Mission Creek Subbasin Alternative Plan Update

In Compliance with the Sustainable Groundwater Management Act

Volume II - Appendices

Prepared For:
Coachella Valley Water District
Desert Water Agency
Mission Springs Water District

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PREPARED FOR
COACHELLA VALLEY WATER DISTRICT
DESERT WATER AGENCY
MISSION SPRINGS WATER DISTRICT

VOLUME II: APPENDICES

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(For Compliance with the Sustainable Groundwater Management Act)

PREPARED BY:

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Acronyms and Abbreviations

Acronym	Definition
°F	Degrees Fahrenheit
AF	Acre-Feet
AFY	Acre-Feet per Year
BCM	Basin Characterization Model
CDWR	California Department of Water Resources
CVWD	Coachella Valley Water District
DHSSB	Desert Hot Springs Subbasin
DWA	Desert Water Agency
GHB	General Head Boundary
GHSA	Garnet Hill Subarea of the Indio Subbasin
GSP	Groundwater Sustainability Plan
GUI	Graphic User Interface
GWV	GWVistas™ Version 8.03
HCM	Hydrogeologic Conceptual Model
HFB	Horizontal Flow Barrier
InSAR	Interferometric Synthetic Aperture Radar
K_h	Horizontal Hydraulic Conductivity
K_v	Vertical Hydraulic Conductivity
MC-GH WMP	Mission Creek-Garnet Hill Water Management Plan
MC-GRF	Mission Creek Groundwater Replenishment Facility
MCSB	Mission Creek Subbasin
MFR	Mountain Front Recharge
MNW	Multi-Node Well
msl	mean sea level
MSWD	Mission Springs Water District
NRMS	Normalized Root Mean Square
PEST	Parameter Estimation
SGMA	Sustainable Groundwater Management Act
S_s	Specific Storage
SSR	Sum of the Square of the Residuals
SWP	State Water Project
S_y	Specific Yield
USGS	United States Geological Survey
Wood	Wood Environment & Infrastructure Solution, Inc.
WWR-GRF	Whitewater River Groundwater Replenishment Facility
WWTP	Wastewater Treatment Plant

A.1 Introduction and Objectives

Wood Environment & Infrastructure Solutions, Inc. (Wood), has prepared this report on behalf of the Coachella Valley Water District (CVWD), Desert Water Agency (DWA), and Mission Springs Water District (MSWD), collectively the Management Committee (Management Committee or the Agencies). This report documents the update and re-calibration of a numerical groundwater flow model for the upper portion of Coachella Valley Groundwater Basin in California (**Figure A1**). This modeling effort is focused on the Mission Creek Subbasin (MCSB), Desert Hot Springs Subbasin (DHSSB), and Garnet Hill Subarea (GHSA) of the Indio Subbasin (**Figure A2**). The groundwater flow model (hereafter called the MCSB model) was prepared to evaluate the future sustainable use of groundwater within the MCSB in accordance with the 2014 Sustainable Groundwater Management Act (SGMA).

The Agencies have completed an assessment and update of the Alternative Plan for the MCSB, consisting of the 2013 Mission Creek-Garnet Hill Water Management Plan (MC-GH WMP; MWH, 2013) and the 2016 SGMA Alternative Groundwater Sustainability Plan Bridge Document for the MCSB (Stantec, 2016). These documents were submitted to, and approved by, the California Department of Water Resources (CDWR) as an Alternative to a Groundwater Sustainability Plan (GSP) and is identified herein as the Alternative Plan. The five-year assessment and update of the Alternative Plan (Alternative Plan Update) addresses many of the SGMA GSP regulations adopted in May 2016, and CDWR recommendations presented in the MCSB Alternative Assessment Staff Report (CDWR, 2019). This first five-year Alternative Plan Update must be completed and submitted to the CDWR by January 1, 2022.

A.1.1 Previous Modeling Efforts

Several analog and numerical groundwater flow models of the Coachella Valley have been developed since 1974. These models include:

- Analog Model Study of the Ground-Water Basin of the Upper Coachella Valley, California (Tyley, 1974).
- Predicted Water-Level and Water-Quality Effects of Artificial Recharge in the Upper Coachella Valley, California, Using a Finite-Element Digital Model (Swain, 1978).
- Evaluation of a Ground-Water Flow and Transport Model of the Upper Coachella Valley, (Reichard, 1992).
- Groundwater Flow Model of Coachella Valley, California: An Overview (Fogg, 2000).
- Technical Memorandum: Conceptual Groundwater Model of the Mission Creek and Garnet Hill Subbasins, Riverside County, California – DRAFT (PSOMAS, 2010); and
- Groundwater Flow Model of the Mission Creek and Garnet Hill Subbasins and Palm Springs Subarea, Riverside County, California (PSOMAS, 2013).

These modeling studies were conducted to evaluate and quantify natural mountain front recharge (MFR), recharge of precipitation and return flows, artificial recharge potential, declining groundwater levels, inter-subbasin flows across faults, and potential changes in groundwater quality. The most recent of the modeling efforts, part of the 2013 MC-GH WMP, was designed to evaluate four potential future management alternatives to maintain and stabilize groundwater levels in the MCSB (PSOMAS, 2013).

A.1.2 Modeling Objectives

The objectives of the current MCSB modeling effort are to:

- Expand the 2013 PSOMAS model domain to include the DHSSB and Indio Hills, as requested by the CDWR.
- Extend the model simulation period from 1936 through 2009 to 1936 through 2019.
- Incorporate more robust estimates of MFR.
- Recalibrate the updated model to available groundwater elevation observations.
- Evaluate the inter-subbasin flows across faults.
- Coordinate with the Indio Subbasin modeling team (Todd Groundwater) regarding the amount of underflow across the Garnet Hill Fault.
- Develop a 50-year forecast model to estimate future groundwater conditions under various groundwater management and project scenarios to attain sustainable groundwater management.

A.1.3 Data Sources for the Model Update

Data used in the MCSB model update were developed from the following sources and processes.

- Data (e.g., water levels, pumping data, well construction, etc.) from the 2013 PSOMAS model for the period 1936 through 2009 were used unless updated or revised through the data review process. Most of the data provided by the Agencies were from 1978 and subsequent years. Agency data from earlier than 1978 are sparse, therefore, data extracted from the 2013 PSOMAS model were mostly retained for the period 1936 to 1978.
- The data review process involved comparing PSOMAS model data with the Agency-provided data and data summarized in the 2020-2021 Engineer's Report for the MCSB (WEI, 2020). Additionally, previous Engineer's Reports (2003 to 2018) were reviewed for relevant information. Data from the Agencies were used for the model update where available. If data reported by an Agency differed from data used by PSOMAS, the data reported directly by the Agency were used. The PSOMAS data set was used to fill gaps.
- MSWD provided a data set in March 2020. This included well construction, pumping, groundwater import and export, water quality, water level, geophysical logs, ecological, water supply, and meter data from wastewater treatment plants (WWTPs) and customers. These data were used to update the model.
  - Data from the WWTPs were extended from 2000 through 2019. Return flows from plant operations were projected back to the time of plant construction.

  - Groundwater extractions (pumping) from wells located on golf courses were projected back to the time of golf course construction.
- MSWD provided an additional data set in June 2020. This included shapefiles and other information pertaining to ongoing septic to sewer system conversion efforts and mesquite hummock coverage. The septic to sewer conversion information was used in the model return flow calculations and reflects the changes in area and return flow volume over time. Wood also reviewed historical aerial photographs to spot-check the locations of return flows used in the PSOMAS model.
- CVWD provided a data set in March 2020. This included well construction, pumping, water levels, and geophysical logs. These data were used in updating the model.
- CVWD provided an additional data set of well construction logs in April 2020. These data were used in updating the model.
- MSWD provided an additional data set in June 2020. This included shapefiles and other information pertaining to ongoing septic to sewer system conversion efforts in addition to existing septic or sewered areas. The historical septic to sewer conversion information was used in the model return flow calculations to reflect the changes in sewered and septic areas and volumes over time.
- CVWD provided an additional data set in July 2020. This included a refinement of municipal water use in the MCSB. These data were used in updating the water balance and the model.
- DWA provided a data set in March 2020. This included Mission Creek Groundwater Replenishment Facility (MC-GRF) surface water deliveries, water levels, and pumping.
  - Pumping from wells located on golf courses was extrapolated to the time of golf course construction.
- Todd Groundwater provided a data set for the GHSA in May 2020. This included well construction, pumping rates, groundwater imports and exports, water levels, geophysical logs, and customer meter data. These data were used in updating the model.
- MSWD provided a data set in September 2020. This included Indio-Garnet Hill customer meter data from 2014 through 2019. These data were used in updating the model.
- Todd Groundwater provided the final 1997-2019 Indio Subbasin Calibration model in July 2021. The Indio Subbasin Calibration model will be used to support the Indio Subbasin Water Management Plan Update (Todd Groundwater and Woodard & Curran [Todd/W&C, 2021]). This model was utilized to coordinate the MCSB model with the Indio Subbasin model as described in the following Section.

A.1.4 Coordination with Indio Subbasin Modeling Efforts

Concurrent with the MCSB modeling effort, an update of the existing Indio Subbasin model (Fogg, 2000, 2010) was being conducted by Todd Groundwater. The updated MCSB model and the updated Indio Subbasin model both include the GHSA (**Figure A3**). At the request of the

Agencies, the Wood and Todd Groundwater modeling teams agreed to coordinate efforts for representation of the GHSA in the two models.

During calibration of the two models, it became apparent that wells in the GHSA were responding to recharge events at the Whitewater River Groundwater Replenishment Facility (WWR-GRF) located in the Indio Subbasin west of the Garnet Hill Fault (**Figure A2**). As a result, it was agreed that the most expeditious method to coordinate the Indio Subbasin and MCSB models would be for Wood to adopt the hydraulic parametrization of the GHSA from the 1997-2019 Indio Subbasin calibration model into the MCSB model, and to utilize the simulated groundwater flow across the Garnet Hill Fault as the western boundary condition for the MCSB model. Using this methodology, the GHSA representations of both models yield nearly identical groundwater flow conditions. The specific modifications made by Wood in coordinating hydraulic parameters and groundwater flux terms are discussed more fully in Sections A.4.5.2 and A.4.5.8.

A.1.5 Study Area Background

The Coachella Valley is divided into an upper valley and lower valley near Point Happy (**Figure A1**; Tyley, 1974). The upper valley primarily consists of desert resort communities, while the lower valley has a predominantly, year-round agricultural economy. These economies are dependent on water from imported surface water and groundwater sources. The rapid expansion of both irrigated agricultural and urban lands in the Coachella Valley between the 1950s and 1970s, with a corresponding increase in groundwater use, resulted in widespread declines in water levels throughout the basin.

Recognizing the need for a more sustainable water supply, groundwater agencies in the Upper Coachella Valley initiated artificial recharge starting in the early 1970s by arranging for the importation of State Water Project (SWP) water exchanged with the Metropolitan Water District of Southern California for Colorado River water delivered through the Colorado River Aqueduct. Artificial recharge started in 1973 at the WWR-GRF in the Indio Subbasin (**Figure A1** and **Figure A2**). Artificial recharge started in 2002 at the MC-GRF in the MCSB. Artificial recharge at these facilities has since stabilized groundwater levels and increased groundwater in storage throughout much of the Upper Coachella Valley.

The warm and dry climate, proximity to the Los Angeles metropolitan area, and availability of an adequate water supply have been the basis for flourishing resort economies in the Upper Coachella Valley. Future expansion on these desert lands will be largely dependent on the continued availability of an adequate water supply, as has been recognized by the Agencies.

A.1.5.1 Physiography

The Coachella Valley is located northeast of the Salton Sea within the Colorado Desert Region (CDWR, 2004) in southern California (**Figure A1**). The valley is about 65 miles long and covers an area of approximately 400 square miles. It is bordered by the San Jacinto and Santa Rosa Mountains on the southwest, the San Bernardino Mountains on the northwest, the Little San Bernardino Mountains and the Mecca Hills on the northeast, and the Salton Sea on the southeast. The Coachella Valley is drained primarily by the Whitewater River, which discharges into the Salton Sea via the Coachella Valley Stormwater Channel. Land-surface elevations vary from more than 230 feet below sea level at the Salton Sea to more than 10,000 feet above sea level at the peaks of the San Jacinto and San Bernardino mountains.

Four subbasins make up the Coachella Valley Groundwater Basin: the Indio Subbasin, San Gorgonio Pass Subbasin, MCSB, and DHSSB (**Figure A2**). The current study focuses primarily on the MCSB, DHSSB, and the GHSA, which is part of the Indio Subbasin (CDWR, 2004). Although the GHSA is part of the Indio Subbasin for SGMA reporting purposes (Todd, 2020a), the GHSA is included with the MCSB for water management and water planning purposes. The GHSA is separated by the Garnet Hill Fault from the Palm Springs Subarea of the Indio Subbasin to the south-southwest (**Figure A2**).

The GHSA is much smaller than the Palm Springs Subarea of the Indio Subbasin. The Palm Springs Subarea is directly connected hydraulically to adjacent subareas of the Indio Subbasin (that is, there are no apparent significant groundwater barriers between the Palm Springs Subarea and the Thousand Palms Subarea). For this reason, the Palm Springs Subarea and other subareas of the Indio Subbasin will be referred to in this report as the main Indio Subbasin to distinguish these portions of the Indio Subbasin from the GHSA of Indio Subbasin. References to the Indio Subbasin are to the entire Indio Subbasin including the GHSA.

The northwestern end of the MCSB includes the active and paleo stream channels of the Whitewater River, which has cut a broad canyon with steep sides along the foothills of the southeastern flank of the San Bernardino Mountains (**Figure A2**). The northwestern extent of the MCSB lies within the active Whitewater River channel at an elevation of approximately 5,000 feet above mean sea level (msl). The Whitewater River channel and northern paleochannel areas are largely uninhabited with the exception of the small community of Bonnie Bell.

The main parts of the MCSB and the GHSA (outside of the Whitewater River channel and northern paleochannel) extend from the base of the San Bernardino Mountain foothills and into the northwestern portion of the Indio Hills (**Figure A2**). Much of the study area is undeveloped and supports sparse desert vegetation. The City of Desert Hot Springs is located in the central part of the MCSB and the northern part of the DHSSB (**Figures A1** and **Figure A2**). The community of North Palm Springs is located in the central part of the MCSB. Palm Springs' city limit also extends into the MCSB and ends just south of the community of North Palm Springs. Individual homes and smaller communities are scattered across the study area with the exception of the Indio Hills, which are generally not inhabited. Numerous wind turbines for generating electricity have been constructed in the GHSA and western part of the MCSB and near the Indio Hills.

Ground surface elevation is approximately 2,000 feet above msl in the northwest part of the MCSB and slopes gently toward the south-southeast and south to an elevation of approximately 700 feet above msl near the western boundary of the Indio Hills. Ground surface elevation then increases toward the uninhabited Indio Hills (**Figure A2**). Ground surface slopes downward toward the southeast from the Edom Hill area to an elevation of approximately 400 feet above msl at the southeastern end of the MCSB.

The Indio Hills are incised and eroded highlands that rise to more than 1,600 feet above msl. The Indio Hills are located within the MCSB and southern GHSA. As described in Section A.2.3, comprise semi-consolidated sediments of low permeability in the saturated groundwater zone. As such, the Indio Hills are not considered part of the main MCSB area for groundwater resources.

A.1.5.2 Climate

The climate in the study area is classified as tropical desert with mild winters and very hot summers (Proctor, 1968). Based on records collected at the Palm Springs Airport from 1981 to 2010, average high temperatures exceed 100 degrees Fahrenheit (°F) in the months of June, July, August, and September (Wood, 2020). Average high temperatures in May and October are in the low to mid 90s°F and average high temperatures in the months of November through April range from 69°F to 88°F. Average low temperatures range from 45°F in January to 78°F in July and August. Most of the precipitation occurs during December through February. Brief but heavy rains occasionally occur from thunderstorms in the summer months (referred to as desert monsoons). Precipitation averages about 5 to 5.5 inches per year in the study area (CDWR, 2004) and can be as high as 15 inches per year or more in the surrounding mountains. Precipitation is highly variable year to year. On the valley floor runoff generated by rainfall events rapidly evaporates and/or infiltrates, although infrequent flash floods may occur after heavy precipitation.

A.1.5.3 Surface Water Systems

Natural surface water flow in the Coachella Valley occurs as a result of direct precipitation and concentrated stream runoff or mountain front recharge (MFR), originating primarily from the San Bernardino Mountains, Little San Bernardo Mountains, and San Jacinto Mountains with lesser amounts originating from the Santa Rosa Mountains. There are 13 watersheds that intermittently discharge into the study area; these are discussed more fully in Section A.4.5.5.

In addition to natural replenishment from precipitation and MFR, the MCSB receives artificial replenishment from importation of Colorado River water in exchange for SWP water. The CVWD and DWA provide artificial replenishment of the MCSB through their Groundwater Replenishment Programs. Groundwater replenishment is accomplished through direct replenishment, in which imported surface water is infiltrated at the MC-GRF and WWR-GRF (**Figure A2**).

The United States Geological Survey (USGS) measured streamflow from October 1967 to 2019 at a gauging station on Mission Creek in the MCSB (**Figure A2**). On February 14, 2019, runoff generated by a storm event altered the channel of Mission Creek at the gauging station to a degree that the USGS could no longer gauge streamflow at that location. The USGS installed a replacement gauge about half a mile downstream of the location of the existing Mission Creek gauging station in late 2019 (Wood, 2020). The USGS also measured streamflow from October 1948 to September 1979 at a gauge on the Whitewater River located in GHSA (**Figure A2**). This gauge was wiped out during a flood event and has not been replaced.

A.1.5.4 Groundwater System

The general direction of groundwater flow in the Coachella Valley is from northwest to southeast from the MFR areas to the Salton Sea. This flow direction is consistent beneath all subbasins. A series of fault zones constitute partial barriers to groundwater flow between subbasins (**Figure A2**). Groundwater beneath the study area in the Upper Coachella Valley occurs under unconfined conditions. Groundwater beneath the Lower Coachella Valley (outside the study area) occurs under confined and unconfined conditions.

Groundwater pumping is the primary outflow from the study area. Groundwater pumping is primarily from the MCSB and GHSA, with lesser amounts from the DHSSB due to highly mineralized groundwater quality. Since the late 1940s, groundwater pumping increased significantly in the Upper Coachella Valley, resulting in declining groundwater levels in the MCSB and GHSA. Starting in the 2003, importation of surface water for groundwater recharge in the MCSB has arrested groundwater decline due to pumping and resulted in increasing groundwater levels in some areas.

A.1.5.5 Land Subsidence

Land subsidence may result from aquifer system compaction due to historic excessive groundwater level declines. It is important to note, however, that geologic processes other than groundwater withdrawal (e.g., tectonic activity) may result in vertical ground level changes and that some changes in ground level due to groundwater withdrawals may be temporary and recoverable (known as elastic deformation). Although land subsidence has not been a concern in the Upper Coachella Valley, it has been a concern in the southern parts of the lower Coachella Valley since the mid-1990s. Subsidence throughout the Coachella Valley has been investigated since 1996 through an ongoing cooperative program between CVWD and the USGS (Sneed et.al, 2014, Sneed and Brandt, 2020)).

Vertical ground surface displacement derived from Interferometric Synthetic Aperture Radar (InSAR) for the region has been collected since 2015. These data were collected by the European Space Agency Sentinel-1A satellite and processed by TRE ALTAMIRA, under contract to the CDWR as part of the CDWR's technical assistance in support of Groundwater Sustainability Agencies (GSAs), other water managers, and the public regarding the SGMA reporting requirements.

Figure A4 shows the estimated vertical displacement of ground level as derived from the InSAR data as raster images obtained from CDWR (CDWR, 2020) for the approximate 4-year monitoring period available for this technology (June 2015 to September 2019). InSAR coverage does not extend into the DHSSB. Ground level changes shown on the image are the lowest increment of change (0 to 0.25 feet upward or downward) in CDWR's raster setting. Because this is a raster, the upper limit is the potential maximum value that may have occurred in the raster area and not a measured absolute value. Most of the basin shows a net increase in ground level elevation for the approximate 4-year monitoring period. Downward vertical ground level displacement during these periods occurred primarily in four areas of the MCSB:

1. the Indio Hills, where no groundwater pumping is documented.
2. a portion of the southeastern section of the main MCSB.
3. a limited area of the middle section of the main MCSB east of the Mission Creek stream course; and
4. the vicinity of the MC-GRF.

Ground level changes near the MC-GRF may be related to groundwater recharge operations. Ground levels may rise temporarily due to a rise in groundwater levels associated with recharge and then decline during periods when little or no recharge occurs, resulting in elastic deformation. The downward change in ground level in this area corresponds to a period when water levels were dropping after significant groundwater mounding had occurred due to major recharge efforts from 2010 through 2012. Groundwater levels declined by nearly 50 feet between June 2015 and September 2019 in the monitoring well near the MC-GRF.

Based on the relatively small magnitude of downward vertical ground level change and lack of a clear trend of increasing vertical downward displacement over the monitoring period, permanent land subsidence attributed to groundwater withdrawal is not apparent in the MCSB.

A.2 Hydrogeologic Conceptual Model

A hydrogeologic conceptual model (HCM) is a simplified representation of the groundwater flow system, frequently in the form of a block diagram or cross section (Anderson & Woessner, 1992). The nature of the HCM determines the dimensions of the numerical model and the design of the model grid. The purpose of the HCM is to establish an initial understanding of the groundwater system and organize the associated field data so that the system can be analyzed more effectively. HCMs were developed for the previous modeling efforts (Fogg, 2000 and PSOMAS 2010, 2013) and formed the basis of the HCM presented here.

Four steps were completed in developing the HCM for the study area including: (1) description of the hydrogeologic setting, (2) delineation of the model domain and layering, (3) estimation of the water budget, and (4) approximation of the flow system.

A.2.1 Geologic Setting

The Coachella Valley is located in the northwestern portion of a broad, tectonic depression known as the Salton Trough, which extends from the Gulf of California to the San Gorgonio Pass. The bedrock that is exposed on mountain ranges that flank the Salton Trough and underlie it is largely composed of solid crystalline materials (igneous and metamorphic rocks) (CDWR, 1964). They are a complex assemblage of Precambrian-age gneisses and schists, intruded by younger granitic rocks, granodiorite and tonalite, associated with the Southern California batholith of the Cretaceous age (**Figure A5**).

The valley floor consists of much younger fine- and medium-grained alluvial sediments derived from the surrounding mountains. The Salton Trough was once subject to marine sedimentation from the Gulf of California. However, over time, sediments deposited by the Colorado River into the Gulf of California formed a large fan-shaped delta or dam across the valley, effectively separating the Salton Trough from the Gulf of California (Terra Nova, 2003).

A.2.2 Structural Geology and Faults

The Coachella Valley has been subdivided by faulting into multiple subbasins and subareas (**Figures A2, A5, A6a,** and **A6b**). The major fault zones include:

- The Garnet Hill Fault, which separates the GHSA from the main Indio Subbasin.
- The Banning (San Andreas) Fault, which separates the MCSB from the GHSA.

- The Mission Creek Fault, which separates the MCSB from the DHSSB.

These fault zones consist of a series of primarily southeast to northwest trending “en echelon” right-lateral oblique strike-slip faults with the southwest side moving to the northwest and an upward movement on the northeast side of the faults (**Figure A5**). The fault zones all show some surface expression indicating they are active and have offset the older and recent alluvium. Faulting has resulted in the uplift of older semi-consolidated sediments of the Indio Hills in the MCSB and southern portion of the GHSA (**Figure A6a** and **Figure A6b**). Surface traces of the Garnet Hill Fault and Banning Fault have been eradicated by occasional flood flows of the Whitewater River where the river disgorges out of the San Bernardino Mountains and onto the valley floor (**Figure A2**). The fault zones that cross the valley form partial barriers to groundwater flow and interrupt the overall flow of groundwater in the valley.

In addition to the major faults as described above, older unnamed faults have resulted in the apparent uplift of older semi-consolidated sediments and bedrock at the northern part of the GHSA and MCSB that effectively separates the active Whitewater River channel from the MCSB (Wood, 2020). This potentially limits the hydraulic connection of the Whitewater River channel deposits and sediments in the GHSA.

A.2.3 Stratigraphy

The formations in the study area range in age from pre-Tertiary to Recent (including units actively being deposited). The geologic units or formations shown on the cross sections presented on **Figures A5, A6a,** and **A6b** are grouped in terms of their degree of consolidation and water-bearing capacity. The sedimentary deposits can be classified into three groups: consolidated, semi-consolidated, and unconsolidated. The consolidated rocks are well-indurated conglomerate, sandstones, shales, and siltstones, which are generally non-water bearing. The semi-consolidated materials are grey sandstone, green siltstones, some interbedded conglomerate, and claystone, which are generally semi-water bearing. The unconsolidated sediments consist of poorly consolidated sandstone, heterogenous gravels, sands, silts, and interbedded clays and comprise the water-bearing aquifer system.

The oldest formations in the area, which range from pre-Cambrian to Tertiary, are considered non-water bearing (**Figures A5, A6a,** and **A6b**). The semi-water bearing formations range in age from Tertiary to Quaternary. The youngest formations are of Quaternary age and comprise the water-bearing formations of the main unconfined aquifer in the study area. The water bearing sediments in the Coachella Valley are very thick (up to 12,000 feet). Beneath the study area, the upper approximately 2,000 feet of sediments constitute the potable aquifer that is used as a water source in the area (Sneed et al, 2014 and CDWR, 1964).

A.2.3.1 Non-Water Bearing Formations

The non-water bearing formations yield little or no water to wells and include the pre-Tertiary crystalline rocks of the San-Bernardino, Little San Bernardino, San Jacinto, Santa Rosa, and Orocopia Mountains. This complex includes the San Gorgonio igneous metamorphic complex and the Chuckwalla complex (**Figures A5 A6a,** and **A6b**). They also include consolidated Tertiary sediments mapped as the Coachella Fanglomerate and the Imperial Formation. The latter is an interbedded tan to yellow fossiliferous sandstone, siltstone, and shale and is the only marine deposit in the area (CDWR, 1964).

A.2.3.2 Semi-Water Bearing Formations

These formations have low permeability and low water-yielding capabilities and yield moderate quantities of water to wells. They include the Painted Hill and Palm Springs Formations and the lower portions of the Cabezon Fanglomerate (**Figures A5, A6a,** and **A6b**). Overall, these formations consist of thick continental and lake deposits of conglomerate, sandstones, siltstones, and clays. Although alluvial sediments considered to be permeable are mapped as surficial deposits through much of the Indio Hills, these sediments are relatively thin and much of the Indio Hills is composed of semi-consolidated sediments at the depths of regional groundwater occurrence; thus, the Indio Hills are described by the Tyley (1974) as "semi-consolidated deposits that yield little water" and by the CDWR (1964) as "essentially semi-water-bearing rocks."

A.2.3.3 Water Bearing Formations

These formations generally yield water readily to wells and are late Pleistocene to Recent unconsolidated heterogeneous alluvial deposits and represent the bulk of the aquifers in the area. Fine-grained materials are predominantly silt-sized particles; however, deposits in the central portion of the Coachella Valley Groundwater Basin are interspersed with lenses of lacustrine clays (CDWR, 1964). Units in this group include Ocotillo Conglomerate, upper portions of the Cabezon Fanglomerate, older alluvium and terrace deposits, and Recent alluvial and dune sand deposits (**Figures A5, A6a** and **A6b**). The Recent deposits have been divided into four units: active channel deposits, alluvial fan and stream wash deposits, alluvial plain and lake deposits, and dune sand.

A.2.4 Hydrogeology

As described in previous sections, the main aquifer is a heterogenous alluvial deposit with discontinuous lenticular clays. The aquifer in the Upper Coachella Valley is predominantly under unconfined conditions but tends to become confined in the main Indio Subbasin southeast of Happy Point (Tyley, 1974; **Figure A1**).

A.2.4.1 Groundwater Elevations

The DHSSB aquifer has remained relatively undeveloped over the years primarily due to elevated dissolved mineral content in the groundwater. As a result, groundwater levels in the subbasin have also remained relatively stable as shown on a long-term hydrograph for well 2S/5E-32E06 (**Figure A7**). Water levels are in decline in the Miracle Hill Subarea of the DHSSB (**Figure A2**) because this is where most of the groundwater extraction is taking place (CDWR, 2004). Spatially sparse water level data availability has made it difficult to estimate groundwater level changes over the DHSSB. This is not considered a data gap because the DHSSB is not a focus of the planning area and water level data available were adequate for the purposes of this model.

Historically, groundwater levels in the MCSB aquifer decreased significantly as groundwater resources were developed. A long-term hydrograph for wells 3S/4E-12B01&C01 shows that groundwater levels in portions of the MCSB declined almost 100 feet between 1936 and 2006 (**Figure A7**). Between 2006 and 2019, groundwater levels stabilized and then recovered almost

20 feet as a result of conservation efforts and recharge of imported water at the MC-GRF (location shown on **Figure A2** and **Figure A5**). Between 2002 and 2012, water levels increased as much as 275 feet in well 2S/4E-21H01 located near the MC-GRF (**Figure A6**). The change in water levels varied significantly with the volume of water recharged. During the same period, the central portion of the MCSB experienced a groundwater level decline of 0 to 5 feet and the southeastern portion of the subbasin showed a water level rise of 0 to 5 feet (Wood 2020).

The GHSA aquifer also experienced some decline in groundwater levels prior to initiation of groundwater recharge activities. A long-term hydrograph for well 3S/4E-22A01 shows that groundwater levels in the GHSA declined about 20 feet between 1950 and 1965 (**Figure A7**). Groundwater levels stabilized in the early 1970s due to the start of recharge operation at the WWR-GRF in the Indio Subbasin (**Figure A2**). Since the mid-1980s, groundwater levels in the GHSA have recovered over 60 feet.

A.2.4.2 Groundwater Flow Direction

Figures A8a through **A8d** present groundwater contours for 1936, 1993, 2009, and 2019. The general direction of groundwater flow in the Coachella Valley is from northwest to southeast and is consistent in all subbasins. A series of fault zones (Section A.2.2) constitute partial barriers to groundwater flow. The Mission Creek Fault, which separates the DHSSB from the MCSB, is an effective flow barrier with a groundwater elevation differential across the fault of 150 to 200 feet (Swain, 1978). The Banning (San Andreas) Fault, which separates the MCSB from the GHSA, exhibits a groundwater elevation differential across the fault of 100 to 300 feet. Additionally, the Garnet Hill Fault, which separates the GHSA from the main Indio Subbasin, is an effective groundwater flow barrier, with a groundwater elevation differential across the fault of 100 to 200 feet (**Figures A8a** through **A8d**).

A.2.5 Model Domain

This model update is based, in part, on a model domain originally developed for evaluation of groundwater flow beneath the entire Indio Subbasin (including the GHSA), extending from the San Bernardino Mountains to the Salton Sea (Fogg, 2000; and **Figure A9**). This modeling effort is focused primarily on the Upper Coachella Valley (specifically the GHSA, MCSB, and DHSSB) and extends from the San Bernardino Mountains to the southern end of the Indio Hills (**Figure A9**). The original 2000 model domain was retained (but deactivated in the lower Coachella Valley) to remain compatible with modeling efforts conducted by others that are preparing a SGMA Alternative Plan Update as part of the Water Management Plan Update for the Indio Subbasin.

A.2.6 Water Budget

The water budget describes the inflow and outflow to and from the hydrogeologic system. Inflow and outflow can occur from the hydraulic boundaries of the system, from various sources such as precipitation or recharge areas, and from the exit points or sinks such as wells or drainage systems. The boundaries, sources, and sinks identified within the model domain are discussed below.

A.2.6.1 Inflows

Several sources of water to groundwater influence groundwater levels in the study area. They are described below.

- **Precipitation:** Long-term (1930-2019) average precipitation on the Upper Coachella Valley floor as measured at the Palm Springs International Airport (WRCC, 2020) is only about 5.4 inches per year and occurs primarily between November and May with occasional monsoonal rains in the summer months (**Figure A10**). Due to the high evaporation rate and low precipitation rate, direct groundwater recharge from precipitation is usually negligible on the valley floor.
- **Mountain Front Recharge:** MFR typically occurs where precipitation (including snow melt) on steep-sided bedrock mountains like the San Jacinto, San Bernardino, and Little San Bernardino Mountains runs off, collects and flows down intermittent streams, and ultimately discharges into alluvium at the base of the mountains. Although the MFR runoff flow can be highly variable and intermittent (based on precipitation intensity and duration), it can be a significant source of groundwater recharge to mountain-bounded valleys like the Coachella Valley. However, there may be a significant time lag between recharge at the mountain front and response in groundwater levels in the areas where pumping occurs.

  The USGS Basin Characterization Model (BCM) was used to estimate MFR (see Section A.4.5.5). Based on the BCM, the GHSA, MCSB, and DHSSB in the upper portion of the Coachella Valley receive MFR from 13 mountain watersheds in the San Bernardino and Little San Bernardino Mountains including the South Fork Whitewater River, Mission Creek, Chino Canyon, Grant Wash, Big Morongo Creek, Little Morongo Creek, Morongo Wash, Long Canyon, East Wide Canyon, Thousand Palms Canyon, Fan Canyon, Pushawalla Canyon, and Berdoo Canyon (**Figure A11**). Annual MFR into the study area, depending on the year, has been estimated to range from 39 to as much as 126,680 acre-feet per year (AFY) (**Table A1**).
- **Artificial Recharge:** Artificial recharge has taken place at the MC-GRF since its construction in 2002. Recharge volumes were calculated based on inflow data assuming a two percent evaporative loss.[1] Recharge amounts range from 0.2 acre-feet (AF) in 2016 to 33,209 AF in 2010 (**Table A2**). Also shown on **Table A2** is the artificial recharge at the WWR-GRF, located in the Indio Subbasin. The recharge at WWR-GRF started almost 30 years earlier than the recharge at MC-GRF and averaged over eight times as much volume. Although the WWR-GRF is separated from the GHSA by the Garnet Hill Fault, the large volume of recharge at the WWR-GRF has had a significant effect on groundwater levels in the GHSA.

1 Return flow calculations and evaporative loss estimates are documented in Appendix B, Computation of Non-Consumptive Return, in: Engineer's Report on Water Supply and Replenishment Assessment 2018-2019, prepared by Krieger & Stewart Engineering Consultants (K&SEC) and Stantec (K&SEC and Stantec, 2018) and in K&SCE and Stantec, 2017.

- **Return Flows:** Return flow consists of the proportion of applied water that returns back to the water cycle as recharge to groundwater after it has been used for its intended purpose (municipal, agricultural, industrial, and golf course). Return flow calculations are based on return flows estimated for the Coachella Valley Groundwater Basin as documented in Appendix B (K&SEC and Stantec, 2018). These return flows were estimated based on water use extending back to 1978 for water balance and cumulative change in storage purposes (Stantec, 2018). These data have been updated with more recent data provided by the Agencies and documented in the annual reports for the MCSB (Stantec, 2018 and Wood, 2020) and data provided for this update.
  - **Applied Water Return Flow:** Applied water return flow includes return flow from municipal outdoor, agricultural, industrial, and golf course use. Return flow has been estimated to be approximately 25 percent of applied water. Applied water return flow varies year to year, but overall increased from 912 AF in 1978 to 2,964 AF in 2019 (**Table A3**).
  - **Septic Systems:** The number of septic systems was calculated from the difference between the total residences with a municipal water account and the number of residences with sewer connections. Septic system return flow (i.e., percolation) was estimated by multiplying the average indoor water use, relative to total municipal water supply, by the number of septic systems in a given year. This amount ranges from 357 AF in 1978 to 2,323 AF in 2005, before gradually decreasing to 1,208 AF in 2019 as a result of ongoing water agency efforts to convert existing septic systems to sewer connections (**Table A3**).
  - **Wastewater Treatment Plants:** The existing Horton and Desert Crest WWTPs, and the proposed Regional Water Reclamation Facility are located within the model domain (**Figure A12**). Historical return flows at the Horton and Desert Crest WWTPs were calculated based on daily flows reported from 2000 to 2019 by the treatment plants and assuming a three percent evaporative loss (**Table A3**). Return flows prior to 2000 were estimated by proportioning the WWTP return flow between the two plants back to the time of plant construction. WWTP return flows range from 175 AF in 1978 to 2,132 AF in 2019. WWTP return flows have increased steadily since 2010 due to the conversion of septic systems to the regional sanitary sewer system and additional development in the subbasin.
- **Local Streams:** There are two ephemeral streams that occasionally discharge into the study area at volumes significant enough to warrant placement and monitoring of stream gauges by the USGS: 1) the Whitewater River, which flows out of the San Bernardino Mountains through the northwestern portion of the GHSA; and 2) Mission Creek, which flows out of the San Bernardino Mountains into the northern portion of MCSB. Stream flows in the Whitewater River and associated downstream reaches were recorded from 1948 to 1979 and ranged from 1,260 AF in 1948 to 90,890 AF in 1969 (**Table A4**). Stream flows in Mission Creek have been recorded since 1968 and ranged from 0.0 AF in 1990 to 20,488 AF in 1980 (**Table A4**).

- **Inter-Subbasin Underflow:** Groundwater elevation differences between the various subbasins in the study area result in groundwater underflow across the faults separating the subbasins. Groundwater underflow is typically from DHSSB to MCSB, then from MCSB to the GHSA. Long-term average annual underflow has been estimated by several authors. Underflow from DHSSB to the MCSB has been estimated to range from "minimal" (Tyley, 1974) to 1,840 AFY (Mayer, 2007). Underflow from the MCSB to the Garnet Hills Subarea has been estimated to range from 4,000 AFY (Mayer, 2007) to as much as 14,000 AFY (GSi/water, 2005). Since the late 1970s, large volumes of artificial recharge at the WWR-GRF have resulted in a net inflow of groundwater from the main Indio Subbasin into the GHSA during some years. This reversal of the typical historical direction of inter-subbasin underflow has become more common in recent years as artificial recharge at the WWR-GRF has increased.

A.2.6.2 Outflows

Several groundwater sinks or outflows influence groundwater levels in the study area. These are described below.

- **Evapotranspiration:** Approximately 1,120 acres of phreatophytes (mostly mesquite) have been identified in the MCSB, along the Banning Fault and Indio Hills, (Mayer, 2007). These phreatophytes consume an estimated 900 to 1,450 AFY of shallow groundwater upwelling along the fault.

  Evapotranspiration losses of applied water utilized for irrigation have been estimated to be approximately 75 percent of applied water. Evapotranspiration of applied water is not directly simulated in the groundwater model. Instead, the evapotranspiration losses of applied water for irrigation are indirectly accounted for as part of the local pumping demand.

- **Local Pumping:** Groundwater pumping is the primary outflow from the study area. Groundwater pumping is primarily from the MCSB with lesser amounts from the DHSSB and GHSA (**Figure A13**). Due to highly mineralized groundwater quality, pumping in the DHSSB is less than 15 percent of pumping in the MCSB. Pumping in the GHSA is limited to a few wells, and averages less than 5 percent of pumping in the MCSB. Groundwater pumping has increased significantly over time, resulting in declining groundwater levels in the MCSB and GHSA. Pumping was determined from records provided by the Agencies. MCSB annual groundwater pumping ranged from approximately 4,720 AF in 1978 to 17,280 AF in 2006 (**Table A5**). In addition, there is an estimated 500 AFY of unreported pumping by minimal pumpers (Wood, 2020).

  No information was provided by the Agencies for the DHSSB as the Agencies do not operate any production wells in this subbasin and private pumpers are not subject to reporting their production to the agencies. Pumping locations and volume were based on a groundwater modeling study for the area (Mayer, 2007). Information from the study indicated relatively stable groundwater pumping in the subbasin from the early 1970s to the late 1990s. This stable pumping of approximately 1,590 AFY was continued through the model calibration period from 1978 to 2019 (**Table A6**).

In the GHSA, pumping is limited to just a few wells. Records provided by the Agencies indicate annual groundwater pumping ranged from 0 AF in 2005 to 670 AF in 1987 (**Table A7**), with recent pumping averaging 265 AFY.

- **Inter-Subbasin Underflow:** Groundwater elevation differences between the various subbasins in the study area result in groundwater underflow across the faults separating the subbasins. Groundwater underflow is typically from DHSSB to MCSB, then from MCSB to the GHSA. The DHSSB has approximately 1,840 AFY of underflow to the MCSB (Mayer, 2007). The MCSB has approximately 4,000 (Mayer, 2007) to 14,000 AFY (GSi/water, 2005) of underflow to the Garnet Hills Subarea. The GHSA typically has had an underflow of approximately 18,360 AFY to the main Indio Subbasin (PSOMAS, 2013). However, as noted in Section A.2.6.1 large volumes of artificial recharge at the WWR-GRF have reversed the direction of inter-subbasin underflow between the GHSA and the main Indio Subbasin in some years.

A.2.6.3 Water Balance

The subbasin groundwater inflows minus the subbasin groundwater outflows for a given period of time yields a net water balance for the subbasin. A negative water balance results in a decrease in groundwater in storage and declining groundwater levels. A positive water balance results in an increase in groundwater in storage and rising groundwater levels. The methods used previously for calculating the water balance for the MCSB (Wood, 2020) was based on utilizing the long-term average value for components of the water balance that are not directly measured (natural MFR, transpiration, inter-subbasin underflow). This approach attenuates wide fluctuations in water balance resulting from wet or dry years or hydrologic cycles.

The guidelines for numerical modeling for SGMA compliance (CDWR, 2016) recommend that the model be capable of meeting several objectives including:

- Assessing how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability to operate the basin within sustainable yield.
- Assessing how annual changes in historical inflows, outflows, and changes in basin storage vary by water year type (hydrology) and water supply reliability.
- Evaluating how the surface and groundwater systems respond to the annual changes in the water budget inflows and outflows.
- Facilitating the estimate of sustainable yield for the basin.
- Evaluating future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate change.
- Informing development and quantification of sustainable management criteria, such as the sustainability goal, undesirable results, minimum thresholds, and measurable objectives.

- Optimizing proposed projects and management actions and evaluating the potential effects those activities have on achieving the sustainability goal for the basin occurring during the 50-year planning and implementation horizon required under SGMA.

To meet these objectives, it is necessary for the numerical model to utilize annual estimates of components of the water balance that are directly measured (imported surface water, pumping, intentional recharge, return flows, etc.) and annual estimates of components of the water balance that are not directly measured (natural MFR, transpiration, inter-subbasin underflow). Use of long-term averages for water balance values (i.e., the same value for every year in the simulation) makes the simulated change in storage less representative of the natural variation of flows into and out of the groundwater basin based on changing hydrologic conditions. Use of long-term averages, however, has utility in short term estimates of water balance such as annual reporting where the focus is the annual water balance compared to the long trend rather than a specific wet or dry year.

A.2.7 Flow System

The hydrogeologic and water budget information described above have been used to conceptualize the movement of groundwater through the model domain. The conceptual groundwater flow system has been described in several previous reports (CDWR, 1964; Tyley, 1974; Swain, 1978; GTI, 1979; Reichard, 1992; Fogg, 2000; GSi/water, 2005; Mayer, 2007; Catchings, 2009; PSOMAS, 2010 and 2013; and MWH, 2013) and is summarized below.

Groundwater recharge occurs primarily through MFR from the surrounding mountains (**Figure A11**), inter-basin underflow, ephemeral stream leakage, return flows from municipal irrigation, return flows from septic systems (**Figure A14**) and from municipal WWTPs (**Figure A12**), and artificial recharge.

Groundwater discharge occurs primarily through groundwater pumping (**Figure A13**), inter-basin underflow, and evapotranspiration where groundwater is near the surface.

Groundwater elevation data collected in the study area indicate a long-term decline in groundwater levels in some areas of the Upper Coachella Valley starting in the mid-1950s as a result of development of groundwater resources as the population of the Coachella Valley grew over time.

In the MCSB, groundwater levels declined as much as 90 feet between 1955 and 2005 (**Figure A7**). Groundwater levels in the MCSB have since stabilized and even increased in some areas due to importation and intentional recharge of Colorado River water.

In the GHSA, groundwater levels declined about 20 feet between 1950 and the early 1970s when artificial recharge was started at the WWR-GRF in the main Indio Subbasin. Since recharge started in 1973, groundwater levels in some areas of the GHSA have increased as much as 60 feet (**Figure A7**).

Unlike the MCSB and GHSA, groundwater levels beneath much of the DHSSB have remained relatively stable over time (**Figure A7**). This is due to limited groundwater pumping from the DHSSB because of the relatively high mineral content of its groundwater.

