

South American Subbasin Groundwater Sustainability Plan Development

REVIEW OF CLIMATE CHANGE METHODOLOGY

SASb GSPWG:

- County of Sacramento
- Northern Delta
- Omochumne-Hartnell Water District
- Sacramento Central Groundwater Authority
- Sloughouse RCD

September 11, 2020



DWR SGMA Regulations for Climate Change

§ 354.18. (c) Each Plan shall quantify the ... projected water budget for the basin as follows:

(3) Projected water budgets ... shall ... estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:

(A) Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information ... (and) shall also be applied ... to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.

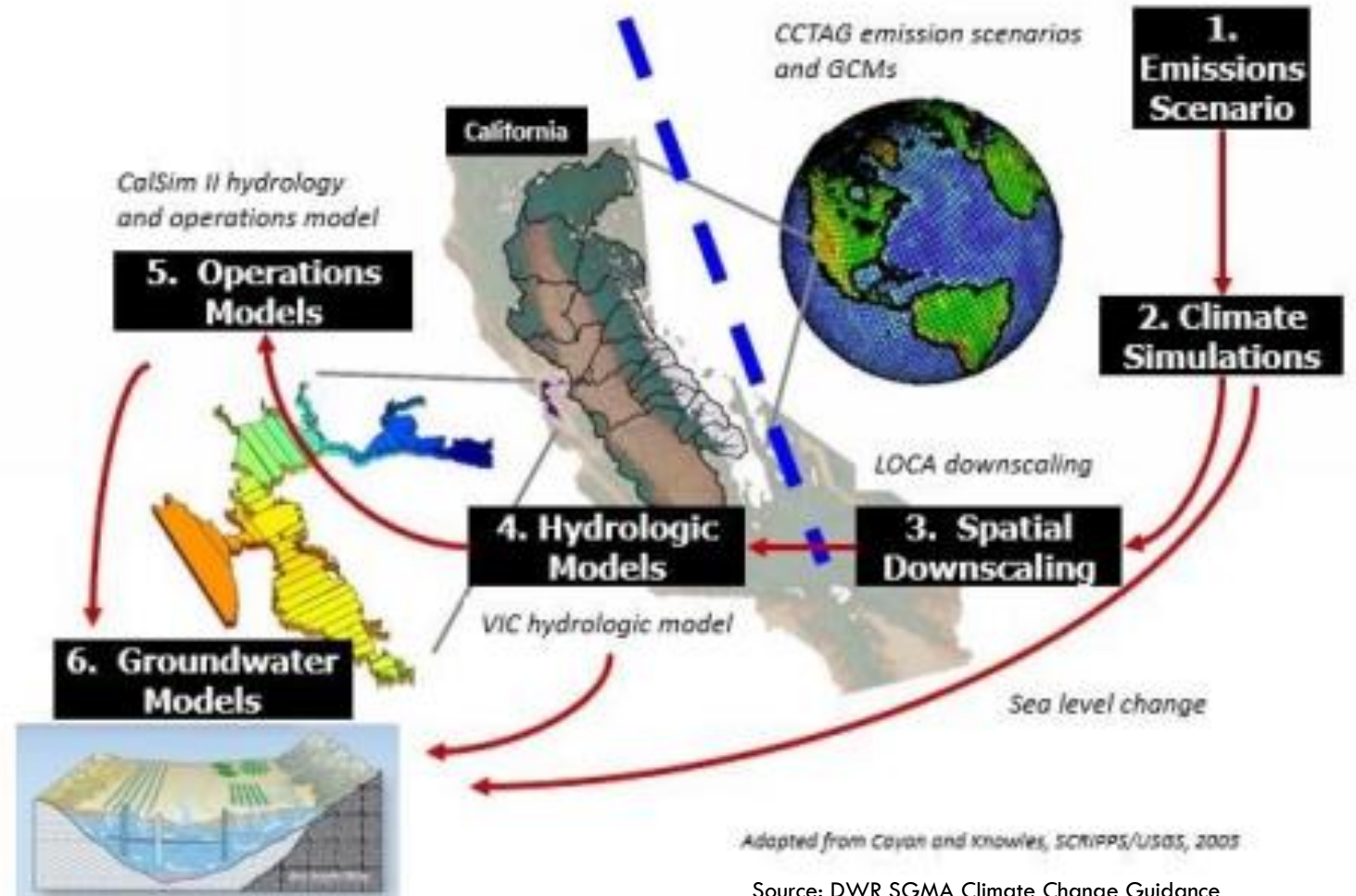
(B) Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information ... (and) shall also be applied ... to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate.

(C) Projected surface water supply shall utilize the most recent water supply information as the ... (and) shall also be applied ... to evaluate future scenarios of surface water supply availability and reliability as a function of the ... projected changes in local land use planning, population growth, and climate.

