

**Borrego Springs Watermaster  
Technical Advisory Committee Meeting  
November 1, 2023  
AGENDA ITEM IV**

**To:** Technical Advisory Committee (TAC)  
**From:** Andy Malone, PG (West Yost), Technical Consultant  
**Date:** October 25, 2023  
**Subject:** Time Period to Evaluate the Redetermination of the Sustainable Yield 2025

**Background**

The Judgment defines the Sustainable Yield of the Borrego Springs Subbasin (Basin) consistent with SGMA (Water Code, § 10721(w)) as: "The maximum quantity of water, calculated over a base period representative of long-term conditions in the Basin, that can be cumulatively pumped on an annual basis from the Basin without causing an Undesirable Result."

The Borrego Valley Hydrologic Model (BVHM) and its supporting tools, the Basin Characterization Model (BCM) and the Farm Process (FMP), were originally developed by the United States Geological Survey (USGS) and were used to improve the hydrogeologic understanding of the Basin and evaluate future management scenarios that would eliminate conditions of overdraft (initial BVHM).<sup>1</sup> The USGS estimated the long-term, annual average natural recharge to the Basin at 5,700 acre-feet per year (afy) for the period of 1945 to 2010.

The initial BVHM was updated and extended by Dudek and used to simulate historical groundwater conditions in the Basin from October 1929 through September 2016 (2016 BVHM).<sup>2</sup> The 2016 BVHM results were used to characterize the water budget for the Basin. Dudek estimated the long-term, annual average natural recharge to the Basin at 6,770 afy for the period of 1945-2016, 5,751 afy for the recent 20-year period of 1997-2016, and 4,737 for the recent 10-year period of 2007-2016.

Based on these studies, Section II.E of the Judgment established the initial Sustainable Yield at 5,700 afy and requires it to be redetermined by January 1, 2025, and every five years thereafter through 2035. If the redetermination results in a changed Sustainable Yield, then the Rampdown rate is adjusted accordingly to bring pumping in the Basin within the Sustainable Yield by 2040.

During its meeting on October 12, 2023, the Watermaster Board requested that the TAC discuss the appropriate time period to use to redetermine the Sustainable Yield in 2025.

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<sup>1</sup> USGS. 2015. [\*Hydrogeology, Hydrologic Effects of Development, and Simulation of Groundwater Flow in the Borrego Valley, San Diego County, California\*](#). Scientific Investigations Report 2015–5150.

<sup>2</sup> DUDEK. 2019. [\*Update to USGS Borrego Valley Hydrologic Model for the Borrego Valley GSA \(draft final\)\*](#). Prepared for the County of San Diego, Planning and Development Services.

## **Discussion**

During the August 29, 2023 TAC meeting, the TAC began to discuss the appropriate period to redetermine the Sustainable Yield in 2025, noting that the period should be multi-year to multi-decadal because (i) a long time-period is required by the Sustainable Management Groundwater Act (SGMA) and (ii) desert environments, such as Borrego Springs, experience infrequent but significant storm events and a longer period is required to capture the important effect of these storm events on recharge.

