficiency}}$$

For the purposes of the 1MP, the Blaney-Criddle method was used to calculate consumptive use, which is the same method that was used to calculate consumptive use values for the initial AMAs. Blaney-Criddle utilizes temperature, daylight hours, evapotranspiration, growing seasons, and crop coefficients to determine how much water a specific crop needs to produce in a year. For this analysis, seven years of weather data (2017 – 2023) were used, and crop coefficients were compiled from previous reports and scientific literature[1].

At the beginning of July 2024, The US Geological Survey (USGS) published consumptive use numbers for the Douglas AMA using a modified version of the Blaney-Criddle method, but only using one year (2023) of weather data.

Staff decided to combine the two analyses: using USGS crop coefficients in combination with the longer-term weather data and Blaney-Criddle method used by the Department. This combined analysis includes USGS crop coefficients developed by Doorenbos and Pruitt (1975) and weather data collected from the Bisbee-Douglas International Airport station, which contained a variety of weather patterns. In line with the historical irrigation

[1] https://www.sciencebase.gov/catalog/item/667b72e6d34e4b7815b85976

timeline outlined in A.R.S. § 45-452(G), the analyzed data was collected from the five years preceding the date of the call for the election.

An analysis of self-reported annual report data[2] over the six-year period (2017-2022) from the former Douglas INA was also conducted. Results of the annual report data included annual water use, crops grown, acres irrigated, and a base of 85% irrigation efficiency. Based off crop type, an average, minimum, and maximum reported consumptive use was calculated. A comparison of previously calculated consumptive use, using the method described above, and reported consumptive use determined the actual use is 19% of the Blaney-Criddle method, with a standard deviation of 0.062. By taking into account the Blaney-Criddle method, USGS crop coefficients, and historic reported water use, the Department has determined the calculated consumptive use will be cut by 19% to account for the reality of the water use in the AMA. This comports with the Department's statutory obligation under A.R.S. § 45-564 to calculate irrigation water duties as the quantity of water reasonably required to irrigate the crops historically grown.

[2] https://infoshare.azwater.gov/docushare/dsweb/HomePage