Potentiometric surface maps based on water levels measured in 1936, 1992, 2009, and 2019 indicate the general direction of groundwater flow beneath the Upper Coachella Valley has consistently been down the valley from northwest to southeast from the San Bernardino Mountains to the Salton Sea (**Figures A8a** through **A8d**). In addition, there is a small component of inter-basin underflow from northeast to southwest (perpendicular) across the faults which divide the Coachella Valley into multiple subbasins and subareas. Inter-basin underflow is generally from the DHSSB to MCSB, then from MCSB to the GHSA, and then from the GHSA to the main Indio Subbasin (**Figures A8a** through **A8d**), with some variability as described above in Sections A.2.6.1 and A.2.6.2.

A.3 Model Selection

In order to meet the model objectives discussed in Section A.1.3, the groundwater flow model code used for the MCSB, and surrounding area, must meet the following criteria:

- be able to simulate three-dimensional groundwater flow within the model domain,
- be well documented and verified against analytical solutions for specific flow scenarios,
- be accepted by regulatory agencies,
- be readily understandable and usable by others for simulation of future groundwater conditions, and
- have a readily available technical support structure.

The model code MODFLOW2005-NWT (Niswonger, 2011) meets these criteria and was used to develop the study area model.

MODFLOW2005-NWT is one of the latest versions of MODFLOW, a modular, finite-difference computer code developed by the USGS to simulate three-dimensional groundwater flow (McDonald & Harbaugh, 1988). The use of MODFLOW is well documented in technical literature and is the "de facto" standard for groundwater flow modeling worldwide. MODFLOW solves the partial-differential equations that describe three-dimensional groundwater flow by approximating the solution through the finite-difference method, wherein the continuous groundwater flow system is replaced by a finite set of discrete points in time and space. This process leads to a system of linear algebraic equations, which are solved by the computer program to yield values of potentiometric head and groundwater flow velocity at specific locations and at specific points in time (McDonald & Harbaugh, 1988).

A.3.1 Code Assumptions and Limitations

There are certain model code assumptions and limitations that constrain the accuracy of the model simulations. The assumptions and limitations that may affect the models are briefly discussed below.

- **Unsaturated Flow:** MODFLOW2005-NWT has an Unsaturated Zone Flow package that can simulate delay in surface recharge reaching the groundwater table. Due to the lack of available information about unsaturated zone properties for the study area, unsaturated flow was not simulated. The MODFLOW model used for this study simulates flow only in saturated porous media.

- **Fracture Bedrock Flow:** It is likely that some of the bedrock mountains surrounding the alluvial valley may contain and transmit some groundwater via fractures. MODFLOW2005-NWT does not simulate fracture flow in bedrock.
- **Structured Grid:** MODFLOW2005-NWT (and previous versions) utilizes a rectangular grid with consistent grid spacing for all layers. This means that layers must extend across the entire model domain without pinch-outs. New versions of MODFLOW allow the use of unstructured grids, but these versions were not used, for compatibility with modeling efforts by others for the Indio Subbasin.

A.3.2 Graphic Pre/Post-Processor

To facilitate the preparation and evaluation of each model simulation, Wood utilized the graphics pre/post processor GWVistas™ Version 8.xx (GWV) by Environmental Simulations, Inc. GWV is a Windows® program that utilizes a graphic user interface (GUI) to build and modify a database of model parameters. The model grid, hydraulic properties, and boundary conditions are input using the GUI, and then GWV creates the necessary MODFLOW data input files. The input files generated by GWV are generic (standard) MODFLOW files compatible with USGS MODFLOW2005-NWT. Wood also utilized some in-house utilities and Microsoft Excel spreadsheets to generate standard MODFLOW data input files for selected simulations.

GWV was also utilized to post-process the model simulations. GWV can display the simulated head results as plan views and cross sections. In plan view, the contour intervals and labels specified by the user and dry cells are denoted by a different color. In cross-section view, the water table surface is also plotted. Most outputs to the screen can be saved in a number of formats (SHP, DXF, WMF, PCX, SURFER, etc.) for utilization in other graphics programs. Wood also utilized some in-house utilities and Microsoft Excel spreadsheets for post-processing simulation results.

A.4 Model Design

The following sections describe the numerical groundwater flow model for the study area.

A.4.1 Model Simulation Period and Stress Periods

MODFLOW simulates transient groundwater flow using multiple stress periods of variable duration. A stress period is defined as a period of time during which hydraulic stresses are held constant. The model was designed to simulate the 84-year period from pre-development (1936) conditions in the Coachella Valley area to present (2019). Due to a lack of data, the periods 1936 to 1940 and 1941 to 1944 were simulated using two five-year stress periods representing long-term average conditions. The period from 1945 to 1948 was simulated with a single 3-year stress period based on 1945 estimated conditions.

The duration of the simulation stress periods was decreased in subsequent years because there were more data available to estimate pumping rates, recharge, and groundwater level elevations. The period from 1949 to 1989 was simulated using 41 annual stress periods. The period from 1990 to 2019 was simulated using 120 quarterly stress periods. The duration of the simulation stress periods was decreased in more recent times to take advantage of the additional data available for estimating pumping rates, recharge, and groundwater level elevations, and to reproduce the observed seasonal pumping and recharge activities more accurately in the study area.

A.4.2 Model Grid

As noted above, the model domain is centered on the Coachella Valley from the San Bernardino Mountains to the Salton Sea (**Figure A9**). Since the study area of this modeling effort is focused on the GHSA, MCSB, and DHSSB in the upper portion of the Coachella Valley, the model domain extending beyond this study area was deactivated (**Figure A9**).

The model grid consists of 280 rows, 113 columns, and 4 layers for a total of 126,560 model cells. The model grid was rotated 50.4 degrees to the west of north to align the model grid with the primary direction of groundwater flow. The active study area consists of 18,172 model cells or less than 15 percent of the total number of model cells. The remaining 85 percent of the model cells were deactivated as they represent bedrock or the Lower Coachella Valley area outside of this study area. The model has a uniform cell size of approximately 1,000 feet by 1,000 feet. The active model area covers approximately 104,293 acres, or about 163 square miles (**Figure A9**).

A.4.3 Model Layers

The purpose of model layers is to represent the hydraulic influence of stratigraphy at a scale appropriate to the model objectives. It is understood that stratigraphic variations occur at scales that are both smaller and larger than that characterized for this model. The conceptual and numerical models of the Coachella Valley were developed based on consideration of several types of hydrostratigraphic information, including previous modeling efforts, existing literature, lithologic logs, cross sections, and monitoring well perforation intervals in subareas of the Coachella Valley, and the prerequisite that the model be compatible with modeling efforts by others for the Indio Subbasin.

Previous modeling efforts subdivided the alluvial sediments in the lower portion of the Coachella Valley into four layers to represent an unconfined aquifer and confined aquifer separated by an aquitard. The aquitard was represented with two relatively thin layers. Due to layering constraints of earlier versions of MODFLOW, this four-layer scheme was extended into the upper portion of the Coachella Valley even though there is no aquitard present. For consistency with previous modeling efforts and compatibility with modeling efforts by others for the Indio Subbasin, the four-layer scheme was maintained through the upper portion of the Coachella Valley. Because the Upper Coachella Valley has unconfined groundwater conditions, it was assumed the initial hydraulic property distributions were the same in all model layers.

A.4.4 Hydraulic Parameters

To remain consistent with previous modeling efforts, model hydraulic parameters were assigned to the model grid using property zones, where the parameter values in each zone are consistent throughout each zone (**Figure A15**). The hydraulic property zones assigned to model layers were kept as consistent as possible with the 2013 PSOMAS model. In addition, for consistency with the current 1997-2019 Indio Subbasin calibration model, the hydraulic property zones assigned to the GHSA were adopted from that model (**Figure A15**). The hydraulic property zones were only modified as necessary to improve the calibration of the model to field observations. As such, the model contains no more complexity than is justified by the available data and the model objectives.

It should be noted that the hydraulic parameters for the Indio Hills area adopted from the 1997-2009 Indio Subbasin calibration model are very similar to the hydraulic parameters used in the same model for other portions of the lower GHSA where less-consolidated alluvial sediments have been interpreted. This differs from the description (Tyley, 1974) of the Indio Hills as comprised of semi-consolidated, semi-water bearing formations and also from representation of the Indio Hills as a low-flow or no-flow region in some previous models (PSOMAS, 2010). The hydraulic parameters of the Indio Hills should be evaluated further during a future model update or refinement.

The range of final hydraulic properties, horizontal hydraulic conductivity (K_h), vertical hydraulic conductivity (K_v), storage, specific yield (S_y), and porosity used as a result of the calibration process are briefly summarized below.

A.4.4.1 Hydraulic Conductivity

K_h distributions for each model layer were initially derived from the PSOMAS 2010 model (PSOMAS, 2010). The PSOMAS K_h distributions were in turn based on previous estimates by others (Tyley, 1974; GTI, 1979; and Mayer, 2007). In addition, for consistency, the hydraulic conductivity values assigned to the GHSA were adopted from the current 1997-2009 Indio Subbasin calibration model. The PSOMAS K_h distributions had significant heterogeneity in the DHSSB and Indio Hills areas of the model that were previously deactivated. These areas were initially assigned a relatively uniform K_h distribution to simplify the initial K_h distribution throughout the active model domain (**Figure A15**). Because the Upper Coachella Valley has unconfined groundwater conditions, it was assumed that the K_h distribution was the same in all model layers.

Initial and final hydraulic conductivity values range between 0.1 and 250 feet per day (ft/d) (**Figure A15**). These values are typical of silty and clayey sediments to coarse sand sediments. K_v was initially specified as 1/10 K_h for all model layers. Values of K_h and K_v were modified as necessary during the calibration process to obtain a better fit to observed water level data (**Figure A15**).

A.4.4.2 Storage

A specific storage (S_s) value of 1e-4 was initially assigned for all active zones (**Figure A16**). This value is within the published range of values for the clayey to sandy sediment types beneath the study area (Spitz & Moreno, 1996). In addition, for consistency, the specific storage values assigned to the GHSA were adopted from the current 1997-2019 Indio Subbasin calibration model. Because the Upper Coachella Valley is unconfined, it was assumed that the specific storage distribution was the same in all model layers. S_s values were modified as necessary during the calibration process to obtain a better fit to observed water level data.

A.4.4.3 Specific Yield

S_y values were initially assumed to be a uniform 0.15 for all active zones (**Figure A16**). This value is within the published range of values for the clayey to sandy sediment types beneath the study area (Spitz & Moreno, 1996). In addition, for consistency, the specific yield values assigned to the GHSA were adopted from the current 1997-2019 Indio Subbasin calibration model. Because the Upper Coachella Valley is unconfined, it was assumed that the S_y distribution was the same in all model layers. S_y values were modified as necessary during the calibration process to obtain a better fit to observed water level data.

A.4.5 Boundary Conditions

Significant hydraulic boundaries (sources and sinks) within the study area must be considered in the numerical model. These boundaries are discussed below.

A.4.5.1 Initial Head Distribution

The initial head distribution for the model was based on maps prepared in 1936 by the USGS (Tyley, 1974) and others (MWH, 2013). The 1936 potentiometric surface map clearly shows the differences in groundwater level beneath the DHSSB, MCSB, GHSA, and main Indio Subbasin (**Figure A8a**). It was assumed that the 1936 potentiometric surface was uniform across all model layers.

A.4.5.2 Flow Barriers (Fault Zones)

As described in Section A.2.2, the DHSSB, MCSB, GHSA and main Indio Subbasin are separated by several faults including the Mission Creek Fault, Banning Fault, Garnet Hill Fault, and Indio Hills Fault (**Figure A2 and Figure A9**). These fault zones are simulated using the Horizontal Flow Barrier (HFB) package of MODFLOW. The HFB package works by multiplying a user-specified fault hydraulic conductivity term times a user-specified fault thickness to calculate a fault conductance term which reduces flow between adjacent cells and allows for large differences in simulated groundwater levels across the fault. A total of 14 HFB reaches were utilized in the model (**Figure A17**). HFB hydraulic conductivity values were modified as necessary during the calibration process to obtain a better fit to observed water level data and to approximate the estimated intra-basin underflows.

A.4.5.3 General Head Boundaries

The General Head Boundaries (GHB) package of MODFLOW was utilized to represent groundwater flow to or from aquifer areas outside of the active model domain. GHBs were specified in all model layers at the south end of the DHSSB to simulate observed heads just to the south of the active model domain in the lower portion of the Coachella Valley.

A.4.5.4 Evapotranspiration

As noted in Section A.2.6.2, approximately 1,120 acres of phreatophytes (mostly mesquite) have been identified within the MCSB, along the juncture of the Banning Fault and Indio Hills (Mayer, 1997). These phreatophytes consume an estimated 900 to 1,450 AFY of shallow groundwater upwelling along the fault. Transpiration losses were simulated using the standard Evapotranspiration package of MODFLOW (**Figure A17**).

A.4.5.5 Mountain Front Recharge

MFR typically occurs where precipitation on steep-sided bedrock mountains like the San Jacinto, San Bernardino, and Little San Bernardino Mountains runs off, collects, flows down intermittent streams, and ultimately discharges into alluvium at the base of the mountains. Although the

MFR runoff flow can be highly variable and intermittent (based on precipitation intensity and duration), it can be a significant source of groundwater recharge to mountain bounded valleys like the Coachella Valley.

The GHSA, MCSB, and DHSSB in the upper portion of the Coachella Valley receive MFR from 13 mountain watersheds in the San Bernardino and Little San Bernardino Mountains including the South Fork Whitewater River, Mission Creek, Chino Canyon, Grant Wash, Big Morongo Creek, Little Morongo Creek, Morongo Wash, Long Canyon, East Wide Canyon, Thousand Palms Canyon, Fan Canyon, Pushawalla Canyon, and Berdoo Canyon (**Figure A11** and **Figure A14**).

MFR for each of the 13 watersheds was estimated using the BCM, which covers the entire state of California (Flint, 2020). The BCM is a sophisticated water balance model that takes into consideration:

1. Parameter-Elevation Regressions on Independent Slopes Model generated estimates of precipitation.
2. Monthly vegetation-specific actual evapotranspiration for 65 vegetation types.
3. Spatially distributed calibration coefficients for snow accumulation and snow melt.
4. Hydraulic properties of mapped bedrock.
5. Calculated mapped soil organic matter.
6. Soil hydraulic properties calculated from soil texture and soil organic matter.
7. Soil dry-out below wilting point at a rate driven by average statewide aridity.
8. A switch allowing for the incorporation of urban impermeable surfaces; and
9. Internally calculated gaining and losing streams.

The BCM model runs at a monthly time scale to calculate the unimpaired water balance for 18-acre (270-meter by 270-meter) grid cells covering all of California, including all basins draining into the state, for the period from 1896 to 2019. The USGS has calibrated the BCM to base flow separation analyses at 160 stream gauges.

The BCM calculates unimpaired recharge and runoff for each user-specified area using the water balance approach described above and produces monthly recharge and runoff estimates as gridded maps. The monthly gridded maps can then be summed by watershed area to yield a recharge and runoff monthly time series for each watershed. If unimpaired stream gauging data are available for the watershed, the BCM estimates can be adjusted to “calibrate” the BCM runoff results to observed stream flows.

For this modeling effort the only available stream gauge data for the 13 watersheds draining into the upper portion of the Coachella Valley was for Mission Creek near Desert Hot Springs and the former Whitewater River gauge in the upper GHSA (**Figure A2**, **Table A4**). The Mission Creek gauge data have several gaps where the gauge was apparently washed out for several years. The BCM estimated runoff for the Mission Creek watershed was calibrated by Wood to the available Mission Creek stream gauge data as best as possible, with a correlation coefficient of 76 percent, with most of the discrepancy associated with low flow periods (**Figure A18**).

Because of lack of stream gauge data for the other watersheds, the calibration parameters used for Mission Creek were applied to the other 11 watersheds discharging into the MCSB and DHSSB.

The Whitewater River had a USGS gauge station from October 1948 through September 1979 (**Table A4**). The BCM estimated runoff for the Whitewater River watershed was calibrated by Wood to the available Whitewater River stream gauge data as best as possible, with a correlation coefficient of 66 percent, with most of the discrepancy associated with peak (flood) flow periods (**Figure A18**). Starting in 1997, for consistency, the Whitewater River recharge utilized was extracted from the 1997-2019 Indio Subbasin calibration model.

The BCM estimates of runoff for each of the 13 watersheds for each stress period were simulated using the standard MODFLOW Recharge package at the locations shown on **Figure A14**. A summary of the preliminary BCM estimated annual runoff by watershed for the simulation period is provided in **Table A1**. MFR values were modified as necessary during the calibration process to obtain a better fit to observed water level data at the study area and to approximate the estimated intra-basin underflows. A summary of the calibrated BCM estimates of annual runoff by watershed for the simulation period is provided in **Table A8**.

A.4.5.6 Return Flow and Artificial Recharge

As discussed in Section A.2.6, return flow from applied water for agricultural, industrial, municipal, and golf course uses provides a significant source of recharge to the regional aquifer system. Return flows from septic systems and WWTPs are also a significant source of recharge. The largest single source of recharge is from artificial recharge at the MC-GRF. A total of 45 unique return flow zones, including one artificial recharge facility, are represented within the model domain (**Figure A14**). Return flow estimates for these zones from 1936 to 1978 were derived from Tyley (1974) and PSOMAS (2013). Return flow estimates from 1978 to 2019 provided by the Agencies. In addition, estimates of the artificial recharge from 2002 to 2019 were provided by the Agencies. Aquifer recharge from all these sources was simulated in the model using the standard MODFLOW Recharge package. A summary of estimated annual recharge by recharge zone for the model simulation period is provided in **Table A9**.

A.4.5.7 Pumping Wells

As discussed in Section A.2.6, groundwater pumping for agricultural, industrial, municipal, and golf course uses is one of the largest sinks in the regional aquifer system. A total of 94 wells have been identified within the study area (**Figure A19**). Most of these wells are located within the MCSB, fewer in the DHSSB, and only a couple of pumping wells from the GHSA. Pumping wells were simulated using the Multi-Node Well (MNW) package of MODFLOW. The MNW package allows for the specification of well screens across multiple model layers and automatically allocated pumping from each layer based on layer transmissivity. MNW will also automatically reallocate pumping to lower layers if upper layers should go dry. Pumping rates for the period 1936 to 1978 were based on prior modeling efforts (Tyley, 1974 and PSOMAS, 2013). Pumping rates for the period 1978 to 2019 are based on estimates and reported pumping by the Agencies or in literature (**Tables A4** to **A7**).

A.4.5.8 Garnet Hill Flux Boundary

As discussed in Sections A.1.5 and A.4.4, the MCSB model was made consistent with the 1997-2019 Indio Subbasin calibration model by adopting the Indio Subbasin hydraulic properties in the Garnet Hill overlap area. Likewise, the boundary flux (underflow) to and from the GHSA to the main Indio Subbasin across the Garnet Hill Fault was also extracted from the Indio Subbasin 1997-2019 calibration model and used for this model. To calculate the underflow, the GHSA in the Indio Subbasin 1997-2019 calibration model was subdivided into multiple hydrostratigraphic units (HSUs). The groundwater underflow between the main Indio Subbasin (HSU 1) and the GHSA (HSUs 11- 16) was then calculated for each quarterly stress period of the model (**Figure A20**). In addition, the Whitewater River (HSU 8) recharge was also calculated from the 1997-2019 Indio Subbasin calibration model.

To simulate the underflow in the MCSB model, a flux boundary was set up using the Well package of MODFLOW. The flux boundary was set up immediately southwest of the Garnet Hill Fault using 332 wells in a series of six reaches (consistent with HSUs) in all model layers (**Figure A20**). Unlike the MNW package, the Well package does not reallocate pumping when a model layer goes dry; this provides a more realistic representation of flow across a fault. The flux for each flux boundary reach from 1936 to 1997 was estimated using the simulated underflow from the PSOMAS model (**Figure A20**; PSOMAS, 2013). The fault flux for each well reach from 1997 through 2019 was based on underflow values extracted from the 1997-2019 Indio Subbasin calibration model. A plot of the annual underflow (fault flux) across the Garnet Hill Fault shows that prior to 1978, the underflow was consistently from the GHSA to the main Indio Subbasin (**Figure A20**). Starting in 1978, the underflow from the GHSA started to decrease, most likely in response to artificial recharge at the WWR-GRF. In 1986-1987 underflow briefly reversed and flowed from the main Indio Subbasin into the GHSA. From 1997 to 2019, the underflow was more variable, with more frequent periods where the net underflow reversed direction and went from the main Indio Subbasin into the GHSA. This is attributed to increased artificial recharge at the WWR-GRF in the main Indio Subbasin during some years after 1997.

A.5 Calibration

Calibration of a groundwater flow model is a process through which the model is demonstrated to be capable of simulating the field-measured heads (groundwater levels) and flows that comprise the calibration targets. Calibration is accomplished by selecting a set of model parameters, boundary conditions, and stresses that produce simulated heads and fluxes that match field measurements within a pre-established range of errors. Because of the multiplicity of parameters involved in the calibration process, a unique solution (e.g., one set of parameters) cannot be achieved. A brief discussion of the calibration of the groundwater flow model for the study area is presented below.

A.5.1 Calibration Criteria

The quantitative fit of the MCSB model to observed water level measurements was conducted through statistical analysis of the residuals, meaning the difference between observed and simulated water levels (or heads) at specified observation locations, and in the case of transient calibration, with time. In GWV (ESI, 2017), the residual is calculated as the observed value minus the simulated value; for instance, a positive residual indicates the simulated head value is less that the observed value, and vice-versa. The principal statistical measures of the residuals of all data points combined include the following:

- the mean of the residuals,
- the mean of the absolute value of the residuals,
- the standard deviation of the residuals,
- the sum of the square of the residuals (SSR),
- the root mean square of the residuals,
- the minimum and maximum of the residuals,
- the range of the observed values, and
- normalized measures of the residuals compared to the range (e.g., the normalized root mean square (NRMS) value or the normalized standard deviation).

Plots of observed versus computed head values should track close to a 45-degree line. Plots of residuals versus observed head values should show a random distribution around the zero line. For transient data, hydrographs of observed and simulated values for a given observation well and associated model cell should track closely over time. The cumulative SSR is used to help identify targets or areas where the residual values are largest (i.e., where the modeled water levels for a well or area are not as close to the observed water levels). The mean of the residuals should also be randomly distributed spatially. Clusters or patterns of gradation of positive or negative residuals may suggest areas (or stress periods) where model parameters need to be adjusted further.

There is not an industry standard for determining when a numerical model is “adequately” calibrated. However, a commonly used “rule of thumb” for acceptable calibration is that the NRMS error should be less than 10 percent (Zheng and Neville, 1994). The NRMS is the square root of the SSR divided by the number of observations throughout the model divided by the range of observed water level measurements.

A.5.2 Transient Calibration

The Mission Creek model was calibrated to 7,128 groundwater elevations in 58 wells (**Figure A21**) and estimated underflow between subbasins. Calibration was accomplished using a process of manual trial-and-error and autocalibration using Parameter Estimation (PEST) software. A total of 28 model variants (with modifications of hydraulic parameters, fault conductance, general head boundaries, flux boundaries, etc.) were evaluated during the calibration process. Multiple manual runs were made with each model variant, and several of the variants were further calibrated using PEST.

A typical PEST calibration simulation consisted of varying 50 to 70 model parameters (K_h, K_v, S_s, S_y, fault conductivity, fault flux). PEST initially ran the model once for each parameter to calculate parameter sensitivity. The most sensitive parameters were identified (typically about 50 percent of the total). PEST then ran a series of iterations where the model was run for each of the most sensitive parameters. At the end of each iteration, the sensitivity of each parameter was again calculated, and the more sensitive parameters were slightly adjusted for the next iteration. Typically, a PEST simulation would run for 10 to 15 iterations and many 100s to 1,000s of simulations before converging on the best set of parameter values. These values were then incorporated into the model.

A.5.2.1 Quantitative Calibration Results

As noted above, a model can be considered well calibrated when the NRMS error is 10 percent or less. Following the calibration process, the resulting NRMS error for the entire MCSB model was 3.7 percent, meeting the calibration criteria. For the DHSSB, MCSB, and GHSA, the NRMS error was 5.5 percent, 2.3 percent, and 3.8 percent, respectively. A scatter plot shows that most observed versus computed head values fall along a 45-degree line with only a few outliers (**Figure A22**, left-hand side of figure). Likewise, the plot of residual distribution shows a relatively uniform distribution around the mean value (**Figure A22**, right-hand side of figure). The scatter plot shows that there is a group of observations where the simulated heads are notably less than the observed heads. These observations are from two monitoring wells located southwest of the MC-GRF, where the large volume of recharge water makes it very difficult to match the large change in heads observed.

A.5.2.3 Qualitative Calibration Results

A comparison of observed and simulated heads on hydrographs provides a visual, qualitative measure of the goodness of fit of the model to observations. A plot of hydrographs for selected wells in the MCSB and GHSA shows reasonably good fit for most wells (**Figure A23**). **Appendix A1** contains hydrographs of observed and simulated heads for all 58 observation wells (**Figure A21**).

A comparison of estimated and simulated average underflow between subbasins is another qualitative measure of the goodness of fit of the model to observations. A plot of historical underflow estimates (Tyley, 1974, PSOMAS, 2010) and simulated average annual underflows shows that the simulated underflows between the DHSSB and MCSB, between the MCSB and GHSA, and between the GHSA and main Indio Subbasin are lower than previously estimated (**Figure A24**). This reduction is likely the result of the increased artificial recharge and MC-GRF and WWR-GRF since 2010, which has caused an overall increase in groundwater levels in the MCSB and GHSA.

A.5.3 Model Calculated Water Balance

In addition to simulating groundwater elevations, the model can generate a summary of the inflows and outflows for each model cell. These inflows and outflows can be compiled for various areas of the active model domain to approximate the water balance for each subbasin and subarea (**Figure A25**).

The change in groundwater in storage for each subbasin and subarea can be calculated with equation 1 as shown below:

$$\text{Total Inflows (AFY)} - \text{Total Outflows (AFY)} = \text{Change in Storage (AFY)} \qquad \text{Equation 1}$$

The simulated annual water balances for the 1978 to 2019 period for the MCSB, DHSSB, and GHSA are described below.

A.5.3.1 Mission Creek Subbasin

The simulated water balance for the MCSB for the period 1978 through 2019 is briefly discussed below and is summarized in **Table A10** and shown on **Figure A26**. **Table A10** includes a summary of the minimum, maximum, and average values for the components of inflow and outflow though the simulation period as well as the minimum, maximum, and average of the total annual inflows and outflows. The components are independent of each other, so the minimum (or maximum) for each component may occur in a different year than the minimum (or maximum) for other components. Consequently, the sum of the minimum (or maximum) values for all components will not equal the minimum (or maximum) value for total inflow in a single year. Summary values shown are rounded to the nearest 10 AF or AFY.

Simulated Inflows

- **Natural Recharge** occurs primarily from MFR, mostly from the Mission Creek watershed with minor inflows from the Chino Canyon, Garnet Wash, and Big Morongo Creek watersheds. Simulated natural recharge from 1978 to 2019 ranged between 10 and 66,880 AFY and averaged 9,400 AFY.
- **Groundwater Underflow** into the MCSB from DHSSB across the Mission Creek Fault during the period 1978 to 2019 was simulated to range from 1,060 to 1,700 AFY and average about 1,230 AFY.
- **Applied Water Return Flow** was calculated from groundwater production per agency records and subdivided into Agricultural, Industrial, Municipal, and Golf Course production, each with its own return flow factor. Between 1978 and 2019, simulated applied water return flow ranged between 570 and 1,880 AFY and averaged about 1,330 AFY.
- **Septic Return Flow** was estimated based on agency estimates of the number of households not connected to City sewer systems. Between 1978 and 2019, simulated septic return flow ranged between 210 and 1,750 AFY and averaged about 930 AFY.
- **Wastewater Return Flows** were estimated for the Horton WWTP and Desert Crest WWTP based on agency estimates and records. Between 1978 and 2019, simulated wastewater return flow ranged between 180 and 2,130 AFY and averaged about 1,030 AFY.
- **Artificial Recharge** was estimated based on agency-provided records of recharge at the MC-GRF. Between 2002 and 2019, simulated artificial recharge ranged between 0 and 33,210 AFY and averaged about 9,190 AFY.
- **Total Inflows** are the summation by year of the various inflow components described above. Between 1978 and 2019, simulated total inflows ranged between 2,740 and 71,590 AFY and averaged about 17,840 AFY (see summary in **Table A10**).

Simulated Outflows

- **Pumping** was based primarily on agency-provided records. Between 1978 and 2019, simulated groundwater pumping ranged between 4,580 and 17,610 AFY and averaged about 12,190 AFY (**Figure A26**).
- **Evapotranspiration** from phreatophytes was simulated between 1978 and 2019, and ranged between 880 and 1,140 AFY and averaged about 1,030 AFY.
- **Groundwater Underflow** from the MCSB to the GHSA across the Banning Fault was simulated between 1978 and 2019. Underflow ranged from 1,630 to 3,300 AFY and averaged about 2,290 AFY. Outflow to the Indio Hills has been subdivided into two areas as shown in **Figure A25**. Indio Hills East consists of the main portion of the Indio Hills within the MCSB, and Indio Hills West consists of the portion of the Indio Hills, southwest of the Banning Fault, that bounds the southeastern side of the GHSA. The 1978 to 2019 groundwater underflow from the MCSB to the Indio Hills East Subarea of the MCSB was simulated and ranged from 290 to 680 AFY and averaged about 450 AFY. Likewise, the 1978 to 2019 groundwater underflow from the MCSB to the Indio Hills West Subarea of the GHSA was simulated and ranged from 290 to 380 AFY and averaged about 330 AFY.
- **Total Outflows** are the summation by year of the various outflow components described above. Between 1978 and 2019, simulated total outflows ranged between 10,070 and 20,840 AFY and averaged about 16,290 AFY (see summary in **Table A10**).

Simulated Change in Groundwater Storage

The change in groundwater storage in the MCSB can be calculated with Equation 1. Between 1978 and 2019, total simulated inflows minus total simulated outflows ranged between negative 12,970 and positive 55,040 AFY and averaged about positive 1,560 AFY, as shown in **Table A10** and by the green Change in Storage line on the graph for the MCSB on **Figure A26**. **Table A10** and **Figure A26** also show that the MCSB has had a cumulative change in storage of about 30,845 AF since 1978, and a cumulative change in storage of about 16,560 AF since the start of artificial recharge in 2002 (despite mostly drought conditions). Note that the changes in storage as calculated by the model will not correspond immediately to water level responses in large portions of the subbasin. Much of the MFR is subsurface inflow or surface inflow that quickly infiltrates into the alluvium at the mountain front in the upper parts of the subbasin. These upper parts of the subbasin, however, are several miles hydraulically upgradient of the main portion of the subbasin where wells are located (i.e., southeast of the MC-GRF), and the groundwater level response to this recharge is delayed and damped with distance from the mountain front.

Underflow from Desert Hot Springs Subbasin to Mission Creek Subbasin

Conceptually, underflow from the DHSSB to the MCSB will increase with increasing water level difference across the Mission Creek Fault. The calibrated groundwater model was used to evaluate the relative magnitude of this underflow in comparison to natural and artificial recharge to the MCSB and how this underflow has changed in response to changes in recharge and water levels in both subbasins.

Underflow across the Mission Creek Fault is shown in **Table A10** and on **Figure A27**. The top chart on **Figure A27** shows

the historical values of underflow from the DHSSB to the MCSB (shown as the dark blue line extending across the chart), natural recharge to the DHSSB (orange bars on the chart), natural recharge to the MCSB (green bars), and artificial recharge into the MCSB at the MC-GRF (blue bars). Note that on this chart, the scale for recharge is 100 times greater than the scale for groundwater underflow, illustrating that underflow from the DHSSB is a very small component of the total inflow to the MCSB. As shown on this chart, underflow across the Mission Creek Fault has been relatively stable except for brief periods when it increased abruptly in response to periods of relatively high natural recharge in both the MCSB and DHSSB. Because the DHSSB is a smaller subbasin with thinner alluvium, years with high natural recharge (e.g., 1980, 1993, and 2005) disproportionally impact groundwater levels in this subbasin and result in higher groundwater underflows across the Mission Creek Fault into the MCSB.

As also shown on this chart, artificial recharge at the MC-GRF appears to generally reduce underflow from the DHSSSB to the MCSB. Artificial recharge approaching 25,000 and 20,000 AF occurs in 2005 and 2006, respectively. Little to no impact of artificial recharge on groundwater underflow across the fault is apparent for these years; however, the start of this recharge corresponds to a high natural recharge year that may have offset the potential impact on groundwater underflow. Additional high-volume artificial recharge events occurred at the MC-GRF in three consecutive years beginning in 2010, ranging from approximately 33,000 AF in 2010 to approximately 26,000 AF in 2013. This period of increased artificial recharge corresponds to a steep decline in groundwater underflow across the fault. The lack of natural recharge in the region during the latter part of this period likely also contributed to the decline in groundwater underflow across the fault. From 2013 through 2019, groundwater underflow across the Mission Creek Fault has been relatively stable averaging approximately 1,140 AFY. This underflow is comparable to the average of approximately 1,090 AFY observed from 1985 to 1992 and is well below the average of approximately 1,310 AFY between 2000 and 2010.

The lower chart on **Figure A27** shows

groundwater underflow across the Mission Creek Fault compared with groundwater levels on each side of the fault. Well 03S05E17J01 (17J01), located in the southeastern part of the MCSB, shows declining groundwater levels from 1975 through 2009, stable water levels from 2009 through 2011, and then increasing water levels beginning in 2012 due to groundwater replenishment at the MC-GRF (see the upper chart for artificial recharge). Well 03S05E10R01 (10R01), located in the DHSSB across the Mission Creek Fault from the southern MCSB area where 17J01 is located, shows groundwater levels increasing from 1990 to about 2017 and relatively stable water levels since then with a slight decline in 2019. The difference in groundwater levels across the fault in 1990 (1990 average) was approximately 166 feet, and the difference across the fault in 2009 (2009 average) was approximately 216 feet. Between rising groundwater levels on the DHSSB side of the fault and declining groundwater levels on the MCSB side of the fault, the net change in groundwater levels between 1990 and 2009 was about 50 feet.

Together, the two charts show that even though the southeastern part of the MCSB continues to have a relatively high difference in groundwater levels across the fault, groundwater underflow across the fault declined as a result of lower natural recharge in the region due to persistent drought conditions and due to artificial recharge at the MC-GRF. A combination of artificial recharge efforts in the MCSB and low natural recharge in the DHSSB have significantly reduced groundwater underflow across the fault compared to much of the 1990s and 2000s. The implications of MCSB groundwater management on underflow across the Mission Creek Fault are further discussed in Section 7 of the Alternative Plan Update.

A.5.3.2 Desert Hot Springs Subbasin

The 1978 through 2019 simulated water balance for the DHSSB is briefly discussed below and summarized in **Table A11** and shown on **Figure A26**. **Table A11** includes a summary of the minimum, maximum, and average values for the components of inflow and outflow though the simulation period as well as the minimum, maximum and average of the total annual inflows and outflows. The components are independent of each other, so the minimum (or maximum) for each component may occur in a different year than the minimum (or maximum) for other components. Consequently, the sum of the minimum (or maximum) values for all components will not equal the minimum (or maximum) value for total inflow in a single year. Summary values shown are rounded to the nearest 10 AF or AFY.

Simulated Inflows

- **Natural Recharge** occurs primarily from MFR mostly from the Little Morongo Creek and Long Canyon watersheds, with minor inflow from the Mongo Wash, East Wide Canyon, 1000 Palm Canyon, Fan Canyon, Pushawalla Canyon, and Berdoo Canyon watersheds (**Figure A14**). Between 1978 and 2019, simulated natural recharge ranged between near 0 and 36,380 AFY and averaged 3,220 AFY.
- **Applied Water Return Flow** was calculated from groundwater production per agency records and subdivided into Agricultural, Industrial, Municipal, and Golf Course categories, each with its own return flow factor. Between 1978 and 2019, simulated total applied water return flow ranged between 450 and 1,340 AFY and averaged about 970 AFY.
- **Septic Return Flow** was estimated based off agency estimates of the number of households not connected to City sewer systems. Between 1978 and 2019, simulated septic return flow ranged between 510 and 2,260 AFY and averaged about 1,590 AFY.
- **Total Inflows** are the summation by year of the various inflow components described above. Between 1978 and 2019, simulated total inflows ranged between 1,340 and 38,860 AFY and averaged about 5,780 AFY (see summary in **Table A11**).

Simulated Outflows

- **Pumping** was based on literature results (Mayer, 2007) as the pumping in this subbasin is by private parties and is limited. Between 1978 and 2019, simulated pumping was 1,690 AFY for all years except 1978 when it was 1,700 AFY. Pumping averaged about 1,690 AFY (**Figure A26**).
- **Groundwater Underflow** from the DHSSB to the MCSB across the Mission Creek Fault has been simulated as ranging between 1,060 and 1,700 AFY and averaged about 1,230 AFY between 1978 and 2019. Groundwater underflow from the DHSSB to the Indio Hills Subarea of the MCSB across the Mission Creek Fault was simulated to range from 640 and 970 AFY and averaged about 770 AFY. Groundwater underflow from the DHSSB to the Indio Subbasin south of the Indio Hills was simulated to range from 1.0 and 3.1 AFY and averaged about 1.5 AFY.
- **Total Outflows** are the summation by year of the various outflow components described above. Between 1978 and 2019, simulated total outflows ranged between 3,480 and 4,180 AFY and averaged about 3,690 AFY (see summary in **Table A11**).

Simulated Change in Groundwater Storage

The change in groundwater storage in the DHSSB can be calculated with Equation 1. Between 1978 and 2019, total inflows minus total outflows ranged between negative 2,530 and positive 34,680 AFY and averaged about positive 2,090 AFY, as shown in **Table A11** and the green Change in Storage line on the graph for the DHSSB on **Figure A26**. Since the mid-2000s, the annual change in storage has been relatively stable at about negative 1,100 AFY. The cumulative change in storage from 1978 to 2019 is approximately positive 55,750 AF (**Table A11** and **Figure A26**). The cumulative Change in Storage curve indicates a depletion of groundwater in storage in DHSSB from 1980 to 1992. In 1993, intense MFR restored the subbasin storage. Groundwater storge has remained relatively constant since 1993. However, there is a high degree of uncertainty in the water balance components in the DHSSB due to limited data. Although the water balance components in DHSSB are not well constrained, they were considered adequate for the purposes of the MCSB Model.

A.5.3.3 Garnet Hill Subarea

The 1978 through 2019 simulated water balance for the GHSA is briefly discussed below and summarized in **Table A12** and shown on **Figure A26**. **Table A12** includes a summary of the minimum, maximum, and average values for the components of inflow and outflow though the simulation period as well as the minimum, maximum and average of the total annual inflows and outflows. The components are independent of each other, so the minimum (or maximum) for each component may occur in a different year than the minimum (or maximum) for other components. Consequently, the sum of the minimum (or maximum) values for all components will not equal the minimum (or maximum) value for total inflow in a single year. Summary values shown are rounded to the nearest 10 AF or AFY.

Simulated Inflows

- **Natural Recharge** occurs primarily from MFR from the Whitewater River watershed. Between 1978 and 2019, simulated natural recharge ranged between 3,010 and

34,480 AFY and averaged 12,030 AFY. These values include the Whitewater River Recharge values derived from the 1997-2019 Indio Subbasin calibration model.

- **Groundwater Underflow** into the GHSA from the MCSB across the Banning Fault has been simulated to range from 1,630 to 3,300 AFY and average about 2,290 AFY between 1978 and 2019.
- **Applied Water Return Flow** was calculated from groundwater production per agency records and subdivided into Agricultural, Industrial, Municipal, and Golf Course categories, each with its own return flow factor. Between 1978 and 2019, simulated total applied water return flow ranged between 10 and 140 AFY and averaged about 40 AFY.
- **Septic Return Flow** was estimated based on agency estimates of the number of households not connected to City sewer systems. Between 1978 and 2019, simulated septic return flow ranged between 20 and 410 AFY and averaged about 120 AFY.
- **Total Inflows** are the summation of the various inflows described above. Between 1978 and 2019, simulated total inflows ranged between 4,820 and 37,970 AFY and averaged about 14,490 AFY (see summary in **Table A12**).

Simulated Outflows

- **Pumping** was based primarily on agency-provided records. Between 1978 and 2019, simulated groundwater pumping ranged between 330 and 2,650 AFY and averaged about 600 AFY (**Figure A26**).
- **Groundwater Underflow** from the GHSA to the main Indio Subbasin across the Garnet Hill Fault has been estimated to range between 4,980 to 10,780 AFY and averaged about 7,790 AFY between 1978 and 2019. Underflow from the GHSA to the West Indio Hills has been estimated to range between 320 to 870 AFY and averaged about 660 AFY between 1978 and 2019. As discussed in Section A.4.5.8, increased recharge at the WWR-GRF has occasionally reversed the direction from GHSA to the main Indio Subbasin.
- **Total Outflows** are the summation of the various outflows described above. Between 1978 and 2019, simulated total outflows ranged between 6,450 and 12,230 AFY and averaged about 9,050 AFY (see summary in **Table A12**).

Simulated Change in Groundwater Storage

The change in groundwater storage in the GHSA can be calculated with Equation1. Between 1978 and 2019, total inflows minus total outflows ranged between negative 4,670 AFY and positive 25,880 AFY and averaged about positive 5,440 AFY, as shown in **Table A12** and the green Change in Storage line on the GHSA chart on **Figure A26**. The GHSA had a net increase in annual storage from 1978 to 2006, mostly due to increases in MFR and underflow from the main Indio Subbasin due to recharge at the WWR-GRF. Since then, the GHSA had a net decrease in annual storage. The cumulative change in storage from 1978 to 2019 is approximately positive 202,824 AF, with most of that occurring before 2006 (**Table A12** and **Figure A26**).

A.6 Sensitivity Analysis

A sensitivity analysis was conducted to evaluate the sensitivity of the model to changes in the estimated values of the hydraulic parameters K_h, K_v, S_s, S_y, and HFB conductivity. These values in the model were systematically modified over the plausible range of values for the sediment types present beneath the study area, and the model was re-run. The hydraulic parameters of K_h, K_v, and S_s were modified with nine multipliers ranging from 0.1 to 10 times. The S_y hydraulic parameters were modified with nine multipliers ranging from 0.1 to 4 times. Because the hydraulic parameters of K_h, K_v, S_s, and S_y values are matrix based, the multipliers were applied using the HSUs used for evaluation the water balance (**Figure A25**). The conductivity values for the 14 fault reaches (HFBs) were modified with 11 multipliers ranging from 0.1 to 10 times. A total of 323 sensitivity runs were conducted and compared to the calibration model results to evaluate the change in calibration due to the change in the model parameters. The sensitivity analysis results were evaluated using a series of charts for each hydraulic parameter (**Figure A28**). The charts show the calibrated hydraulic values (located at 1 on the horizontal axis) are generally at the nadir (e.g., low point) of most of the parameters and that most parameter variations increase the residual sum of squares error. However, the charts also show that model calibration may be improved slightly by modifying the K_v matrix in the GHSA (HSU2) and the S_s matrix in the MCSB (HSU3). The model is relatively insensitive to changes in the other model parameters (**Figure A28**). Revision of the above-noted more sensitive parameters would not significantly improve model calibration and therefore no revisions were incorporated into the model at this time.

A.7 Data Limitations

The available data for the study area are limited to those provided by the parties and information gathered from various public agencies. Formation hydraulic conductivity estimates were based on grain-size analysis, lithologic descriptions, pump test analyses by others, the PSOMAS 1936-2010 model, and the 1997-2019 Indio Subbasin model. Estimates of formation contacts were based on observations made during the construction of wells and mapping by the USGS. Most wells and borings were too shallow to provide information about the characteristics of the deeper aquifer. Pumping rates, return flows, artificial recharge, and other model inputs from 1936 to 1978 were estimated based on previous models of the area. Pumping rates, return flows, artificial recharge, and other model inputs from 1978 to 2019 are based primarily on agency records.

A.8 Summary of Model Reliability and Uncertainty

As with any model there is an inherent uncertainty in the model results due to uncertainty in several model inputs. For example, the HCM may be over simplified or miss important hydrogeologic features. As noted in Section A.4.4, the current representation of the Indio Hills area as having hydraulic parameters similar to those in other parts of the Garnet Hills Subarea should be evaluated further. Hydraulic parameters may or may not be estimated from physical tests or aquifer tests, and/or may be more or less heterogenous than simulated. Groundwater levels used for calibration may contain outliers or be influenced by unknown pumping or recharge. Groundwater pumping may not be metered, but instead estimated by assumed demands. Likewise, recharge from return flow or MFR are typically estimated and not measured. Uncertainty in all these inputs can increase the overall uncertainty in the simulation results.