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Climate Change Data Downscaling to Groundwater Model Applications

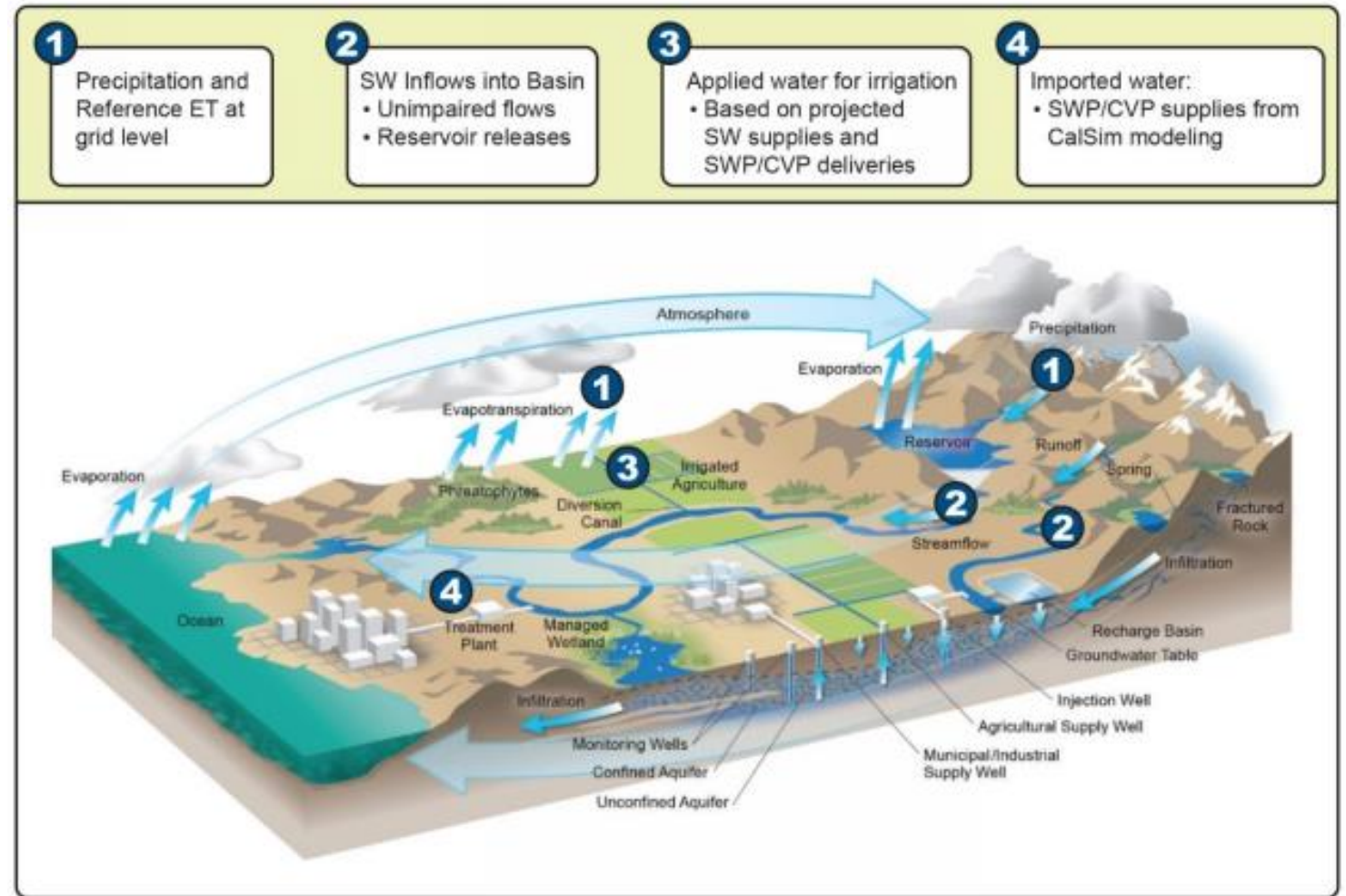
- Data from Global Climate Models (GCMs) are downscaled to a regional planning scale
- Downscaled data is available in pre-existing datasets



Source: DWR SGMA Climate Change Guidance

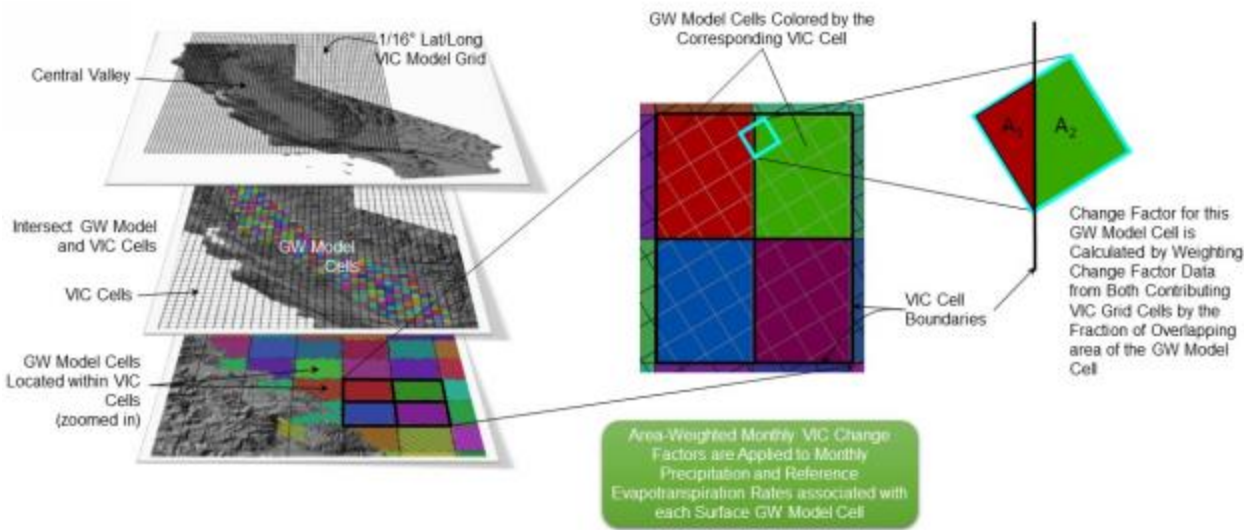
DWR SGMA Climate Change Guidance

- All applicable water budget components should be modified for climate change based Computations

