# Overview

Attached please find a multiple trace timeseries dataset from 3 different models issued by the US Bureau of Reclamation for the purpose of modeling Colorado River operations and supply. The models are used to assist in planning and operate on 3 different time horizons: 24 months, 5 years, and 10+ years. They are:

* July 2022 24-Month Study – July 2022 version of a model that is issued monthly by the Bureau and is used for short-term planning. This model is deterministic and employs the MOST probable hydrology for the coming 24-month period by the Colorado Basin River Forecast Center (CBRFC), an arm of the National Weather Service. In addition to the Most probable hydrology, this model is also issued quarterly with the MAXIMUM and MINIMUM probable hydrology.
* May 2022 Colorado River Mid-term Modeling System (CRMMS) – May 2022 version of a model that is issued periodically by the Bureau and is used to simulate river operations and supply on an intermediate (5 year) time horizon. This model is probabilistic and employs an ensemble of unregulated streamflow forecasts developed from the 1991-2020 precipitation and temperature record by CBRFC. A detailed explanation of model development is available here: <https://www.usbr.gov/lc/region/g4000/riverops/model-info.html#crmms-ensemble>
* January 2022 Colorado River Simulation System (CRSS) – January 2022 version of a model that is issued periodically by the Bureau and is used to simulate river operations and supply on a long-term (>10 year) time horizon. This model is probabilistic and employs historical natural flows (run in *trace sequential* mode) as hydrologic inputs. These flows generally encompass the period between 1906-2019, though other historically reconstructed or otherwise “synthetic” (GCM) hydrologies may also be used. A detailed explanation of model development is available here: <https://www.usbr.gov/lc/region/g4000/riverops/model-info.html#crss>

All models operate on a monthly timestep and are built on the RiverWare™ platform, a software developed and maintained by the [Center for Advanced Decision Support for Water and Environmental Systems (CADSWES)](https://www.colorado.edu/cadswes/) at the University of Colorado Boulder.

The attached data are in Excel format. In the Excel file are 5 worksheets:

* Mead Pool elevation – containing monthly Lake Mead pool elevation outputs for each model, aligned by date for graphing convenience.
* AZ – containing CRSS model outputs of annual volumes used by the state of AZ for each trace.
* CAP – containing CRSS model outputs of monthly volumes used by Central AZ Project for each trace.
* Shortage – containing a summary of:
  + end-of-calendar-year Mead Pool elevations for each year of model run
  + Annual ’07 Interim Guidelines shortage tier for Lake Mead (applied in following year)
  + Annual ’07 Interim Guidelines cut to AZ (applied in following year)
  + Annual DCP cut to AZ (applied in following year)
  + Volume available to AZ (theoretical, calculated)
  + Average volume available to AZ (model output) – averaged because across multiple traces. Note that all results in this category are from CRSS.
  + Average volume diverted by Central AZ Project (model output) – averaged because across multiple traces. Note that all results in this category are from CRSS.
* Chart 1 - A graph of all Lake Mead pool elevations for all traces in all models, showing ’07 Interim Guidelines shortage tier elevations

Also attached in this deliverable are a list of assumptions and overview of initial conditions associated with each model as issued by the Bureau.