Uncertainty in a calibration model can be reduced by constructing and evaluating alternative HCMs and conducting a sensitivity analysis of model parameters and boundary conditions. This is typically part of the "step-wise" model calibration process, wherein complexity is iteratively added to the model only as necessary to improve calibration. For example, a fault zone may start as a single HFB boundary, but through calibration, it may be divided into several HFBs with different values. Uncertainty in a forecast or predictive model can also be estimated by forecasting over the plausible range of future pumping and/or recharge conditions (e.g., worst-case and best-case scenarios), thereby "bracketing" the likely outcome.

The groundwater flow model for the study area is an approximation of existing conditions beneath and in the study area. As such, the model can approximate, but not completely reproduce, all observations across the entire study area under all conditions. The groundwater flow model can reliably predict heads in the MCSB in response to pumping and recharge alternatives within the calibrated historical range of pumping and recharge rates. However, simulations with extreme ranges in pumping or recharge (i.e., severe drought conditions or extreme flooding) may produce less reliable results. Groundwater models overall are better at estimating relative difference of alternatives (i.e., scenario comparison) than estimating absolute numerical values of a particular alternative.

A.9 References

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Tables

Table A1

Annual Mountain Front Recharge by Watershed from BCM 1936 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Date	Year	Whitewater Zone 2[1] (AFY)	MCSB Total[3] (AFY)	Reach 51 MissionCreekGage (AFY)	Reach 52 ChinoCanyon (AFY)	Reach 53 GarnetWash (AFY)	Reach 54 BigMorongoCreek (AFY)	DHSSB Total[4] (AFY)	Reach 55 LittleMorongoCreek (AFY)	Reach 56 MorongoWash (AFY)	Reach 57 LongCanyon (AFY)	Reach 58 EastWideCanyon (AFY)	Reach 59 1kPalmCanyon (AFY)	Reach 60 FanCanyon (AFY)	Reach 61 PushawallaCanyon (AFY)	Reach 62 BerdooCanyon (AFY)	Total[2] (AFY)	Cumulative[2] (AF)
Jan-36	1936	8,491.42	1,103.71	1,093.91	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	1,130	1,130
Jan-37	1937	39,341.11	14,418.91	13,799.29	3.27	3.27	613.09	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	14,445	15,575
Jan-38	1938	43,634.75	15,208.94	14,054.71	3.27	3.27	1,147.68	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	15,235	30,810
Jan-39	1939	7,406.43	1,806.15	1,796.34	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	1,832	32,642
Jan-40	1940	12,153.21	957.89	948.09	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	984	33,626
Jan-41	1941	32,619.93	15,342.90	13,432.02	3.27	3.27	1,904.34	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	15,369	48,995
Jan-42	1942	2,262.01	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	49,035
Jan-43	1943	30,094.50	9,004.68	8,994.87	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	9,031	58,065
Jan-44	1944	18,076.31	4,545.61	4,535.81	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	4,572	62,637
Jan-45	1945	21,479.00	2,817.31	2,807.51	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	2,843	65,481
Jan-46	1946	15,889.64	1,220.56	1,210.75	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	1,247	66,727
Jan-47	1947	2,082.13	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	66,767
Jan-48	1948	3,446.77	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	66,806
Jan-49	1949	7,440.70	1,148.01	1,138.21	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	1,174	67,980
Jan-50	1950	7,864.88	3,436.31	3,426.50	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3,462	71,442
Jan-51	1951	959.24	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	71,482
Jan-52	1952	28,646.06	9,840.92	7,382.88	108.63	385.82	1,963.60	4,959.61	2,838.40	217.65	513.84	3.27	3.27	541.47	446.58	395.12	14,801	86,282
Jan-53	1953	3.27	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	86,321
Jan-54	1954	13,126.85	6,561.51	3,957.13	106.01	254.97	2,243.40	5,028.69	3,513.19	265.31	3.27	3.27	3.27	456.87	397.75	385.77	11,590	97,912
Jan-55	1955	2,038.03	150.82	3.27	40.25	104.04	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	177	98,089
Jan-56	1956	1,422.23	670.72	660.91	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	697	98,785
Jan-57	1957	8,184.77	1,585.38	886.21	45.45	101.57	552.16	1,888.05	932.84	206.99	3.27	3.27	3.27	3.27	374.25	360.90	3,473	102,259
Jan-58	1958	44,043.80	16,009.67	11,370.85	191.40	500.92	3,946.50	8,291.53	5,802.41	641.41	3.27	3.27	432.48	528.41	456.83	423.45	24,301	126,560
Jan-59	1959	3,230.74	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	126,599
Jan-60	1960	2,088.78	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	126,639
Jan-61	1961	3.27	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	126,678
Jan-62	1962	12,850.40	2,349.29	2,339.48	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	2,375	129,053
Jan-63	1963	1,335.23	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	129,092
Jan-64	1964	3.27	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	129,132
Jan-65	1965	25,183.59	14,786.08	8,129.34	329.02	728.94	5,598.79	23,047.49	9,043.06	1,634.41	2,607.92	1,809.12	1,957.06	2,246.29	2,031.80	1,717.84	37,834	166,965
Jan-66	1966	22,410.57	7,451.05	5,446.18	76.55	174.85	1,753.48	2,015.93	1,750.86	245.46	3.27	3.27	3.27	3.27	3.27	3.27	9,467	176,432
Jan-67	1967	44,789.72	12,843.02	12,833.21	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	12,869	189,301
Jan-68	1968	3.27	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	189,341
Jan-69	1969	81,119.01	40,336.50	25,483.52	399.78	745.05	13,708.16	36,783.56	12,809.22	2,545.19	4,443.20	3,502.23	3,015.29	3,764.40	3,419.19	3,284.83	77,120	266,461
Jan-70	1970	4,502.24	199.29	3.27	3.27	189.49	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	225	266,686
Jan-71	1971	3.27	916.80	3.27	49.71	120.51	743.31	3,378.33	1,246.11	270.97	463.48	3.27	364.95	582.05	444.23	3.27	4,295	270,981
Jan-72	1972	4,051.10	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	271,020
Jan-73	1973	20,515.28	5,103.54	5,093.73	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	5,130	276,150
Jan-74	1974	12,131.77	3,376.34	2,280.62	53.20	124.90	917.61	3,929.81	1,373.82	277.79	452.78	3.27	415.92	492.79	466.87	446.55	7,306	283,456
Jan-75	1975	6,713.70	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	283,496
Jan-76	1976	6,807.13	4,815.66	1,658.81	136.79	341.42	2,678.63	15,154.79	4,752.33	1,053.33	1,665.82	1,210.77	1,502.08	1,883.65	1,670.27	1,416.54	19,970	303,466
Jan-77	1977	1,661.83	1,830.32	904.64	40.38	188.76	696.54	2,776.45	1,121.29	235.26	3.27	3.27	395.03	557.11	457.95	3.27	4,607	308,073
Jan-78	1978	75,640.21	42,451.04	28,196.08	486.45	1,186.39	12,582.13	53,659.55	17,697.37	3,065.87	6,032.91	5,459.72	4,596.29	6,431.46	5,324.52	5,051.41	96,111	404,183
Jan-79	1979	44,621.50	21,559.23	16,345.60	84.30	396.89	4,732.44	18,454.04	11,834.65	616.47	1,223.09	920.64	839.69	1,127.03	989.88	902.59	40,013	444,197
Jan-80	1980	82,944.34	53,508.28	36,786.90	384.32	738.62	15,598.44	53,154.92	22,145.90	2,673.71	5,127.99	4,730.54	3,865.46	5,766.73	4,600.61	4,243.98	106,663	550,860
Jan-81	1981	8,191.28	1,556.94	1,547.13	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	1,583	552,443
Jan-82	1982	25,559.14	5,204.84	5,195.04	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	5,231	557,674
Jan-83	1983	86,523.38	35,885.87	31,704.16	3.27	3.27	4,175.17	4,496.21	3,641.78	3.27	3.27	834.82	3.27	3.27	3.27	3.27	40,382	598,056
Jan-84	1984	3.27	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	598,095
Jan-85	1985	13,817.95	1,690.29	1,680.49	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	1,716	599,812

Table A1

Annual Mountain Front Recharge by Watershed from BCM 1936 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Date	Year	Whitewater Zone 2[1] (AFY)	MCSB Total[3] (AFY)	Reach 51 MissionCreekGage (AFY)	Reach 52 ChinoCanyon (AFY)	Reach 53 GarnetWash (AFY)	Reach 54 BigMorongoCreek (AFY)	DHSSB Total[4] (AFY)	Reach 55 LittleMorongoCreek (AFY)	Reach 56 MorongoWash (AFY)	Reach 57 LongCanyon (AFY)	Reach 58 EastWideCanyon (AFY)	Reach 59 1kPalmCanyon (AFY)	Reach 60 FanCanyon (AFY)	Reach 61 PushawallaCanyon (AFY)	Reach 62 BerdooCanyon (AFY)	Total[2] (AFY)	Cumulative[2] (AF)
Jan-86	1986	30,654.33	4,897.82	4,888.02	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	4,924	604,736
Jan-87	1987	6,626.40	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	604,775
Jan-88	1988	7,161.70	1,429.71	1,419.90	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	1,456	606,231
Jan-89	1989	4,695.90	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	606,270
Jan-90	1990	1,421.34	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	606,309
Jan-91	1991	18,655.18	5,919.39	5,359.61	3.27	3.27	553.24	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	5,946	612,255
Jan-92	1992	26,265.88	6,297.51	6,287.71	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	6,324	618,578
Jan-93	1993	110,650.50	66,918.51	42,627.85	451.12	951.56	22,887.98	59,758.09	25,729.78	2,754.18	7,675.01	7,252.45	3,793.14	5,124.97	3,754.12	3,674.43	126,677	745,255
Jan-94	1994	19,007.81	4,710.85	4,701.04	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	4,737	749,992
Jan-95	1995	63,440.09	29,924.62	24,901.78	3.27	94.75	4,924.83	5,468.11	3,757.65	237.11	848.12	612.15	3.27	3.27	3.27	3.27	35,393	785,385
Jan-96	1996	25,819.40	4,933.30	4,923.49	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	4,959	790,344
Jan-97	1997	18,901.48	3,435.17	3,425.37	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3,461	793,805
Jan-98	1998	15,886.97	21,544.16	17,923.71	66.62	133.17	3,420.65	4,965.47	1,301.97	3.27	1,183.12	1,454.19	494.04	522.34	3.27	3.27	26,510	820,315
Jan-99	1999	12,123.43	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	820,354
Jan-00	2000	8,161.06	768.55	758.74	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	795	821,149
Jan-01	2001	4,451.55	730.96	721.15	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	757	821,906
Jan-02	2002	4,944.76	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	821,945
Jan-03	2003	4,086.99	1,154.46	1,144.66	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	1,181	823,126
Jan-04	2004	6,712.27	2,614.09	2,604.28	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	2,640	825,766
Jan-05	2005	24,745.49	31,719.89	25,346.55	185.64	344.39	5,843.32	13,839.99	4,815.39	676.13	3,043.14	3,310.96	741.18	876.84	3.27	373.09	45,560	871,326
Jan-06	2006	10,907.46	1,780.50	1,770.70	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	1,807	873,133
Jan-07	2007	4,948.29	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	873,172
Jan-08	2008	6,860.15	2,341.51	2,331.70	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	2,368	875,540
Jan-09	2009	3,004.93	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	875,579
Jan-10	2010	10,086.98	9,556.15	6,923.32	120.91	249.99	2,261.93	7,483.06	3,067.97	578.06	916.60	592.35	578.22	691.81	559.76	498.29	17,039	892,618
Jan-11	2011	8,326.37	5,050.47	5,040.67	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	5,077	897,695
Jan-12	2012	6,268.47	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	897,734
Jan-13	2013	5,169.36	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	897,773
Jan-14	2014	5,030.64	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	897,812
Jan-15	2015	4,078.70	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	897,852
Jan-16	2016	4,825.95	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	897,891
Jan-17	2017	6,500.49	7,529.44	6,730.23	3.27	3.27	792.67	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	7,556	905,446
Jan-18	2018	5,948.81	13.07	3.27	3.27	3.27	3.27	26.15	3.27	3.27	3.27	3.27	3.27	3.27	3.27	3.27	39	905,486
Jan-19	2019	12,161.05	19,518.40	19,511.32	2.45	2.45	2.18	19.61	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	19,538	925,024
Average[2] 1936-2019		17,214	7,081	5,554	42	98	1,386	3,931	1,659	219	434	380	276	379	305	279	11,012	
Average[2] 1978-2019		20,139	9,400	7,401	45	100	1,854	5,289	2,240	255	623	602	358	492	365	354	14,689	
Min[2] 1978-2019		3	13	3	2	2	2	20	2	2	2	2	2	2	2	2	39	
Max[2] 1978-2019		110,650	66,919	42,628	486	1,186	22,888	59,758	25,730	3,066	7,675	7,252	4,596	6,431	5,325	5,051	126,677	

Notes
1. Whitewater River specified recharge, Zone 2.
2. Average, minimum (min), maximum (max), total, and cumulative values rounded to the nearest whole unit.
3. MCSB Total = Sum of Reaches 51 through 54 in Mission Creek Subbasin.
4. DHSSB Total = Sum of Reached 55 through 62 in Desert Hot Springs Subbasin.

Abbreviations
AF = acre-feet
AFY = acre-feet per year
BCM = Basin Characterization Model
MCSB = Mission Creek Subbasin
DHSSB = Desert Hot Springs Subbasin

Table A2

Reported Annual Artificial Recharge 1970 - 2019

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Mission Creek Groundwater Replenishment Facility (AFY)	Whitewater River Replenishment Facility (AFY)
1970	--	--
1971	--	--
1972	--	--
1973	--	7,475
1974	--	15,396
1975	--	20,126
1976	--	13,206
1977	--	0
1978	--	0
1979	--	25,192
1980	--	26,341
1981	--	35,251
1982	--	27,020
1983	--	53,732
1984	--	83,708
1985	--	251,994
1986	--	298,201
1987	--	104,334
1988	--	1,096
1989	--	12,478
1990	--	31,721
1991	--	14
1992	--	40,870
1993	--	60,153
1994	--	36,763
1995	--	61,318
1996	--	138,266
1997	--	113,677
1998	--	132,455
1999	--	90,601
2000	--	72,450
2001	--	707

Table A2

Reported Annual Artificial Recharge 1970 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Mission Creek Groundwater Replenishment Facility (AFY)	Whitewater River Replenishment Facility (AFY)
2002	4,736	33,435
2003	59	902
2004	5,822	13,224
2005	24,723	165,554
2006	19,900	98,959
2007	1,012	16,009
2008	503	8,008
2009	4,090	57,024
2010	33,209	228,330
2011	26,237	232,214
2012	23,406	257,267
2013	2,379	26,620
2014	4,323	3,533
2015	171	865
2016	0.2	35,699
2017	9,248	385,994
2018	2,026	129,725
2019	5,390	243,357
Average	**9,291**	**78,538**
Minimum	**0.2**	**0.0**
Maximum	**33,209**	**385,994**

Abbreviation
AFY = acre-feet per year

Table A3

Estimated Annual Return Flows 1978 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Date	Applied Water Return (AFY)	Septic Return (AFY)	Wastewater Return (AFY)
1978	912	357	175
1979	977	426	229
1980	1,156	719	265
1981	1,181	747	309
1982	1,172	717	337
1983	1,240	769	435
1984	1,319	710	451
1985	1,412	766	420
1986	1,536	1,101	386
1987	1,507	1,188	454
1988	1,642	1,242	494
1989	1,796	1,385	575
1990	2,068	1,163	721
1991	2,012	1,075	754
1992	2,084	1,161	788
1993	2,160	1,240	882
1994	2,271	1,447	827
1995	2,309	1,539	783
1996	2,339	1,562	782
1997	2,224	1,443	825
1998	2,335	1,527	883
1999	2,395	1,571	930
2000	2,465	1,641	1,022
2001	2,479	1,967	1,048
2002	2,524	1,724	1,083
2003	2,575	1,774	1,253
2004	2,831	2,102	1,314
2005	2,794	2,323	1,400
2006	2,950	2,224	1,538
2007	2,964	2,203	1,504
2008	2,892	2,058	1,453
2009	2,723	2,047	1,409
2010	2,619	1,837	1,287
2011	2,725	1,825	1,394

Table A3

Estimated Annual Return Flows 1978 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Date	Applied Water Return (AFY)	Septic Return (AFY)	Wastewater Return (AFY)
2012	2,637	1,753	1,498
2013	2,730	1,724	1,605
2014	2,654	1,690	1,715
2015	2,482	1,620	1,880
2016	2,581	1,660	1,866
2017	2,618	1,598	1,970
2018	2,797	1,097	2,045
2019	2,499	1,208	2,132
Average	**2,181**	**1,427**	**1,027**
Minimum	**912**	**357**	**175**
Maximum	**2,964**	**2,323**	**2,132**

Abbreviation
AFY = acre-feet per year

Table A4

Measured and Estimated Stream Flows 1936 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Whitewater River Headwaters Gage (AFY)	BCM[1] Whitewater River (AFY)	Mission Creek Gage (AFY)	BCM Mission Creek River (AFY)
1936-1940	--	22,205	--	6,338
1941-1945	--	20,906	--	5,955
1948-1948	1,263	7,140	--	406
1949	5,164	7,441	--	1,138
1950	4,747	7,865	--	3,426
1951	3,983	959	--	3
1952	9,910	28,646	--	7,383
1953	7,264	3	--	3
1954	9,609	13,127	--	3,957
1955	7,277	2,038	--	3
1956	4,238	1,422	--	661
1957	5,001	8,185	--	886
1958	23,759	44,044	--	11,371
1959	8,081	3,231	--	3
1960	5,257	2,089	--	3
1961	2,762	3	--	3
1962	4,586	12,850	--	2,339
1963	4,102	1,335	--	3
1964	4,138	3	--	3
1965	15,663	25,184	--	8,129
1966	10,619	22,411	--	5,446
1967	16,512	44,790	--	12,833
1968	10,605	3	90	3
1969	90,887	81,119	7,674	25,484
1970	15,542	4,502	1,752	3
1971	7,434	3	738	3
1972	2,308	4,051	54	3
1973	10,208	20,515	109	5,094
1974	8,442	12,132	17	2,281
1975	5,073	6,714	2	3
1976	3,536	6,807	71	1,659
1977	5,333	1,662	190	905
1978	47,437	75,640	7,102	28,196

Table A4

Measured and Estimated Stream Flows 1936 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Whitewater River Headwaters Gage (AFY)	BCM[1] Whitewater River (AFY)	Mission Creek Gage (AFY)	BCM Mission Creek River (AFY)
1979	18,833	44,622	4,756	16,346
1980	--	82,944	20,488	36,787
1981	--	8,191	2,194	1,547
1982	--	25,559	1,310	5,195
1983	--	86,523	3,077	31,704
1984	--	3	1,817	3
1985	--	13,818	1,412	1,680
1986	--	30,654	789	4,888
1987	--	6,626	378	3
1988	--	7,162	295	1,420
1989	--	4,696	11	3
1990	--	1,421	0	3
1991	--	18,655	195	5,360
1992	--	26,266	1,296	6,288
1993	--	110,650	10,932	42,628
1994	--	19,008	2,302	4,701
1995	--	63,440	3,765	24,902
1996	--	25,819	883	4,923
1997	--	18,901	276	3,425
1998	--	15,887	1,412	17,924
1999	--	12,123	390	3
2000	--	8,161	125	759
2001	--	4,452	1	721
2002	--	4,945	0	3
2003	--	4,087	1	1,145
2004	--	6,712	--	2,604
2005	--	24,745	64	25,347
2006	--	10,907	2,780	1,771
2007	--	4,948	1,086	3
2008	--	6,860	1,585	2,332
2009	--	3,005	1,129	3
2010	--	10,087	2,505	6,923
2011	--	8,326	2,838	5,041
2012	--	6,268	1,325	3
2013	--	5,169	442	3
2014	--	5,031	93	3

Table A4

Measured and Estimated Stream Flows 1936 - 2019

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Whitewater River Headwaters Gage (AFY)	BCM[1] Whitewater River (AFY)	Mission Creek Gage (AFY)	BCM Mission Creek River (AFY)
2015	--	4,079	70	3
2016	--	4,826	91	3
2017	--	6,500	617	6,730
2018	--	5,949	235	3
2019	--	12,161	2,548	19,511
Average	**11,862**	**17,016**	**1,830**	**5,629**
Minimum	**1,263**	**3**	**0**	**3**
Maximum	**90,887**	**110,650**	**20,488**	**42,628**

Note
1. BCM = USGS Basin Characterization Model, discussed in Section 4.5.5 of the text.

Abbreviation
AFY = acre-feet per year

Table A5

Annual Mission Creek Subbasin Pumping 1978 - 2019

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Average Annual Pumping Mission Creek Subbasin[1]	1978 (AFY)2	1979 (AFY)	1980 (AFY)	1981 (AFY)	1982 (AFY)	1983 (AFY)	1984 (AFY)	1985 (AFY)	1986 (AFY)
2S4E-26D1_MCSB	0	0	0	0	0	0	0	0	0
3S4E-11B2_MCSB	9	2	0	0	0	0	0	0	0
3S4E-11L3_MCSB	0	0	0	114	291	318	1,042	1,143	1,377
3S4E-11M1_MCSB	361	315	389	227	26	0	0	0	0
3S4E-11P1_MCSB	0	0	0	0	0	0	96	0	0
3S4E-13N1_MCSB	0	0	0	0	0	0	0	0	0
3S5E-16M1_MCSB	132	0	4	2	0	11	0	0	0
3S5E-18L1_MCSB	13	0	13	13	13	13	13	13	13
3S5E-18N_MCSB	13	11	9	7	4	2	0	0	0
3S5E-18P_MCSB	11	9	8	6	4	2	0	0	0
Well159_MCSB	0	0	0	0	0	0	0	0	0
Well160-P27_MCSB	0	0	0	0	0	0	0	0	0
MCSB_2S4E-23L01_P32	385	385	385	385	385	385	385	385	385
MCSB_2S4E-23L02_P29	385	385	385	385	385	385	385	385	385
MCSB_2S4E-23L03_P28	385	385	385	385	385	385	385	385	385
MCSB_2S4E-23N01_23	413	565	293	317	236	245	301	277	836
MCSB_2S4E-23N02_30	0	0	0	0	0	0	0	0	0
MCSB_2S4E-26C01_28	0	0	0	0	0	0	0	0	0
MCSB_2S4E-28A01_34	0	0	0	0	0	0	0	0	0
MCSB_2S4E-36D01_22	465	627	1,119	1,219	1,090	877	1,006	1,184	792
MCSB_2S4E-36D02_24	960	962	1,297	1,047	1,035	1,566	1,333	1,494	1,399
MCSB_2S4E-36K01_29	0	0	0	0	0	0	0	0	0
MCSB_2S4E-36P01_37	0	0	0	0	0	0	0	0	0
MCSB_3S4E-04P01_PW2	0	0	0	0	0	0	0	0	0
MCSB_3S4E-04Q02_PW1	0	0	0	0	0	0	0	0	0
MCSB_3S4E-11A02_32	0	0	0	0	0	0	0	0	0
MCSB_3S4E-11L01_27	0	0	0	104	265	289	947	1,039	1,252
MCSB_3S4E-11L04_31	0	0	0	0	0	0	0	0	0
MCSB_3S4E-12B02_3408	280	500	553	292	292	230	516	814	661
MCSB_3S4E-12C01_3405	280	250	277	1,010	1,010	1,212	1,399	1,334	1,498
MCSB_3S4E-12C2S	0	0	0	0	0	0	0	0	0
MCSB_3S4E-12F01_3410	0	0	0	0	0	0	0	0	0
MCSB_3S4E-12H01_3407-1	280	250	277	0	0	0	0	0	0
MCSB_3S4E-12H02_3409-1	0	0	0	0	0	0	0	0	0
MCSB_3S4E-12H03_3409-2	0	0	0	0	0	0	0	0	0
MCSB_3S5E-05Q01_P27	244	244	244	244	244	244	244	244	244
MCSB_3S5E-08B01_P26	0	0	0	0	0	0	0	0	0
MCSB_3S5E-08P01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-08P02	0	0	0	0	0	0	0	0	0
MCSB_3S5E-15L01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-15N01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-15N03	0	0	0	0	0	0	0	0	0
MCSB_3S5E-15R01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-15R02	0	0	0	0	0	0	0	0	0
MCSB_3S5E-17M01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-17N01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-18J01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-20H02	0	0	0	0	0	0	0	0	0
Mission Creek Subbasin Total Pumping	4,617	4,891	5,639	5,758	5,667	6,165	8,053	8,698	9,228
Model Domain Total Pumping	6,371	6,609	7,927	8,051	7,960	8,436	9,790	10,433	11,522

Note

1. Well name is a composite of the California State Well Number and the Subbasin/ Subarea where the well is located. Well names with trailing subbasin/subarea names are from the PSOMAS model with California State Well Numbers assigned based on well location.

Abbreviation

AFY = acre-feet per year

Table A5

Annual Mission Creek Subbasin Pumping 1978 - 2019

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Average Annual Pumping Mission Creek Subbasin[1]	**1987 (AFY)**	**1988 (AFY)**	**1989 (AFY)**	**1990 (AFY)**	**1991 (AFY)**	**1992 (AFY)**	**1993 (AFY)**	**1994 (AFY)**	**1995 (AFY)**
2S4E-26D1_MCSB	0	0	412	606	442	737	910	960	958
3S4E-11B2_MCSB	0	0	0	0	0	0	0	0	0
3S4E-11L3_MCSB	1,533	1,487	1,723	1,720	1,586	1,457	1,810	1,452	344
3S4E-11M1_MCSB	0	0	0	0	0	0	0	0	0
3S4E-11P1_MCSB	0	0	0	0	0	0	0	0	0
3S4E-13N1_MCSB	0	0	0	0	0	878	0	0	0
3S5E-16M1_MCSB	0	0	0	0	0	0	0	0	0
3S5E-18L1_MCSB	27	11	11	11	11	79	0	0	0
3S5E-18N_MCSB	0	0	0	0	0	0	0	0	0
3S5E-18P_MCSB	0	0	0	0	0	0	0	0	0
Well159_MCSB	0	0	0	0	0	0	0	0	0
Well160-P27_MCSB	0	0	0	0	0	0	0	0	0
MCSB_2S4E-23L01_P32	385	385	385	385	385	385	385	385	385
MCSB_2S4E-23L02_P29	385	385	385	385	385	385	385	385	385
MCSB_2S4E-23L03_P28	385	385	385	385	385	385	385	385	385
MCSB_2S4E-23N01_23	890	1,027	1,042	380	532	383	326	279	0
MCSB_2S4E-23N02_30	0	0	0	0	0	0	2	168	499
MCSB_2S4E-26C01_28	0	0	375	551	402	670	827	872	871
MCSB_2S4E-28A01_34	0	0	0	0	0	0	0	0	0
MCSB_2S4E-36D01_22	649	679	1,233	1,038	1,473	2,145	1,421	874	933
MCSB_2S4E-36D02_24	1,550	1,777	1,456	2,258	1,752	1,664	1,838	1,366	1,030
MCSB_2S4E-36K01_29	0	0	0	0	0	0	274	1,411	1,432
MCSB_2S4E-36P01_37	0	0	0	0	0	0	0	0	0
MCSB_3S4E-04P01_PW2	0	0	0	0	0	0	0	0	0
MCSB_3S4E-04Q02_PW1	0	0	0	0	0	0	0	0	0
MCSB_3S4E-11A02_32	0	0	0	0	0	0	0	0	0
MCSB_3S4E-11L01_27	1,394	1,352	1,566	1,564	1,442	1,325	1,645	1,320	312
MCSB_3S4E-11L04_31	0	0	0	0	0	0	0	498	1,810
MCSB_3S4E-12B02_3408	665	1,748	2,210	2,145	1,215	846	493	910	1,358
MCSB_3S4E-12C01_3405	1,027	555	396	368	1,077	1,310	910	1,796	980
MCSB_3S4E-12C2S	0	0	0	0	0	0	0	0	0
MCSB_3S4E-12F01_3410	0	0	0	0	0	0	0	0	0
MCSB_3S4E-12H01_3407-1	0	0	0	0	0	0	0	0	0
MCSB_3S4E-12H02_3409-1	1	0	0	0	0	32	1,124	158	527
MCSB_3S4E-12H03_3409-2	0	0	0	0	0	0	0	0	0
MCSB_3S5E-05Q01_P27	244	244	244	244	244	244	244	244	244
MCSB_3S5E-08B01_P26	0	0	0	250	250	250	250	250	250
MCSB_3S5E-08P01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-08P02	0	0	0	0	0	0	0	0	0
MCSB_3S5E-15L01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-15N01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-15N03	0	0	0	0	0	0	0	0	0
MCSB_3S5E-15R01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-15R02	0	0	0	0	0	0	0	0	0
MCSB_3S5E-17M01	0	0	0	556	556	556	556	556	556
MCSB_3S5E-17N01	0	0	0	584	584	584	584	584	584
MCSB_3S5E-18J01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-20H02	0	0	0	0	0	0	0	0	0
Mission Creek Subbasin Total Pumping	9,136	10,036	11,824	13,431	12,722	14,316	14,369	14,853	13,843
Model Domain Total Pumping	11,493	12,359	14,068	15,227	14,501	16,098	16,117	16,600	15,597

Note

1. Well name is a composite of the California State Well Number and the Subbasin/ Subarea where the well is located. Well names with trailing subbasin/subarea name are from the PSOMAS model with California State Well Numbers assigned based on well location.

Abbreviation

AFY = acre-feet per year

Table A5

Annual Mission Creek Subbasin Pumping 1978 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Average Annual Pumping Mission Creek Subbasin[1]	1996 (AFY)	1997 (AFY)	1998 (AFY)	1999 (AFY)	2000 (AFY)	2001 (AFY)	2002 (AFY)	2003 (AFY)	2004 (AFY)
2S4E-26D1_MCSB	1,072	1,150	1,356	1,432	1,331	1,386	1,505	1,456	313
3S4E-11B2_MCSB	0	0	0	0	0	0	0	0	0
3S4E-11L3_MCSB	532	436	473	504	417	494	548	532	104
3S4E-11M1_MCSB	0	0	0	0	0	0	0	0	0
3S4E-11P1_MCSB	0	0	0	0	0	0	0	0	0
3S4E-13N1_MCSB	0	0	0	0	0	0	0	0	0
3S5E-16M1_MCSB	0	0	0	0	0	0	0	0	0
3S5E-18L1_MCSB	0	0	0	0	0	0	0	0	0
3S5E-18N_MCSB	0	0	0	0	0	0	0	0	0
3S5E-18P_MCSB	0	0	0	0	0	0	0	0	0
Well159_MCSB	0	0	0	0	0	0	0	108	53
Well160-P27_MCSB	0	0	0	0	0	0	0	165	85
MCSB_2S4E-23L01_P32	385	385	385	385	385	385	385	374	133
MCSB_2S4E-23L02_P29	385	385	385	385	385	385	385	374	0
MCSB_2S4E-23L03_P28	385	385	385	385	385	385	385	374	1,038
MCSB_2S4E-23N01_23	0	21	0	169	88	169	282	220	0
MCSB_2S4E-23N02_30	445	466	405	205	321	227	134	248	761
MCSB_2S4E-26C01_28	975	1,045	1,233	1,302	1,210	1,260	1,368	1,324	1,507
MCSB_2S4E-28A01_34	0	0	0	0	0	0	0	0	0
MCSB_2S4E-36D01_22	358	403	1,304	981	1,633	1,684	1,715	1,776	1,963
MCSB_2S4E-36D02_24	1,891	1,967	1,190	1,392	719	986	611	876	1,315
MCSB_2S4E-36K01_29	1,397	1,260	1,125	1,338	1,575	1,256	1,664	1,824	1,950
MCSB_2S4E-36P01_37	0	0	0	0	0	0	0	0	0
MCSB_3S4E-04P01_PW2	0	0	0	0	0	0	0	0	0
MCSB_3S4E-04Q02_PW1	0	0	0	0	0	0	0	0	0
MCSB_3S4E-11A02_32	0	0	0	0	0	0	0	0	0
MCSB_3S4E-11L01_27	484	397	430	458	379	449	498	484	501
MCSB_3S4E-11L04_31	1,734	1,609	1,652	1,744	1,929	1,811	1,829	1,815	2,041
MCSB_3S4E-12B02_3408	142	109	695	739	737	69	735	792	702
MCSB_3S4E-12C01_3405	539	95	349	610	321	120	436	470	731
MCSB_3S4E-12C2S	0	0	0	0	0	0	0	0	0
MCSB_3S4E-12F01_3410	793	403	766	728	1,251	926	1,510	1,176	1,138
MCSB_3S4E-12H01_3407-1	0	0	0	0	0	0	0	0	0
MCSB_3S4E-12H02_3409-1	1,363	1,497	948	927	867	1,310	715	1,013	957
MCSB_3S4E-12H03_3409-2	0	0	0	0	0	0	0	0	0
MCSB_3S5E-05Q01_P27	244	244	244	244	244	244	244	244	255
MCSB_3S5E-08B01_P26	250	250	250	250	250	250	250	150	410
MCSB_3S5E-08P01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-08P02	0	0	0	0	0	0	0	0	0
MCSB_3S5E-15L01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-15N01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-15N03	0	0	0	0	0	0	0	0	0
MCSB_3S5E-15R01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-15R02	0	0	0	0	0	0	0	0	0
MCSB_3S5E-17M01	556	556	556	556	556	556	556	556	459
MCSB_3S5E-17N01	584	584	584	584	584	584	584	584	459
MCSB_3S5E-18J01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-20H02	0	0	0	0	0	0	0	0	0
Mission Creek Subbasin Total Pumping	14,515	13,647	14,716	15,319	15,568	14,937	16,339	16,932	16,874
Model Domain Total Pumping	16,788	15,745	16,450	17,068	17,331	16,690	18,105	18,697	18,575

Note
1. Well name is a composite of the California State Well Number and the Subbasin/ Subarea where the well is located. Well names with trailing subbasin/subarea name are from the PSOMAS model with California State Well Numbers assigned based on well location.

Abbreviation
AFY = acre-feet per year

Table A5

Annual Mission Creek Subbasin Pumping 1978 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Average Annual Pumping Mission Creek Subbasin[1]	2005 (AFY)	2006 (AFY)	2007 (AFY)	2008 (AFY)	2009 (AFY)	2010 (AFY)	2011 (AFY)	2012 (AFY)	2013 (AFY)
2S4E-26D1_MCSB	0	0	0	0	0	0	0	0	0
3S4E-11B2_MCSB	0	0	0	0	0	0	0	0	0
3S4E-11L3_MCSB	0	0	0	0	0	0	0	0	0
3S4E-11M1_MCSB	0	0	0	0	0	0	0	0	0
3S4E-11P1_MCSB	0	0	0	0	0	0	0	0	0
3S4E-13N1_MCSB	0	0	0	0	0	0	0	0	0
3S5E-16M1_MCSB	0	0	0	0	0	0	0	0	0
3S5E-18L1_MCSB	0	0	0	0	0	0	0	0	0
3S5E-18N_MCSB	0	0	0	0	0	0	0	0	0
3S5E-18P_MCSB	0	0	0	0	0	0	0	0	0
Well159_MCSB	0	0	0	0	0	0	0	0	0
Well160-P27_MCSB	0	0	0	0	0	0	0	0	0
MCSB_2S4E-23L01_P32	304	459	457	494	238	197	184	260	390
MCSB_2S4E-23L02_P29	0	0	0	0	0	0	0	0	0
MCSB_2S4E-23L03_P28	741	727	733	693	757	851	897	585	717
MCSB_2S4E-23N01_23	0	0	0	0	0	0	0	0	0
MCSB_2S4E-23N02_30	665	777	752	90	0	0	0	0	0
MCSB_2S4E-26C01_28	1,548	1,705	1,309	1,326	964	378	127	129	57
MCSB_2S4E-28A01_34	0	0	115	411	0	505	692	723	754
MCSB_2S4E-36D01_22	2,149	2,078	1,314	929	1,080	980	456	957	951
MCSB_2S4E-36D02_24	1,126	927	1,756	2,433	1,356	789	975	1,037	1,130
MCSB_2S4E-36K01_29	1,983	2,134	1,828	1,429	1,775	1,513	1,789	1,305	1,346
MCSB_2S4E-36P01_37	0	0	0	0	329	1,345	1,639	1,733	1,706
MCSB_3S4E-04P01_PW2	0	0	0	0	0	0	0	73	208
MCSB_3S4E-04Q02_PW1	0	0	0	0	0	0	57	61	53
MCSB_3S4E-11A02_32	519	1,844	1,097	972	494	644	951	1,159	1,293
MCSB_3S4E-11L01_27	656	450	477	518	1,041	466	255	286	287
MCSB_3S4E-11L04_31	1,672	1,220	1,498	1,362	1,756	1,613	981	785	604
MCSB_3S4E-12B02_3408	520	810	790	732	574	717	757	1,031	2,011
MCSB_3S4E-12C01_3405	477	324	195	662	703	508	526	777	123
MCSB_3S4E-12C2S	0	0	0	0	0	0	0	0	0
MCSB_3S4E-12F01_3410	1,112	1,073	1,054	1,774	1,423	1,082	1,099	1,027	514
MCSB_3S4E-12H01_3407-1	0	0	0	0	0	0	0	0	0
MCSB_3S4E-12H02_3409-1	848	1,028	1,080	282	880	803	525	23	0
MCSB_3S4E-12H03_3409-2	0	0	0	0	0	0	0	197	291
MCSB_3S5E-05Q01_P27	234	244	254	233	250	258	275	305	351
MCSB_3S5E-08B01_P26	287	42	296	343	253	280	328	434	489
MCSB_3S5E-08P01	1	1	1	1	1	1	0	0	0
MCSB_3S5E-08P02	49	49	49	49	49	141	489	476	533
MCSB_3S5E-15L01	36	36	36	36	6	0	0	0	0
MCSB_3S5E-15N01	1	1	1	1	16	3	0	19	0
MCSB_3S5E-15N03	39	38	38	38	10	0	0	0	0
MCSB_3S5E-15R01	0	0	162	182	130	120	178	20	24
MCSB_3S5E-15R02	0	0	0	0	10	0	0	0	0
MCSB_3S5E-17M01	573	560	618	559	469	558	645	591	521
MCSB_3S5E-17N01	591	654	522	578	574	556	482	417	423
MCSB_3S5E-18J01	0	0	0	0	0	0	0	0	0
MCSB_3S5E-20H02	0	0	0	0	16	16	16	16	16
Mission Creek Subbasin Total Pumping	16,132	17,182	16,433	16,127	15,156	14,322	14,324	14,424	14,794
Model Domain Total Pumping	17,823	18,885	18,640	18,188	17,225	16,319	16,525	16,313	16,712

Note
1. Well name is a composite of the California State Well Number and the Subbasin/ Subarea where the well is located. Well names with trailing subbasin/subarea name are from the PSOMAS model with Californi State Well Numbers assigned based on well location.

Abbreviation
AFY = acre-feet per year

Table A5

Annual Mission Creek Subbasin Pumping 1978 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Average Annual Pumping Mission Creek Subbasin[1]	**2014 (AFY)**	**2015 (AFY)**	**2016 (AFY)**	**2017 (AFY)**	**2018 (AFY)**	**2019 (AFY)**
2S4E-26D1_MCSB	0	0	0	0	0	0
3S4E-11B2_MCSB	0	0	0	0	0	0
3S4E-11L3_MCSB	0	0	0	0	0	0
3S4E-11M1_MCSB	0	0	0	0	0	0
3S4E-11P1_MCSB	0	0	0	0	0	0
3S4E-13N1_MCSB	0	0	0	0	0	0
3S5E-16M1_MCSB	0	0	0	0	0	0
3S5E-18L1_MCSB	0	0	0	0	0	0
3S5E-18N_MCSB	0	0	0	0	0	0
3S5E-18P_MCSB	0	0	0	0	0	0
Well159_MCSB	0	0	0	0	0	0
Well160-P27_MCSB	0	0	0	0	0	0
MCSB_2S4E-23L01_P32	374	370	446	491	195	272
MCSB_2S4E-23L02_P29	0	0	0	0	0	0
MCSB_2S4E-23L03_P28	706	637	622	515	818	511
MCSB_2S4E-23N01_23	0	0	0	0	0	0
MCSB_2S4E-23N02_30	0	0	0	0	0	0
MCSB_2S4E-26C01_28	54	70	34	67	42	405
MCSB_2S4E-28A01_34	620	389	589	615	661	667
MCSB_2S4E-36D01_22	854	1,186	1,171	1,319	919	716
MCSB_2S4E-36D02_24	1,073	1,060	1,014	1,038	1,082	497
MCSB_2S4E-36K01_29	1,224	133	0	0	1,383	1,237
MCSB_2S4E-36P01_37	1,688	1,841	2,076	2,118	1,202	1,716
MCSB_3S4E-04P01_PW2	88	208	188	218	52	187
MCSB_3S4E-04Q02_PW1	169	142	57	53	224	148
MCSB_3S4E-11A02_32	1,387	1,487	1,629	1,196	1,405	1,259
MCSB_3S4E-11L01_27	357	106	0	135	256	297
MCSB_3S4E-11L04_31	496	518	279	719	618	477
MCSB_3S4E-12B02_3408	2,067	1,927	1,120	1,099	749	779
MCSB_3S4E-12C01_3405	184	452	38	2	0	0
MCSB_3S4E-12C2S	0	0	0	0	0	368
MCSB_3S4E-12F01_3410	430	156	1,509	1,710	837	852
MCSB_3S4E-12H01_3407-1	0	0	0	0	0	0
MCSB_3S4E-12H02_3409-1	0	0	0	0	0	0
MCSB_3S4E-12H03_3409-2	269	32	1	106	1,200	644
MCSB_3S5E-05Q01_P27	409	470	482	402	425	468
MCSB_3S5E-08B01_P26	430	309	456	364	414	283
MCSB_3S5E-08P01	0	1	0	0	0	0
MCSB_3S5E-08P02	470	474	469	514	474	525
MCSB_3S5E-15L01	0	0	0	0	0	0
MCSB_3S5E-15N01	0	0	0	0	0	0
MCSB_3S5E-15N03	0	0	0	0	0	0
MCSB_3S5E-15R01	210	208	153	106	101	139
MCSB_3S5E-15R02	0	0	0	0	0	0
MCSB_3S5E-17M01	710	592	715	571	638	506
MCSB_3S5E-17N01	0	248	167	172	170	161
MCSB_3S5E-18J01	0	0	5	0	0	0
MCSB_3S5E-20H02	16	16	18	18	26	20
Mission Creek Subbasin Total Pumping	14,286	13,033	13,238	13,549	13,891	13,136
Model Domain Total Pumping	16,216	15,058	15,226	15,711	15,747	15,101

Note
1. Well name is a composite of the California State Well Number and the Subbasin/ Subarea where the well is located. Well names with trailing subbasin/subarea name are from the PSOMAS model with California State Well Numbers assigned based on well location.

Abbreviation
AFY = acre-feet per year

Table A5

Annual Mission Creek Subbasin Pumping 1978 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Pumping Sources and Assumptions
a.	Well name is a composite of the California State Well Number and the Subbasin/Subarea where the well is located.
b.	Pumping from 2004 to 2019 was based on records provided by the Agencies and were in general agreement with the Engineers Report (WEI, 2020).
c.	Pumping from 1978 to 2003 was based on the PSOMAS model (PSOMAS, 2013) records of pumping where available unless otherwise noted. Although there was general agreement between the agency-provided records and PSOMAS reported pumping, the PSOMAS reported pumping appeared to be more complete and the total pumping matched closer to the total pumping as reported in the Engineers' Reports.
d.	Well MCSB_2S4E-36D02_24 pumping for 1984 was 0 per PSOMAS but 1,333 acre-feet per the agency records. Without this pumping, 1984 was anomalous for Mission Springs Water District pumping and the agency-reported pumping was used for this well for this year.
e.	Well 03S04E12C01S pumping for 1987 was 0 per PSOMAS and agency records. However Coachella Valley Water District pumping was anomalously low for the year without pumping from this well. Pumping was estimated using the average of the previous year and subsequent year pumping for the well.
f.	Desert Dunes Golf Club opened in 1989 according to their web site, but no pumping for wells MCSB_3S5E-17M01 and MCSB_3S5E-17N01 was reported from 1989 through 2003. Pumping for this period was estimated using the average reported pumping from 2005 to 2009.
g.	Desert Dune Golf Course wells MCSB_3S5E-17M01 AND MCSB_3S5E-17N01 reported approximately 1/2 of the previous year's total pumping for 2004. The Engineer's Report indicates a total pumping of 917 acre-feet for the Desert Dunes Golf Course. Pumping was revised to split the pumping reported in the Engineer's Report evenly between the two wells.
h.	Mission Lakes Country Club opened in 1972 according to their web site. Pumping is only reported beginning in 2003. Pumping is extended back to 1978 using the average of pumping for the facility from 2004 to 2009 (2003 appears anomalous). Pumping is split between the three wells at the facility (MCSB_2S4E-23L01_P32, MCSB_2S4E-23L02_P29, and MCSB_2S4E-23L03_P28).
i.	Hidden Springs Country Club Golf Course well MCSB_3S5E-05Q01_P27 was installed in 1973. Average pumping for well MCSB_3S5E-05Q01_P27 from 2004 to 2009 (2003 appears anomalous) was extended to 1978.
j.	Sands RV well MCSB_3S5E-08B01_P26S pumping extended back to 1990 based on reported pumping from 2005 to 2009. Well completion report notes that the well was installed in December 1989.
k.	Mission Springs Water District well MCSB_2S4E-26C01_28 matches PSOMAS pumping for well identified as "02S04E26D01" from 2004 to 2009. There are no agency records for this well. PSOMAS records for "02S04E26D01S" were used for MCSB_2S4E-26C01_28.