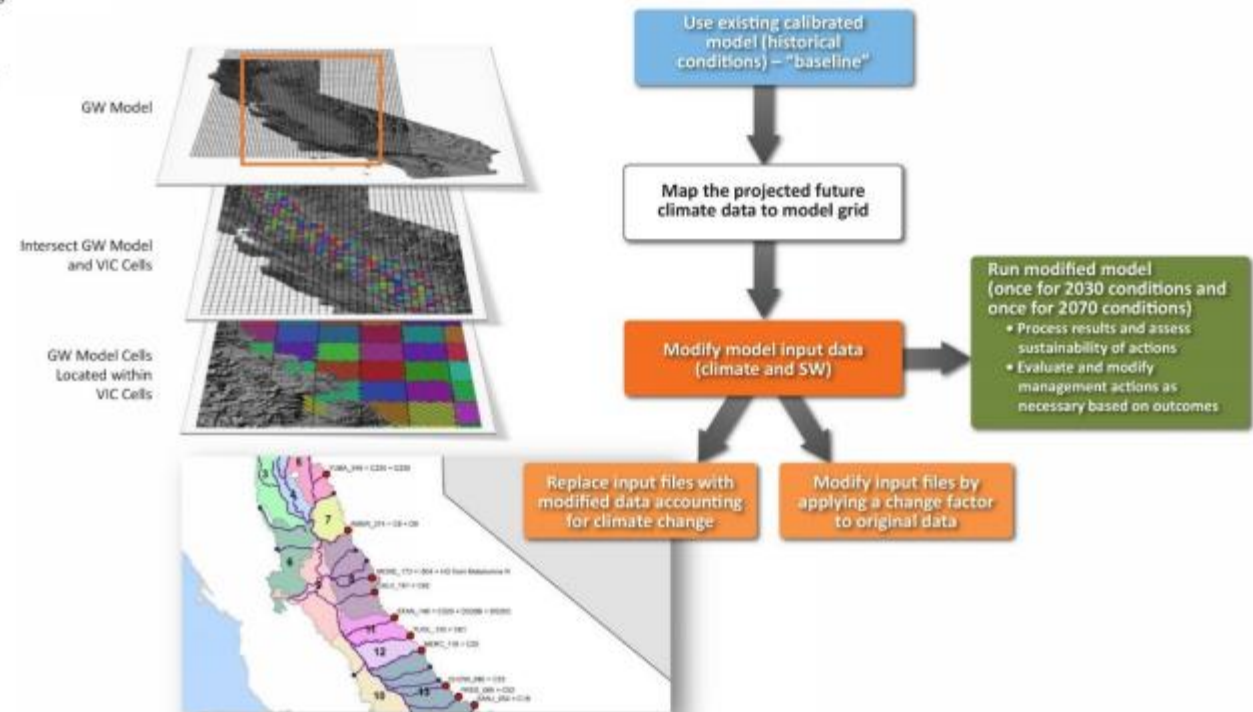


DWR SGMA Climate Change Guidance

- Applying Precip and ET Factors



- Modification of GW Model Components



Summary of DWR Recommended Climate Data

- Climate Scenarios
 - 2030 Central Tendency (CT)
 - 2070 Central Tendency (CT)
 - 2070 Dry, Extreme Warming (DEW)
 - 2070 Wet, Moderate Warming (WMW)

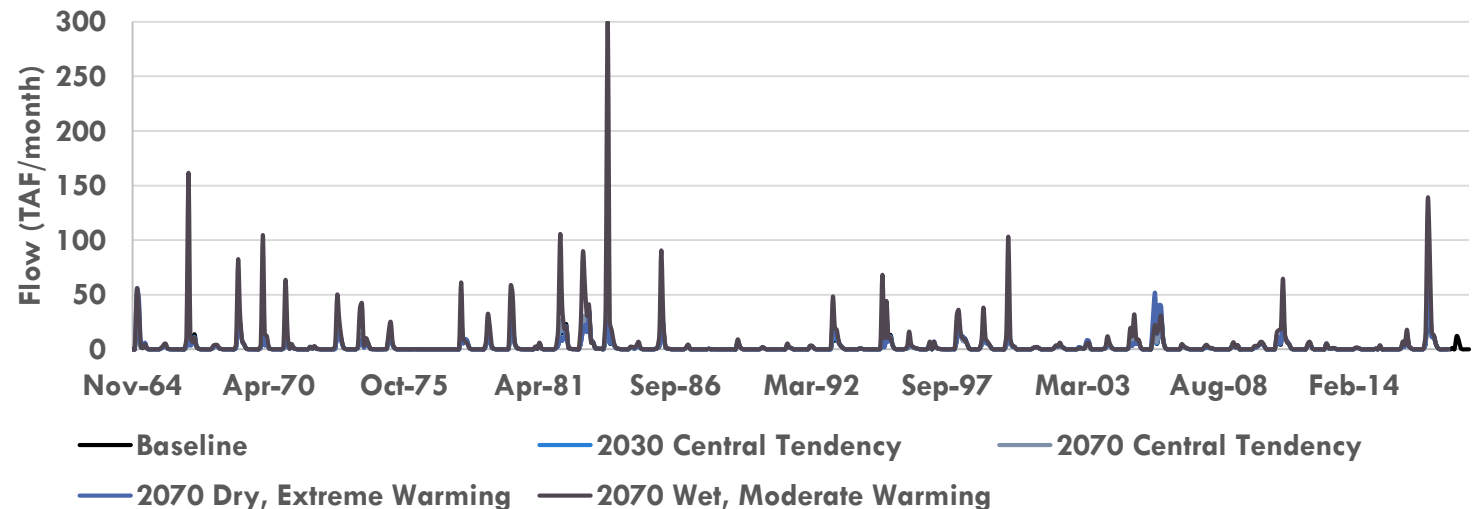
Table 1. Datasets Provided by WSIP and Modified Datasets Provided by SGMP