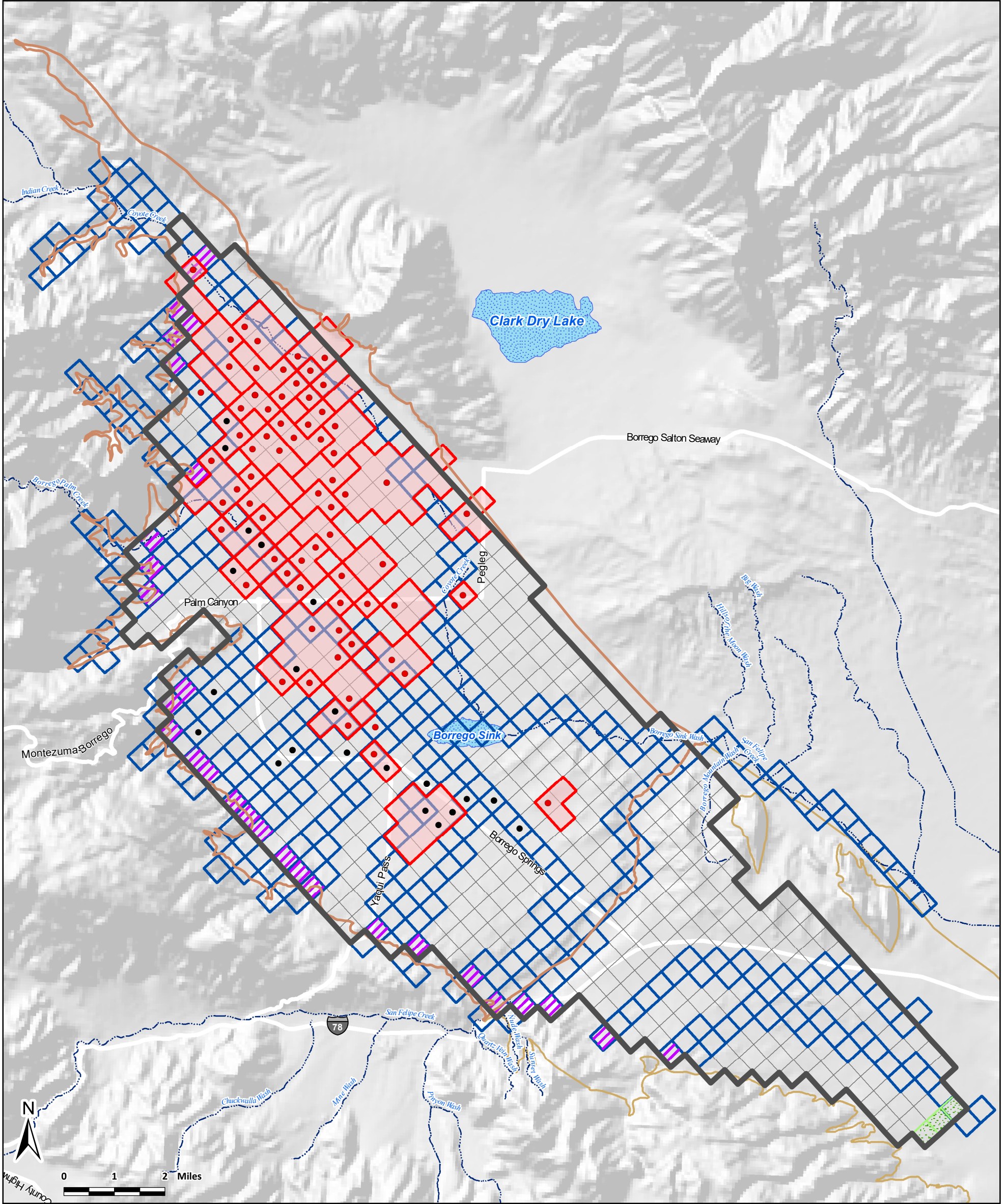
Watermaster staff agrees with the use of a long time-period in the BVHM to redetermine the Sustainable Yield in 2025. However, there are additional details and considerations that should be discussed and considered by the TAC to develop the methods to redetermine the Sustainable Yield, including:

1. Should the Sustainable Yield be based only on the long-term annual average recharge to the Basin as estimated by the BVHM? Or, should the relatively small rates of natural discharge as estimated by the BVHM (such as subsurface outflow and evapotranspiration of groundwater) be subtracted from recharge to estimate the Sustainable Yield?
2. Should the time period used to estimate the Sustainable Yield be the historical calibration period of the BVHM (e.g., 1945-2023)? Or should the time period be a future BVHM projection that accounts for the effects of climate change and future land/water uses that could affect natural recharge?
3. What domain of the BVHM should be used to estimate water budget of the Basin, and hence, form the basis of redetermined Sustainable Yield? The past studies by the USGS and Dudek appeared to use the entire BVHM domain to characterize the water budget of the Basin, but this domain includes the northern portion of the Ocotillo Wells Groundwater Subbasin (see Figure 1). Should this study use only that portion of the BVHM domain that covers the Basin, and hence, exclude the Ocotillo Wells Groundwater Subbasin?


At the TAC meeting, West Yost will provide an overview of this technical memorandum (TM) and facilitate TAC discussion to obtain feedback. TAC members are encouraged to review the USGS and Dudek reports that are referenced earlier in this TM and come prepared to discuss the questions listed above.