Table A6

Annual Desert Hot Springs Subbasin Pumping 1978 - 2019[1]
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Average Annual Pumping Desert Hot Springs Subbasin[1]	1978 (AFY)	1979 (AFY)	1980 (AFY)	1981 (AFY)	1982 (AFY)	1983 (AFY)	1984 (AFY)	1985 (AFY)	1986 (AFY)	1987 (AFY)	1988 (AFY)	1989 (AFY)	1990 (AFY)	1991 (AFY)	1992 (AFY)	1993 (AFY)
2S4E-24Q01_DHSSB	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2S5E-30J02_DHSSB	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2S5E-30K03_DHSSB	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
2S5E-30L01_DHSSB	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
2S5E-32E01_DHSSB	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
2S5E-32H02_DHSSB	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
2S5E-32K02_DHSSB	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
2S5E-32L01_DHSSB	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115
2S5E-32P02_DHSSB	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
2S5E-32R02_DHSSB	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2S5E-33E01_DHSSB	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
2S5E-33M01_DHSSB	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
2S5E-33N01_DHSSB	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
3S5E-05A01_DHSSB	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3S5E-05B04_DHSSB	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
3S5E-10F01_DHSSB	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255
3S5E-10G01_DHSSB	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
3S5E-10H05_DHSSB	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
3S5E-10L02_DHSSB	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
3S5E-10R03_DHSSB	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338
3S5E-11M04_DHSSB	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
3S5E-11R01_DHSSB	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3S5E-13N01_DHSSB	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
3S5E-14C01_DHSSB	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240
3S5E-14G03_DHSSB	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
DHSSB_2S5E-31H01_5	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Desert Hot Springs Subbasin Total Pumping	1,699	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691
Model Domain Total Pumping	6,371	6,609	7,927	8,051	7,960	8,436	9,790	10,433	11,522	11,493	12,359	14,068	15,227	14,501	16,098	16,117

Table A6

Annual Desert Hot Springs Subbasin Pumping 1978 - 2019[1]
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Average Annual Pumping Desert Hot Springs Subbasin[1]	1994 (AFY)	1995 (AFY)	1996 (AFY)	1997 (AFY)	1998 (AFY)	1999 (AFY)	2000 (AFY)	2001 (AFY)	2002 (AFY)	2003 (AFY)	2004 (AFY)	2005 (AFY)	2006 (AFY)	2007 (AFY)	2008 (AFY)	2009 (AFY)
2S4E-24Q01_DHSSB	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2S5E-30J02_DHSSB	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2S5E-30K03_DHSSB	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
2S5E-30L01_DHSSB	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
2S5E-32E01_DHSSB	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
2S5E-32H02_DHSSB	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
2S5E-32K02_DHSSB	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
2S5E-32L01_DHSSB	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115
2S5E-32P02_DHSSB	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
2S5E-32R02_DHSSB	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2S5E-33E01_DHSSB	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
2S5E-33M01_DHSSB	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
2S5E-33N01_DHSSB	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
3S5E-05A01_DHSSB	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3S5E-05B04_DHSSB	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
3S5E-10F01_DHSSB	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255	255
3S5E-10G01_DHSSB	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
3S5E-10H05_DHSSB	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
3S5E-10L02_DHSSB	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
3S5E-10R03_DHSSB	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338	338
3S5E-11M04_DHSSB	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
3S5E-11R01_DHSSB	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3S5E-13N01_DHSSB	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
3S5E-14C01_DHSSB	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240
3S5E-14G03_DHSSB	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
DHSSB_2S5E-31H01_5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Desert Hot Springs Subbasin Total Pumping	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691
Model Domain Total Pumping	16,600	15,597	16,788	15,745	16,450	17,068	17,331	16,690	18,105	18,697	18,575	17,823	18,885	18,640	18,188	17,225

Table A6

Annual Desert Hot Springs Subbasin Pumping 1978 - 2019[1]
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Average Annual Pumping Desert Hot Springs Subbasin[1]	2010 (AFY)	2011 (AFY)	2012 (AFY)	2013 (AFY)	2014 (AFY)	2015 (AFY)	2016 (AFY)	2017 (AFY)	2018 (AFY)	2019 (AFY)
2S4E-24Q01_DHSSB	1	1	1	1	1	1	1	1	1	1
2S5E-30J02_DHSSB	1	1	1	1	1	1	1	1	1	1
2S5E-30K03_DHSSB	85	85	85	85	85	85	85	85	85	85
2S5E-30L01_DHSSB	7	7	7	7	7	7	7	7	7	7
2S5E-32E01_DHSSB	90	90	90	90	90	90	90	90	90	90
2S5E-32H02_DHSSB	28	28	28	28	28	28	28	28	28	28
2S5E-32K02_DHSSB	24	24	24	24	24	24	24	24	24	24
2S5E-32L01_DHSSB	115	115	115	115	115	115	115	115	115	115
2S5E-32P02_DHSSB	14	14	14	14	14	14	14	14	14	14
2S5E-32R02_DHSSB	10	10	10	10	10	10	10	10	10	10
2S5E-33E01_DHSSB	38	38	38	38	38	38	38	38	38	38
2S5E-33M01_DHSSB	45	45	45	45	45	45	45	45	45	45
2S5E-33N01_DHSSB	34	34	34	34	34	34	34	34	34	34
3S5E-05A01_DHSSB	2	2	2	2	2	2	2	2	2	2
3S5E-05B04_DHSSB	7	7	7	7	7	7	7	7	7	7
3S5E-10F01_DHSSB	255	255	255	255	255	255	255	255	255	255
3S5E-10G01_DHSSB	60	60	60	60	60	60	60	60	60	60
3S5E-10H05_DHSSB	35	35	35	35	35	35	35	35	35	35
3S5E-10L02_DHSSB	100	100	100	100	100	100	100	100	100	100
3S5E-10R03_DHSSB	338	338	338	338	338	338	338	338	338	338
3S5E-11M04_DHSSB	50	50	50	50	50	50	50	50	50	50
3S5E-11R01_DHSSB	2	2	2	2	2	2	2	2	2	2
3S5E-13N01_DHSSB	10	10	10	10	10	10	10	10	10	10
3S5E-14C01_DHSSB	240	240	240	240	240	240	240	240	240	240
3S5E-14G03_DHSSB	100	100	100	100	100	100	100	100	100	100
DHSSB_2S5E-31H01_5	0	0	0	0	0	0	0	0	0	0
Desert Hot Springs Subbasin Total Pumping	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691	1,691
Model Domain Total Pumping	16,319	16,525	16,313	16,712	16,216	15,058	15,226	15,711	15,747	15,101

Note
1. Pumping locations and rates based on Mayer, 2007.

Abbreviations:
1. AFY = acre-feet per year

Table A7

Annual Garnet Hill Subarea Pumping 1978 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Average Annual Pumping Garnet Hill Subarea[1]	1978 (AFY)	1979 (AFY)	1980 (AFY)	1981 (AFY)	1982 (AFY)	1983 (AFY)	1984 (AFY)	1985 (AFY)	1986 (AFY)
3S3E-02B_GHSA	0	0	0	0	0	0	0	0	0
3S3E-02P1&2_GHSA	0	0	578	578	575	555	0	0	570
3S4E-13Q1_GHSA	0	0	0	0	0	0	0	0	0
3S4E-17K2_GHSA	55	27	19	24	27	0	46	43	32
GHSA_3S4E-14J01_33	0	0	0	0	0	25	0	0	0
3S4E-15G01_GHSA	--	--	--	--	--	--	--	--	--
Garnet Hill Subarea Total Pumping	55	27	597	602	602	580	46	43	602
Model Domain Total Pumping	6,371	6,609	7,927	8,051	7,960	8,436	9,790	10,433	11,522

Table A7

Annual Garnet Hill Subarea Pumping 1978 - 2019

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Average Annual Pumping Garnet Hill Subarea[1]	1987 (AFY)	1988 (AFY)	1989 (AFY)	1990 (AFY)	1991 (AFY)	1992 (AFY)	1993 (AFY)	1994 (AFY)	1995 (AFY)
3S3E-02B_GHSA	0	0	0	0	0	0	0	0	0
3S3E-02P1&2_GHSA	555	538	441	0	0	0	0	0	0
3S4E-13Q1_GHSA	55	65	65	66	50	50	57	55	64
3S4E-17K2_GHSA	31	30	37	39	38	41	0	0	0
GHSA_3S4E-14J01_33	25	0	10	0	0	0	0	0	0
3S4E-15G01_GHSA	--	--	--	--	--	--	--	--	--
Garnet Hill Subarea Total Pumping	666	633	553	105	88	92	57	55	64
Model Domain Total Pumping	11,493	12,359	14,068	15,227	14,501	16,098	16,117	16,600	15,597

Table A7

Annual Garnet Hill Subarea Pumping 1978 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Average Annual Pumping Garnet Hill Subarea[1]	1996 (AFY)	1997 (AFY)	1998 (AFY)	1999 (AFY)	2000 (AFY)	2001 (AFY)	2002 (AFY)	2003 (AFY)	2004 (AFY)
3S3E-02B_GHSA	516	330	0	0	0	0	0	0	0
3S3E-02P1&2_GHSA	0	0	0	0	0	0	0	0	0
3S4E-13Q1_GHSA	66	76	43	58	72	62	75	74	10
3S4E-17K2_GHSA	0	0	0	0	0	0	0	0	0
GHSA_3S4E-14J01_33	0	0	0	0	0	0	0	0	0
3S4E-15G01_GHSA	--	--	--	--	--	--	--	--	--
Garnet Hill Subarea Total Pumping	581	406	43	58	72	62	75	74	10
Model Domain Total Pumping	16,788	15,745	16,450	17,068	17,331	16,690	18,105	18,697	18,575

Table A7

Annual Garnet Hill Subarea Pumping 1978 - 2019

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Average Annual Pumping Garnet Hill Subarea[1]	2005 (AFY)	2006 (AFY)	2007 (AFY)	2008 (AFY)	2009 (AFY)	2010 (AFY)	2011 (AFY)	2012 (AFY)	2013 (AFY)
3S3E-02B_GHSA	0	0	0	0	0	0	0	0	0
3S3E-02P1&2_GHSA	0	0	0	0	0	0	0	0	0
3S4E-13Q1_GHSA	0	0	0	0	0	0	0	0	0
3S4E-17K2_GHSA	0	0	0	0	0	0	0	0	0
GHSA_3S4E-14J01_33	0	12	516	330	357	288	497	177	202
3S4E-15G01_GHSA	--	--	--	40	20	18	12	21	26
Garnet Hill Subarea Total Pumping	0	12	516	370	378	306	510	198	228
Model Domain Total Pumping	17,823	18,885	18,640	18,188	17,225	16,319	16,525	16,313	16,712

Table A7

Annual Garnet Hill Subarea Pumping 1978 - 2019

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Average Annual Pumping Garnet Hill Subarea[1]	2014 (AFY)	2015 (AFY)	2016 (AFY)	2017 (AFY)	2018 (AFY)	2019 (AFY)
3S3E-02B_GHSA	0	0	0	0	0	0
3S3E-02P1&2_GHSA	0	0	0	0	0	0
3S4E-13Q1_GHSA	0	0	0	0	0	0
3S4E-17K2_GHSA	0	0	0	0	0	0
GHSA_3S4E-14J01_33	216	316	285	449	154	266
3S4E-15G01_GHSA	23	18	12	22	10	8
Garnet Hill Subarea Total Pumping	239	334	297	470	165	274
Model Domain Total Pumping	16,216	15,058	15,226	15,711	15,747	15,101

Note

1. Pumping was based on records provided by the Agencies.

Table A8

Calibrated Annual Mountain Front Recharge by Watershed from BCM 1936 - 2019[1]
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Date	Year	Zone 2 SFWhitewater (AFY)	MCSB Total (AFY)	Reach 51 MissionCreekGage (AFY)	Reach 52 ChinoCanyon (AFY)	Reach 53 GarnetWash (AFY)	Reach 54 BigMorongoCReek (AFY)	DHSSB Total (AFY)	Reach 55 LittleMorongoCreek (AFY)	Reach 56 MorongoWash (AFY)	Reach 57 LongCanyon (AFY)	Reach 58 EastWideCanyon (AFY)	Reach 59 PalmCanyon (AFY)	Reach 60 FanCanyon (AFY)	Reach 61 PushawallaCanyon (AFY)	Reach 62 BerdooCanyon (AFY)	Total[1] (AFY)	Cumulative[1] (AF)
Jan-36	1936	2,845.9	1,103.71	1,093.91	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	1,115	1,115
Jan-37	1937	13,008.3	14,418.91	13,799.29	3.27	3.27	613.09	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	14,430	15,546
Jan-38	1938	17,756.0	15,208.94	14,054.71	3.27	3.27	1,147.68	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	15,221	30,766
Jan-39	1939	10,058.2	1,806.15	1,796.34	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	1,818	32,584
Jan-40	1940	5,925.9	957.89	948.09	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	969	33,553
Jan-41	1941	13,471.7	15,342.90	13,432.02	3.27	3.27	1,904.34	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	15,354	48,908
Jan-42	1942	4,717.0	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	48,933
Jan-43	1943	9,404.2	9,004.68	8,994.87	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	9,016	57,949
Jan-44	1944	7,781.8	4,545.61	4,535.81	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	4,557	62,506
Jan-45	1945	7,958.7	2,817.31	2,807.51	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	2,829	65,335
Jan-46	1946	6,452.1	1,220.56	1,210.75	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	1,232	66,567
Jan-47	1947	3,816.4	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	66,592
Jan-48	1948	2,540.0	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	66,616
Jan-49	1949	3,151.0	1,148.01	1,138.21	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	1,160	67,776
Jan-50	1950	4,345.7	3,436.31	3,426.50	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	3,448	71,224
Jan-51	1951	2,469.4	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	71,248
Jan-52	1952	9,291.5	9,840.92	7,382.88	108.63	385.82	1,963.60	3,585.40	2,838.40	217.65	513.84	1.63	0.03	5.41	4.47	3.95	13,426	84,675
Jan-53	1953	4,658.6	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	84,699
Jan-54	1954	7,236.8	6,561.51	3,957.13	106.01	254.97	2,243.40	3,795.84	3,513.19	265.31	3.27	1.63	0.03	4.57	3.98	3.86	10,357	95,057
Jan-55	1955	3,909.9	150.82	3.27	40.25	104.04	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	162	95,219
Jan-56	1956	2,022.2	670.72	660.91	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	682	95,901
Jan-57	1957	3,251.1	1,585.38	886.21	45.45	101.57	552.16	1,152.15	932.84	206.99	3.27	1.63	0.03	0.03	3.74	3.61	2,738	98,639
Jan-58	1958	13,077.0	16,009.67	11,370.85	191.40	500.92	3,946.50	6,467.13	5,802.41	641.41	3.27	1.63	4.32	5.28	4.57	4.23	22,477	121,116
Jan-59	1959	5,676.5	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	121,140
Jan-60	1960	4,016.9	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	121,165
Jan-61	1961	1,601.2	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	121,190
Jan-62	1962	3,953.9	2,349.29	2,339.48	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	2,361	123,551
Jan-63	1963	2,665.7	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	123,575
Jan-64	1964	2,325.2	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	123,600
Jan-65	1965	7,165.2	14,786.08	8,129.34	329.02	728.94	5,598.79	14,269.47	9,043.06	1,634.41	2,607.92	904.56	19.57	22.46	20.32	17.18	29,056	152,655
Jan-66	1966	10,324.3	7,451.05	5,446.18	76.55	174.85	1,753.48	2,001.35	1,750.86	245.46	3.27	1.63	0.03	0.03	0.03	0.03	9,452	162,108
Jan-67	1967	17,993.0	12,843.02	12,833.21	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	12,855	174,962
Jan-68	1968	7,304.1	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	174,987
Jan-69	1969	22,887.2	40,336.50	25,483.52	399.78	745.05	13,708.16	21,683.57	12,809.22	2,545.19	4,443.20	1,751.12	30.15	37.64	34.19	32.85	62,020	237,007
Jan-70	1970	9,569.7	199.29	3.27	3.27	189.49	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	211	237,218
Jan-71	1971	5,142.9	916.80	3.27	49.71	120.51	743.31	1,996.13	1,246.11	270.97	463.48	1.63	3.65	5.82	4.44	0.03	2,913	240,131
Jan-72	1972	3,106.1	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	240,156
Jan-73	1973	6,985.4	5,103.54	5,093.73	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	5,115	245,271

Table A8

Calibrated Annual Mountain Front Recharge by Watershed from BCM 1936 - 2019[1]
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Date	Year	Zone 2 SFWhitewater (AFY)	MCSB Total (AFY)	Reach 51 MissionCreekGage (AFY)	Reach 52 ChinoCanyon (AFY)	Reach 53 GarnetWash (AFY)	Reach 54 BigMorongoCReek (AFY)	DHSSB Total (AFY)	Reach 55 LittleMorongoCreek (AFY)	Reach 56 MorongoWash (AFY)	Reach 57 LongCanyon (AFY)	Reach 58 EastWideCanyon (AFY)	Reach 59 PalmCanyon (AFY)	Reach 60 FanCanyon (AFY)	Reach 61 PushawallaCanyon (AFY)	Reach 62 BerdooCanyon (AFY)	Total[1] (AFY)	Cumulative[1] (AF)
Jan-74	1974	5,727.5	3,376.34	2,280.62	53.20	124.90	917.61	2,124.25	1,373.82	277.79	452.78	1.63	4.16	4.93	4.67	4.47	5,501	250,771
Jan-75	1975	4,320.9	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	250,796
Jan-76	1976	4,496.9	4,815.66	1,658.81	136.79	341.42	2,678.63	8,141.59	4,752.33	1,053.33	1,665.82	605.38	15.02	18.84	16.70	14.17	12,957	263,753
Jan-77	1977	3,631.5	1,830.32	904.64	40.38	188.76	696.54	1,375.59	1,121.29	235.26	3.27	1.63	3.95	5.57	4.58	0.03	3,206	266,959
Jan-78	1978	24,668.6	42,451.04	28,196.08	486.45	1,186.39	12,582.13	0.00	17,697.37	3,065.87	6,032.91	2,729.86	45.96	64.31	53.25	50.51	72,191	339,150
Jan-79	1979	16,913.9	21,559.23	16,345.60	84.30	396.89	4,732.44	14,173.12	11,834.65	616.47	1,223.09	460.32	8.40	11.27	9.90	9.03	35,732	374,883
Jan-80	1980	23,441.5	53,508.28	36,786.90	384.32	738.62	15,598.44	32,497.64	22,145.90	2,673.71	5,127.99	2,365.27	38.65	57.67	46.01	42.44	86,006	460,888
Jan-81	1981	9,668.3	1,556.94	1,547.13	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	1,569	462,457
Jan-82	1982	12,215.0	5,204.84	5,195.04	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	5,216	467,673
Jan-83	1983	25,643.8	35,885.87	31,704.16	3.27	3.27	4,175.17	4,065.85	3,641.78	3.27	3.27	417.41	0.03	0.03	0.03	0.03	39,952	507,625
Jan-84	1984	6,275.5	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	507,650
Jan-85	1985	6,916.7	1,690.29	1,680.49	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	1,702	509,352
Jan-86	1986	10,946.8	4,897.82	4,888.02	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	4,909	514,261
Jan-87	1987	6,337.5	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	514,286
Jan-88	1988	5,174.8	1,429.71	1,419.90	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	1,441	515,727
Jan-89	1989	3,520.6	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	515,752
Jan-90	1990	1,897.2	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	515,776
Jan-91	1991	6,652.0	5,919.39	5,359.61	3.27	3.27	553.24	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	5,931	521,707
Jan-92	1992	8,724.1	6,297.51	6,287.71	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	6,309	528,016
Jan-93	1993	27,568.4	66,918.51	42,627.85	451.12	951.56	22,887.98	39,948.66	25,729.78	2,754.18	7,675.01	3,626.22	37.93	51.25	37.54	36.74	106,867	634,883
Jan-94	1994	12,372.9	4,710.85	4,701.04	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	4,722	639,606
Jan-95	1995	18,817.5	29,924.62	24,901.78	3.27	94.75	4,924.83	5,149.09	3,757.65	237.11	848.12	306.08	0.03	0.03	0.03	0.03	35,074	674,680
Jan-96	1996	12,605.6	4,933.30	4,923.49	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	4,945	679,624
Jan-97	1997	18,901.5	3,435.17	3,425.37	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	3,447	683,071
Jan-98	1998	15,887.0	21,544.16	17,923.71	66.62	133.17	3,420.65	3,225.69	1,301.97	3.27	1,183.12	727.10	4.94	5.22	0.03	0.03	24,770	707,841
Jan-99	1999	12,123.4	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	707,866
Jan-00	2000	8,161.1	768.55	758.74	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	780	708,646
Jan-01	2001	4,451.6	730.96	721.15	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	743	709,388
Jan-02	2002	4,944.8	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	709,413
Jan-03	2003	4,087.0	1,154.46	1,144.66	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	1,166	710,579
Jan-04	2004	6,712.3	2,614.09	2,604.28	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	2,626	713,205
Jan-05	2005	24,745.5	31,719.89	25,346.55	185.64	344.39	5,843.32	10,210.08	4,815.39	676.13	3,043.14	1,655.48	7.41	8.77	0.03	3.73	41,930	755,135
Jan-06	2006	10,907.5	1,780.50	1,770.70	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	1,792	756,927
Jan-07	2007	4,948.3	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	756,951
Jan-08	2008	6,860.2	2,341.51	2,331.70	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	2,353	759,304
Jan-09	2009	3,004.9	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	759,329
Jan-10	2010	10,087.0	9,556.15	6,923.32	120.91	249.99	2,261.93	4,882.09	3,067.97	578.06	916.60	296.17	5.78	6.92	5.60	4.98	14,438	773,767
Jan-11	2011	8,326.4	5,050.47	5,040.67	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	5,062	778,829
Jan-12	2012	6,268.5	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	778,854
Jan-13	2013	5,169.4	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	778,879
Jan-14	2014	5,030.6	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	778,903
Jan-15	2015	4,078.7	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	778,928
Jan-16	2016	4,826.0	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	778,953
Jan-17	2017	6,500.5	7,529.44	6,730.23	3.27	3.27	792.67	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	7,541	786,494

Table A8

Calibrated Annual Mountain Front Recharge by Watershed from BCM 1936 - 2019[1]
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Date	Year	Zone 2 SFWhitewater (AFY)	MCSB Total (AFY)	Reach 51 MissionCreekGage (AFY)	Reach 52 ChinoCanyon (AFY)	Reach 53 GarnetWash (AFY)	Reach 54 BigMorongoCReek (AFY)	DHSSB Total (AFY)	Reach 55 LittleMorongoCreek (AFY)	Reach 56 MorongoWash (AFY)	Reach 57 LongCanyon (AFY)	Reach 58 EastWideCanyon (AFY)	Reach 59 PalmCanyon (AFY)	Reach 60 FanCanyon (AFY)	Reach 61 PushawallaCanyon (AFY)	Reach 62 BerdooCanyon (AFY)	Total[1] (AFY)	Cumulative[1] (AF)
Jan-18	2018	5,948.8	13.07	3.27	3.27	3.27	3.27	11.57	3.27	3.27	3.27	1.63	0.03	0.03	0.03	0.03	25	786,518
Jan-19	2019	12,161.1	19,518.40	19,511.32	2.45	2.45	2.18	8.68	2.45	2.45	2.45	1.23	0.02	0.02	0.02	0.02	19,527	806,045
Average[1] 1936-2019		8,602	7,081	5,554	42	98	1,386	3,931	1,659	219	434	190	3	4	3	3	9,596	384,064
Average[1] 1978-2019		10,345	9,400	7,401	45	100	1,854	5,289	2,240	255	623	301	4	5	4	4	12,835	646,377
Min 1978-2019		1,897	13	3	2	2	2	20	2	2	2	1	0	0	0	0	25	339,150
Max[1] 1978-2019		27,568	66,919	42,628	486	1,186	22,888	59,758	25,730	3,066	7,675	3,626	46	64	53	51	106,867	806,045

Note
1. Total and cumulative values are rounded to the nearest whole unit.

Abbreviations
AF = acre-feet
AFY = acre-feet per year
BCM = Basin Characterization Model
DHSSB = Desert Hot Springs Subbasin
MCSB = Mission Creek Subbasin

Table A9

Annual Return Flow by Zone 1936-2019

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Zone #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Date	**No Flow Zone (AFY)**	**Whitewater Headwater (AFY)**	**Farm (AFY)**	**Farm (AFY)**	**Farm (AFY)**	**Whitewater Riverbed (AFY)**	**Equestrian Area (AFY)**	**Farm (AFY)**	**Farm (AFY)**	**MCSB Septic (AFY)**	**Unknown Septic (AFY)**	**Mission Lakes Golf Course (AFY)**	**Horton WWTP (AFY)**	**Hidden Springs Golf Course (AFY)**	**The Sands Golf Course (AFY)**	**House & Landscape (AFY)**	**House & Landscape (AFY)**	**Desert Dunes Golf Course (AFY)**	**Mission Creek GRF (AFY)**
1936-1940	0.00	9,918.87	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1941-1945	0.00	8,666.67	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1946-1948	0.00	4,269.50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1949	0.00	3,150.99	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1950	0.00	4,345.73	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1951	0.00	2,469.35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1952	0.00	9,291.49	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	78.67	--
1953	0.00	4,658.56	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	134.64	--
1954	0.00	7,236.77	1.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00	--
1955	0.00	3,909.90	1.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00	--
1956	0.00	2,022.20	1.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00	--
1957	0.00	3,251.08	1.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	46.20	--
1958	0.00	13,077.03	1.40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.66	--
1959	0.00	5,676.51	1.40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	11.09	--
1960	0.00	4,016.91	1.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00	--
1961	0.00	1,601.25	1.60	--	--	--	--	--	--	--	--	--	--	--	--	--	--	96.36	--
1962	0.00	3,953.95	1.40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.53	--
1963	0.00	2,665.68	1.40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.17	--
1964	0.00	2,325.17	1.40	9.59	5.14	0.00	0.89	--	--	--	--	--	--	--	--	5.40	--	0.00	--
1965	0.00	7,165.20	1.40	10.03	5.13	0.00	0.98	--	--	--	--	--	--	--	--	5.40	--	15.58	--
1966	0.00	10,324.26	3.00	10.03	5.13	549.68	0.98	--	--	--	--	--	--	--	--	5.40	--	31.15	--
1967	0.00	17,993.04	3.00	11.52	5.30	0.00	1.25	--	--	--	--	--	--	--	--	5.40	--	421.61	--
1968	0.00	7,304.12	2.86	10.86	4.97	0.00	1.18	--	--	--	--	--	--	--	--	5.40	--	34.58	--
1969	0.00	22,887.25	2.65	10.05	4.63	7,122.36	1.08	--	--	--	--	--	--	--	--	5.40	--	35.64	--
1970	0.00	9,569.73	2.50	9.35	4.32	0.00	1.01	--	--	--	--	--	--	--	--	5.40	--	34.06	--
1971	0.00	5,142.92	2.30	8.72	4.06	0.00	0.94	--	--	--	--	--	--	--	--	5.40	--	37.22	--
1972	0.00	3,106.05	2.16	8.06	3.73	0.00	0.87	--	--	--	--	--	--	--	--	5.40	--	47.52	--
1973	0.00	6,985.42	1.95	7.37	3.39	239.98	0.79	--	--	--	--	--	--	--	--	5.40	--	28.46	--
1974	0.00	5,727.47	1.80	6.68	3.08	512.81	0.72	--	--	--	--	--	--	--	--	5.40	--	28.46	--
1975	0.00	4,320.95	1.60	6.04	2.80	683.75	0.65	--	--	--	--	--	--	--	--	5.40	--	28.46	--
1976	0.00	4,496.93	1.40	5.37	2.49	525.81	0.58	--	--	--	--	--	--	--	--	5.40	--	28.46	--
1977	0.00	3,631.48	1.25	4.68	2.16	0.00	0.50	--	--	--	--	--	--	--	--	5.40	--	28.46	--
1978	0.00	24,668.61	1.05	4.00	1.84	8,396.01	0.43	--	--	391.61	71.31	277.38	132.89	58.59	60.04	5.40	--	28.46	--
1979	0.00	16,913.85	0.90	3.36	1.56	3,840.21	0.36	--	--	483.48	83.64	277.38	184.30	58.59	60.04	5.40	--	28.46	--
1980	0.00	23,441.54	0.70	2.69	1.24	7,360.33	0.29	--	--	564.98	92.76	277.38	217.28	58.59	60.04	5.40	--	28.46	--
1981	0.00	9,668.33	0.55	2.00	0.92	1,199.91	0.22	--	--	581.23	118.33	277.38	258.99	58.59	60.04	5.40	--	28.46	--
1982	0.00	12,215.00	0.35	1.32	0.60	925.07	0.14	--	--	547.93	108.70	277.38	287.12	58.59	60.04	5.40	--	28.46	--
1983	0.00	25,643.78	0.20	0.68	0.32	8,840.11	0.07	--	--	623.42	120.26	277.38	385.09	58.59	60.04	5.40	--	28.46	--
1984	0.00	6,275.52	0.00	0.00	0.00	2,887.00	0.00	--	--	780.67	160.01	277.38	400.61	58.59	60.04	0.00	--	28.46	--
1985	0.00	6,916.72	0.00	0.00	0.00	19,473.37	0.00	--	--	846.61	179.23	277.38	369.57	58.59	60.04	0.00	--	28.46	--
1986	0.00	10,946.80	0.00	0.00	0.00	8,412.76	0.00	--	--	962.12	180.00	277.38	335.62	58.59	60.04	0.00	--	28.46	--

Table A9

Annual Return Flow by Zone 1936-2019

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Zone #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Date	**No Flow Zone (AFY)**	**Whitewater Headwater (AFY)**	**Farm (AFY)**	**Farm (AFY)**	**Farm (AFY)**	**Whitewater Riverbed (AFY)**	**Equestrian Area (AFY)**	**Farm (AFY)**	**Farm (AFY)**	**MCSB Septic (AFY)**	**Unknown Septic (AFY)**	**Mission Lakes Golf Course (AFY)**	**Horton WWTP (AFY)**	**Hidden Springs Golf Course (AFY)**	**The Sands Golf Course (AFY)**	**House & Landscape (AFY)**	**House & Landscape (AFY)**	**Desert Dunes Golf Course (AFY)**	**Mission Creek GRF (AFY)**
1987	0.00	6,337.46	0.00	0.00	0.00	2,711.52	0.00	--	--	1,054.42	186.17	277.38	403.52	58.59	60.04	11.66	4.65	28.46	--
1988	0.00	5,174.77	0.00	0.00	0.00	200.64	0.00	--	--	1,111.46	103.97	277.38	444.26	58.59	60.04	13.91	5.57	28.46	--
1989	0.00	3,520.65	0.00	0.00	0.00	1,142.93	0.00	--	--	1,314.96	129.12	277.38	524.77	58.59	60.04	13.98	5.58	28.46	--
1990	0.00	1,897.22	0.00	0.00	0.00	3,409.44	0.00	--	--	1,290.82	110.29	277.38	671.24	58.59	60.04	13.50	51.12	273.48	--
1991	0.00	6,652.02	0.00	0.00	0.00	2,398.20	0.00	--	--	1,194.85	134.10	277.38	704.22	58.59	60.04	38.84	0.00	273.48	--
1992	0.00	8,724.07	0.00	0.00	0.00	0.00	0.00	--	--	1,309.65	186.09	277.38	738.17	58.59	60.04	107.35	0.00	273.48	--
1993	0.00	27,568.39	0.00	0.00	0.00	0.00	0.00	--	--	1,363.40	275.46	277.38	832.26	58.59	60.04	87.20	0.00	273.48	--
1994	0.00	12,372.86	0.00	0.00	0.00	0.00	0.00	--	--	1,586.79	292.44	277.38	776.97	58.59	60.04	93.88	0.00	273.48	--
1995	0.00	18,817.45	0.00	0.00	0.00	0.00	0.00	--	--	1,615.86	277.91	277.38	733.32	58.59	60.04	21.03	0.00	273.48	--
1996	0.00	12,605.60	0.00	0.00	0.00	0.00	0.00	--	--	1,726.62	278.67	277.38	732.35	58.59	60.04	21.09	0.00	273.48	--
1997	0.00	9,939.87	0.00	0.00	0.00	0.00	0.00	--	--	1,614.50	277.91	277.38	775.03	58.59	60.04	21.03	0.00	273.48	--
1998	0.00	15,427.33	0.00	0.00	0.00	0.00	0.00	--	--	1,700.51	277.91	277.38	833.23	58.59	60.04	21.03	0.00	273.48	--
1999	0.00	3,012.97	0.00	0.00	0.00	0.00	0.00	--	--	1,780.78	277.91	277.38	879.79	58.59	60.04	21.03	0.00	273.48	--
2000	0.00	3,044.03	0.00	0.00	0.00	0.00	0.00	--	--	1,835.79	278.67	277.38	973.88	58.59	60.04	21.09	0.00	273.48	--
2001	0.00	1,626.01	0.00	0.00	0.00	0.00	0.00	--	--	1,838.78	277.91	277.38	997.16	58.59	60.04	21.03	0.00	273.48	--
2002	0.00	650.30	0.00	0.00	0.00	0.00	0.00	--	--	1,945.29	277.91	277.38	1,031.11	58.59	60.04	21.03	0.00	272.75	4,641.14
2003	0.00	3,603.19	0.00	0.00	0.00	0.00	0.00	--	--	1,994.32	277.91	268.92	1,196.01	58.59	35.94	21.03	0.00	276.84	58.04
2004	0.00	4,450.96	0.00	0.00	0.00	0.00	0.00	--	--	2,370.66	278.67	234.29	1,257.12	61.08	77.13	21.09	0.00	220.08	5,705.42
2005	0.00	18,056.37	0.00	0.00	0.00	0.00	0.00	--	--	2,642.19	277.91	250.91	1,343.45	56.23	68.86	21.03	0.00	279.36	24,228.34
2006	0.00	8,176.55	0.00	0.00	0.00	0.00	0.00	--	--	2,538.90	277.91	284.66	1,482.16	58.55	10.02	21.03	0.00	291.36	19,502.27
2007	0.00	493.32	0.00	0.00	0.00	0.00	0.00	--	--	2,392.85	277.91	285.51	1,448.21	61.07	71.15	21.03	0.00	273.60	991.77
2008	0.00	4,052.21	0.00	0.00	0.00	0.00	0.00	--	--	2,225.46	278.67	284.68	1,398.74	56.00	82.33	21.09	0.00	402.00	493.08
2009	0.00	3,021.40	0.00	0.00	0.00	0.00	4.00	--	--	2,137.18	277.91	238.84	1,357.03	60.09	60.71	21.03	0.00	250.20	4,008.57
2010	0.00	8,326.20	0.00	0.00	0.00	0.00	4.00	--	--	1,945.45	277.91	251.63	1,236.75	61.82	67.17	21.03	0.00	267.22	32,544.35
2011	0.00	9,668.67	0.00	0.00	0.00	0.00	4.00	--	--	1,900.17	277.91	259.65	1,345.07	66.02	78.78	21.03	0.00	270.53	25,712.04
2012	0.00	1,237.43	0.00	0.00	0.00	0.00	4.00	--	--	1,871.41	278.67	202.69	1,453.38	73.23	104.04	21.09	0.00	242.02	22,937.97
2013	0.00	277.43	0.00	0.00	0.00	0.00	4.00	--	--	1,843.60	277.91	265.89	1,561.70	84.34	117.28	21.03	0.00	226.46	2,331.59
2014	0.00	347.90	0.00	0.00	0.00	0.00	4.00	--	--	1,747.43	277.91	259.12	1,670.02	98.14	103.12	21.03	0.00	170.40	4,236.70
2015	0.00	689.58	0.00	0.00	0.00	0.00	4.00	--	--	1,615.23	277.91	241.71	1,836.52	112.77	74.27	21.03	0.00	201.65	167.72
2016	0.00	752.52	0.00	0.00	0.00	0.00	4.48	--	--	1,692.89	278.67	256.33	1,825.17	115.77	109.39	21.09	0.00	212.64	0.16
2017	0.00	4,312.52	0.00	0.00	0.00	0.00	4.53	--	--	1,563.95	277.91	241.48	1,921.89	96.51	87.26	21.03	0.00	178.34	9,063.32
2018	0.00	685.40	0.00	0.00	0.00	0.00	6.50	--	--	1,353.48	277.91	243.13	1,994.20	101.99	99.29	21.03	0.00	193.87	1,985.87
2019	0.00	9,655.11	0.00	0.00	0.00	0.00	3.68	--	--	1,249.67	277.91	188.09	2,083.15	112.43	67.87	21.03	0.00	157.94	5,282.57

Table A9

Annual Return Flow by Zone 1936-2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Zone #	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Date	Too Many Palms Nursery (AFY)	Pipeline (AFY)	Overhill Booster Station (AFY)	House & Landscape (AFY)	House & Landscape (AFY)	House & Landscape (AFY)	Desert Springs Aquaculture (AFY)	Ephemeral streambed (AFY)	Nurseries (AFY)	Water Tank (AFY)	San Marcos Date Farm (AFY)	KK&R Nursery (AFY)	Irrigated grass (AFY)	Small Nursery (AFY)	Ranch Estate Glamping (AFY)	Desert Crest WWTP (AFY)	BlueBeyond (Fish farm) (AFY)	MCSB Sewer Municipal Outdoor (AFY)	DHS Septic Municipal Outdoor (AFY)
1936-1940	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1941-1945	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1946-1948	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1949	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1950	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1951	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1952	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1953	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1954	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1955	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1956	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1957	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1958	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1959	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1960	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1961	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1962	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1963	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1964	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1965	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1966	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1967	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1968	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1969	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1970	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1971	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1972	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1973	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1974	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	32.79	--	--	--
1975	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	35.31	--	--	--
1976	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	37.83	--	--	--
1977	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	40.35	--	--	--
1978	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	42.87	--	4.03	403.23
1979	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	45.40	--	4.73	403.79
1980	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	47.92	--	5.88	404.71
1981	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.44	--	5.93	404.75
1982	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.44	--	5.81	404.65
1983	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.44	--	6.57	405.26
1984	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.44	--	34.04	427.26
1985	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.44	--	37.93	430.38
1986	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.44	--	40.35	432.31

Table A9

Annual Return Flow by Zone 1936-2019

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Zone #	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Date	Too Many Palms Nursery (AFY)	Pipeline (AFY)	Overhill Booster Station (AFY)	House & Landscape (AFY)	House & Landscape (AFY)	House & Landscape (AFY)	Desert Springs Aquaculture (AFY)	Ephemeral streambed (AFY)	Nurseries (AFY)	Water Tank (AFY)	San Marcos Date Farm (AFY)	KK&R Nursery (AFY)	Irrigated grass (AFY)	Small Nursery (AFY)	Ranch Estate Glamping (AFY)	Desert Crest WWTP (AFY)	BlueBeyond (Fish farm) (AFY)	MCSB Sewer Municipal Outdoor (AFY)	DHS Septic Municipal Outdoor (AFY)
1987	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.44	--	41.10	432.91
1988	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.44	--	45.31	436.28
1989	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.44	--	52.95	442.41
1990	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.16	--	53.76	443.05
1991	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.16	--	51.71	441.41
1992	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.16	--	56.41	445.18
1993	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.16	--	58.34	446.72
1994	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.16	--	66.06	452.90
1995	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.16	--	66.94	453.60
1996	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.16	--	70.38	456.36
1997	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.16	--	67.76	454.27
1998	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.16	--	70.69	456.61
1999	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.16	--	73.43	458.80
2000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	48.28	--	76.14	460.97
2001	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	50.35	--	74.40	459.58
2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	51.87	--	78.79	463.10
2003	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	57.12	--	83.02	466.48
2004	--	--	--	--	--	--	--	--	--	--	--	--	--	32.10	--	56.58	--	96.17	477.01
2005	0.37	--	--	--	--	--	--	--	--	--	--	--	--	32.01	9.00	56.20	5.04	102.02	481.70
2006	0.37	--	--	--	--	--	--	--	--	--	--	--	--	32.01	9.00	55.71	5.04	125.45	500.39
2007	0.37	--	--	--	--	--	16.23	--	--	--	--	--	--	32.01	9.00	55.71	5.04	139.95	508.56
2008	0.37	--	--	--	--	--	18.24	--	--	--	--	--	--	32.10	9.00	53.99	5.04	144.51	513.21
2009	4.94	--	--	--	--	--	14.04	--	--	--	--	--	--	32.01	1.50	51.57	5.04	184.36	543.97
2010	0.98	--	--	--	--	--	12.00	--	--	--	--	--	--	32.01	0.00	50.72	14.16	184.81	546.69
2011	0.00	--	--	--	--	--	17.86	--	--	--	--	--	--	32.01	0.00	48.56	48.93	183.35	543.06
2012	5.80	--	--	--	--	--	2.05	--	--	--	--	--	--	32.10	0.00	44.77	47.56	178.65	542.96
2013	0.00	--	--	--	--	--	2.42	--	--	--	--	--	--	32.01	0.00	42.86	53.26	179.23	543.07
2014	0.00	--	--	--	--	--	20.98	--	--	--	--	--	--	32.01	0.00	44.86	46.98	224.77	579.21
2015	0.00	--	--	--	--	--	20.85	--	--	--	--	--	--	32.01	0.00	43.07	47.47	249.06	596.30
2016	0.00	--	--	--	--	--	15.33	--	--	--	--	--	--	32.10	0.00	40.45	46.91	206.00	611.66
2017	0.00	--	--	--	--	--	10.67	--	--	--	--	--	--	32.01	0.00	48.34	51.43	218.79	623.27
2018	0.00	--	--	--	--	--	10.14	--	--	--	--	--	--	32.01	0.00	51.11	47.42	284.80	678.34
2019	0.00	--	--	--	--	--	13.91	--	--	--	--	--	--	32.01	0.00	49.13	52.52	214.38	620.09

Abbreviations

AFY = acre-feet per year

MCSB = Mission Creek Subbasin

WWTP = Wastewater Treatment Plant

-- = not available

Table A9

Annual Return Flow by Zone 1936-2019

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Zone #	39	40	41	42	43
Date	DHS Septic Municipal Outdoor (AFY)	Upper Sky Valley Septic (AFY)	Lower Sky Valley Septic (AFY)	Unknown Septic A (AFY)	Unknown Septic B (AFY)
1936-1940	--	--	--	--	--
1941-1945	--	--	--	--	--
1946-1948	--	--	--	--	--
1949	--	--	--	--	--
1950	--	--	--	--	--
1951	--	--	--	--	--
1952	--	--	--	--	--
1953	--	--	--	--	--
1954	--	--	--	--	--
1955	--	--	--	--	--
1956	--	--	--	--	--
1957	--	--	--	--	--
1958	--	--	--	--	--
1959	--	--	--	--	--
1960	--	--	--	--	--
1961	--	--	--	--	--
1962	--	--	--	--	--
1963	--	--	--	--	--
1964	--	--	--	--	--
1965	--	--	--	--	--
1966	--	--	--	--	--
1967	--	--	--	--	--
1968	--	--	--	--	--
1969	--	--	--	--	--
1970	--	--	--	--	--
1971	--	--	--	--	--
1972	--	--	--	--	--
1973	--	--	--	--	--
1974	--	--	--	--	--
1975	--	--	--	--	--
1976	--	--	--	--	--
1977	--	--	--	--	--
1978	665.99	56.45	85.51	--	--
1979	714.19	66.68	85.51	--	--
1980	771.33	78.81	85.51	--	--
1981	800.55	85.01	85.51	--	45.80
1982	796.13	84.07	85.51	--	97.82
1983	843.70	94.17	85.51	--	105.56
1984	953.25	128.84	85.51	--	116.79
1985	1,018.45	144.03	85.51	--	121.81
1986	1,040.48	149.16	85.51	--	121.80