| Data Type | Specific Data | WSIP | SGMP ^a |
|------------------|---|--|--|
| Climate | Precipitation, reference ET | Individual text files for each VIC model grid cell with associated VIC grid GIS data | VIC model grid GIS data with related table of timeseries data for each grid cell (as change factors) |
| Hydrology | Central Valley stream inflows | Timeseries data developed as input to the CalSim II model | Point locations provided as GIS data with related timeseries data in .csv format for each location |
| Hydrology | Statewide unimpaired streamflow change factors ^b | N/A; runoff and baseflow provided in individual text files for each VIC grid | Dataset developed by combining VIC runoff and baseflow for each HUC 8 watershed; provided based on HUC 8 GIS data with related table of timeseries data |
| Water Operations | Diversion/deliveries and reservoir outflow data | Dataset embedded in CalSim II model runs | Point locations provided as GIS data with related timeseries data in .csv format for each location; delivery data available through lookup table of contracted amounts with CalSim II timeseries outputs in Excel format |

DWR Recommended Data for Streamflow

- Unimpaired streamflows
 - Utilize VIC-model data for individual streams
- Unimpaired streamflows
 - Based on CalSIM II data from Water Storage Investment Program (WSIP)
 - Uses CalSim II generated perturbation factors

- Example of Streamflow adjust for climate change



DWR Recommended Data for Precipitation and Evapotranspiration

- Utilize VIC-model data downscaled to California grids
- Multiply historical precipitation and evapotranspiration (ET) data using VIC-based climate change factors
- Incorporated climate-modified precipitation and ET data as input into CoSANA projected model

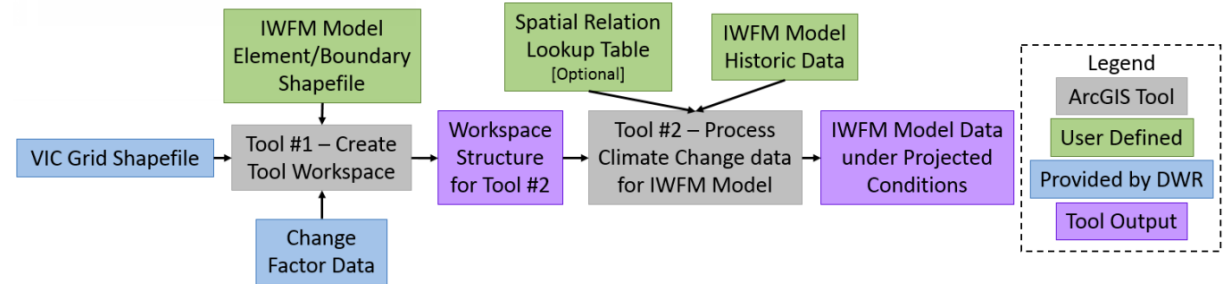
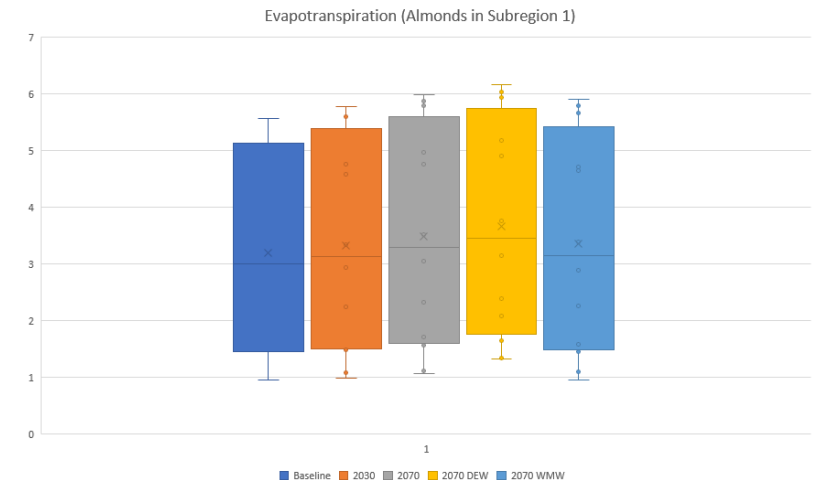