## **Enclosures**





Figure 1. Map of the BVHM Domain





**BVHM Cells**

 Boundary of Active Cells in the BVHM



**BVHM Packages Applied to BVHM Cells**

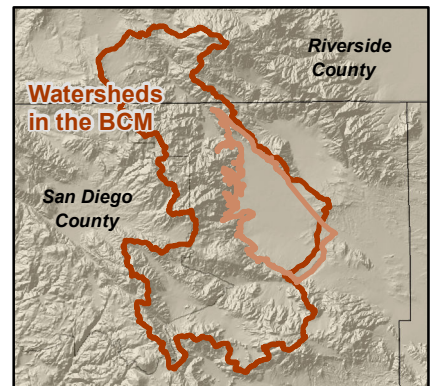
-  Streamflow Routing
-  Flow and Head Boundary
-  Constant Head
-  Non-FMP Well in MNW2 Package

**Farm Process Features**

-  Water Budget Subregion in the FMP
-  FMP Well in MNW2 Package

**Other Features**

-  Borrego Springs Groundwater Subbasin (7-024.01)
-  Ocotillo Wells Groundwater Subbasin (7-024.02)



**Borrego Springs Watermaster**  
Extension of the BVHM through WY 2021

Prepared by:



Figure 1

Borrego Valley Hydrologic Model (BVHM) Domain

**Exhibit 1. Responses to TAC Comments/Recommendations on Task 5 - Redetermine the Sustainable Yield**

TAC Comments/Recommendations	TAC Members					Technical Consultant Responses
	AAWARE <i>Bob Wagner</i>	BWD <i>Trey Driscoll</i>	County of San Diego <i>Jim Bennett</i>	T2 Borrego <i>Tom Watson</i>	Roadrunner Club <i>John Peterson</i>	
<b>Water-budget components to use to redetermine the Sustainable Yield</b>						
Long-term annual average recharge as estimated by the BVHM				X		We agree with the majority TAC opinion that net recharge to the Basin will be calculated as the difference between long-term annual average recharge and discharge. The water budget terms defined in Table 2.2-9 of the GMP should be used to redetermine the Sustainable Yield.
Long-term annual average recharge minus discharge (subsurface outflow and evapotranspiration [ET] of groundwater)	X	X <sup>1</sup>	X <sup>1</sup>			
<b>Time period to use to redetermine the Sustainable Yield</b>						
Historical calibration period (1945-2022)		X <sup>2</sup>	X <sup>3</sup>	X		We agree with the majority TAC opinion that the historical calibration period should be used to redetermine the Sustainable Yield. Specifically, the entire calibration period (1945-2022) should be used to estimate inflows. A more recent historical period (2007-2022) should be used to estimate outflows because it is more representative of current and future conditions.
Future BVHM projection that accounts for the effects of climate change and future land/water uses that could affect natural recharge	X					
<b>Model Domain to use to calculate the water budget</b>						
Entire BVHM domain (Borrego Springs Subbasin and Ocotillo Wells Subbasin)						We agree with the majority TAC opinion that the BVHM domain used to estimate the water budget and redetermine the Sustainable Yield should include only the portion of the domain that overlies the Borrego Springs Subbasin ( <i>i.e.</i> , exclude the portion of the domain overlying the Ocotillo Wells Subbasin).
Portion of the BVHM domain that contains only the Borrego Springs Subbasin		X <sup>4</sup>	X	X	X <sup>5</sup>	
More discussion is needed	X					

- Notes:*
1. Recommendation to use the inflow and outflow components listed in Table 2.2-9 of the GMP to estimate the Sustainable Yield. Table 2.2-9 identifies inflows as stream recharge, unsaturated zone recharge, and underflow, and outflows as evapotranspiration of groundwater and underflow.
  2. Recommendation to use a more recent historical time period for calibration which better reflects current land use and, therefore, ET from native and non-native vegetation (*e.g.* loss of native phreatophytes which has decreased ET). ET estimates from external sources, such as OpenET could be used to check the model estimate.
  3. This approach is consistent with the existing GMP and indirectly addresses climate change and future land/water uses by coupling the change in storage threshold to the chronic lowering of groundwater levels threshold. Natural recharge to Borrego Springs is highly variable and there is much greater uncertainty associated with precipitation and recharge than climate change projections. The Monte Carlo Simulation uncertainty analysis performed to redetermine the Sustainable Yield established the minimum threshold for the chronic lowering of groundwater levels using the variability in recharge to the Basin.
  4. Recommendation that if the model domain is revised, underflow from the southern end of the of the model should be evaluated in terms of the outflows used in the provisional estimate of Sustainable Yield.
  5. Verbal comment from the November 1, 2023 TAC meeting.