Table A9

Annual Return Flow by Zone 1936-2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Zone #	39	40	41	42	43
Date	DHS Septic Municipal Outdoor (AFY)	Upper Sky Valley Septic (AFY)	Lower Sky Valley Septic (AFY)	Unknown Septic A (AFY)	Unknown Septic B (AFY)
1987	982.54	135.67	85.51	--	118.21
1988	1,099.69	166.40	85.51	--	122.16
1989	1,206.01	191.69	85.51	28.58	93.68
1990	1,200.06	190.27	85.51	16.50	105.75
1991	1,152.37	178.93	85.51	32.50	89.75
1992	1,177.89	185.00	85.51	15.00	45.00
1993	1,221.48	219.18	85.51	46.20	78.88
1994	1,304.00	241.19	85.51	46.20	78.88
1995	1,311.02	243.07	85.51	46.20	78.88
1996	1,334.33	249.29	85.51	46.20	78.88
1997	1,215.45	217.57	85.51	46.20	78.88
1998	1,326.20	247.12	85.51	46.20	78.88
1999	1,380.74	261.67	85.51	78.88	46.20
2000	1,425.15	273.52	85.51	78.88	46.20
2001	1,310.73	242.99	85.51	78.88	46.20
2002	1,475.48	286.95	85.51	78.88	46.20
2003	1,516.11	297.79	85.51	66.38	43.57
2004	1,599.15	358.94	85.51	78.19	26.02
2005	1,527.57	345.66	85.51	65.35	21.75
2006	1,561.71	436.61	85.51	65.41	21.77
2007	1,479.03	410.01	85.51	65.41	21.77
2008	1,481.91	411.11	85.51	65.41	21.77
2009	1,457.15	401.70	85.51	73.67	24.51
2010	1,343.78	358.62	85.51	76.65	25.51
2011	1,288.32	343.96	85.51	77.28	25.72
2012	1,323.99	357.77	85.51	74.34	24.74
2013	1,309.50	352.16	85.51	77.28	25.72
2014	1,284.88	345.85	85.51	77.25	25.71
2015	1,152.40	322.26	85.51	77.10	25.66
2016	1,158.41	333.66	85.51	77.28	25.72
2017	1,267.35	384.77	85.51	77.18	25.68
2018	1,120.84	398.20	85.51	77.24	25.70
2019	1,125.14	385.57	85.51	77.29	25.72

Abbreviations
AFY = acre-feet per year
MCSB = Mission Creek Subbasin
WWTP = Wastewater Treatment Plant
-- = not available

Table A10

Simulated Mission Creek Subbasin Water Balance 1978 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)							Simulated Outflows (AFY)						Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Underflow From Desert Hot Springs Subbasin	Applied Water Return	Septic Return	Wastewater Return	Artificial recharge	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills West[1]	Underflow to Indio Hills East[2]	Total Outflow		
1978	42,473	1,205	567	214	175		44,634	-4,579	-1,141	-3,300	-375	-677	-10,072	34,562	0
1979	21,547	1,304	598	275	229		23,953	-5,055	-1,140	-3,281	-374	-670	-10,520	13,433	13,433
1980	53,526	1,493	650	306	265		56,240	-5,717	-1,142	-3,260	-373	-664	-11,155	45,084	58,518
1981	1,558	1,250	652	320	309		4,090	-5,890	-1,138	-3,228	-371	-653	-11,279	-7,189	51,328
1982	5,188	1,098	647	292	337		7,561	-5,829	-1,137	-3,201	-369	-643	-11,179	-3,618	47,710
1983	35,903	1,117	681	334	435		38,470	-6,320	-1,136	-3,163	-367	-634	-11,620	26,850	74,561
1984	13	1,087	745	449	451		2,744	-7,403	-1,138	-3,102	-366	-626	-12,635	-9,891	64,670
1985	1,689	1,060	786	477	420		4,432	-8,043	-1,133	-3,029	-363	-613	-13,182	-8,750	55,920
1986	4,897	1,067	811	569	386		7,729	-8,339	-1,132	-2,975	-361	-600	-13,407	-5,678	50,243
1987	13	1,070	819	654	454		3,010	-8,077	-1,130	-2,933	-359	-586	-13,084	-10,074	40,169
1988	1,431	1,081	864	670	494		4,541	-9,039	-1,132	-2,844	-358	-573	-13,945	-9,405	30,764
1989	13	1,095	944	799	575		3,426	-10,179	-1,126	-2,740	-354	-556	-14,955	-11,529	19,235
1990	13	1,103	1,286	767	721		3,891	-11,594	-1,122	-2,615	-350	-538	-16,220	-12,329	6,906
1991	5,923	1,114	1,265	691	754		9,747	-11,183	-1,116	-2,583	-347	-518	-15,748	-6,001	905
1992	6,304	1,129	1,314	760	788		10,295	-11,665	-1,112	-2,522	-345	-500	-16,144	-5,849	-4,943
1993	66,882	1,698	1,335	795	882		71,592	-12,151	-1,101	-2,473	-341	-482	-16,548	55,044	50,100
1994	4,711	1,317	1,382	977	827		9,214	-12,943	-1,091	-2,403	-337	-467	-17,242	-8,028	42,072
1995	29,867	1,336	1,391	998	783		34,374	-13,043	-1,081	-2,345	-334	-452	-17,255	17,120	59,192
1996	4,935	1,272	1,425	1,077	782		9,492	-13,412	-1,073	-2,287	-332	-437	-17,540	-8,048	51,144
1997	3,434	1,259	1,399	989	825		7,906	-12,563	-1,059	-2,262	-328	-422	-16,633	-8,727	42,417
1998	21,509	1,287	1,429	1,048	883		26,157	-13,388	-1,048	-2,183	-325	-413	-17,356	8,800	51,217
1999	13	1,276	1,456	1,103	930		4,778	-13,884	-1,035	-2,107	-322	-404	-17,752	-12,973	38,243
2000	768	1,288	1,483	1,133	1,022		5,695	-14,321	-1,024	-2,034	-319	-395	-18,093	-12,398	25,846
2001	730	1,293	1,466	1,152	1,048		5,689	-13,557	-1,005	-1,990	-315	-383	-17,251	-11,563	14,283
2002	13	1,306	1,510	1,218	1,083	4,736	9,866	-14,788	-989	-1,888	-311	-372	-18,348	-8,482	5,801
2003	1,154	1,315	1,520	1,228	1,253	59	6,530	-15,172	-970	-1,825	-308	-361	-18,636	-12,106	-6,305
2004	2,614	1,334	1,675	1,483	1,314	5,822	14,242	-16,821	-952	-1,734	-304	-350	-20,162	-5,920	-12,225
2005	31,753	1,420	1,697	1,747	1,400	24,723	62,740	-16,556	-930	-1,724	-300	-332	-19,842	42,898	30,673
2006	1,780	1,318	1,766	1,583	1,538	19,900	27,885	-17,606	-913	-1,703	-296	-320	-20,838	7,047	37,720
2007	13	1,291	1,813	1,494	1,504	1,012	7,127	-16,856	-903	-1,722	-294	-299	-20,073	-12,946	24,774
2008	2,340	1,297	1,756	1,399	1,453	503	8,749	-16,551	-896	-1,681	-293	-293	-19,714	-10,965	13,809
2009	13	1,291	1,608	1,396	1,409	4,090	9,807	-15,623	-884	-1,629	-290	-299	-18,724	-8,917	4,892

Table A10

Simulated Mission Creek Subbasin Water Balance 1978 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)							Simulated Outflows (AFY)						Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Underflow From Desert Hot Springs Subbasin	Applied Water Return	Septic Return	Wastewater Return	Artificial recharge	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills West[1]	Underflow to Indio Hills East[2]	Total Outflow		
2010	9,561	1,287	1,612	1,262	1,287	33,209	48,219	-14,818	-879	-1,670	-288	-304	-17,959	30,260	35,152
2011	5,048	1,237	1,749	1,234	1,394	26,237	36,898	-14,824	-882	-1,763	-288	-303	-18,060	18,837	53,989
2012	13	1,150	1,651	1,205	1,498	23,406	28,923	-14,904	-895	-1,806	-291	-327	-18,224	10,699	64,688
2013	13	1,128	1,754	1,177	1,605	2,379	8,056	-15,293	-906	-1,780	-292	-343	-18,614	-10,558	54,130
2014	13	1,133	1,697	1,149	1,715	4,323	10,030	-14,785	-916	-1,757	-294	-337	-18,090	-8,060	46,070
2015	13	1,134	1,619	1,120	1,880	171	5,938	-13,530	-925	-1,768	-295	-340	-16,858	-10,920	35,150
2016	13	1,147	1,709	1,159	1,866	0	5,895	-13,736	-937	-1,755	-298	-356	-17,082	-11,187	23,962
2017	7,530	1,154	1,662	1,001	1,970	9,248	22,565	-14,049	-940	-1,714	-298	-367	-17,367	5,199	29,161
2018	13	1,149	1,879	652	2,045	2,026	7,765	-14,391	-943	-1,703	-298	-369	-17,705	-9,939	19,222
2019	19,526	1,147	1,596	695	2,132	3,498	28,594	-13,636	-949	-1,720	-299	-367	-16,970	11,623	30,845
Average[3] 1978-2019	9,400	1,230	1,330	930	1,030	9,190	17,840	-12,190	-1,030	-2,290	-330	-450	-16,290	1,560	
Min[3] 1978-2019	10	1,060	570	210	180	0	2,740	-17,610	-1,140	-3,300	-380	-680	-20,840	-12,970	
Max[3] 1978-2019	66,880	1,700	1,880	1,750	2,130	33,210	71,590	-4,580	-880	-1,630	-290	-290	-10,070	55,040	

Notes
1. Indio Hill west of Banning Fault.
2. Indio Hills east of Banning Fault (formerly inactive area).
3. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre-feet
AFY = acre-feet per year

Table A11

Simulated Desert Hot Springs Subbasin Water Balance 1978 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)				Simulated Outflows (AFY)					Change in Storage (AFY)	Cumulative Change in Storage (AF)
						Underflow Outflow					
	Natural Recharge	Applied Water Return	Septic Return	Total Inflow	Pumping[1]	Underflow to Mission Creek	Underflow to Indio Hills East[2]	Underflow to Indio SB[3]	Total Outflow		
1978	35,044	450	508	36,002	-1,699	-1,205	-967	-2.0	-3,873	32,129	0
1979	8,625	483	603	9,711	-1,691	-1,304	-952	-2.8	-3,949	5,762	5,762
1980	31,951	522	685	33,159	-1,691	-1,493	-940	-2.9	-4,127	29,032	34,794
1981	20	542	779	1,341	-1,691	-1,250	-923	-3.1	-3,868	-2,527	32,267
1982	20	538	776	1,335	-1,691	-1,098	-910	-2.5	-3,701	-2,366	29,901
1983	1,766	571	863	3,200	-1,691	-1,117	-897	-2.0	-3,707	-508	29,394
1984	20	678	1,127	1,825	-1,691	-1,087	-887	-1.8	-3,666	-1,841	27,553
1985	20	726	1,262	2,009	-1,691	-1,060	-872	-1.7	-3,625	-1,617	25,936
1986	20	743	1,283	2,046	-1,691	-1,067	-861	-1.6	-3,620	-1,573	24,363
1987	20	704	1,066	1,790	-1,691	-1,070	-849	-1.5	-3,612	-1,822	22,541
1988	20	792	1,383	2,195	-1,691	-1,081	-841	-1.5	-3,614	-1,419	21,121
1989	20	872	1,576	2,468	-1,691	-1,095	-828	-1.4	-3,615	-1,147	19,974
1990	20	869	1,537	2,426	-1,691	-1,103	-818	-1.4	-3,613	-1,187	18,787
1991	20	834	1,419	2,273	-1,691	-1,114	-808	-1.3	-3,615	-1,342	17,445
1992	20	855	1,399	2,275	-1,691	-1,129	-801	-1.3	-3,622	-1,347	16,097
1993	36,376	912	1,573	38,860	-1,691	-1,698	-790	-1.8	-4,180	34,680	50,778
1994	20	978	1,761	2,760	-1,691	-1,317	-781	-2.2	-3,791	-1,031	49,746
1995	2,650	984	1,767	5,401	-1,691	-1,336	-773	-1.8	-3,801	1,600	51,346
1996	20	1,003	1,775	2,799	-1,691	-1,272	-767	-1.5	-3,732	-933	50,413
1997	20	915	1,411	2,346	-1,691	-1,259	-757	-1.4	-3,709	-1,363	49,050
1998	3,738	998	1,739	6,475	-1,691	-1,287	-750	-1.4	-3,730	2,745	51,795
1999	20	1,039	1,873	2,933	-1,691	-1,276	-743	-1.3	-3,711	-779	51,017
2000	20	1,074	1,971	3,065	-1,691	-1,288	-738	-1.3	-3,718	-653	50,363
2001	20	989	1,604	2,613	-1,691	-1,293	-729	-1.3	-3,714	-1,101	49,263

Table A11

Simulated Desert Hot Springs Subbasin Water Balance 1978 - 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)				Simulated Outflows (AFY)					Change in Storage (AFY)	Cumulative Change in Storage (AF)
						Underflow Outflow					
	Natural Recharge	Applied Water Return	Septic Return	Total Inflow	Pumping[1]	Underflow to Mission Creek	Underflow to Indio Hills East[2]	Underflow to Indio SB[3]	Total Outflow		
2002	20	1,113	2,091	3,224	-1,691	-1,306	-723	-1.2	-3,722	-497	48,765
2003	20	1,140	2,143	3,303	-1,691	-1,315	-717	-1.2	-3,725	-421	48,344
2004	20	1,256	2,260	3,536	-1,691	-1,334	-713	-1.2	-3,740	-204	48,140
2005	9,741	1,225	1,996	12,962	-1,691	-1,420	-706	-1.2	-3,817	9,145	57,285
2006	20	1,344	2,175	3,540	-1,691	-1,318	-700	-1.2	-3,711	-171	57,114
2007	20	1,290	2,066	3,376	-1,691	-1,291	-695	-1.2	-3,679	-303	56,811
2008	20	1,296	2,191	3,507	-1,691	-1,297	-693	-1.2	-3,682	-175	56,636
2009	20	1,276	2,218	3,515	-1,691	-1,291	-686	-1.1	-3,670	-155	56,480
2010	4,603	1,195	1,961	7,759	-1,691	-1,287	-682	-1.1	-3,661	4,097	60,578
2011	20	1,156	1,836	3,013	-1,691	-1,237	-678	-1.2	-3,607	-594	59,983
2012	20	1,147	1,924	3,092	-1,691	-1,150	-675	-1.2	-3,517	-425	59,558
2013	20	1,178	1,870	3,068	-1,691	-1,128	-669	-1.1	-3,488	-420	59,138
2014	20	1,185	1,856	3,062	-1,691	-1,133	-664	-1.1	-3,489	-427	58,711
2015	20	1,101	1,628	2,750	-1,691	-1,134	-660	-1.1	-3,486	-736	57,975
2016	20	1,138	1,674	2,832	-1,691	-1,147	-657	-1.1	-3,496	-664	57,311
2017	20	1,214	1,858	3,092	-1,691	-1,154	-650	-1.1	-3,497	-405	56,906
2018	20	1,254	1,785	3,060	-1,691	-1,149	-646	-1.1	-3,487	-427	56,479
2019	0	1,136	1,616	2,752	-1,691	-1,147	-642	-1.0	-3,480	-728	55,751
Average[3] 1978-2019	3,220	970	1,590	5,780	-1,690	-1,230	-770	-1.5	-3,690	2,090	
Min[3] 1978-2019	0	450	510	1,340	-1,700	-1,700	-970	-3.1	-4,180	-2,530	
Max[3] 1978-2019	36,380	1,340	2,260	38,860	-1,690	-1,060	-640	-1.0	-3,480	34,680	

Notes
1. Pumping from Mayer et al., 2007.
2. Indio Hills East of Banning Fault (formerly inactive area).
3. Discharge at General Head Boundary located along bottom edge of model where Desert Hot Springs Subbasin flows into the Indio Subbasin (Figure A17).
4. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre-feet
AFY = acre-feet per year
CVWD = Coachella Valley Water District
MSWD = Mission Springs Water District
SB = Subbasin

Table A12

Simulated Garnet Hill Subarea Water Balance 1978 - 2019

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)					Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Underflow From Mission Creek	Applied Water Return	Septic Return	Total Inflow	Pumping	Underflow to Indio Subbasin	Underflow to Indio Hills West[1]	Total Outflow		
1978	33,065	3,300	10	28	36,403	-68	-9,973	-868	-10,909	25,494	0
1979	20,754	3,281	6	16	24,057	-38	-10,338	-860	-11,236	12,821	12,821
1980	30,802	3,260	88	253	34,403	-605	-10,676	-855	-12,136	22,267	35,088
1981	10,868	3,228	89	255	14,439	-609	-10,777	-845	-12,232	2,208	37,296
1982	13,140	3,201	88	254	16,684	-607	-10,687	-838	-12,132	4,552	41,848
1983	34,483	3,163	85	244	37,974	-582	-10,679	-831	-12,092	25,882	67,730
1984	9,162	3,102	7	19	12,290	-46	-10,472	-827	-11,345	945	68,675
1985	26,390	3,029	6	18	29,443	-43	-8,716	-818	-9,577	19,866	88,541
1986	19,359	2,975	88	252	22,674	-602	-6,300	-811	-7,714	14,960	103,501
1987	9,049	2,933	97	279	12,357	-666	-4,982	-805	-6,453	5,904	109,405
1988	5,375	2,844	92	265	8,577	-633	-5,962	-801	-7,396	1,181	110,585
1989	4,663	2,740	80	231	7,715	-553	-6,845	-793	-8,191	-476	110,109
1990	5,315	2,615	15	44	7,989	-105	-7,078	-799	-7,982	7	110,116
1991	8,993	2,583	18	53	11,647	-127	-7,368	-791	-8,285	3,362	113,478
1992	8,748	2,522	21	59	11,349	-141	-7,508	-786	-8,434	2,914	116,393
1993	27,386	2,473	26	75	29,961	-179	-7,564	-778	-8,521	21,440	137,833
1994	12,284	2,403	22	63	14,772	-151	-7,827	-773	-8,751	6,021	143,854
1995	18,672	2,345	45	131	21,194	-313	-7,894	-768	-8,974	12,219	156,073
1996	12,665	2,287	22	65	15,039	-155	-7,406	-766	-8,327	6,712	162,786
1997	18,920	2,262	30	87	21,299	-2,646	-6,586	-756	-9,988	11,311	174,097
1998	15,903	2,183	22	62	18,169	-1,805	-6,435	-744	-8,985	9,185	183,281
1999	12,101	2,107	9	27	14,245	-1,160	-6,276	-731	-8,167	6,078	189,359
2000	8,192	2,034	16	47	10,289	-558	-6,443	-717	-7,718	2,571	191,930
2001	4,456	1,990	141	406	6,993	164	-6,878	-697	-7,411	-418	191,512
2002	4,950	1,888	8	23	6,868	310	-7,504	-676	-7,871	-1,002	190,510
2003	4,080	1,825	15	44	5,964	335	-7,995	-655	-8,315	-2,351	188,158
2004	6,737	1,734	23	66	8,560	77	-8,568	-633	-9,125	-565	187,593
2005	24,771	1,724	18	53	26,566	-1,845	-8,400	-608	-10,853	15,713	203,306
2006	10,919	1,703	25	73	12,720	-1,711	-7,866	-585	-10,162	2,557	205,864
2007	4,939	1,722	62	180	6,904	-979	-7,852	-561	-9,393	-2,489	203,375
2008	6,886	1,681	45	128	8,740	-472	-8,345	-539	-9,356	-615	202,759
2009	3,008	1,629	46	133	4,815	-327	-8,650	-513	-9,490	-4,675	198,084
2010	10,097	1,670	39	113	11,919	-1,022	-8,592	-489	-10,104	1,815	199,899

Table A12

Simulated Garnet Hill Subarea Water Balance 1978 - 2019

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Year	Simulated Inflows (AFY)					Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Underflow From Mission Creek	Applied Water Return	Septic Return	Total Inflow	Pumping	Underflow to Indio Subbasin	Underflow to Indio Hills West[1]	Total Outflow		
2011	8,311	1,763	53	153	10,281	-1,562	-7,673	-466	-9,701	580	200,480
2012	6,286	1,806	32	93	8,218	-1,129	-6,387	-445	-7,962	256	200,736
2013	5,175	1,780	34	99	7,087	-604	-5,637	-424	-6,665	422	201,158
2014	5,036	1,757	36	104	6,933	-192	-6,425	-405	-7,023	-89	201,068
2015	4,071	1,768	41	119	5,999	-74	-7,404	-387	-7,865	-1,866	199,203
2016	4,840	1,755	39	113	6,747	-112	-8,319	-370	-8,801	-2,054	197,149
2017	6,507	1,714	43	131	8,395	-1,119	-7,813	-351	-9,283	-889	196,260
2018	5,955	1,703	33	83	7,774	-931	-6,316	-335	-7,582	191	196,451
2019	12,139	1,720	43	135	14,037	-1,720	-5,624	-320	-7,664	6,372	202,824
Average[2] 1978-2019	12,030	2,290	40	120	14,490	-600	-7,790	-660	-9,050	5,440	
Min[2] 1978-2019	3,010	1,630	10	20	4,820	-2,650	-10,780	-870	-12,230	-4,670	
Max[2] 1978-2019	34,480	3,300	140	410	37,970	330	-4,980	-320	-6,450	25,880	

Notes

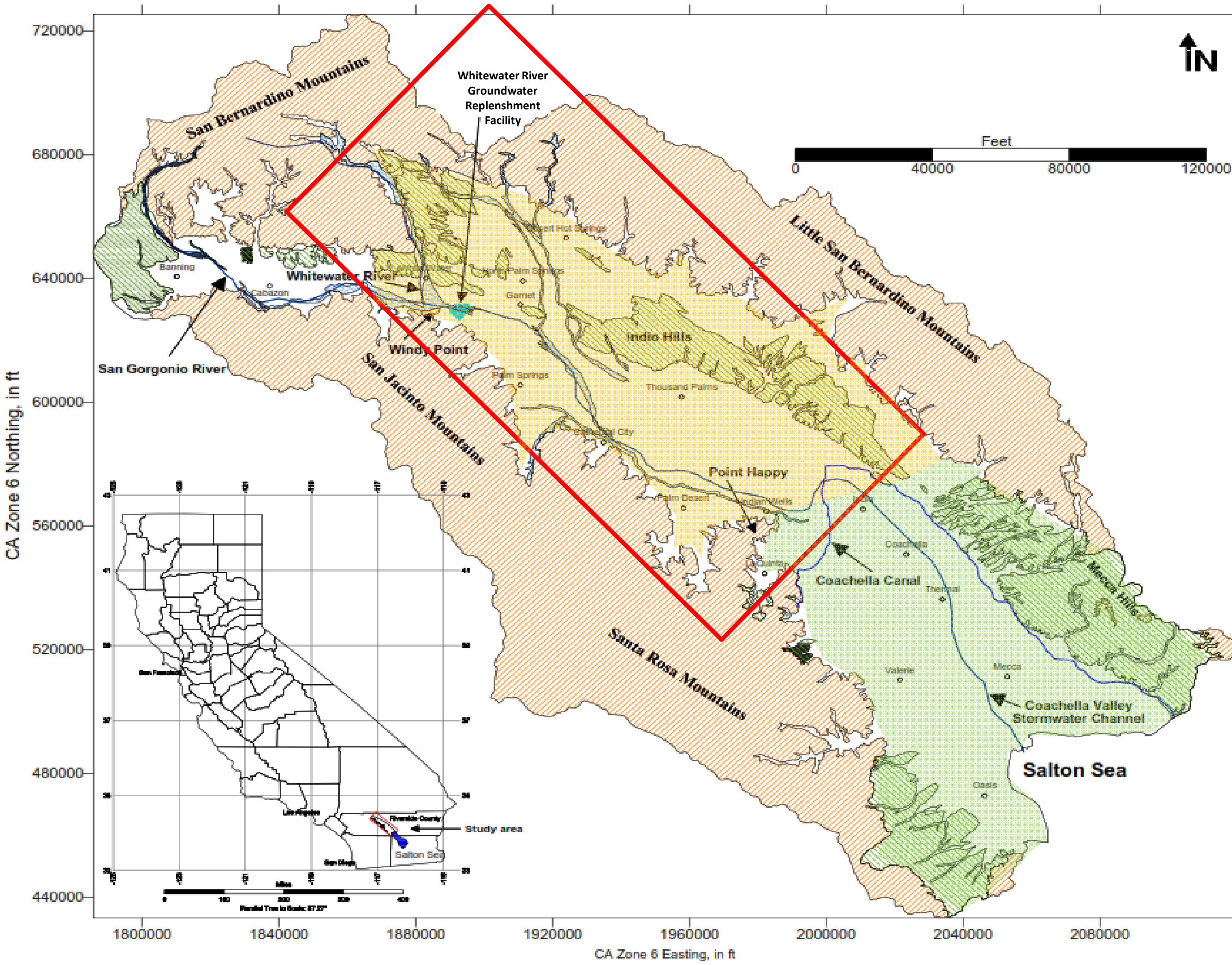
1. Indio Hills west of Banning Fault.
2. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations

AF = acre-feet

AFY = acre-feet per year

Figures



Explaination

Study Area

Upper Coachella Valley

Lower Coachella Valley

Note: Modified from Groundwater Flow Model of Coachella Valley, California: An Overview (Fogg, 2000)

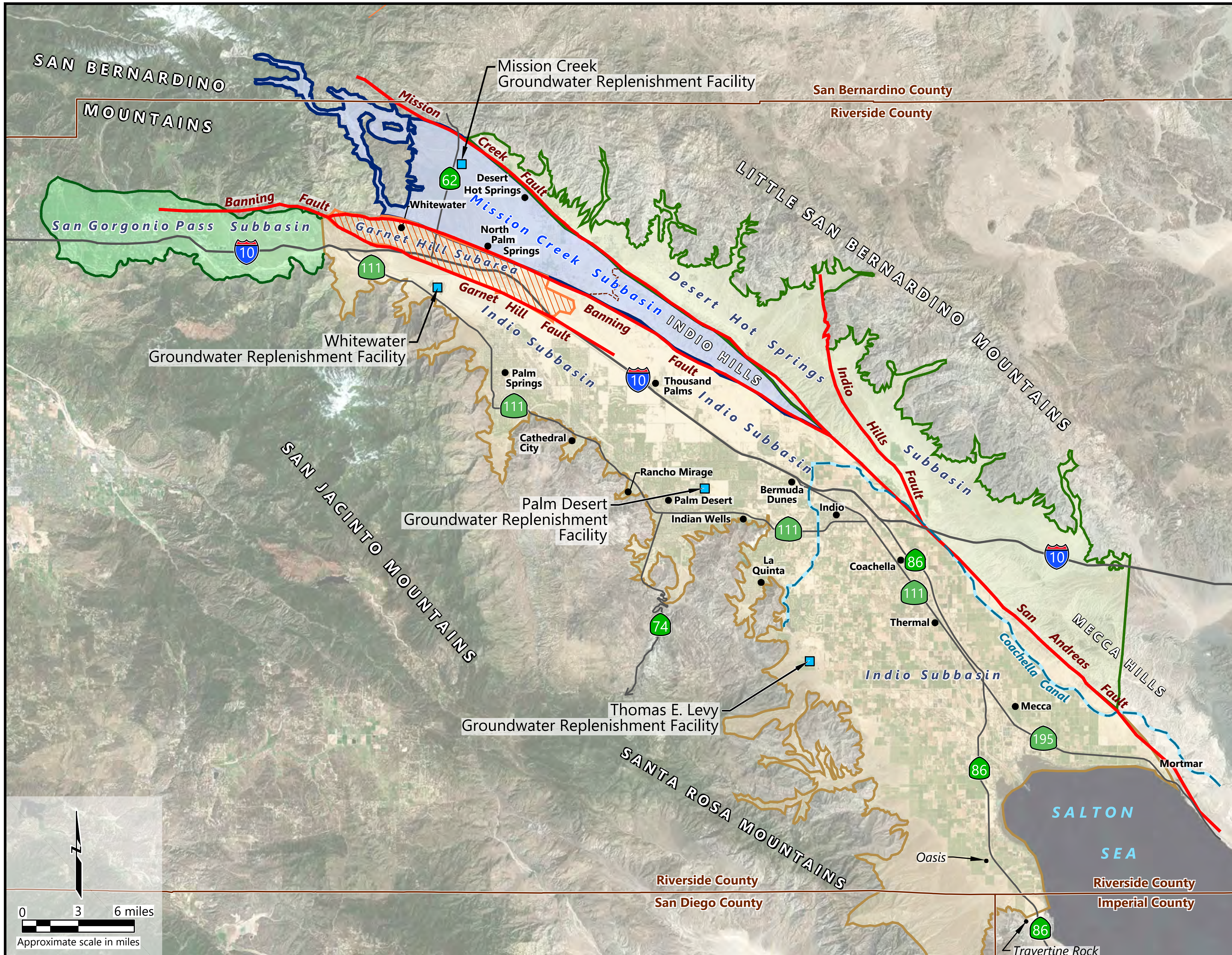
Location Map

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 08/24/2021	Project No.: CM19167351

wood.

Figure **A1**



Explanation

- Mission Creek Subbasin
- Desert Hot Springs Subbasin
- San Gorgonio Pass Subbasin
- Indio Subbasin
- Garnet Hill Subarea of Indio Subbasin
- Fault
- Indio Hills boundary
- Coachella Canal

Location Map
Not to Scale

Basemap modified from an undated drawing by Krieger & Stewart Engineering, subbasin boundaries from "Mission Creek and Garnet Hill Subbasins Water Management Plan Final Report", January 2013, and an aerial photo from Esri World Imagery- Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEROGRID, IGN, and the GIS User Community, dated 10-15-2017.

Note:

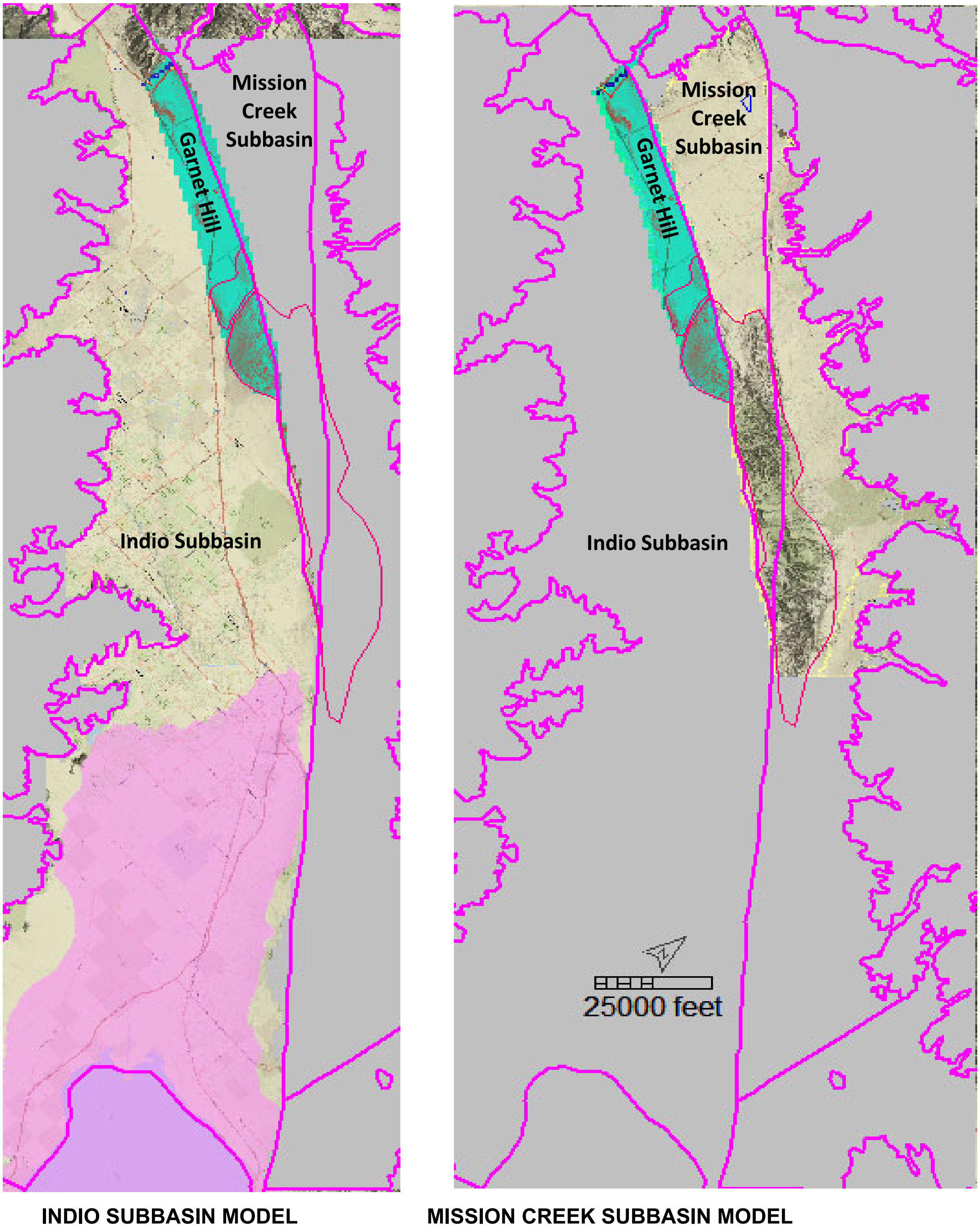
All locations are approximate.

Coachella Valley Groundwater Basin Subbasins and Garnet Hill Subarea Map

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: jrw	Date: 9/30/2021	Project No. CM19167351
wood.		Figure A2

Plot Date: 10/18/2021 3:44:31 PM, Plotted by: pat.herring
Drawing Path: Y:\CM19167351 (MISSION CREEK ALTERNATE)\ESRI\ALTERNATIVE UPDATE\ACAD\1-1_CV BASIN-SUBBASINS_V2.DWG, Subbasins

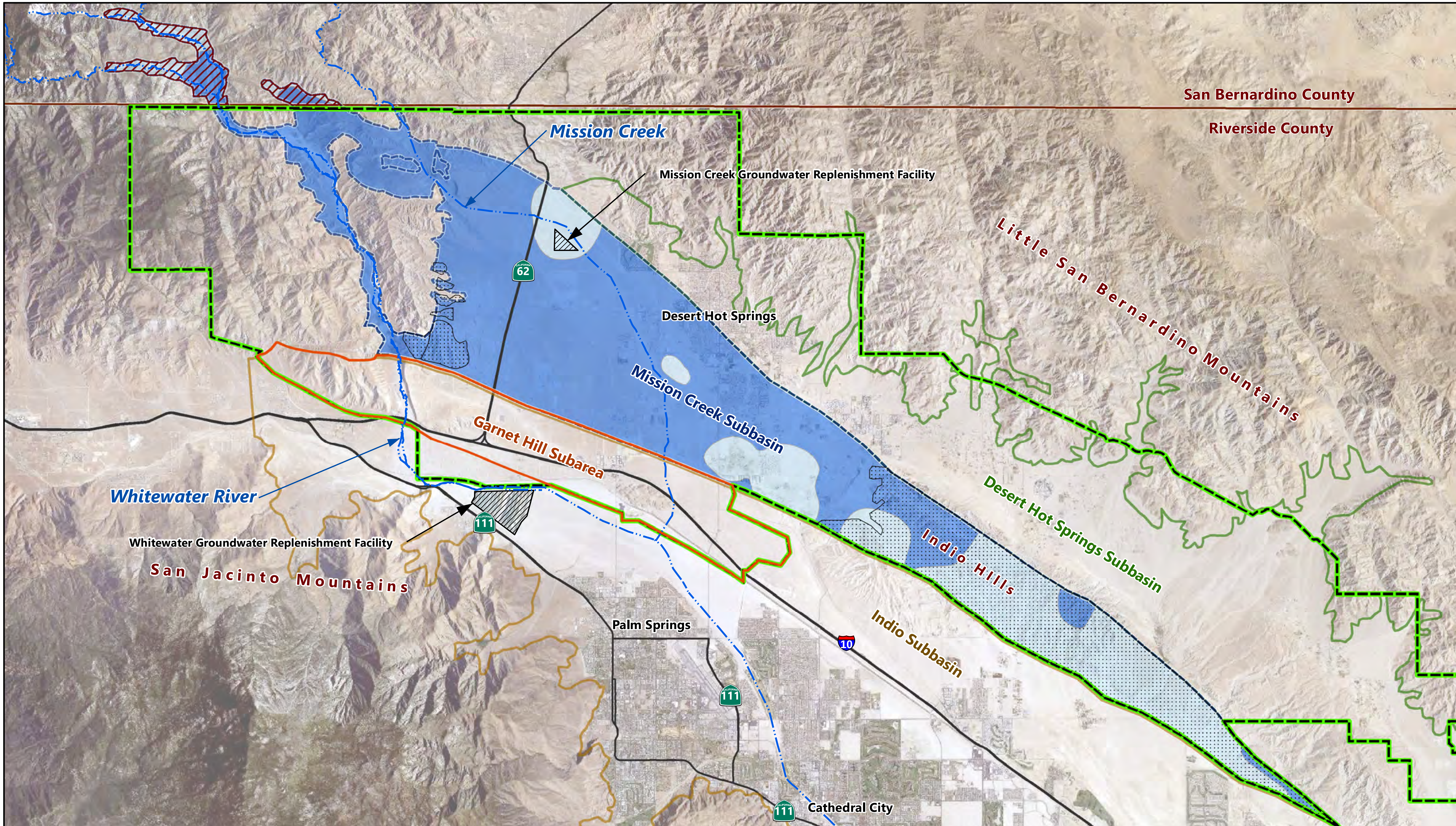


Garnet Hill Overlap Area

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

By: dmb	Date: 08/24/2021	Project No.: CM19167351
wood.		Figure A3



Explanation

- Facility
- Planning Area
- Streams
- Highway/road
- Mission Creek Subbasin fringe area
- Garnet Hill Subarea of Indio Subbasin
- Low permeability/non-water bearing sediments/bedrock
- Desert Hot Springs Subbasin
- Indio Subbasin
- Mission Creek Subbasin

Vertical displacement raster (feet)

- -0.25 to 0
- 0 to 0.25

Source: Vertical ground surface displacement estimates raster is derived from Interferometric Synthetic Aperture Radar (InSAR) data collected by European Space Agency and processed by TRE ALTAMIRA under contract with California.

0 6,000 12,000
Approximate Scale in Feet

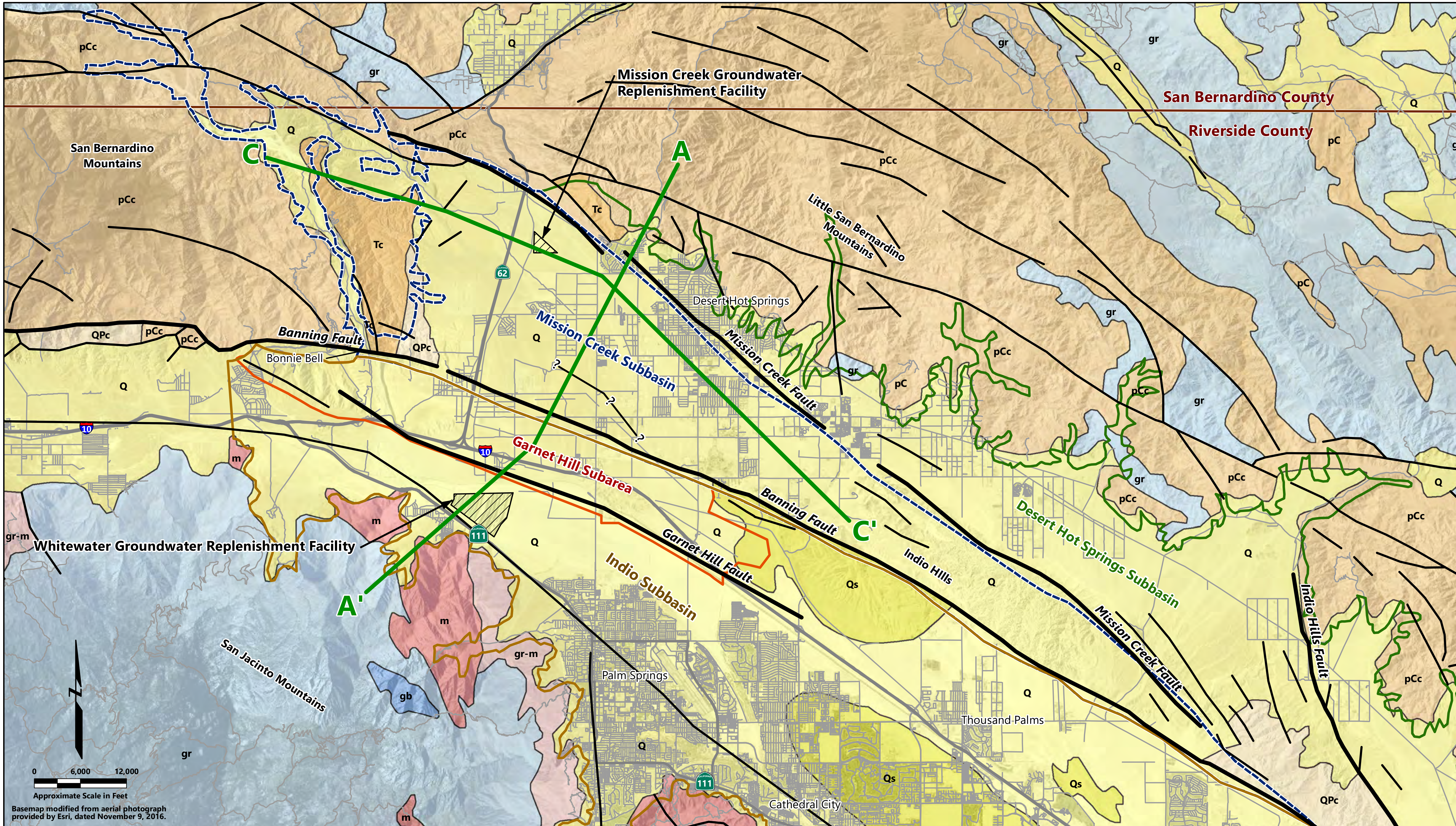
Basemap modified from aerial photograph provided by Esri, dated November 9, 2016. GSA areas from SGMA. Water.CA.gov.

N

Change in Ground Level 2015 to 2019
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: pah	Date: 9/9/2021	Project No.: CM19167351
wood.		Figure **A4**

Date: 9/9/2021 Printed by: pat.herring
Path: Y:\CM19167351 (Mission Creek Alternate)\Esri\Alternative Update\A4_MCS_Planning_and_Subsidence.mxd



Explanation

- Cross section location
- Fault
- Facility
- Highway/road

Site Features

- Desert Hot Springs Subbasin
- Indio Subbasin
- Mission Creek Subbasin
- Garnet Hill Subarea of Indio Subbasin

Geology

- **Qs**: dune sand (Quaternary)
- **Q**: alluvium (Quaternary)
- **QPc**: sandstone (Tertiary-Quaternary)
- **Tc**: sandstone conglomerate (Tertiary)
- **gb**: gabbro (Triassic)
- **gr**: diorite (Permian)
- **pC/pCc**: gneiss (Paleozoic)
- **gr-m**: plutonic rock (Early Proterozoic to Late Cretaceous)
- **m**: schist (Early Proterozoic to Cretaceous)

Sources:
1. USGS Open File Report 2005-1305, 2007.
2. Geotechnical Consultants, 1978.

Note:
Fault and groundwater basin boundary alignments differ due to different sources.