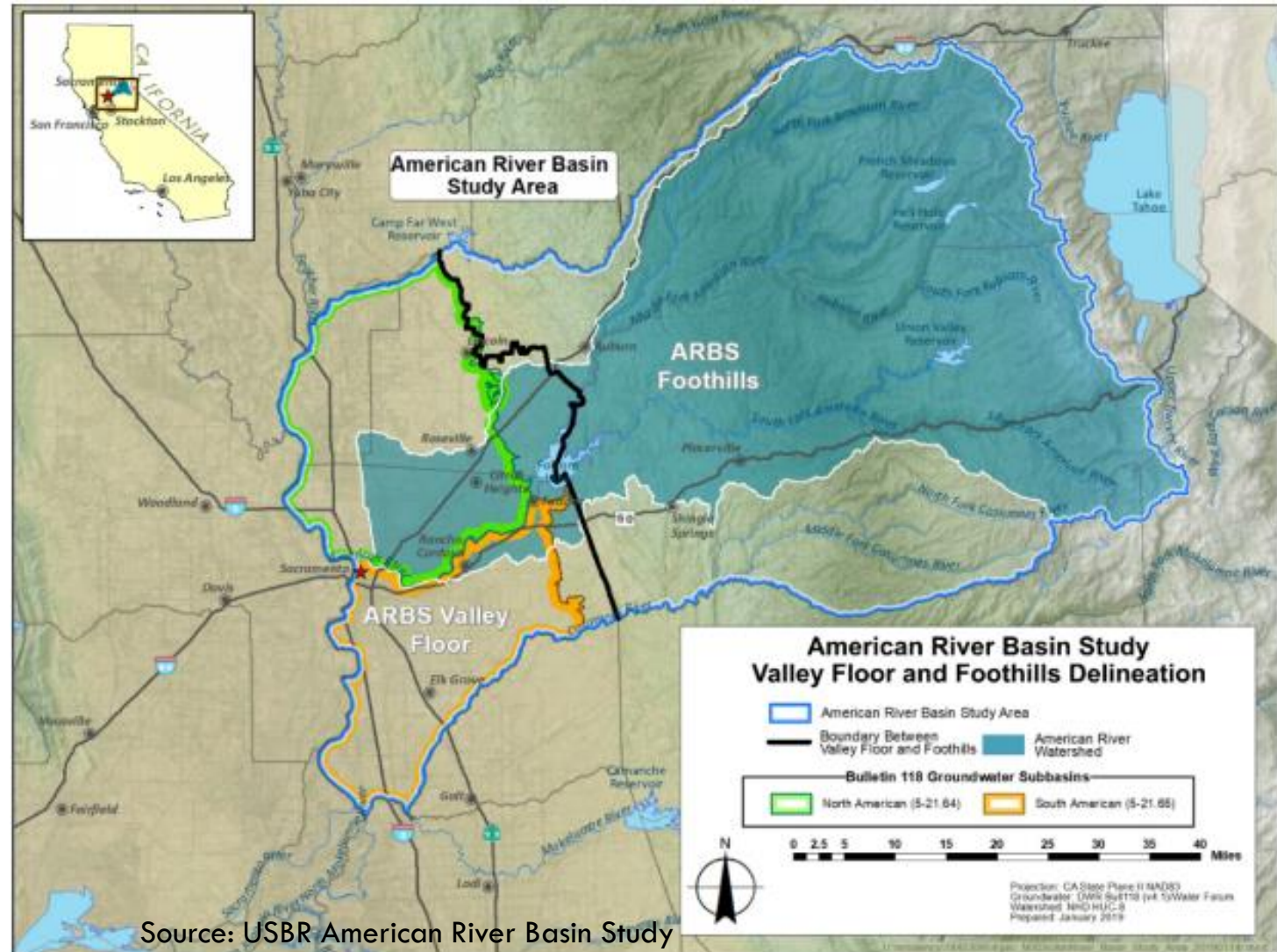
Figure 1 – Process Flow Diagram of IWFM Tool

- ET adjustment example



Overview of USBR American River Basin Study

- Key Technical Features:
 - Assesses supplies and demands and supply/demand imbalance under existing and future climate conditions
 - Develops adaptation strategies to address supply/demand imbalances
- Study Area includes:
 - North American and South American subbasins
 - American River foothills(data is also included for the Cosumnes subbasin)



USBR American River Basin Study – Climate Scenarios

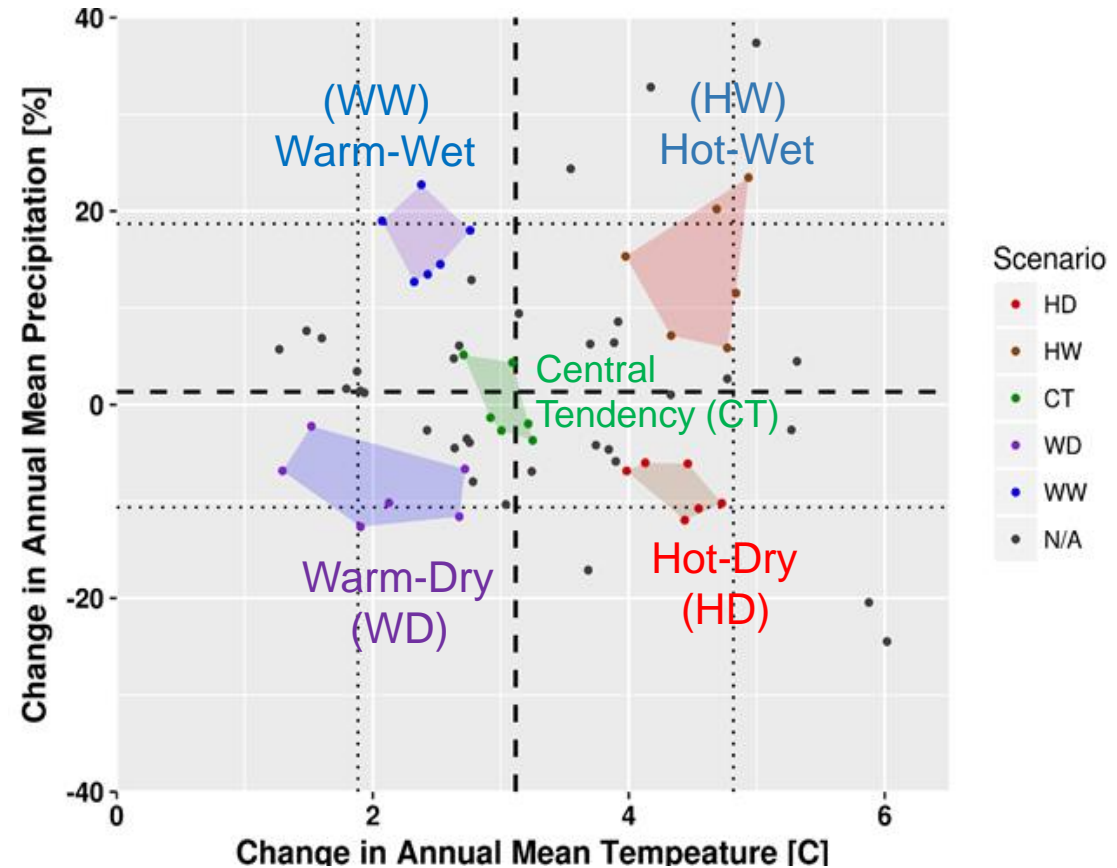
California future climate projections predict:

- Increase in temperature
- Uncertainty in amount of precipitation

Future climates reflect:

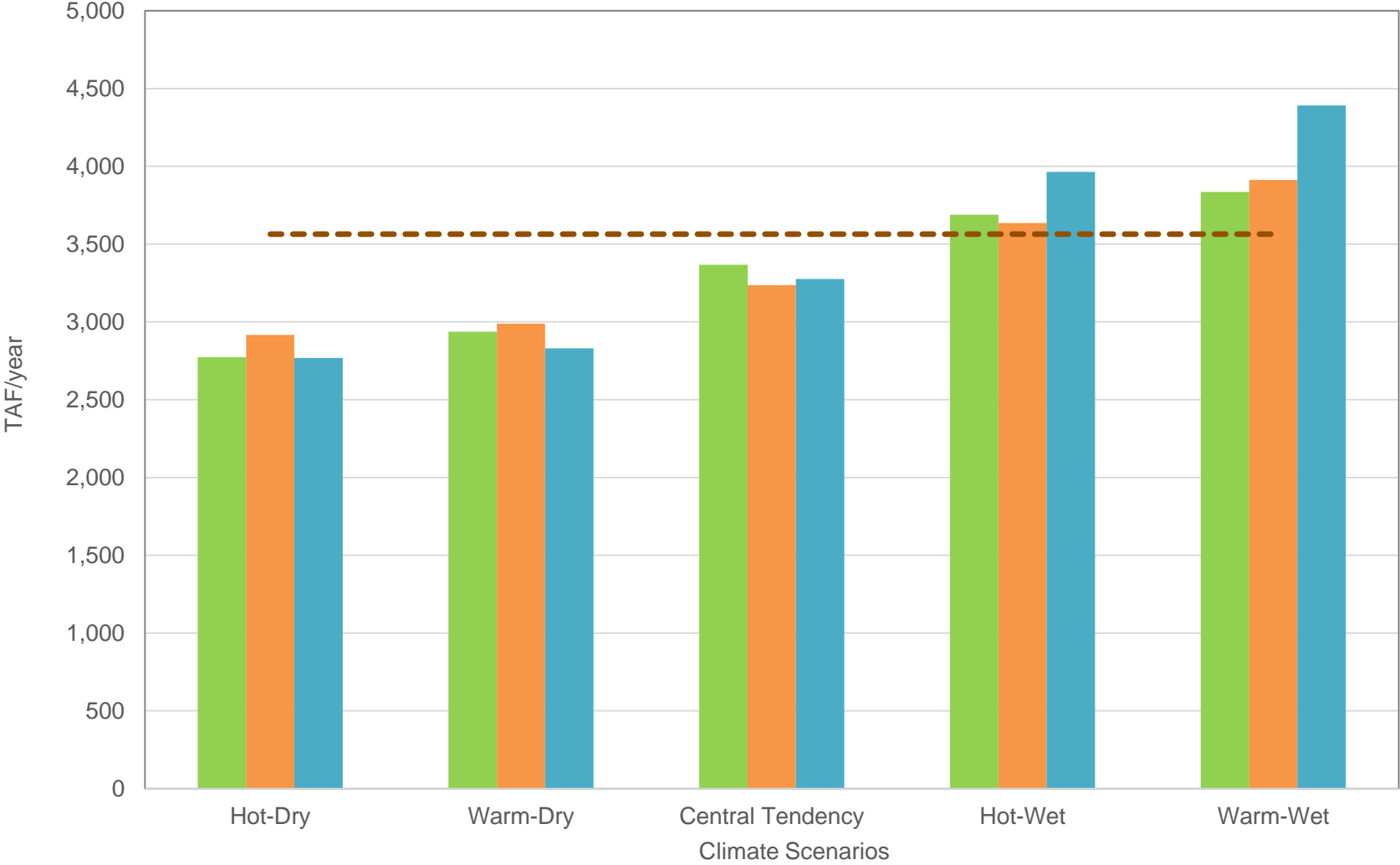
- 2 scenarios for global growth of greenhouse gases
- 32 global climate models
- Multiple initial climate conditions

To describe the full range of potential climate futures, ARBS developed 5 scenarios.