Regional Geology in the Mission Creek Subbasin Area

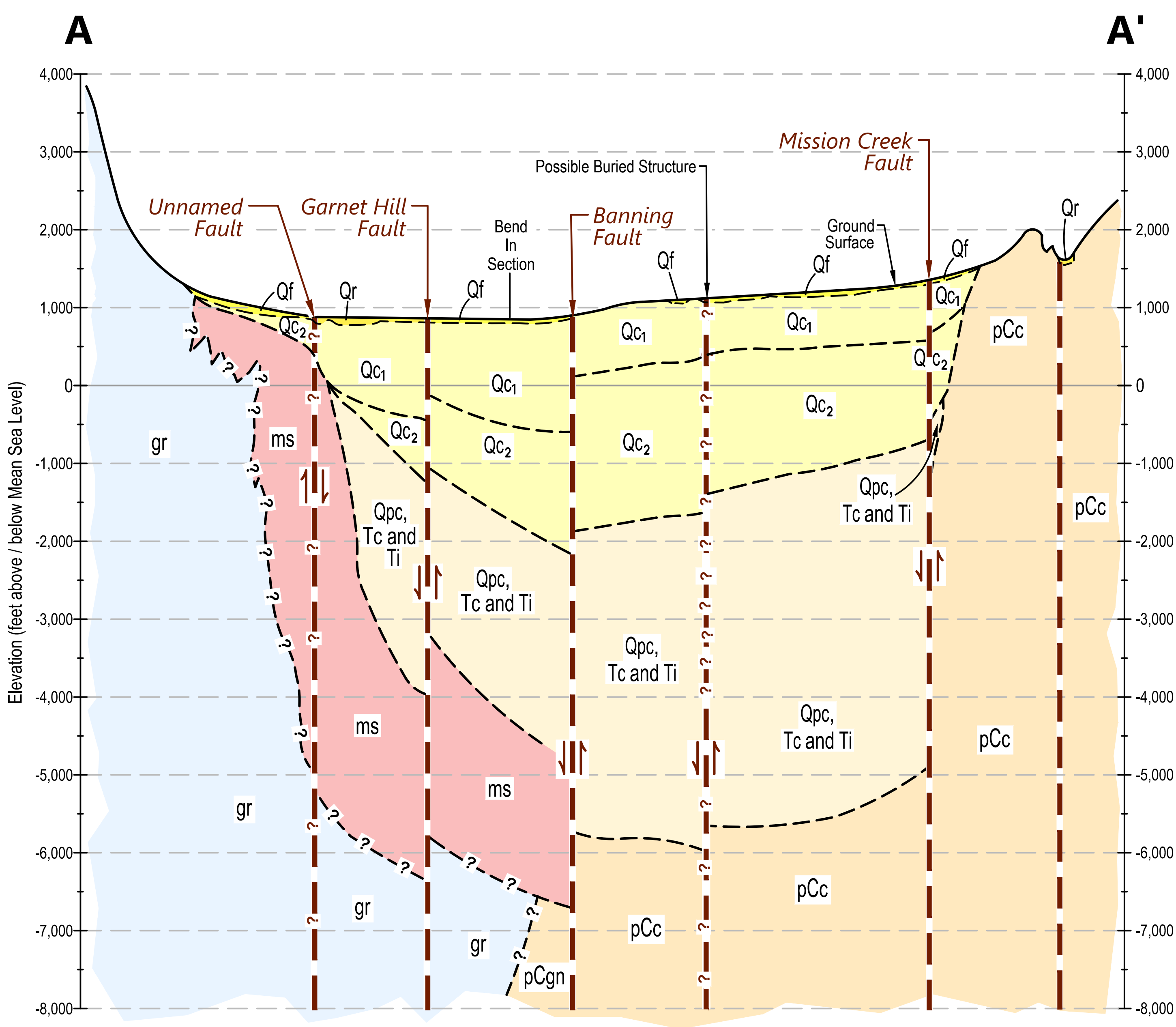
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: pah | Date: 11/8/2021 | Project No.: CM19167351

wood.

Figure A5

Date: 11/8/2021 Printed by: pat.herring
Path: Y:\CM19167351 (Mission Creek Alternate)\Esri\Alternative Update\Appendix\A5_Regional_Geology.mxd



Explanation

Sedimentary Rocks

Water-Bearing Sediments

Qr	Active channel deposits boulders, gravel and sand of larger streams
Qf	Alluvial fan and stream wash deposits boulders, gravel, sand, and silt
Qc_1	Cabezon Fanglomerate boulder conglomerate with sand, silt, and clay

Semi Water-Bearing Sediments

Qc_2	Cabezon Fanglomerate
Qpc	Painted Hill Formation buff silty sandstone and conglomerate includes interlayered basalt flows

Non Water-Bearing Sediments

Tc	Coachella Fanglomerate varicolored, basal conglomerate and breccia includes interlayered basalt flows
Ti	Imperial Formation shale and varicolored sandstone, siltstone, fossiliferous marine

Igneous and Metamorphic Rocks

gr	Granitic intrusive rocks granodiorite, granite, and pegmatite of the Southern California Batholith
ms	Metamorphic rocks of the San Jacinto and Santa Rose Mountains metasedimentary series of gneiss, schist, and marble
pCc	San Gorgonio-Chuckwalla Complex undifferentiated complex of banded gneiss, schist, diorite, and andesite

? Contact or mapped bed (dashed and querried where inferred)

? Fault (querried where inferred)

Fault direction of movement

Approximate vertical scale in feet
4.25x vertical exaggeration

2,000
1,000
0
~4,250
~8,500

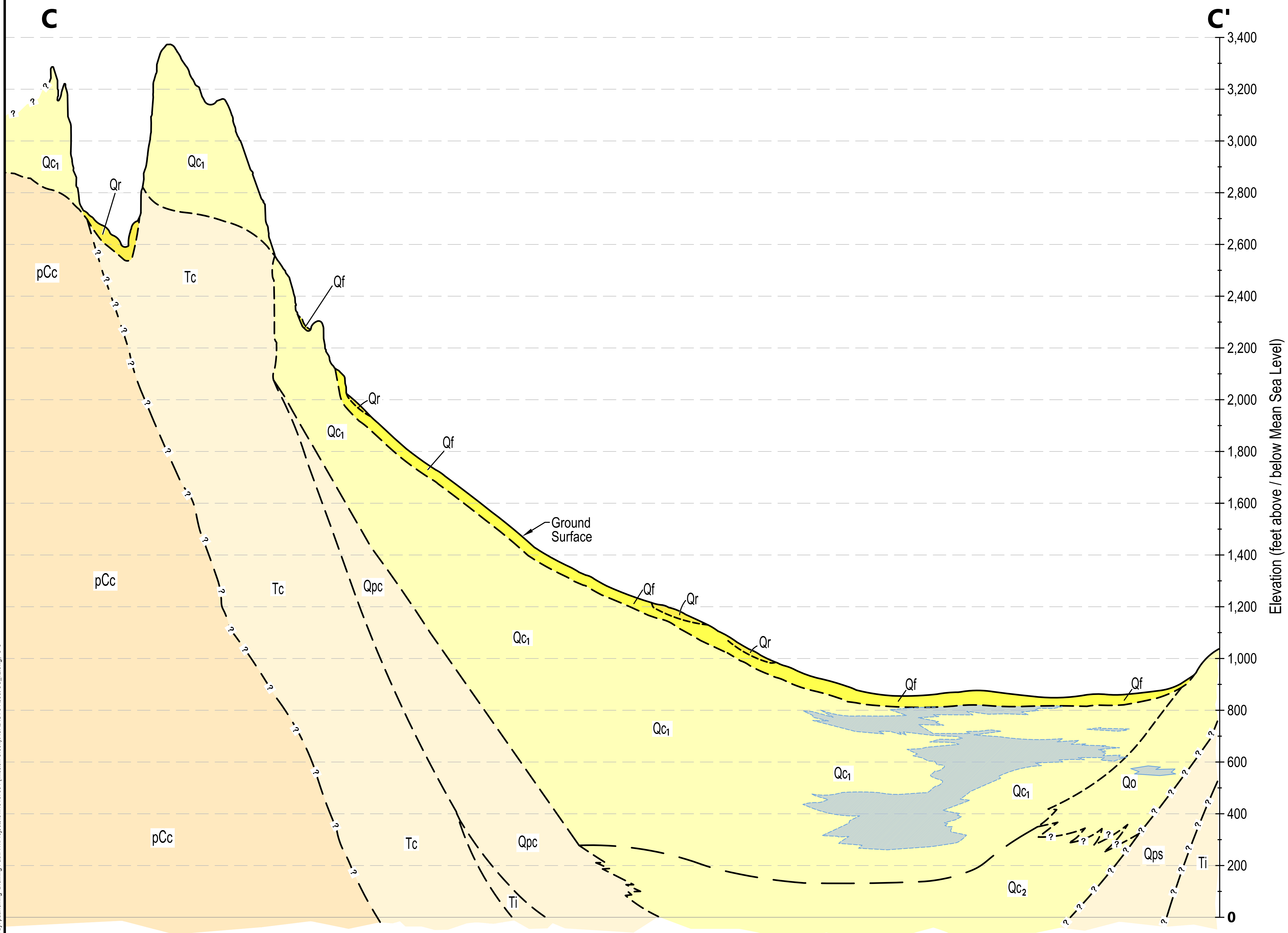
Approximate scale in feet

Basemap modified from a drawing by Geotechnical Consultants, Inc., dated October 1979.

Regional Cross Section A-A'

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: jrw	Date: 08/25/2021	Project No. CM19167351
wood.		Figure **A6a**



Explanation

Sedimentary Rocks

Water-Bearing Sediments

- **Qr** — Active channel deposits: boulders, gravel and sand of larger streams
- **Qf** — Alluvial fan and stream wash deposits: boulders, gravel, sand, and silt
- **Qc_1** — Cabezon Fanglomerate: boulder conglomerate with sand, silt, and clay
- **Qo** — Ocotillo Conglomerate: with sand and silt

Semi Water-Bearing Sediments

- **Qc_2** — Cabezon Fanglomerate
- **Qpc** — Painted Hill Formation: buff silty sandstone and conglomerate, includes interlayered basalt flows
- **Qps** — Palm Springs Formation: silty sandstone and conglomerate interbedded with basalt flows

Non Water-Bearing Sediments and Rock

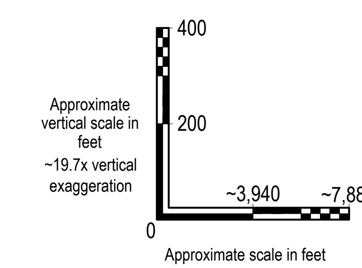
- **Tc** — Coachella Fanglomerate: varicolored, basal conglomerate and breccia, includes interlayered basalt flows
- **Ti** — Imperial Formation: shale and varicolored sandstone, siltstone, fossiliferous marine

Igneous and Metamorphic Rocks

- **pCc** — San Gorgonio-Chuckwalla Complex: undifferentiated complex of banded gneiss, schist, diorite, and andesite

? — Contact or mapped bed (dashed and querried where inferred)

Lower permeability sediments



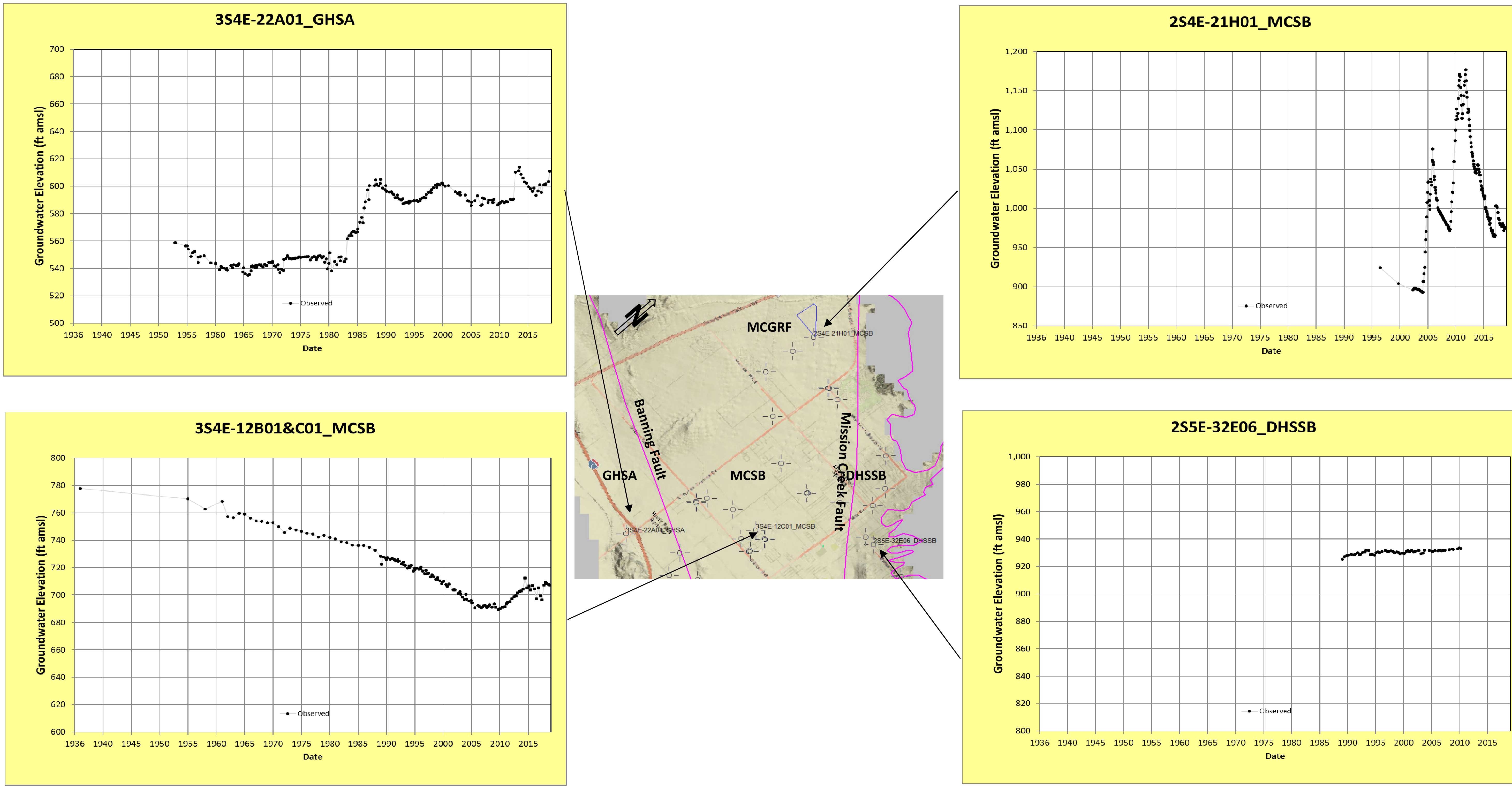
Basemap modified from a drawing by Geotechnical Consultants, Inc., dated October 1979.

Note:

All locations are approximate.

Regional Cross Section C-C'
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

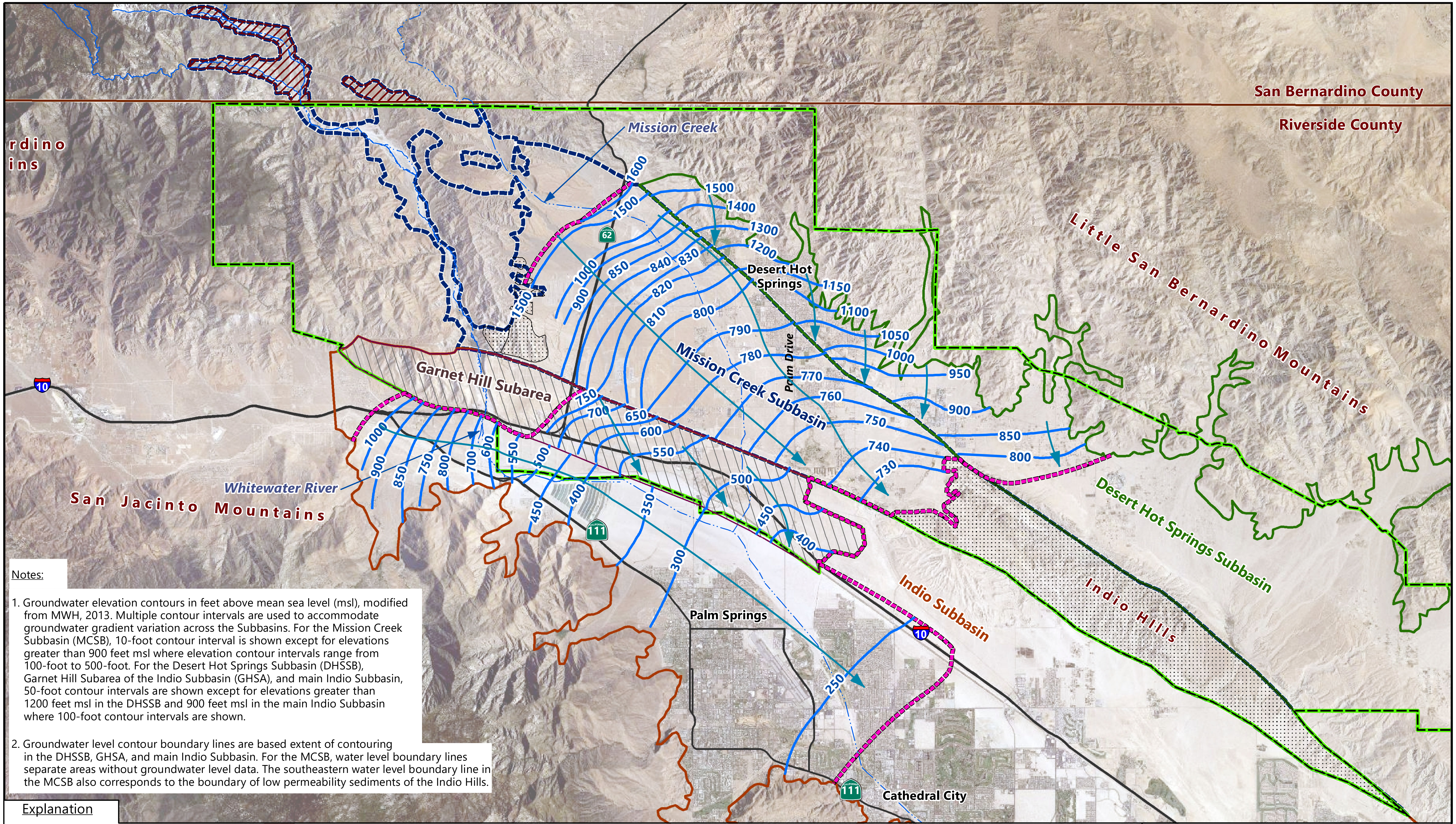
By: jrw	Date: 02/15/2021	Project No. CM19167351
wood.		Figure **A6b**



GHSA = Garnet Hill Subarea
MCSB = Mission Creek Subbasin
DHSSB = Desert Hot Springs Subbasin
MCGRF = Mission Creek Groundwater Replenishment Facility

Example Long-Term Hydrographs
Mission Creek Groundwater Model Update
Riverside County, California

By: dmb	Date: 08/24/2021	Project No.: CM19167351
wood.		Figure **A7**



Notes:

1. Groundwater elevation contours in feet above mean sea level (msl), modified from MWH, 2013. Multiple contour intervals are used to accommodate groundwater gradient variation across the Subbasins. For the Mission Creek Subbasin (MCSB), 10-foot contour interval is shown except for elevations greater than 900 feet msl where elevation contour intervals range from 100-foot to 500-foot. For the Desert Hot Springs Subbasin (DHSSB), Garnet Hill Subarea of the Indio Subbasin (GHSA), and main Indio Subbasin, 50-foot contour intervals are shown except for elevations greater than 1200 feet msl in the DHSSB and 900 feet msl in the main Indio Subbasin where 100-foot contour intervals are shown.

2. Groundwater level contour boundary lines are based extent of contouring in the DHSSB, GHSA, and main Indio Subbasin. For the MCSB, water level boundary lines separate areas without groundwater level data. The southeastern water level boundary line in the MCSB also corresponds to the boundary of low permeability sediments of the Indio Hills.

Date: 6/14/2021 Printed by: joanna.worker
Path: Y:\CM19167351 (Mission Creek Alternative Update)\Esri\Alternative Update_tb_GW_Cont_1936.mxd

Explanation

- Groundwater elevation contour (modified from MWH, 2013)
- Groundwater level contour boundary
- Groundwater flow direction
- Low permeability/non-water-bearing sediments/bedrock
- Highway/road
- Mission Creek Subbasin fringe area
- Garnet Hill Subarea of Indio Subbasin
- Planning Area
- Indio Subbasin
- Desert Hot Springs Subbasin
- Mission Creek Subbasin

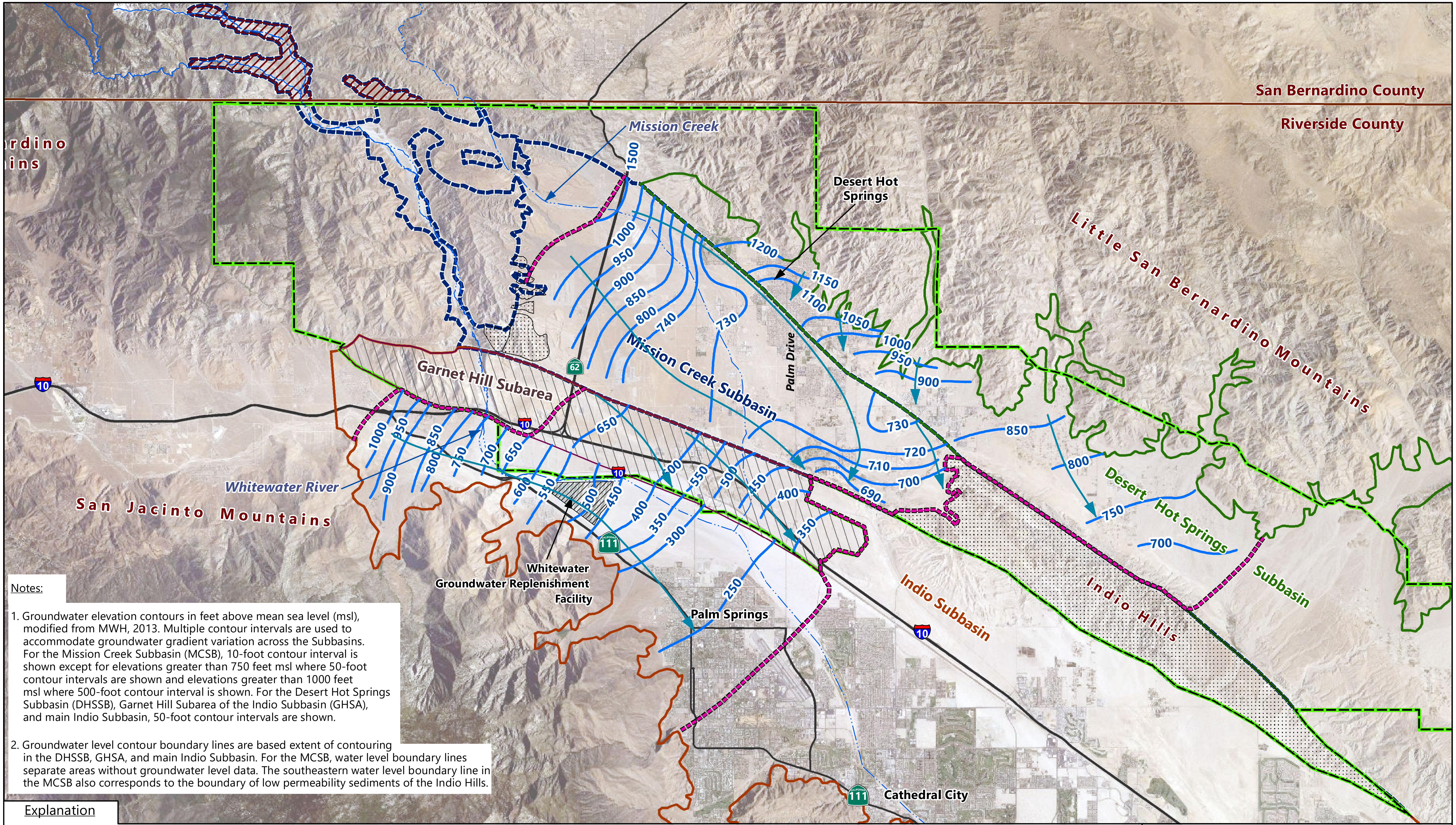
0 6,000 12,000
Approximate Scale in Feet

Basemap modified from aerial photograph provided by Esri, dated November 9, 2016. GSA areas from SGMA. Water.CA.gov.

GROUNDWATER ELEVATION CONTOURS 1936

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: jrw/pah	Date: 6/14/2021	Project No.: CM19167351
wood.	Figure	A8a



Notes:

1. Groundwater elevation contours in feet above mean sea level (msl), modified from MWH, 2013. Multiple contour intervals are used to accommodate groundwater gradient variation across the Subbasins. For the Mission Creek Subbasin (MCSB), 10-foot contour interval is shown except for elevations greater than 750 feet msl where 50-foot contour intervals are shown and elevations greater than 1000 feet msl where 500-foot contour interval is shown. For the Desert Hot Springs Subbasin (DHSSB), Garnet Hill Subarea of the Indio Subbasin (GHSA), and main Indio Subbasin, 50-foot contour intervals are shown.

2. Groundwater level contour boundary lines are based extent of contouring in the DHSSB, GHSA, and main Indio Subbasin. For the MCSB, water level boundary lines separate areas without groundwater level data. The southeastern water level boundary line in the MCSB also corresponds to the boundary of low permeability sediments of the Indio Hills.

Explanation

- Groundwater elevation contour (modified from MWH, 2013)
- Groundwater level contour boundary
- Groundwater flow direction
- Facility
- Low permeability/non-water-bearing sediments/bedrock
- Mission Creek Subbasin fringe area
- Garnet Hill Subarea of Indio Subbasin
- Planning Area
- Indio Subbasin
- Desert Hot Springs Subbasin
- Mission Creek Subbasin
- Highway/road

0 6,000 12,000
Approximate Scale in Feet

Basemap modified from aerial photograph provided by Esri, dated November 9, 2016. GSA areas from SGMA. Water.CA.gov.

GROUNDWATER ELEVATION CONTOURS 1992

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: jrw/pah	Date: 6/14/2021	Project No.: CM19167351
wood.	Figure	A8b

Date: 6/14/2021 Printed by: joanna.worker
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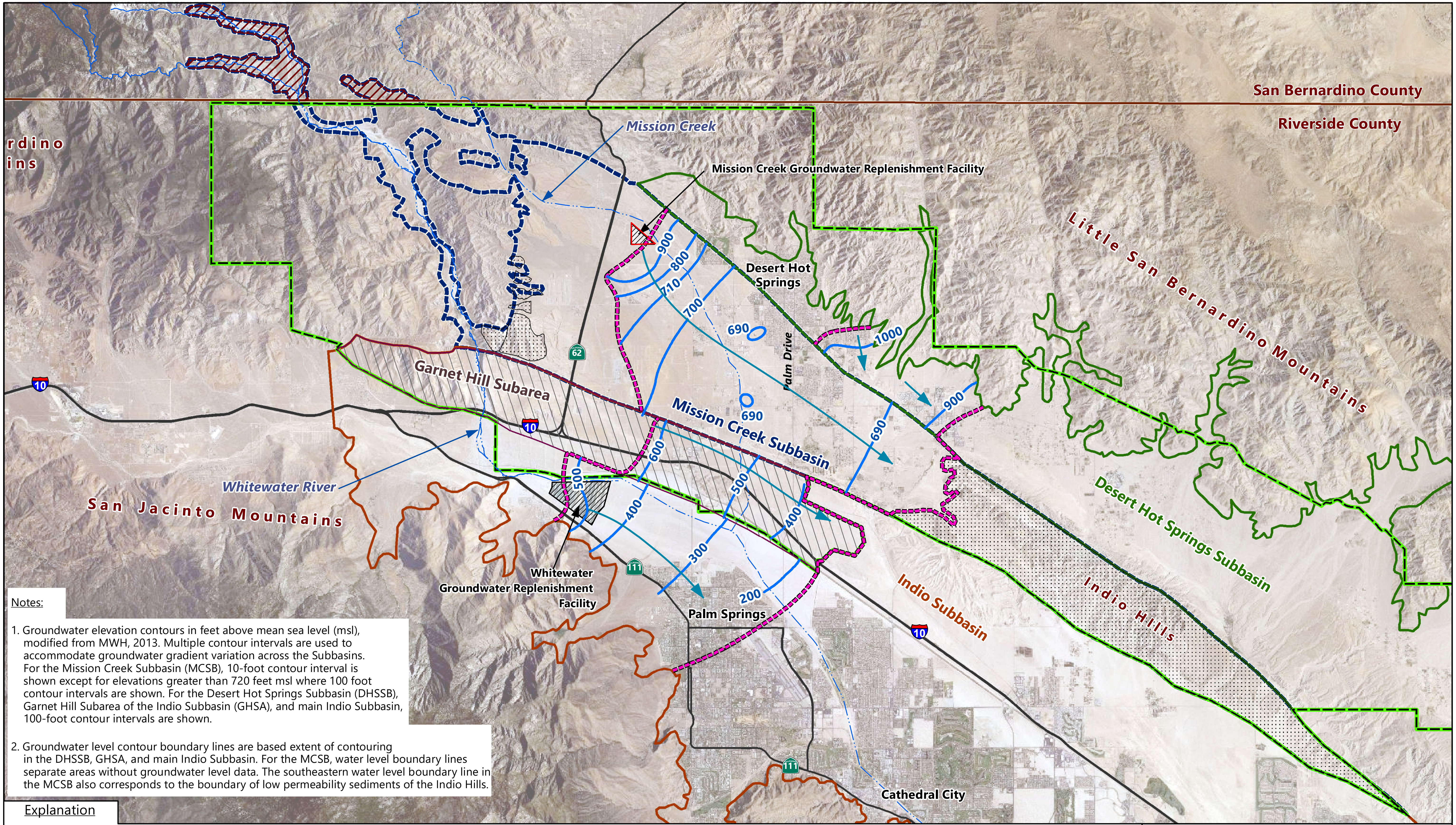


Notes:

1. Groundwater elevation contours in feet above mean sea level (msl), modified from MWH, 2013. Multiple contour intervals are used to accommodate groundwater gradient variation across the Subbasins. For the Mission Creek Subbasin (MCSB), 10-foot contour interval is shown except for elevations greater than 720 feet msl where 100 foot contour intervals are shown. For the Desert Hot Springs Subbasin (DHSSB), Garnet Hill Subarea of the Indio Subbasin (GHSA), and main Indio Subbasin, 100-foot contour intervals are shown.

2. Groundwater level contour boundary lines are based extent of contouring in the DHSSB, GHSA, and main Indio Subbasin. For the MCSB, water level boundary lines separate areas without groundwater level data. The southeastern water level boundary line in the MCSB also corresponds to the boundary of low permeability sediments of the Indio Hills.

Explanation

- Groundwater elevation contour (modified from MWH, 2013)
- Groundwater level contour boundary
- Groundwater flow direction
- Facility
- Low permeability/non-water-bearing sediments/bedrock
- Mission Creek Subbasin fringe area
- Garnet Hill Subarea of Indio Subbasin
- Planning Area
- Indio Subbasin
- Desert Hot Springs Subbasin
- Mission Creek Subbasin
- Highway/road

0 6,000 12,000
Approximate Scale in Feet

Basemap modified from aerial photograph provided by Esri, dated November 9, 2016. GSA areas from SGMA. Water.CA.gov.

N

GROUNDWATER ELEVATION CONTOURS 2009

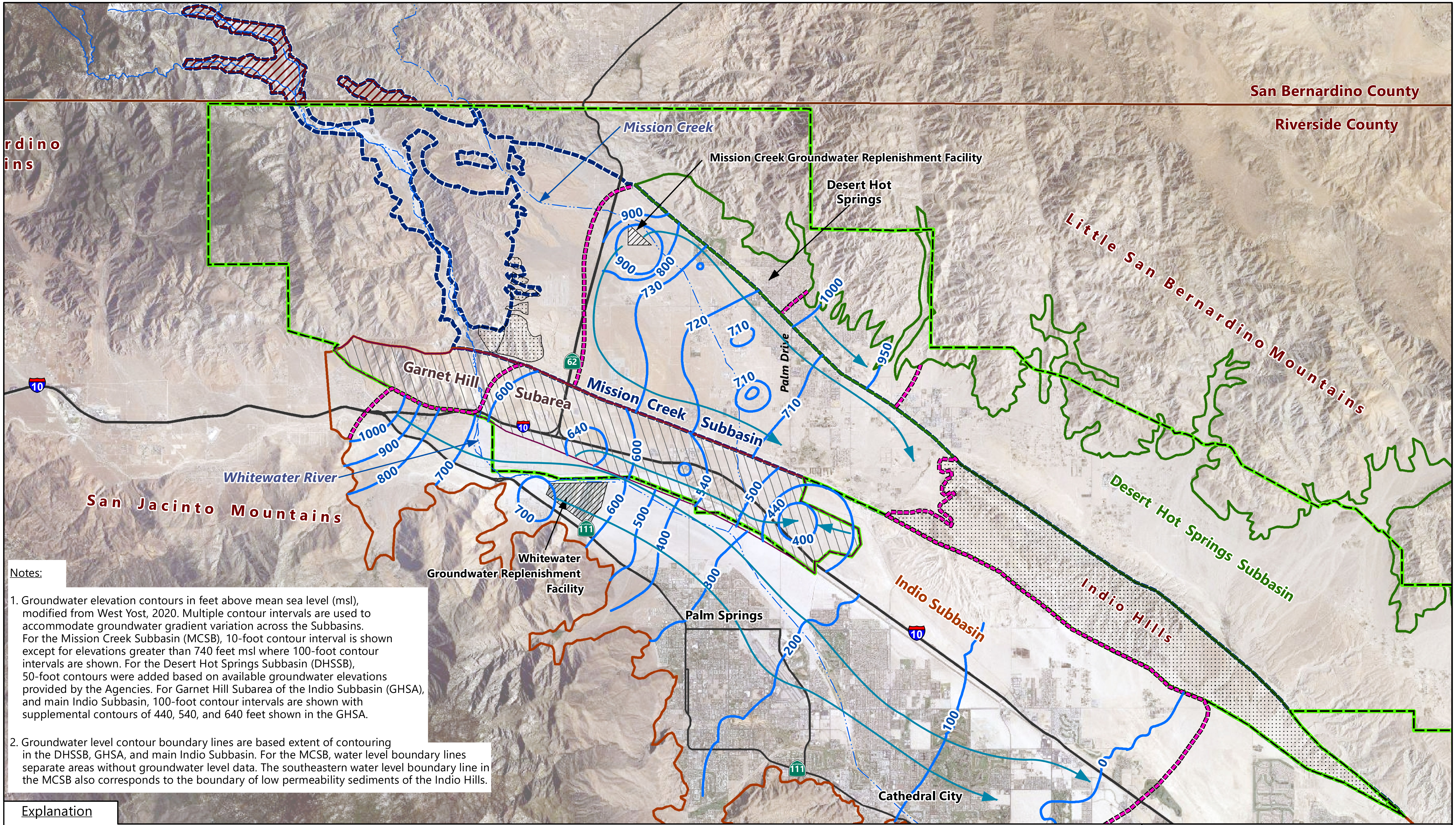
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: jrw/pah | Date: 6/14/2021 | Project No.: CM19167351

wood.

Figure A8c

Date: 6/14/2021 Printed by: joanna.worker
Path: Y:\CM19167351 (Mission Creek Alternative)\Esri\Alternative Update_tb_GW_Cont_2009.mxd



Notes:

1. Groundwater elevation contours in feet above mean sea level (msl), modified from West Yost, 2020. Multiple contour intervals are used to accommodate groundwater gradient variation across the Subbasins. For the Mission Creek Subbasin (MCSB), 10-foot contour interval is shown except for elevations greater than 740 feet msl where 100-foot contour intervals are shown. For the Desert Hot Springs Subbasin (DHSSB), 50-foot contours were added based on available groundwater elevations provided by the Agencies. For Garnet Hill Subarea of the Indio Subbasin (GHSA), and main Indio Subbasin, 100-foot contour intervals are shown with supplemental contours of 440, 540, and 640 feet shown in the GHSA.

2. Groundwater level contour boundary lines are based extent of contouring in the DHSSB, GHSA, and main Indio Subbasin. For the MCSB, water level boundary lines separate areas without groundwater level data. The southeastern water level boundary line in the MCSB also corresponds to the boundary of low permeability sediments of the Indio Hills.

Explanation

- Groundwater elevation contour (modified from West Yost, 2020)
- Groundwater flow direction
- Groundwater level contour boundary
- Facility
- Low permeability/non-water-bearing sediments/bedrock
- Mission Creek Subbasin fringe area
- Garnet Hill Subarea of Indio Subbasin
- Planning Area
- Indio Subbasin
- Desert Hot Springs Subbasin
- Mission Creek Subbasin
- Highway/road

0 6,000 12,000
Approximate Scale in Feet

Basemap modified from aerial photograph provided by Esri, dated November 9, 2016. GSA areas from SGMA. Water.CA.gov.

GROUNDWATER ELEVATION CONTOURS 2019

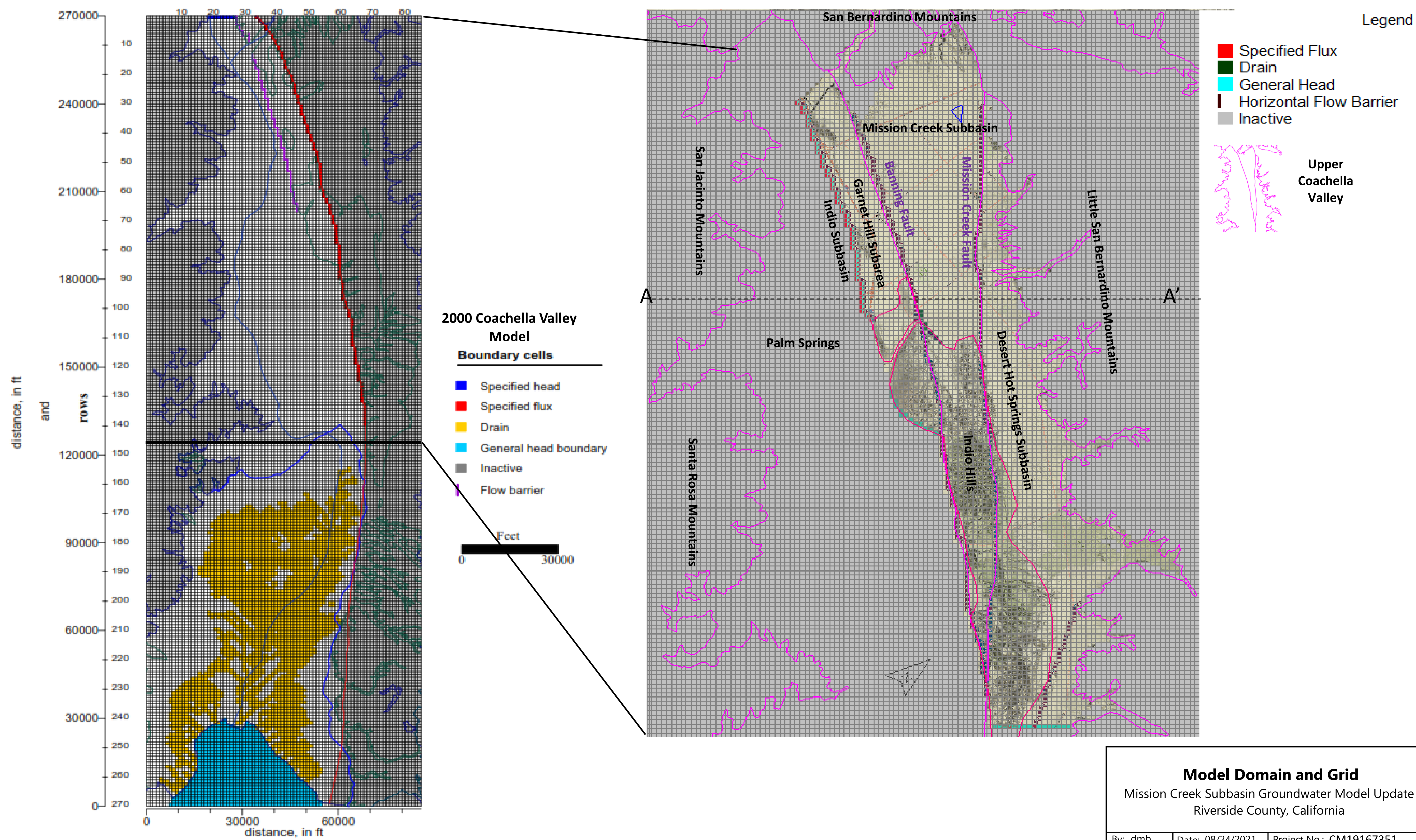
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: jrw/pah | Date: 6/11/2021 | Project No.: CM19167351

wood.

Figure A8d

Date: 6/11/2021 Printed by: joanna.worker
Path: Y:\CM19167351 (Mission Creek Alternate)\Esri\Alternative Update_tb_GW_Cont_2019.mxd



Modified from Fogg, 2000

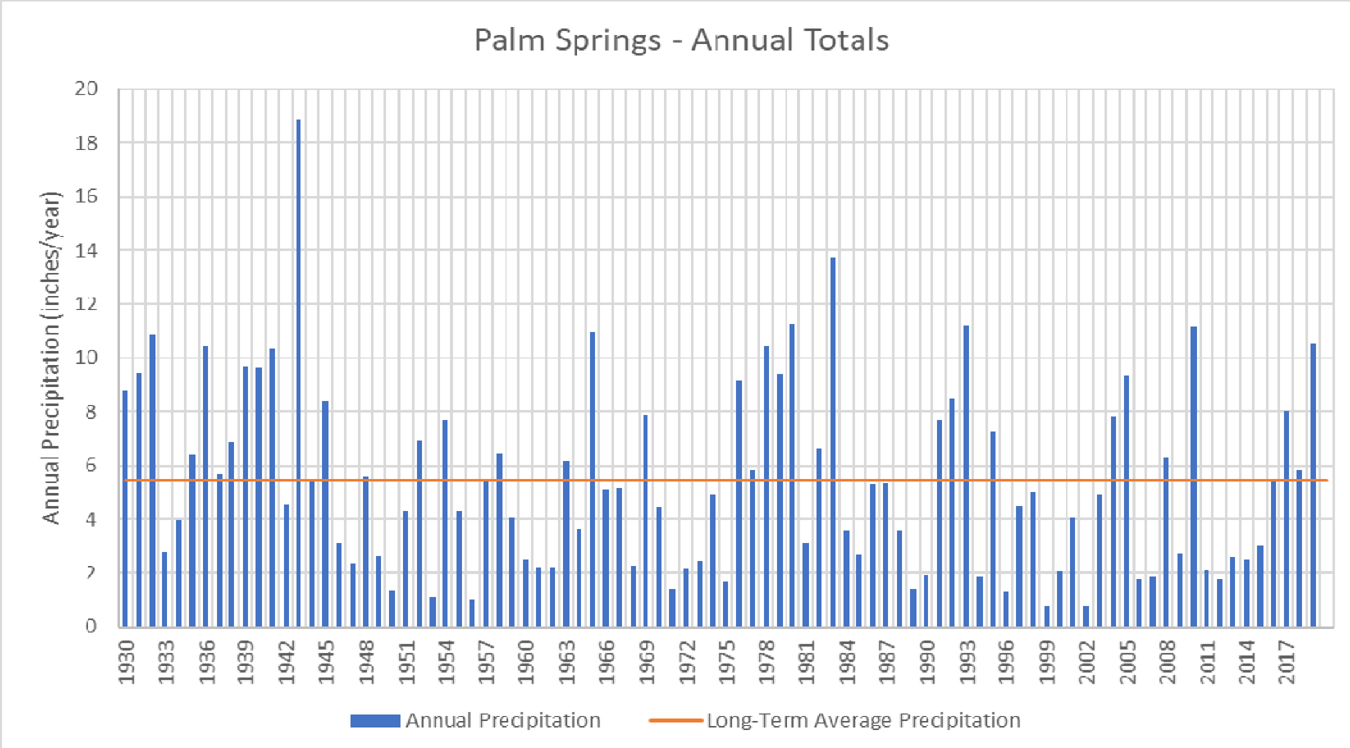
Model Domain and Grid

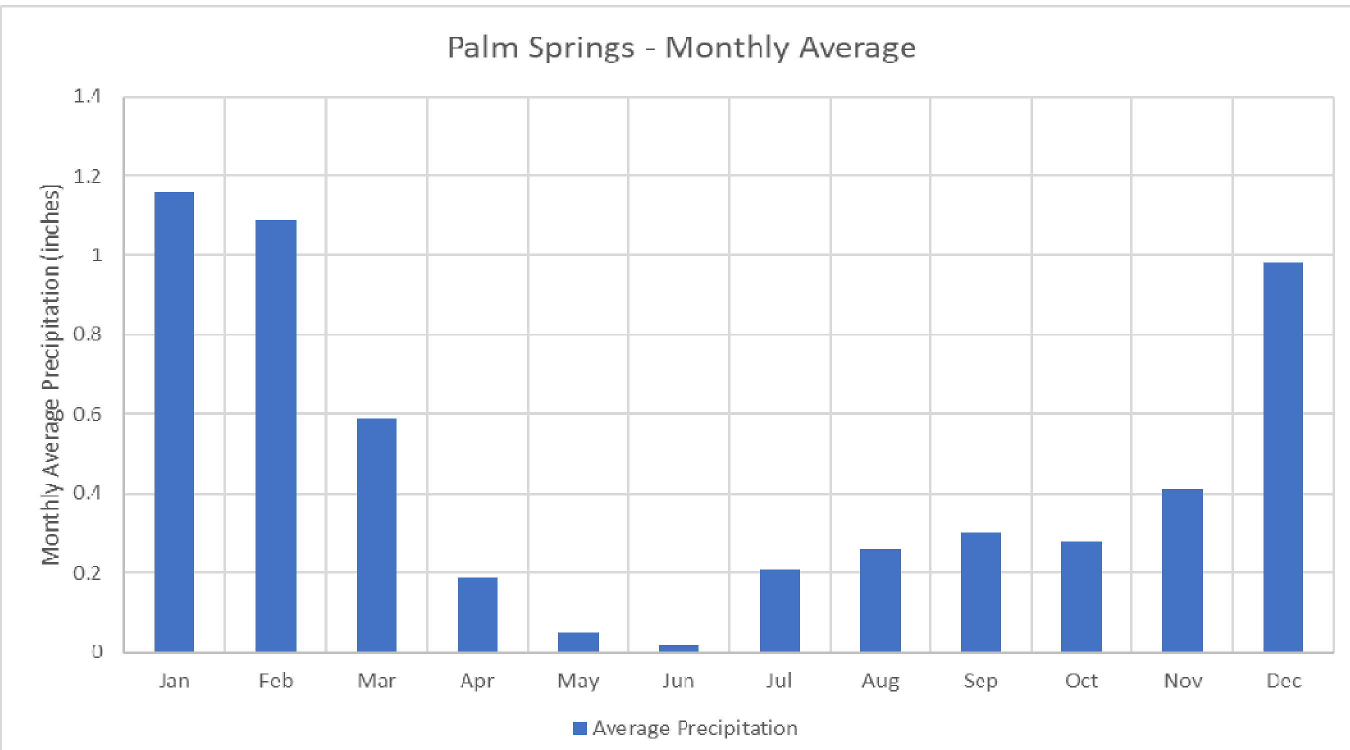
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb | Date: 08/24/2021 | Project No.: CM19167351

wood.