Source: USBR American River Basin Study

USBR American River Basin Study – Change in Runoff



2050

2070

2085

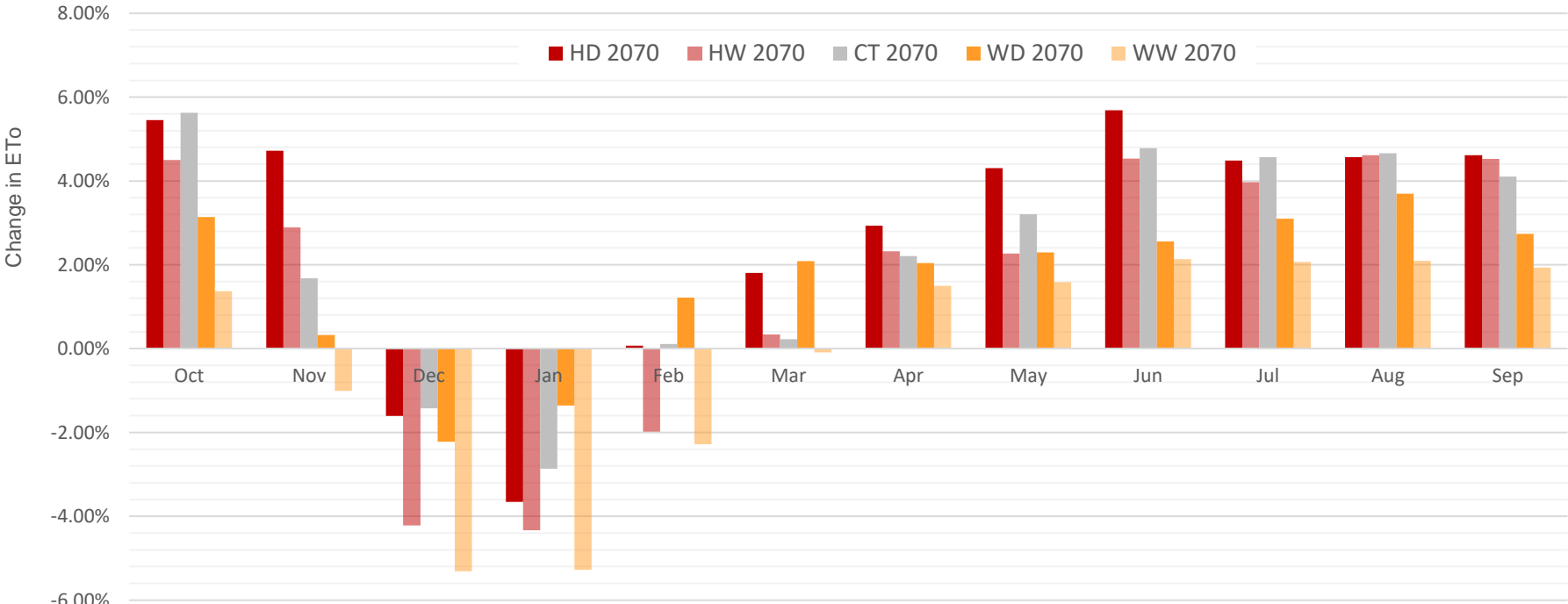
Baseline

Source: USBR American River Basin Study

USBR American River Basin Study – Change in Evapotranspiration

Future increase in temperature can result in higher evapotranspiration of 2% to 4% in the growing season (April to October).

Lower evapotranspiration is expected during rainy season (December to February).

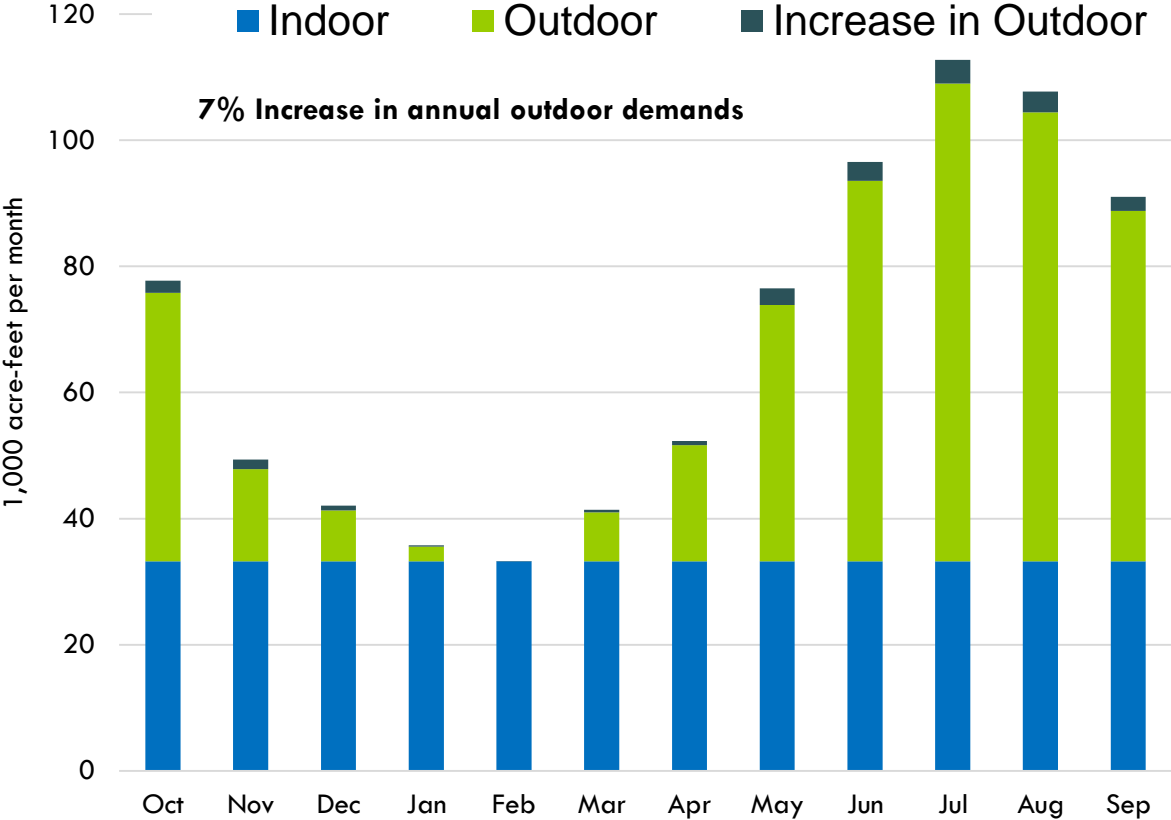


Source: USBR American River Basin Study

USBR American River Basin Study – Urban Outdoor Demand

Higher evapotranspiration rate results in higher outdoor irrigation demand.