Figure A9



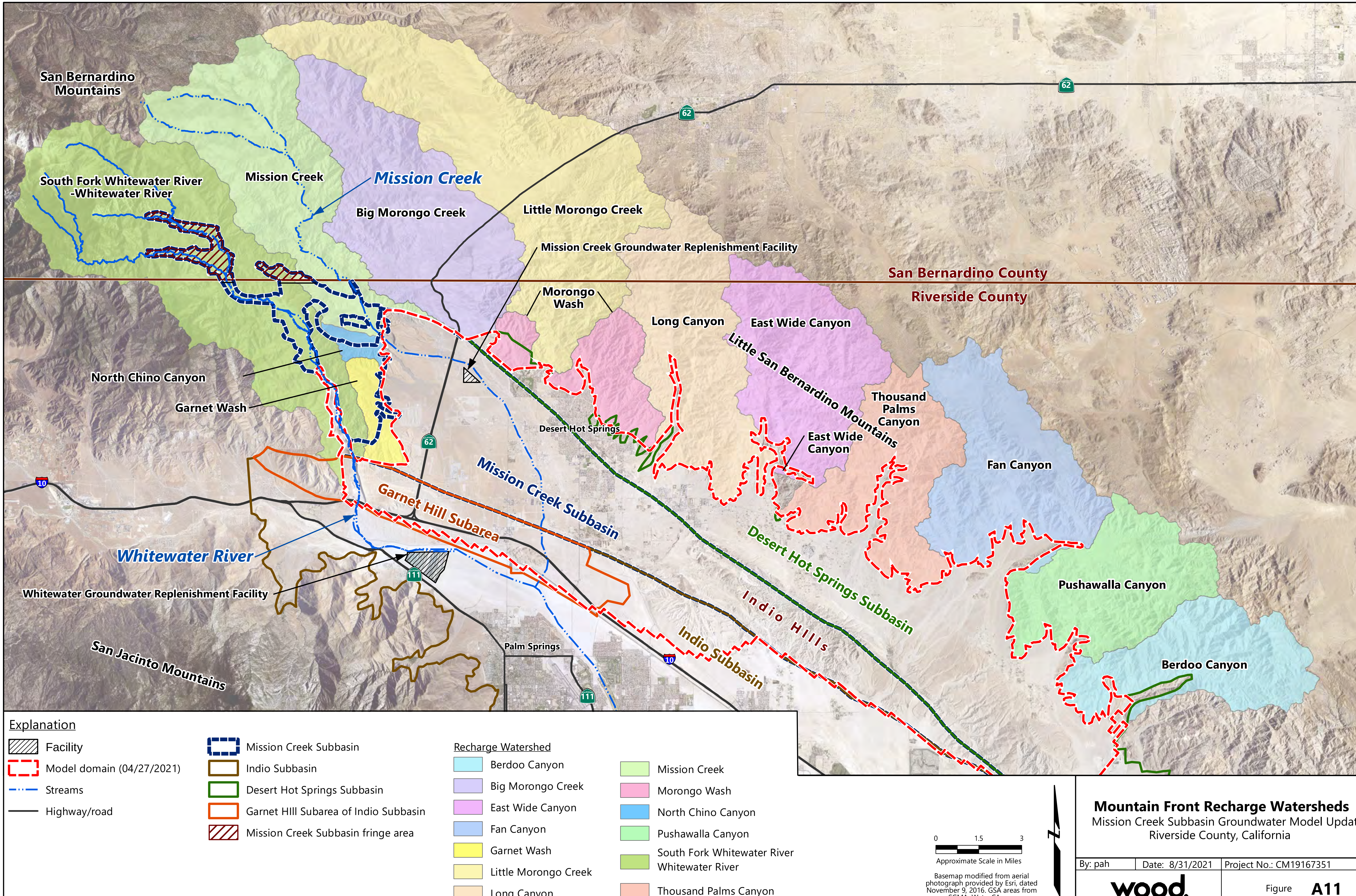


Precipitation recorded at Palm Springs International Airport (Station: 046635)
https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca6635

Historical Precipitation at Palm Springs International Airport

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 08/24/2021	Project No.: CM19167351
wood.		Figure **A10**



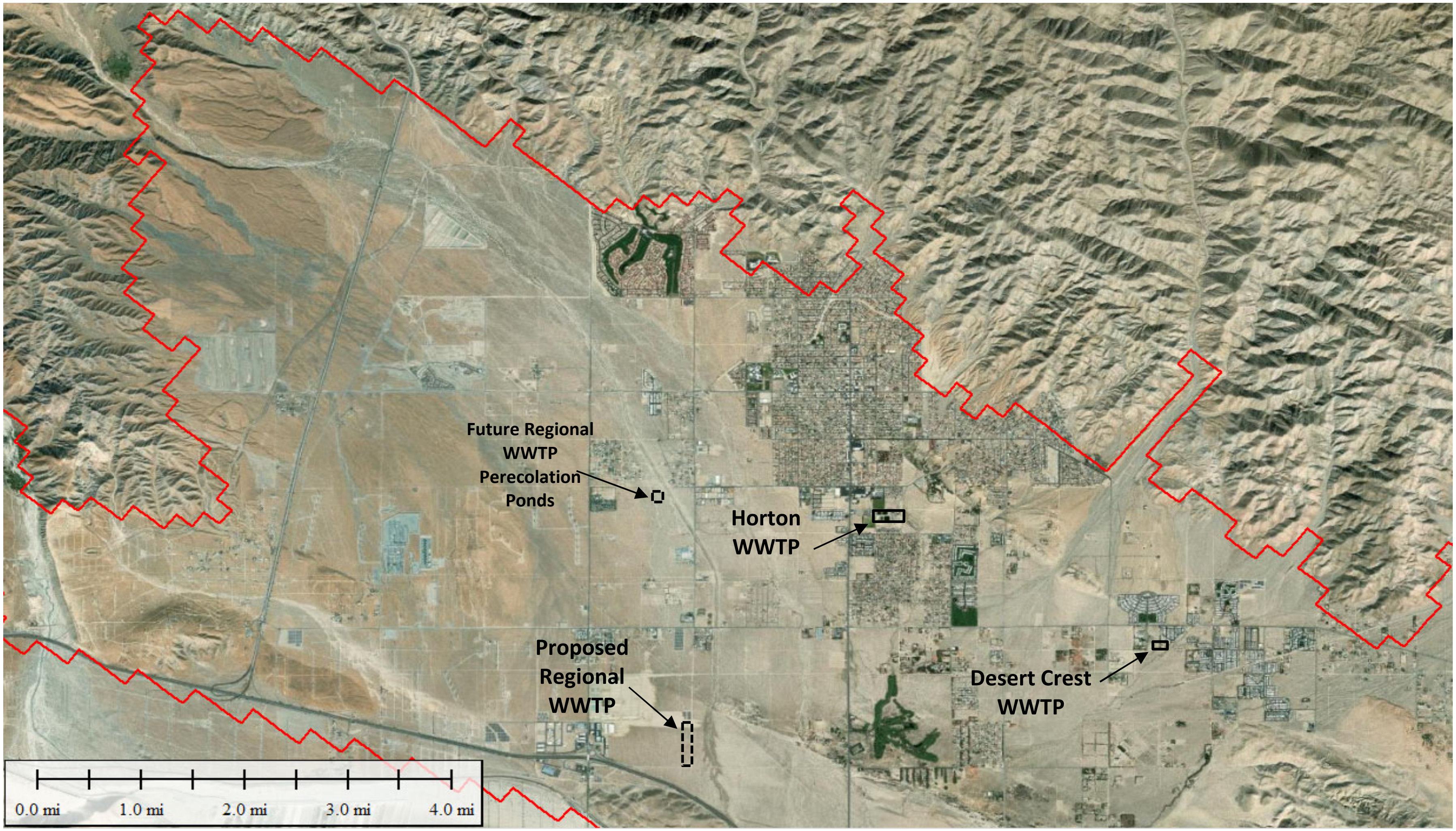
Mountain Front Recharge Watersheds
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: pah | Date: 8/31/2021 | Project No.: CM19167351

wood.

Figure A11

Date: 8/31/2021 Printed by: pat.herring
Path: Y:\CM19167351 (Mission Creek Alternate)\Esri\Alternative Update_tb_Recharge_Watershed.mxd



Note: WWTP = Wastewater Treatment Plant

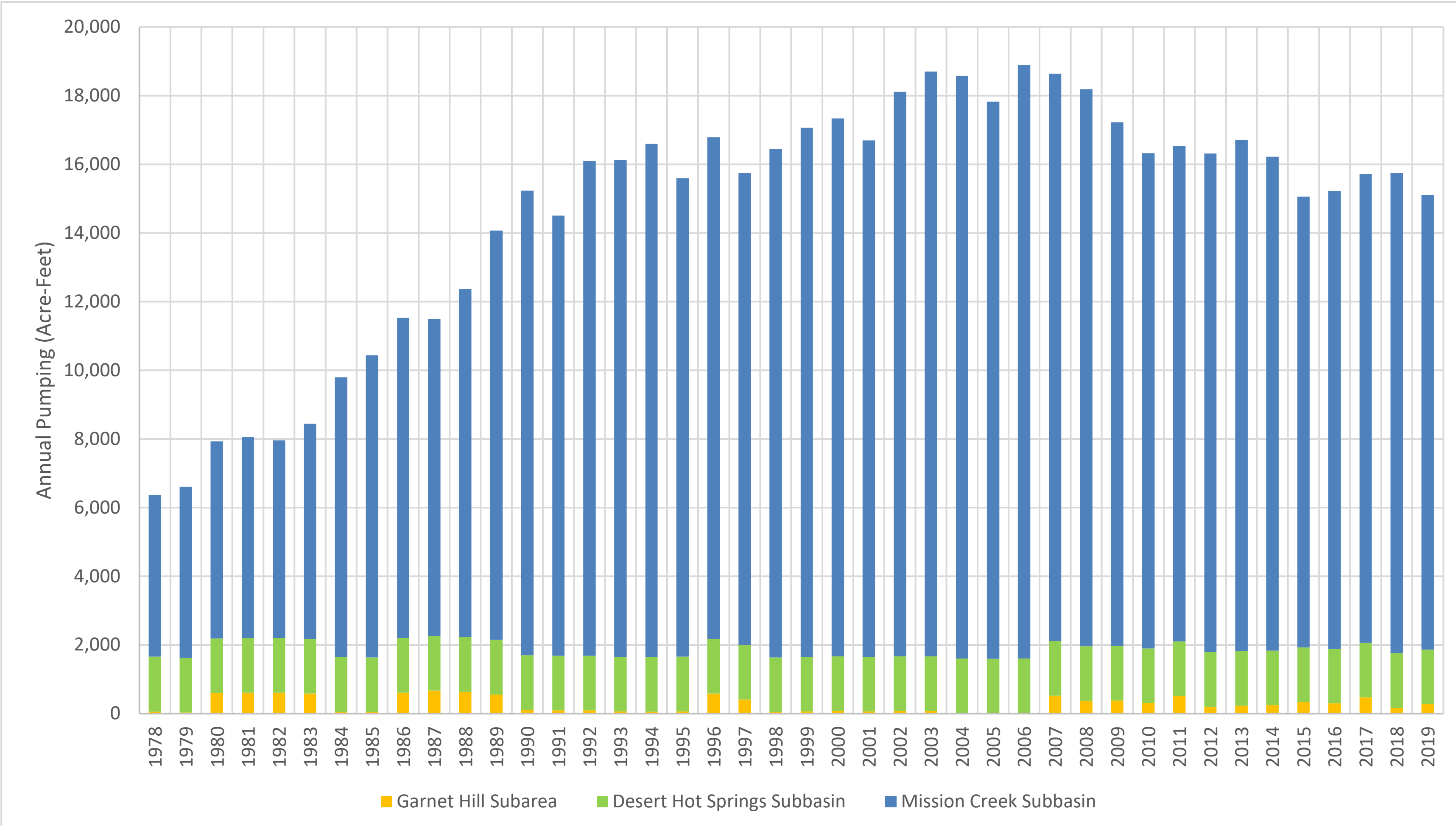
Active Model Domain

Wastewater Treatment Plant Locations

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

By: dmb	Date: 08/24/2021	Project No.: CM19167351
wood.	Figure	A12



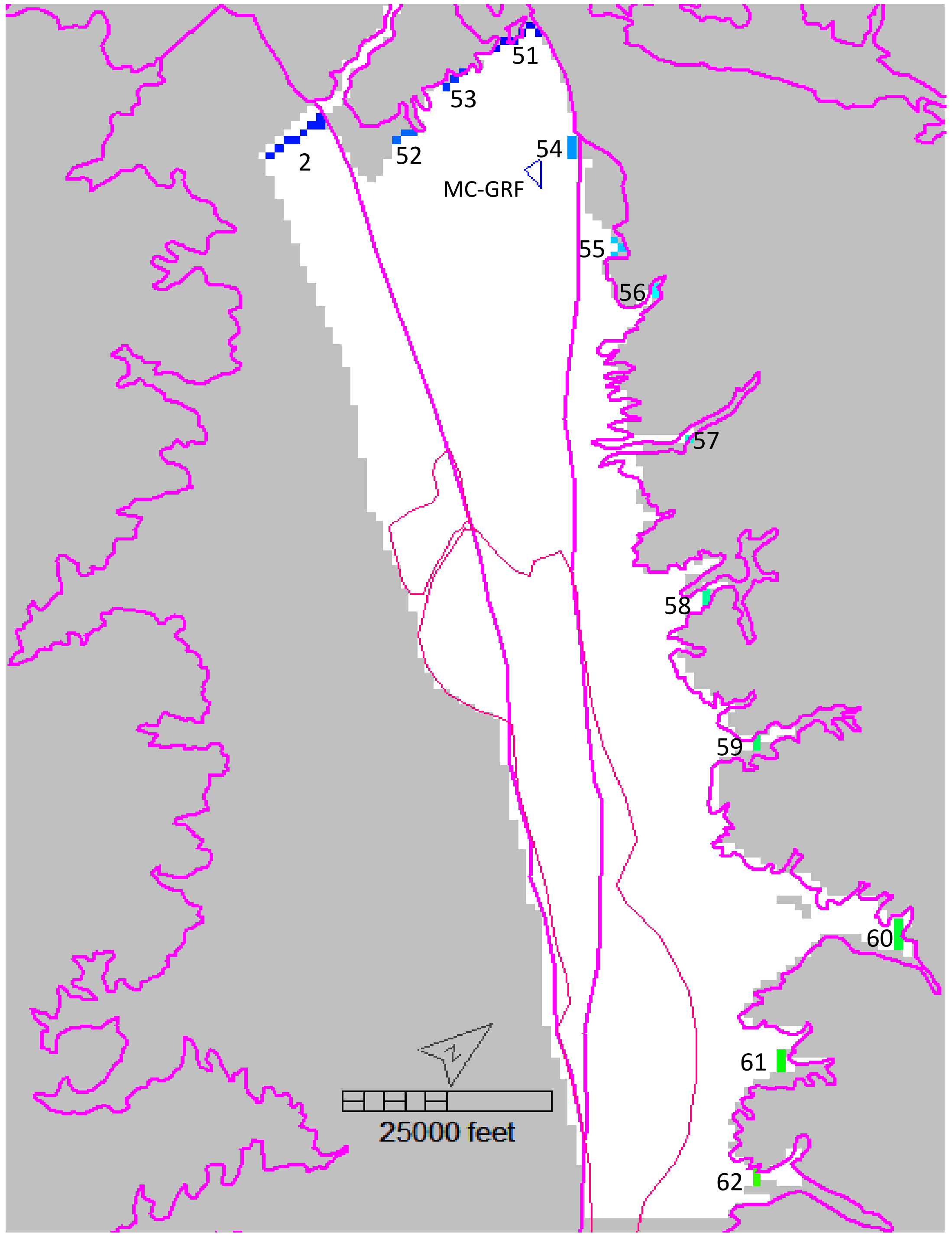
Note: Pumping records compiled from various sources including Fogg, 2000, PSOMAS, 2010, and Agency records

Annual Pumping By Subbasin/Subarea

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

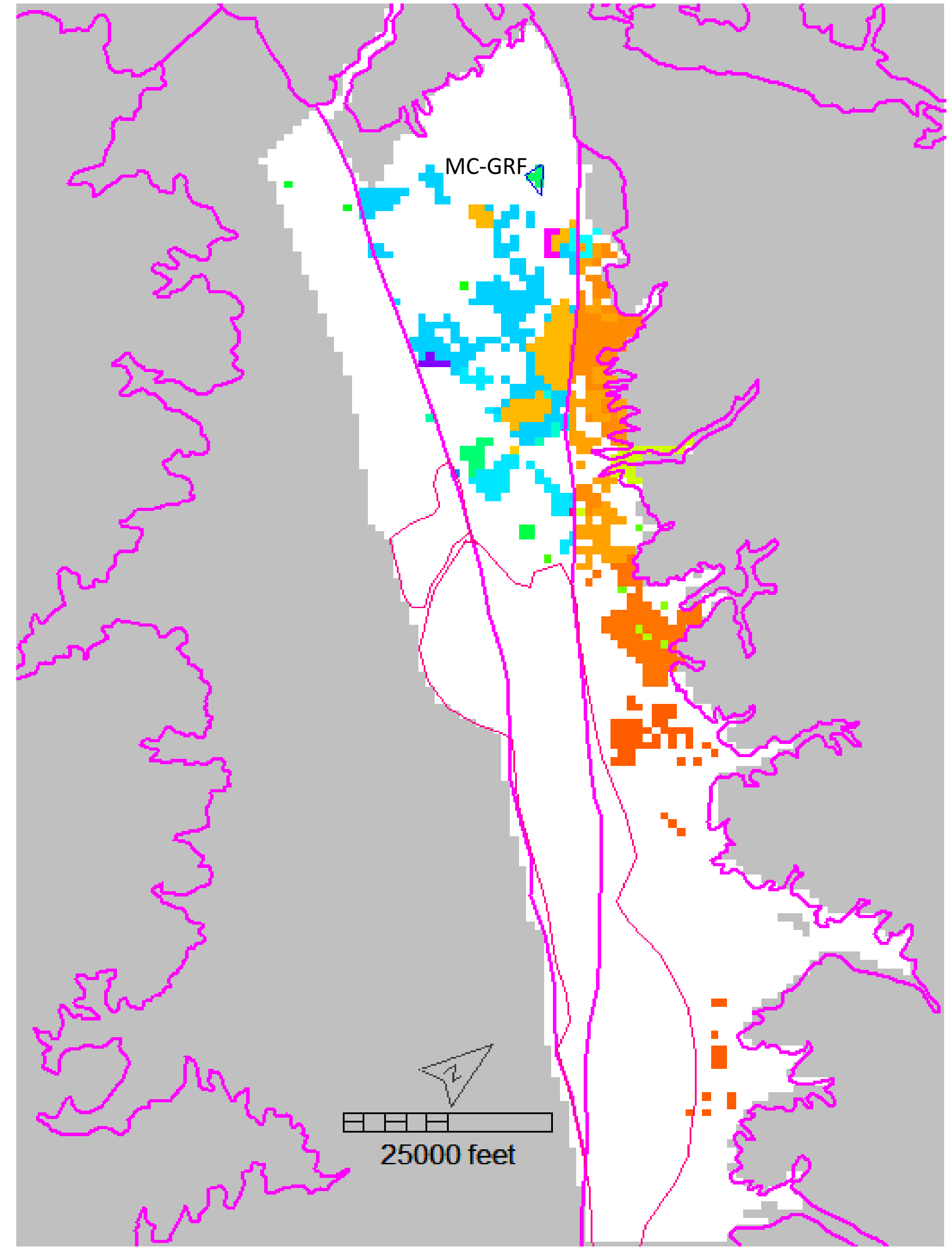
By: dmb	Date: 08/24/2021	Project No.: CM19167351
wood.		Figure **A13**



Legend

Mountian Front Recharge

Zone	
1	No RCH
2	Whitewater
51	Mission Creek
52	Chino Canyon
53	Garnet Wash
54	Big Morongo
55	Little Morongo
56	Morongo Wash
57	Long Cnayon
58	East Wide Canyon
59	Thousand Palm
60	Fan Canyon
61	Pushawalla
62	Berdoo Canyon



Legend

Recharge

Zone	Value
1	0.000e+00
7	6.392e-04
10	8.950e-04
11	7.210e-04
12	2.716e-03
13	0.246
14	6.810e-03
15	1.240e-02
16	2.510e-03
18	2.504e-03
19	0.166
20	0.000e+00
21	0.000e+00
22	0.000e+00
24	0.000e+00
26	1.004e-03
27	0.000e+00
28	0.000e+00
29	0.000e+00
30	0.000e+00
31	0.000e+00
32	0.000e+00
33	1.910e-03
35	5.950e-03
36	5.497e-03
37	4.748e-04
38	4.068e-04
39	9.481e-04
40	5.545e-04
41	1.557e-04
42	1.040e-03
43	3.460e-04

Notes: MC-GRF - Mission Creek Groundwater Relenishment Facility
Location of Return Flow areas derived from Agency records and historical aerial photographs
Return Flow and Mountain Front Recharge values are in feet per day (ft/d)
Not all Recharge zones are active in image shown

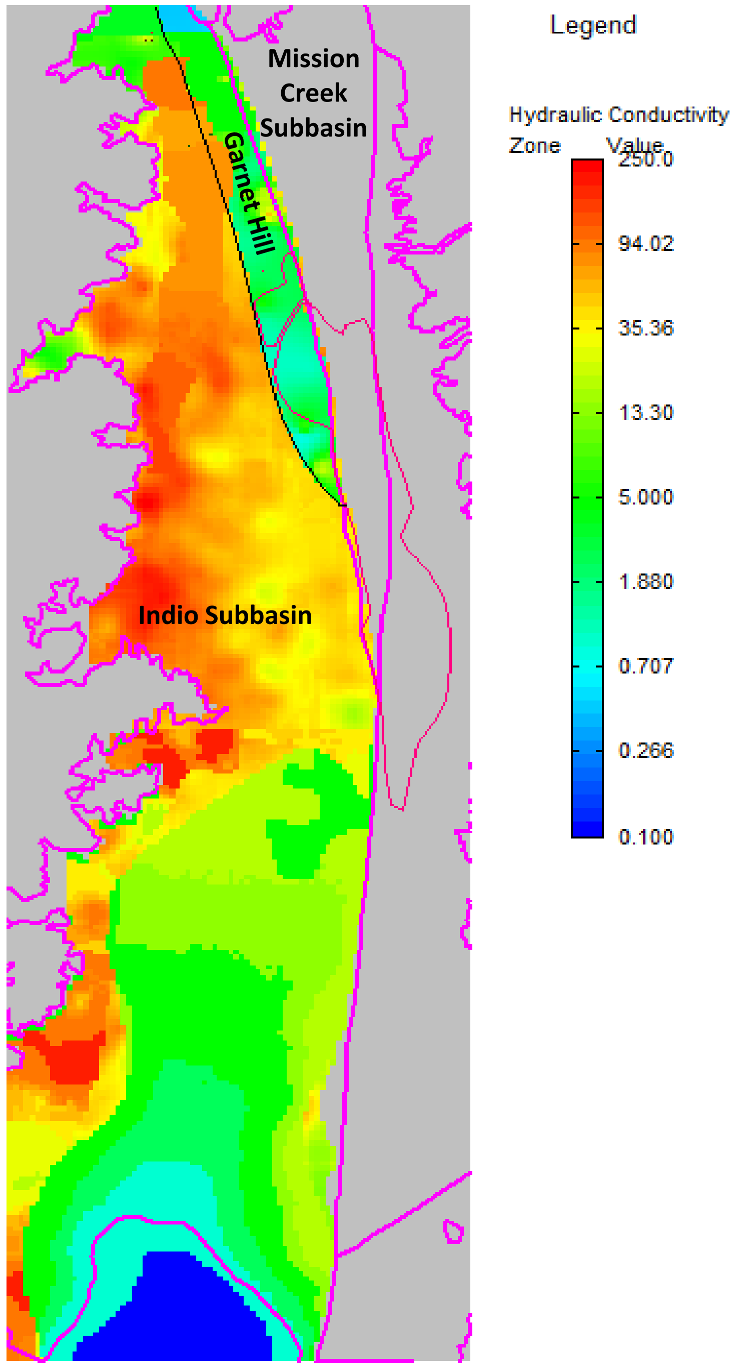
Mountain Front Recharge and Return Flow Zones

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

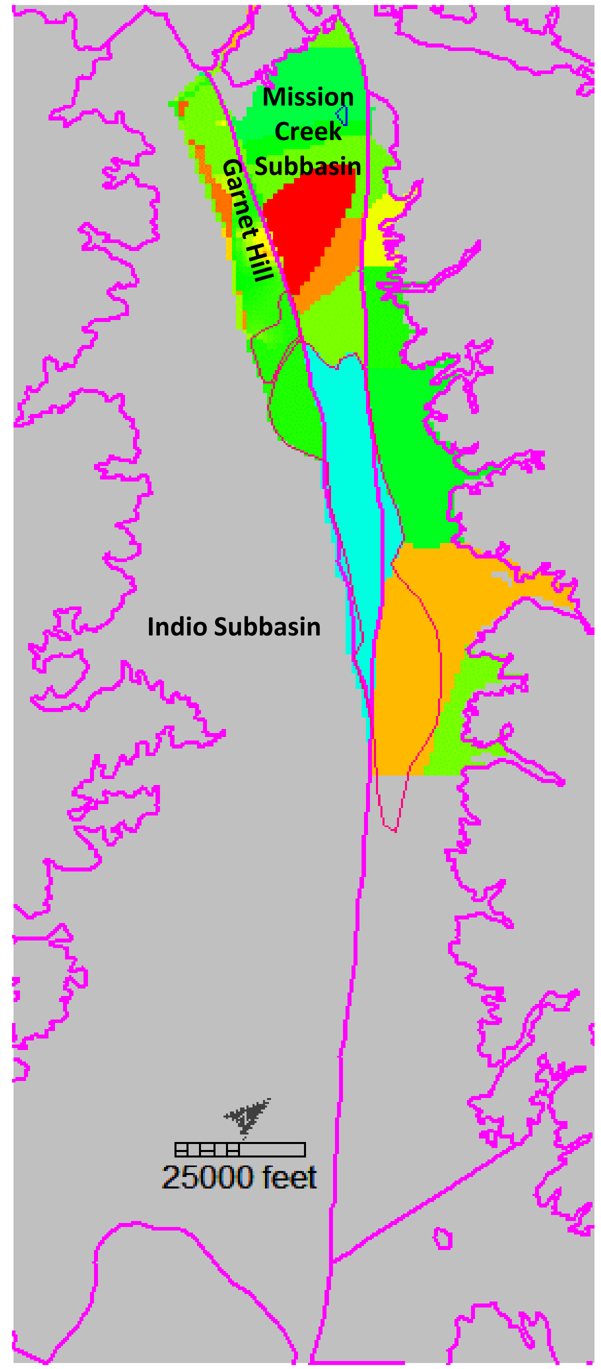
By: dmb | Date: 08/24/2021 | Project No.: CM19167351

wood.

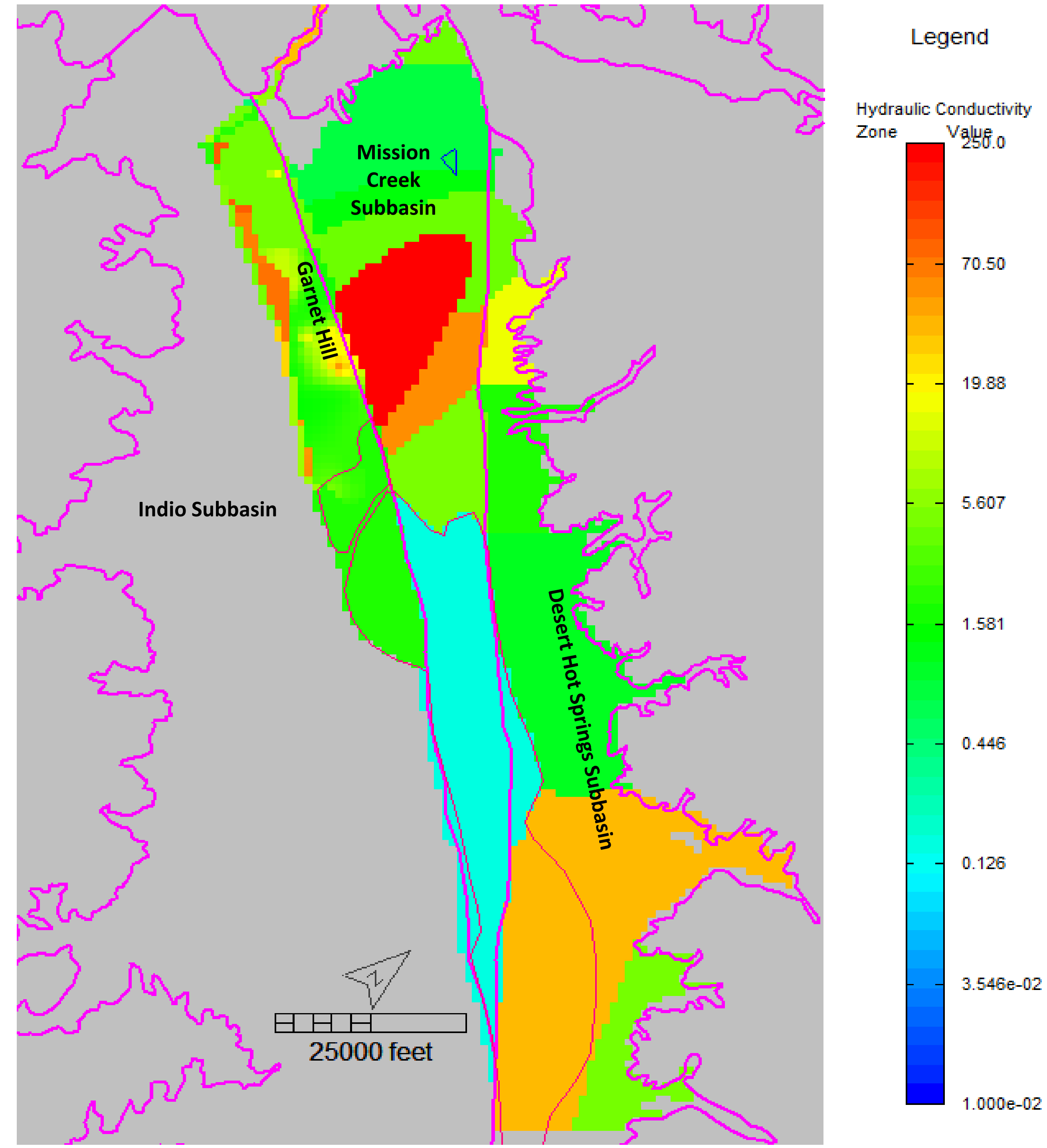
Figure A14



INDIO SUBBASIN MODEL



MISSION CREEK SUBBASIN MODEL

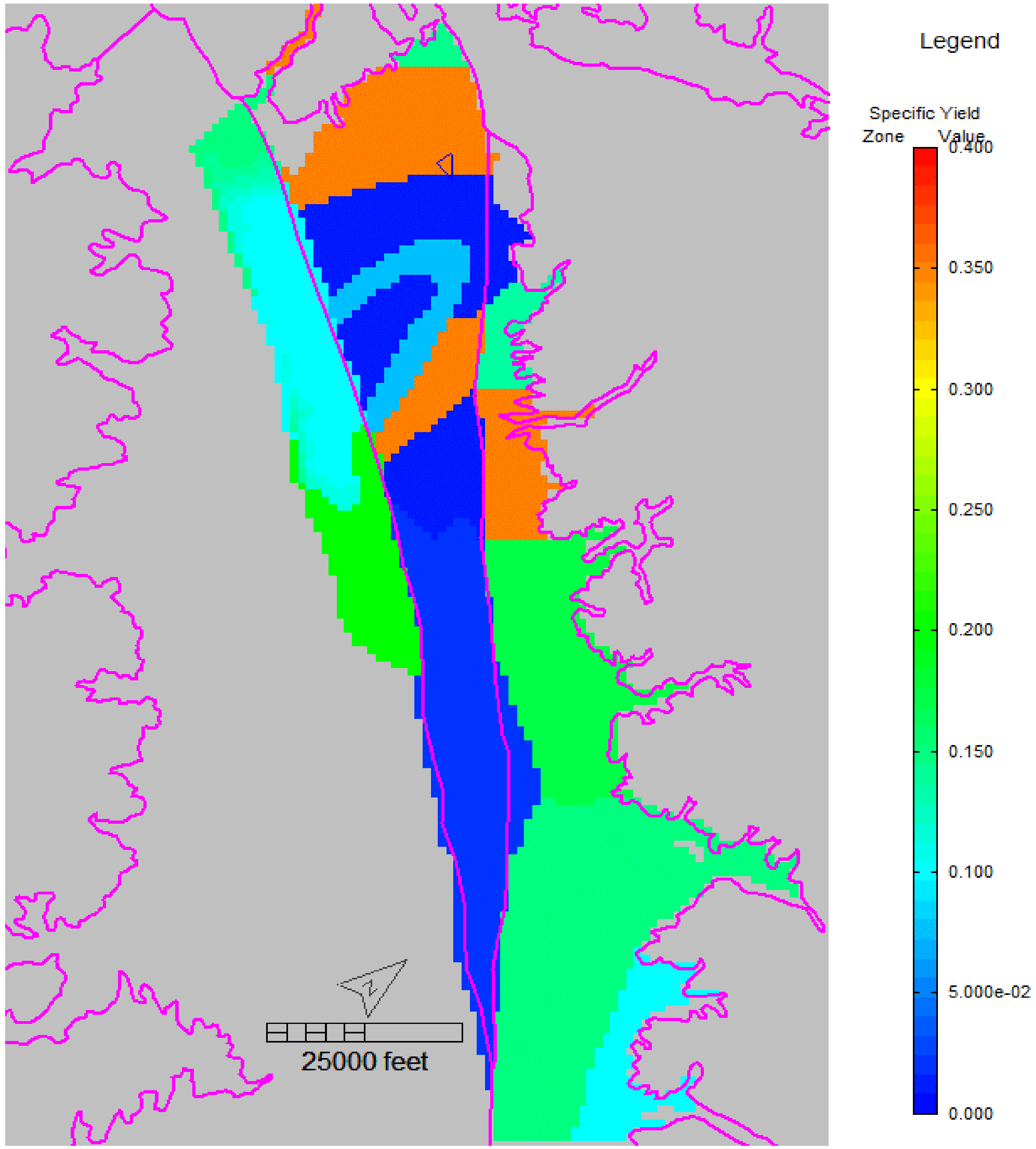


MISSION CREEK SUBBASIN MODEL

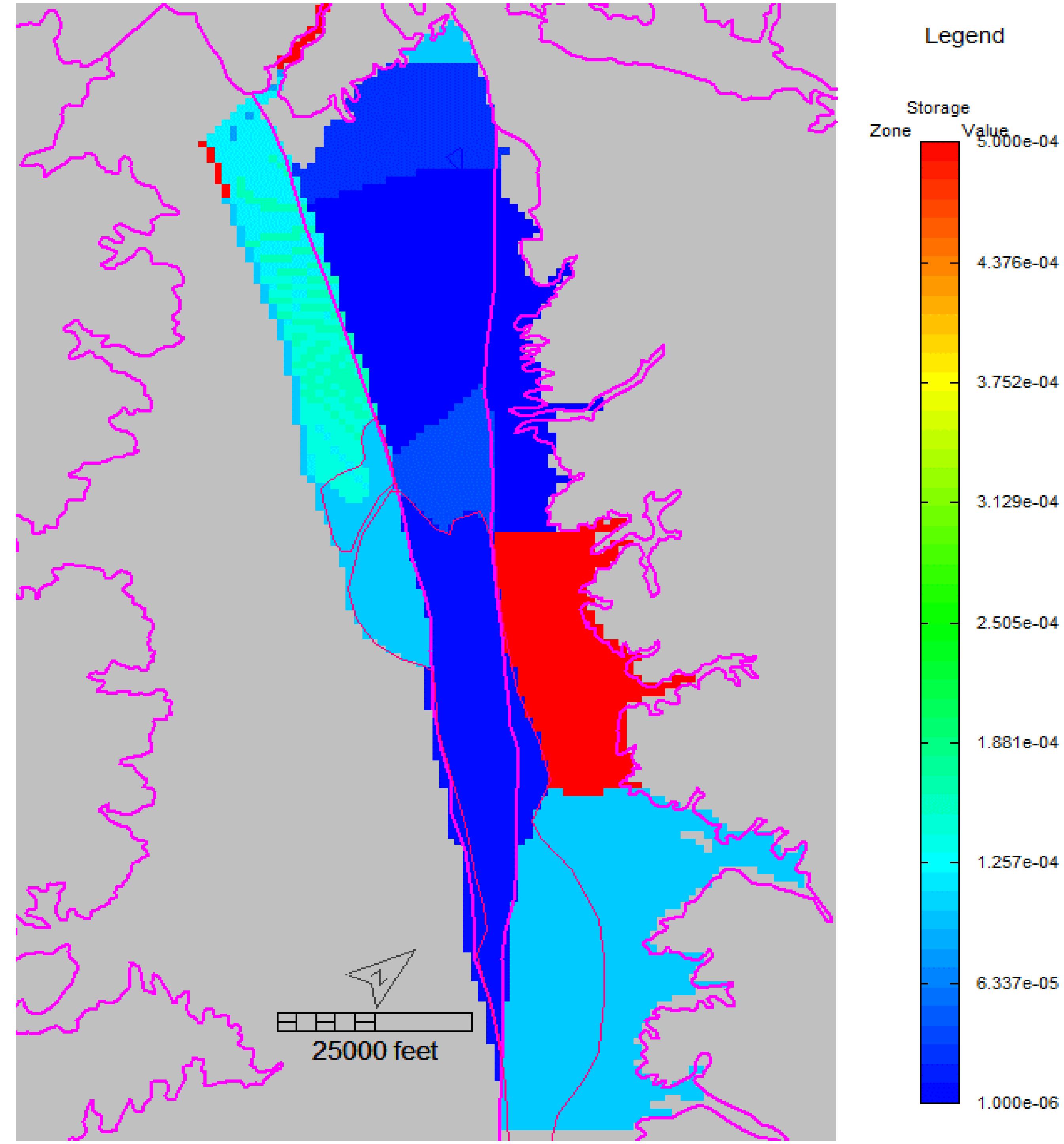
Horizontal Hydraulic Conductivity Distribution

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 08/24/2021	Project No.: CM19167351
wood.		Figure A15



Specific Yield



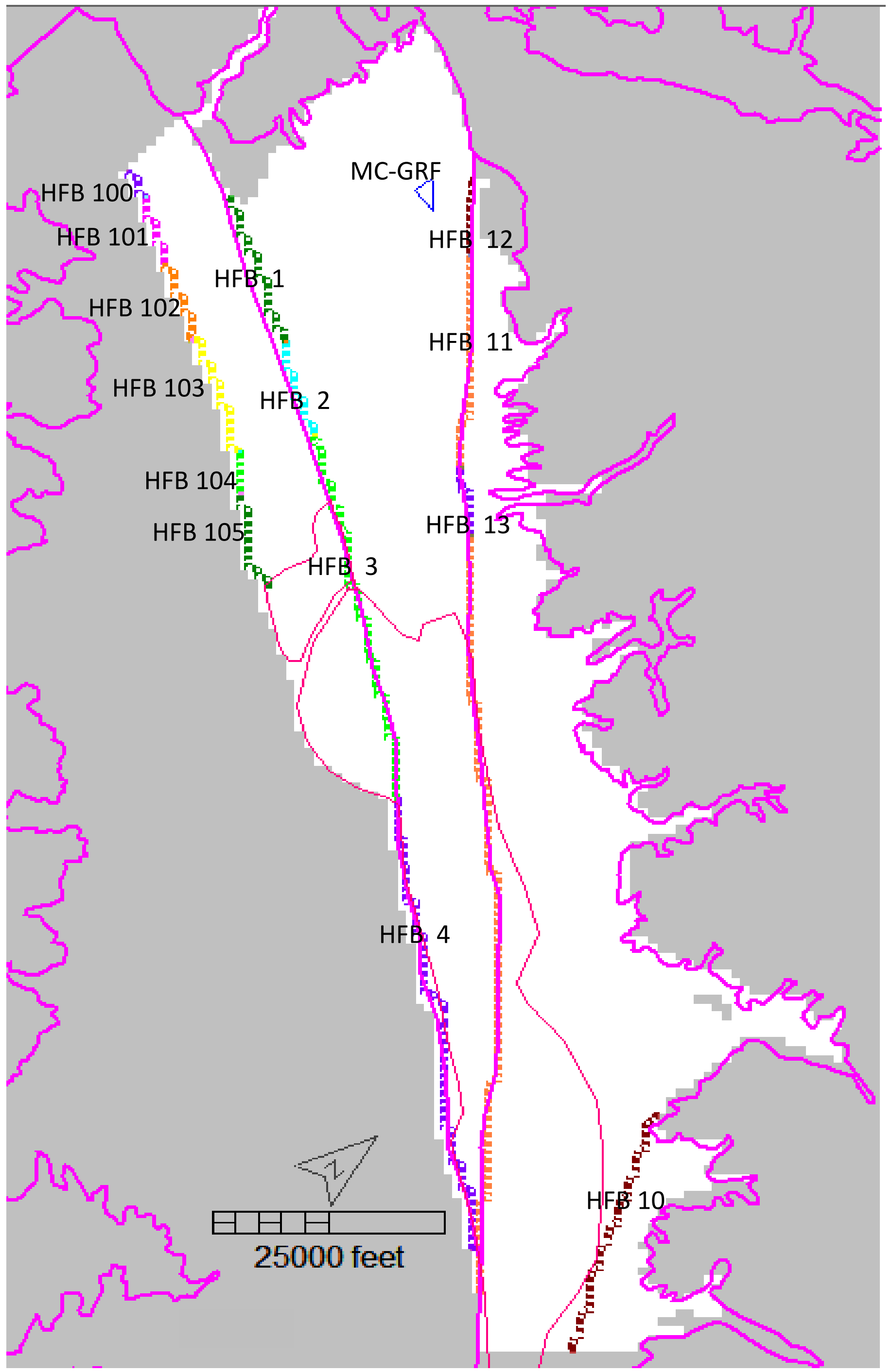
Specific Storage

Note: Specific Yield values are in percent
Specific Storage values are unitless
Distribution modified from PSOMAS, 2013