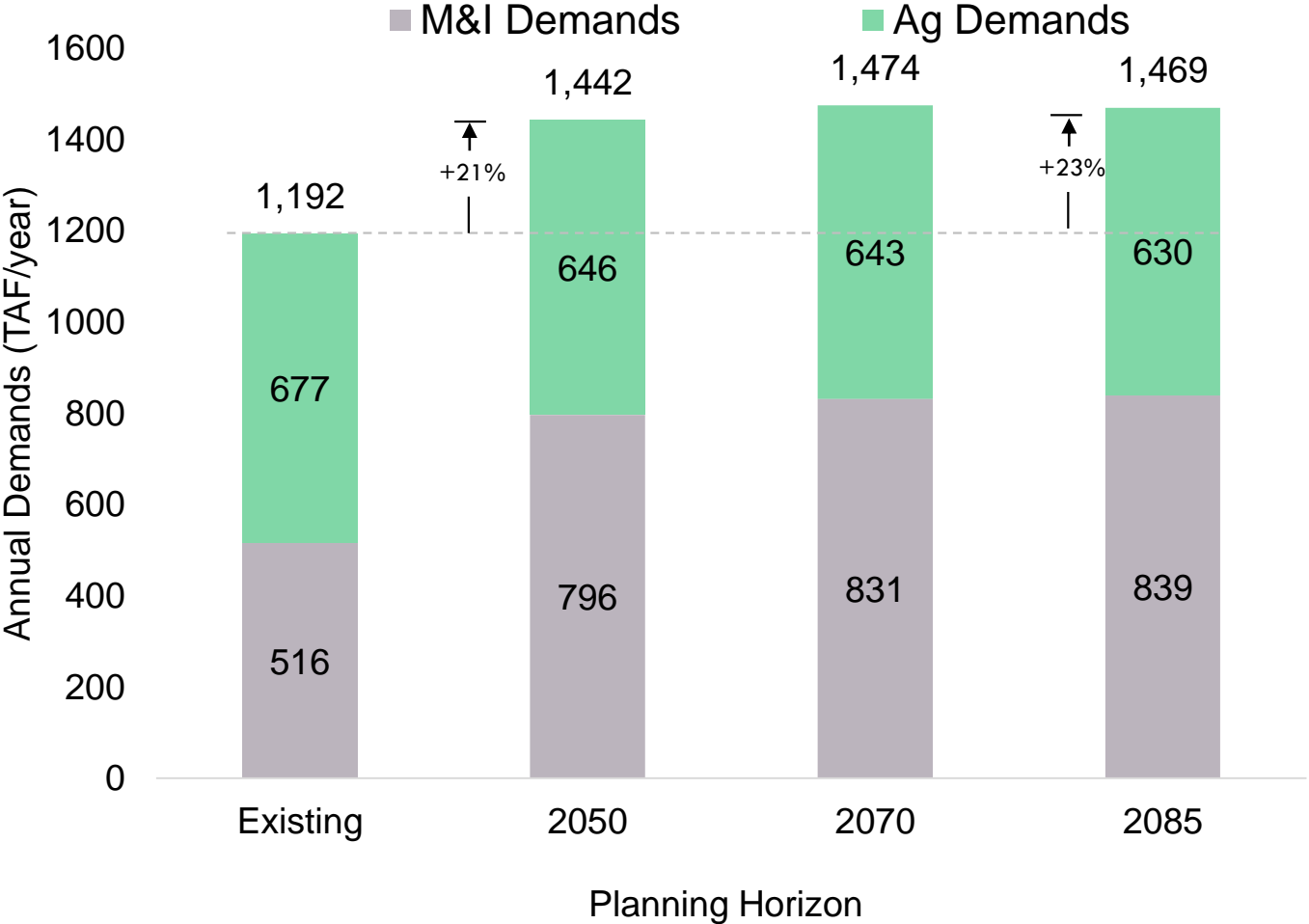
Under similar urban landscaping, irrigation water demands could increase up to 7%, about 3% in total demands (2050 Central-Tendency scenario)



Source: USBR American River Basin Study

USBR American River Basin Study – Overall Change in Water Demand

- Key assumptions:**
- No change in current crop types
 - No change in urban outdoor practices
 - Most urban buildout reached by 2050
 - Maintain current levels of water use efficiency



Source: USBR American River Basin Study

Comparison of DWR and USBR Approaches

- DWR Approach
 - Datasets:
 - Ag and outdoor urban ET (VIC)
 - Precipitation-based runoff (VIC)
 - Surface water flows and deliveries (CalSim II)
 - Projections:
 - 2030, 2070
 - 3 scenarios developed for 2070
- USBR Approach
 - Datasets:
 - Ag and outdoor urban ET (VIC)
 - Precipitation-based runoff (VIC)
 - Surface water flows and deliveries (CalSim 3)
 - Projections:
 - 2050, 2070, 2085
 - 5 scenarios developed for 2070

Questions?