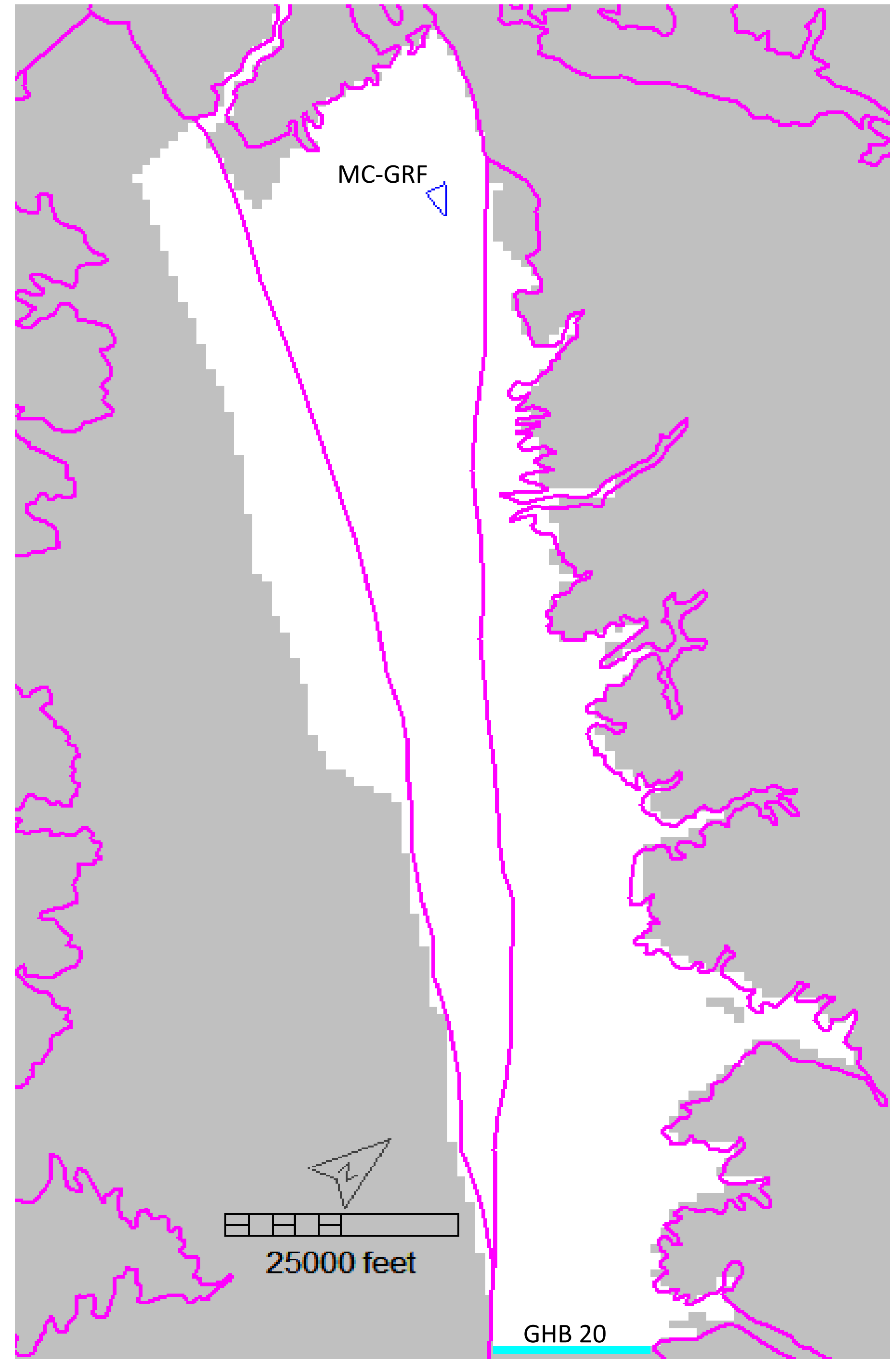
Specific Yield and Specific Storage Distributions

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

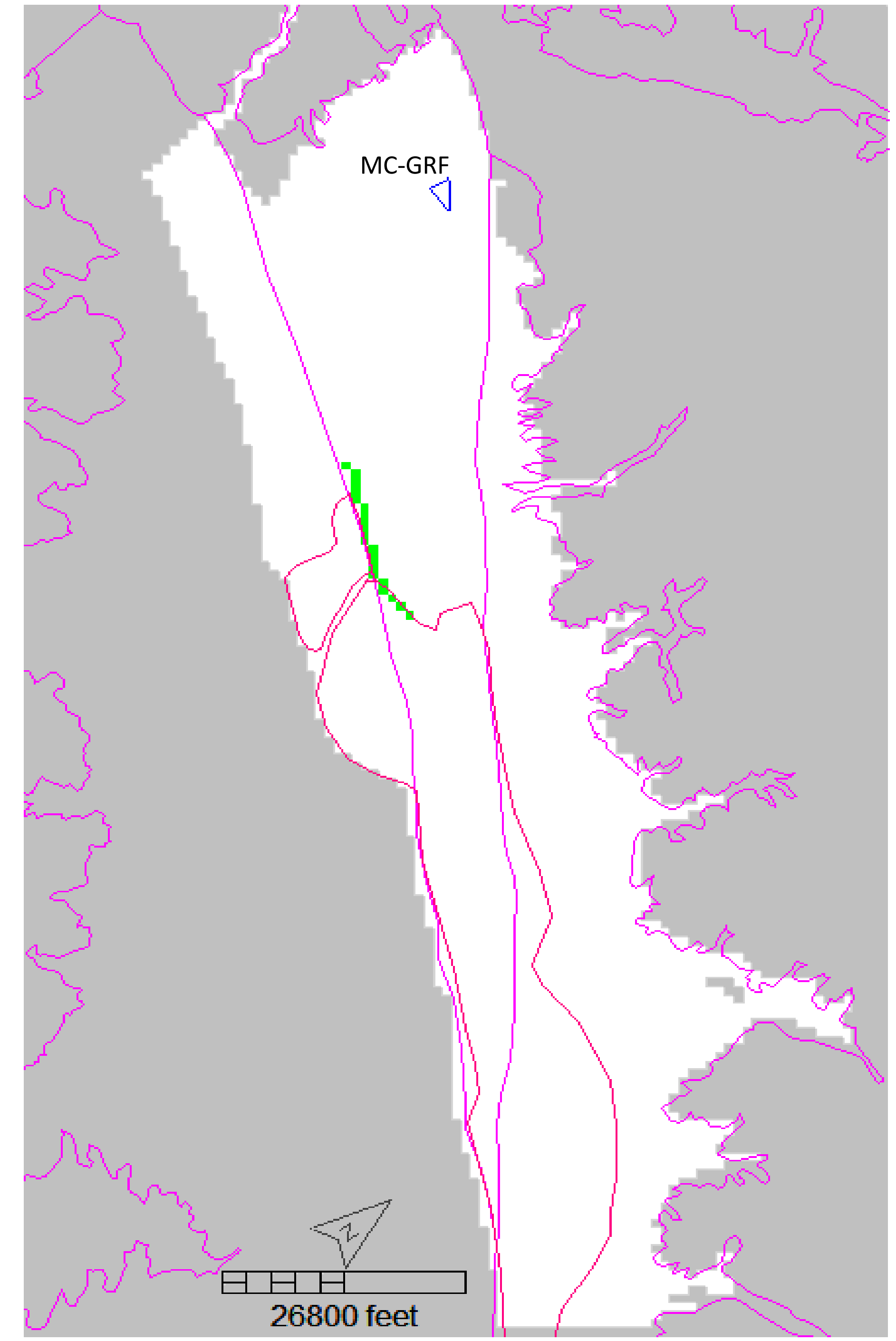
By: dmb	Date: 08/24/2021	Project No.: CM19167351
wood.	Figure	A16



Horizontal Flow Boundaries (Fault Zones)



General Head Boundaries



Evapotranspiration

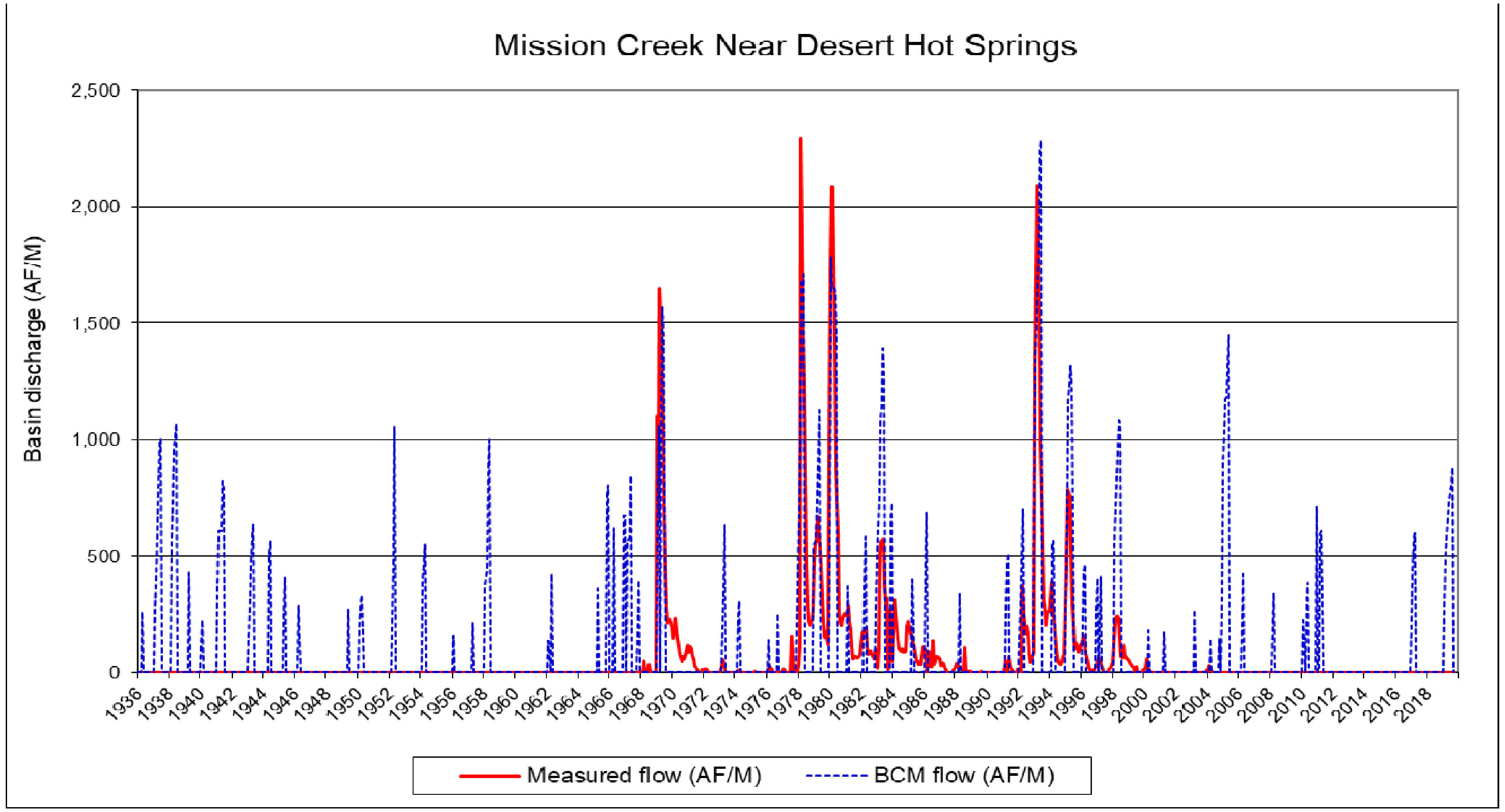
MODFLOW Boundary Conditions

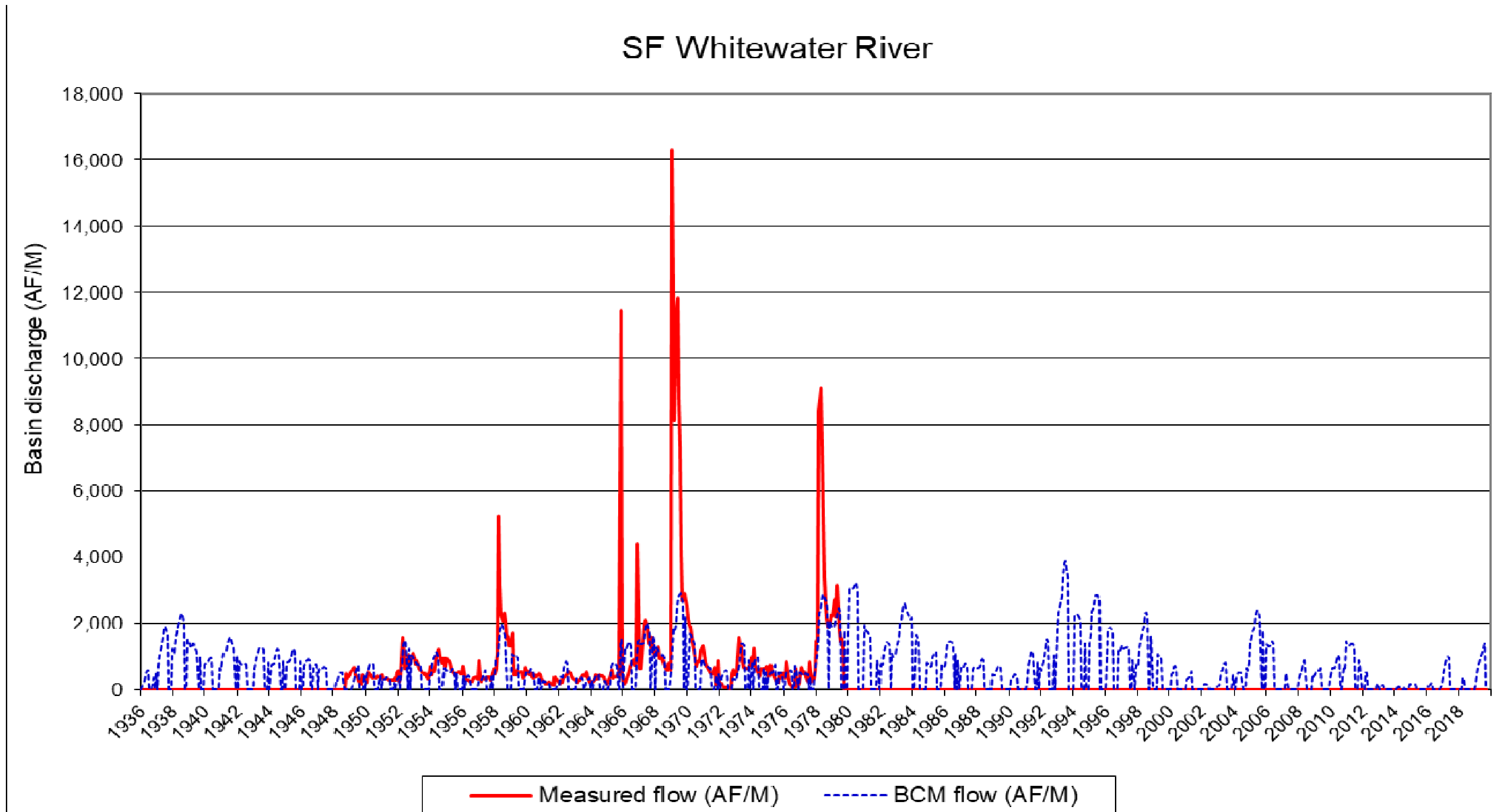
Mission Creek Subbasin Groundwater Model Update

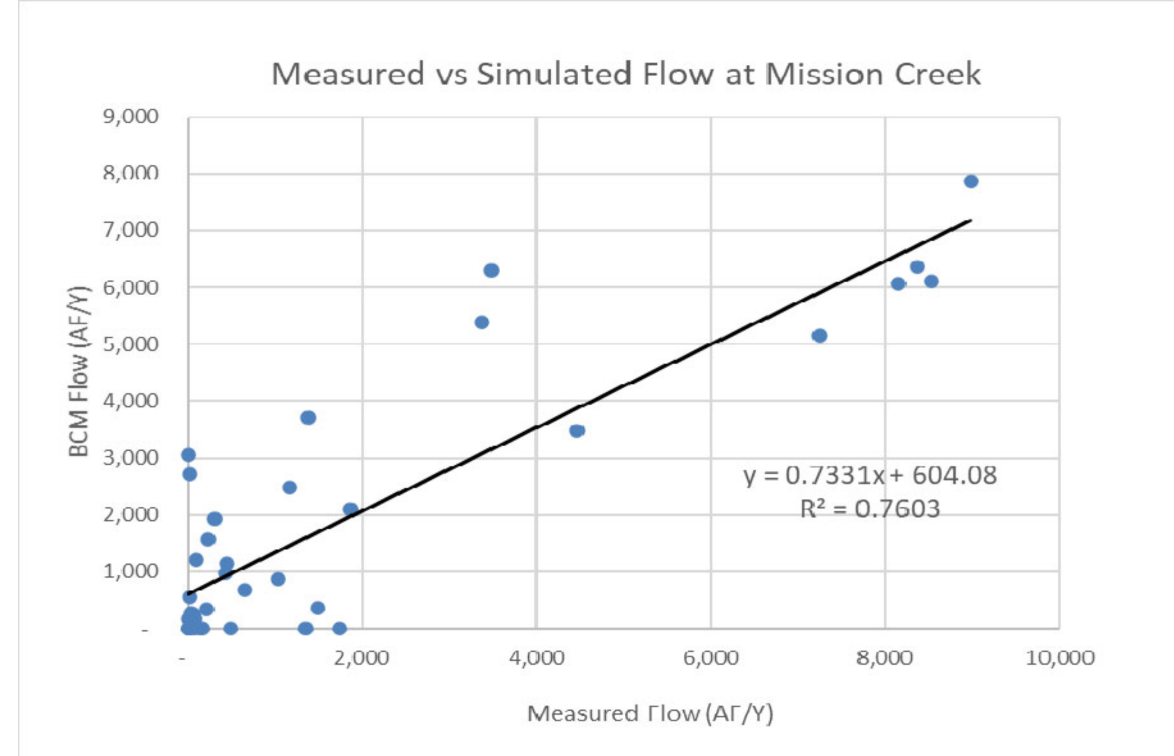
Riverside County, California

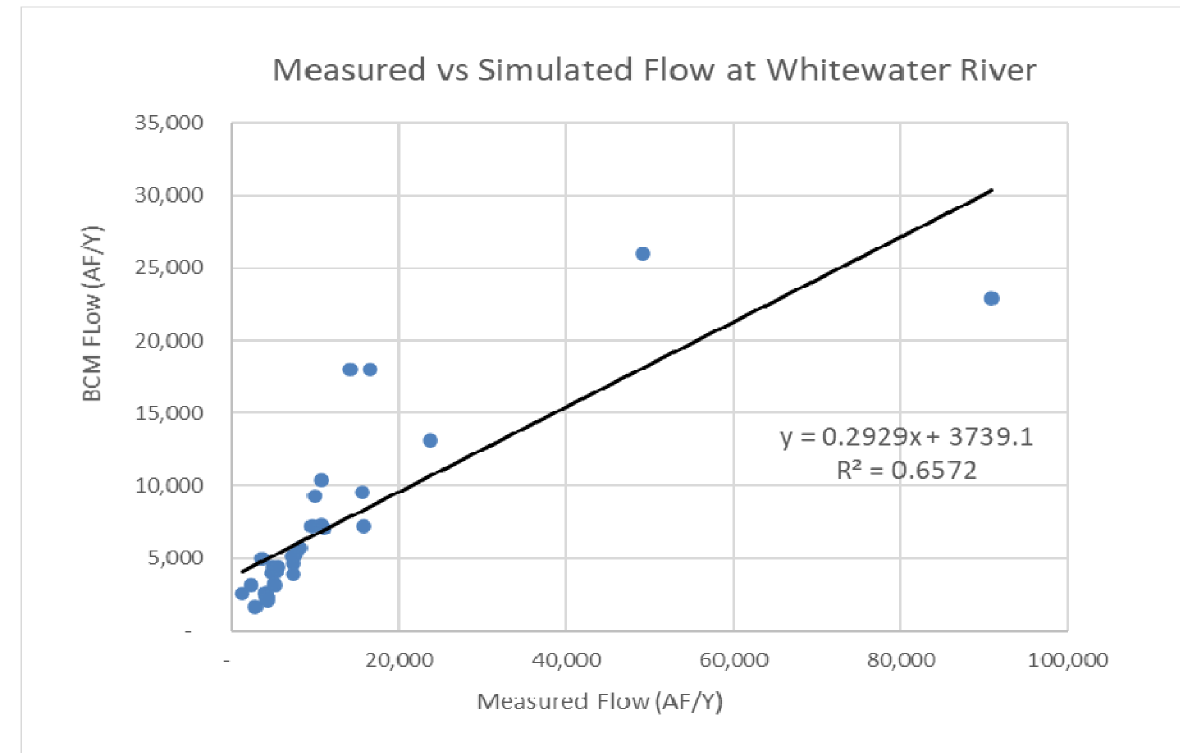
By: dmb	Date: 08/24/2021	Project No.: CM19167351
wood.	Figure	A17

Note: MC-GRF - Mission Creek Groundwater Relenishment Facility
Distribution of Boundary Conditiions in part modified from PSOMAS, 2013









BCM = Basin Characterization Model

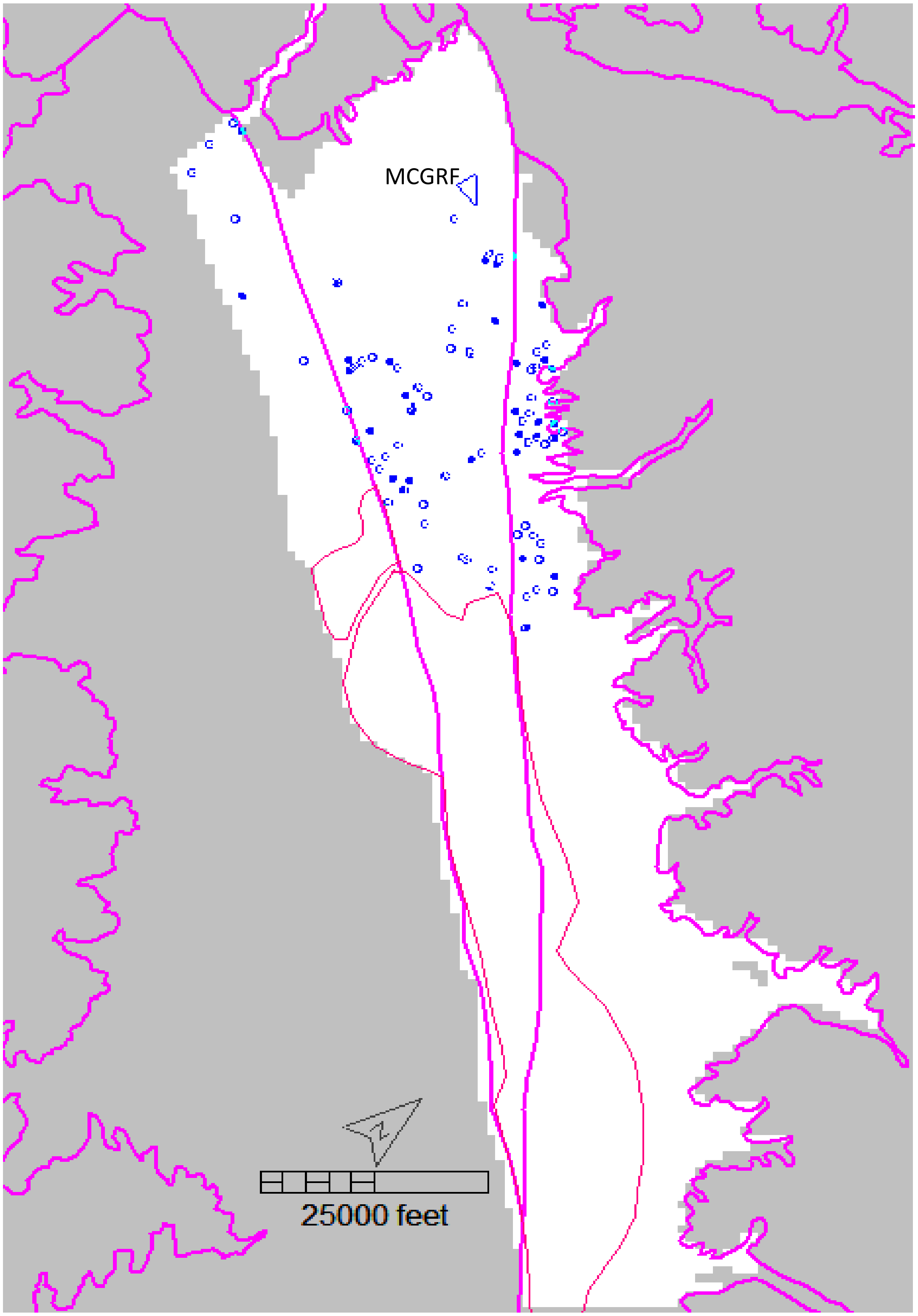
Calibration of BCM Data to Stream Gauges

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb | Date: 08/24/2021 | Project No.: CM19167351

wood.

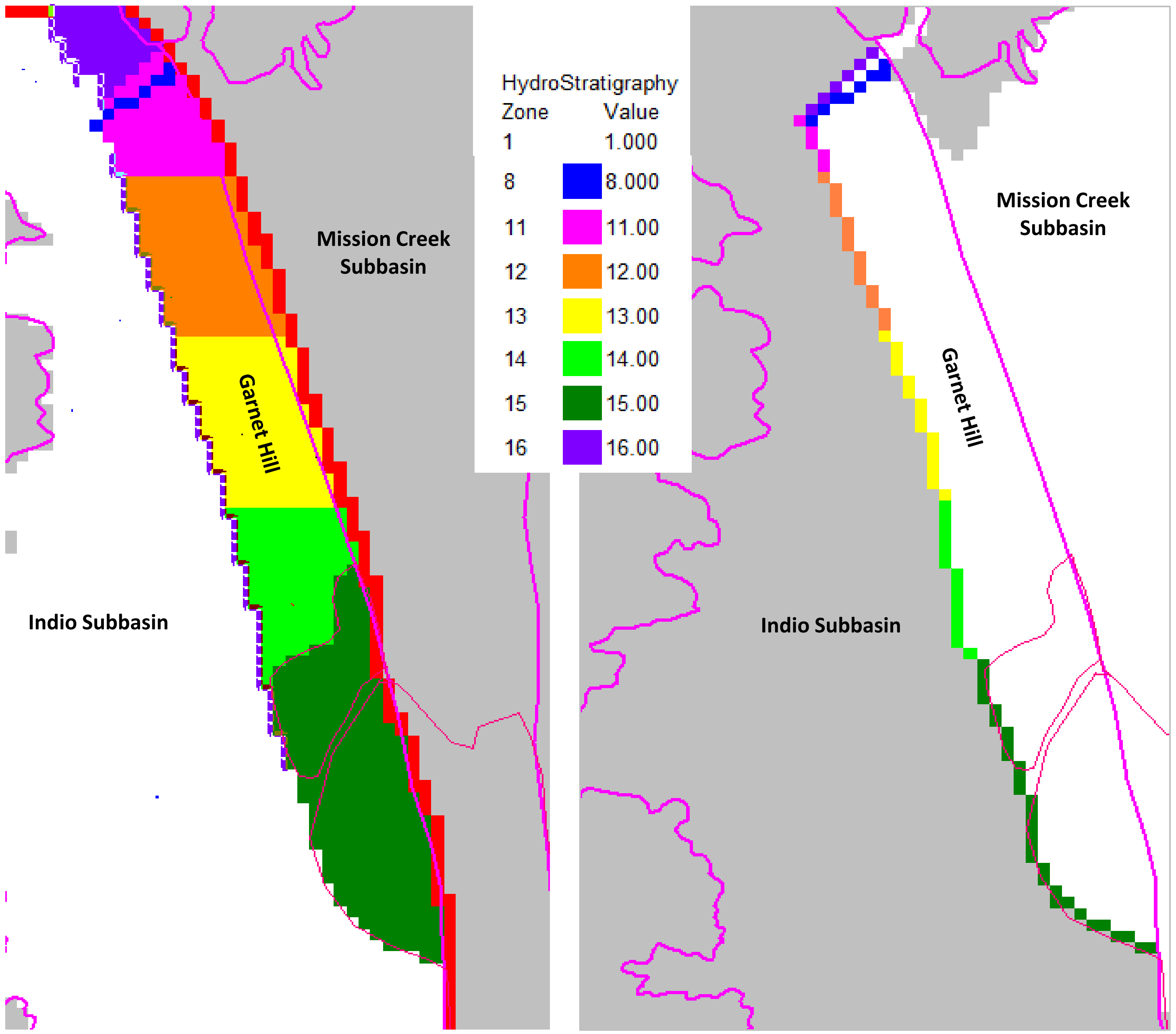
Figure A18



Pumping Well
Well Locations derived from PSOMAS, 2013
and Agency records

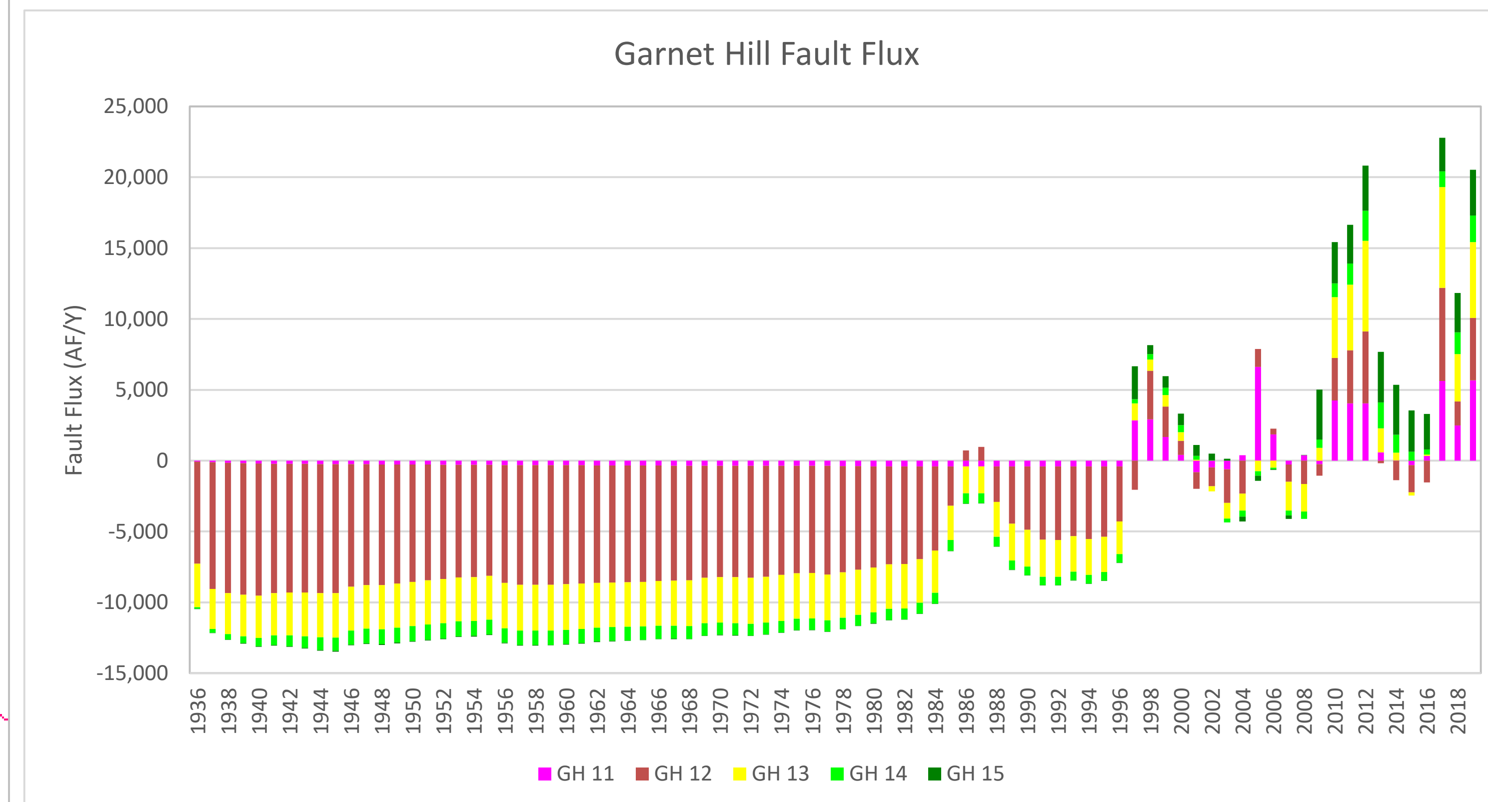
Pumping Well Locations
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 08/24/2021	Project No.: CM19167351
wood.	Figure	A19



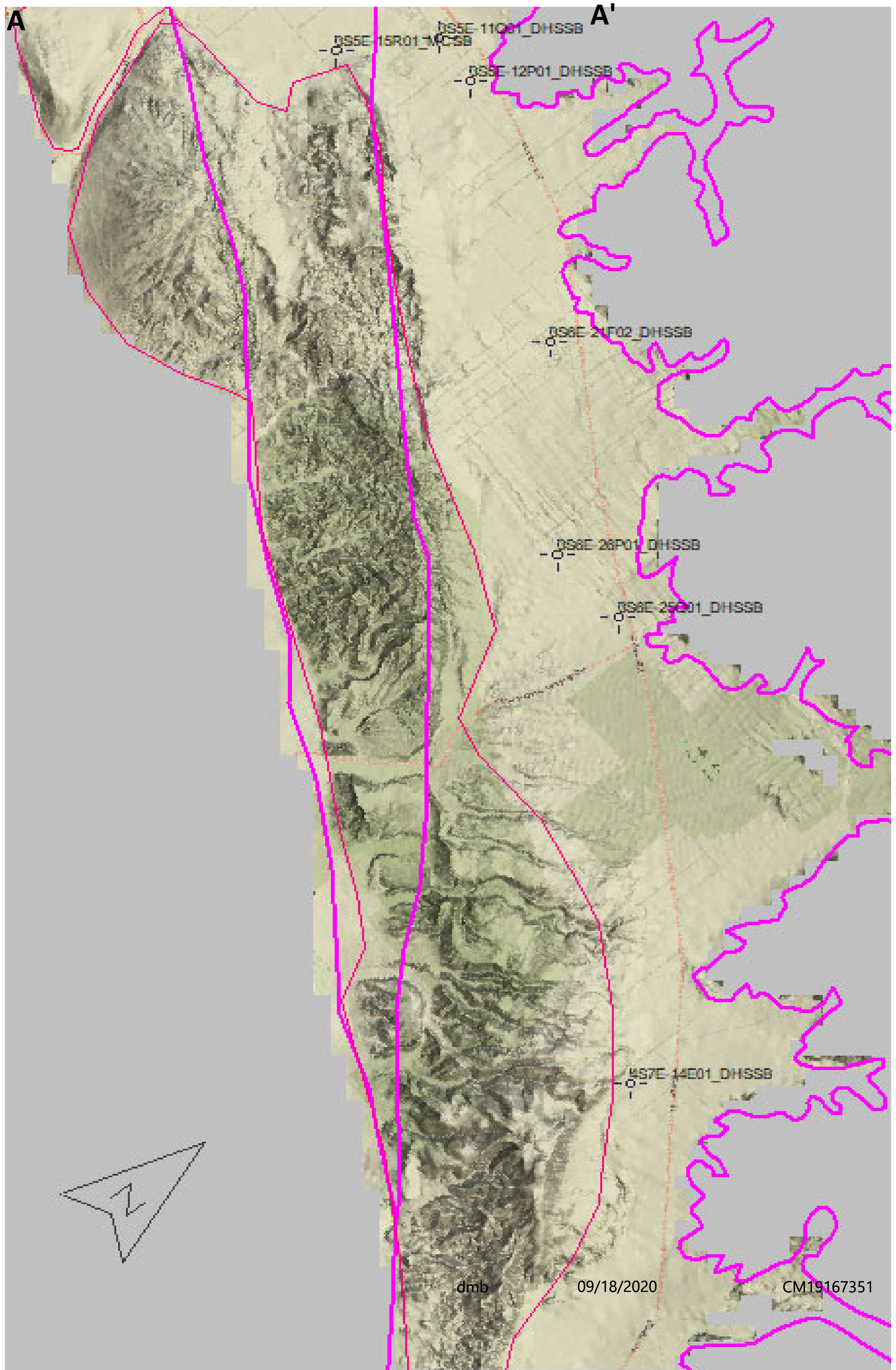
INDIO SUBBASIN MODEL
Water Balance Zones

MISSION CREEK SUBBASIN MODEL
Fault Flux Zones



Garnet Hill Subarea Model
Fault Flux Coordination
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 08/24/2021	Project No.: CM19167351
wood.		Figure **A20**



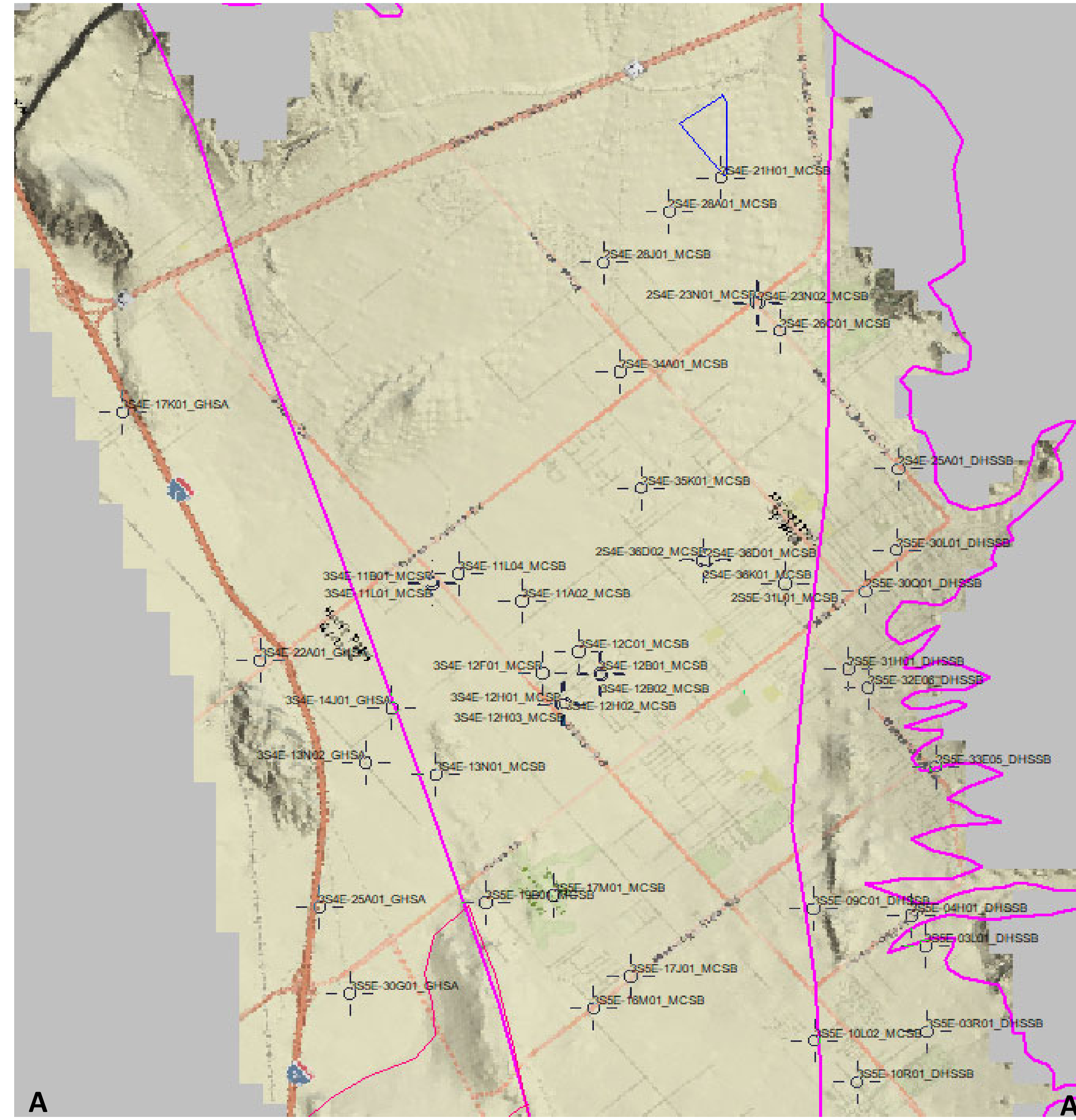


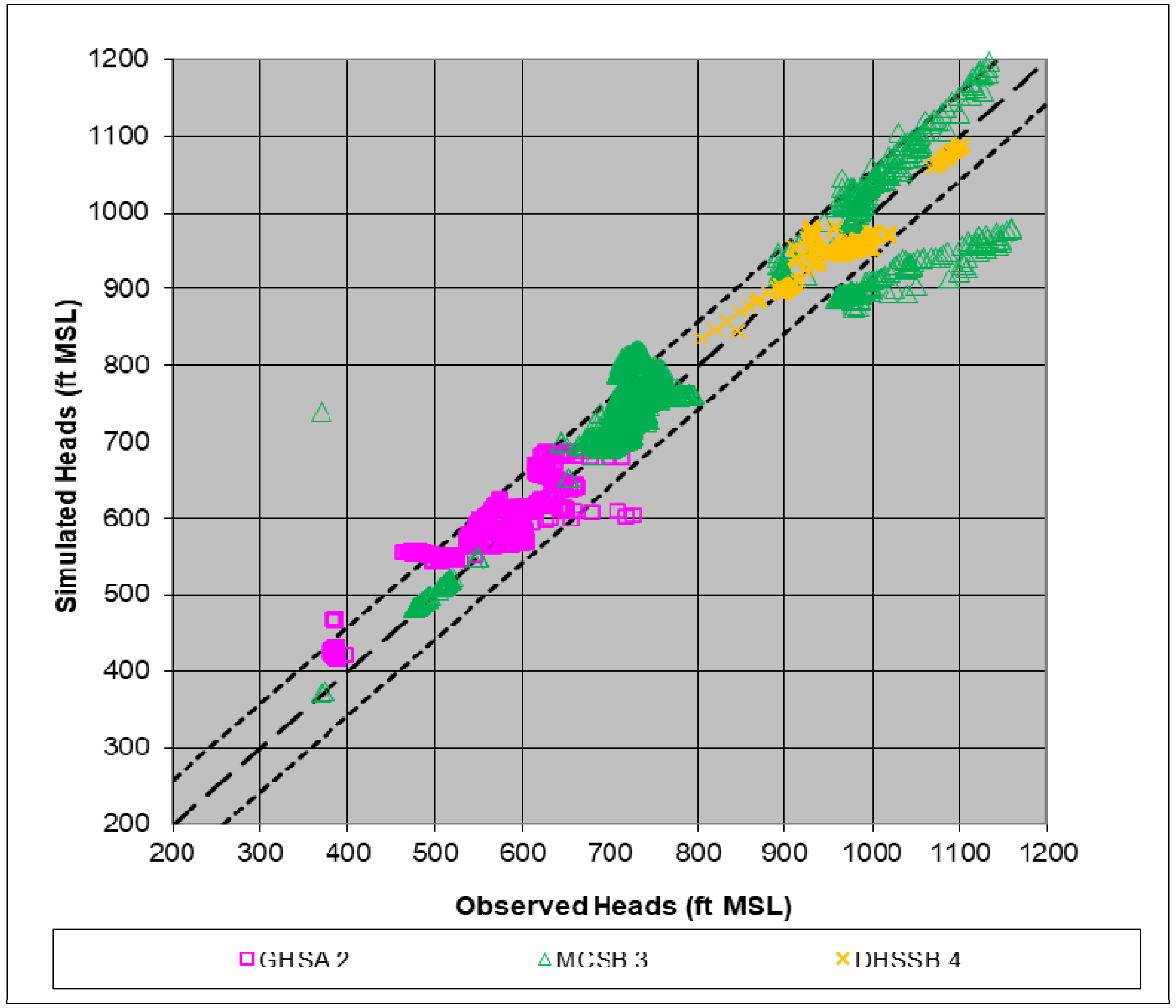
Figure continued at left

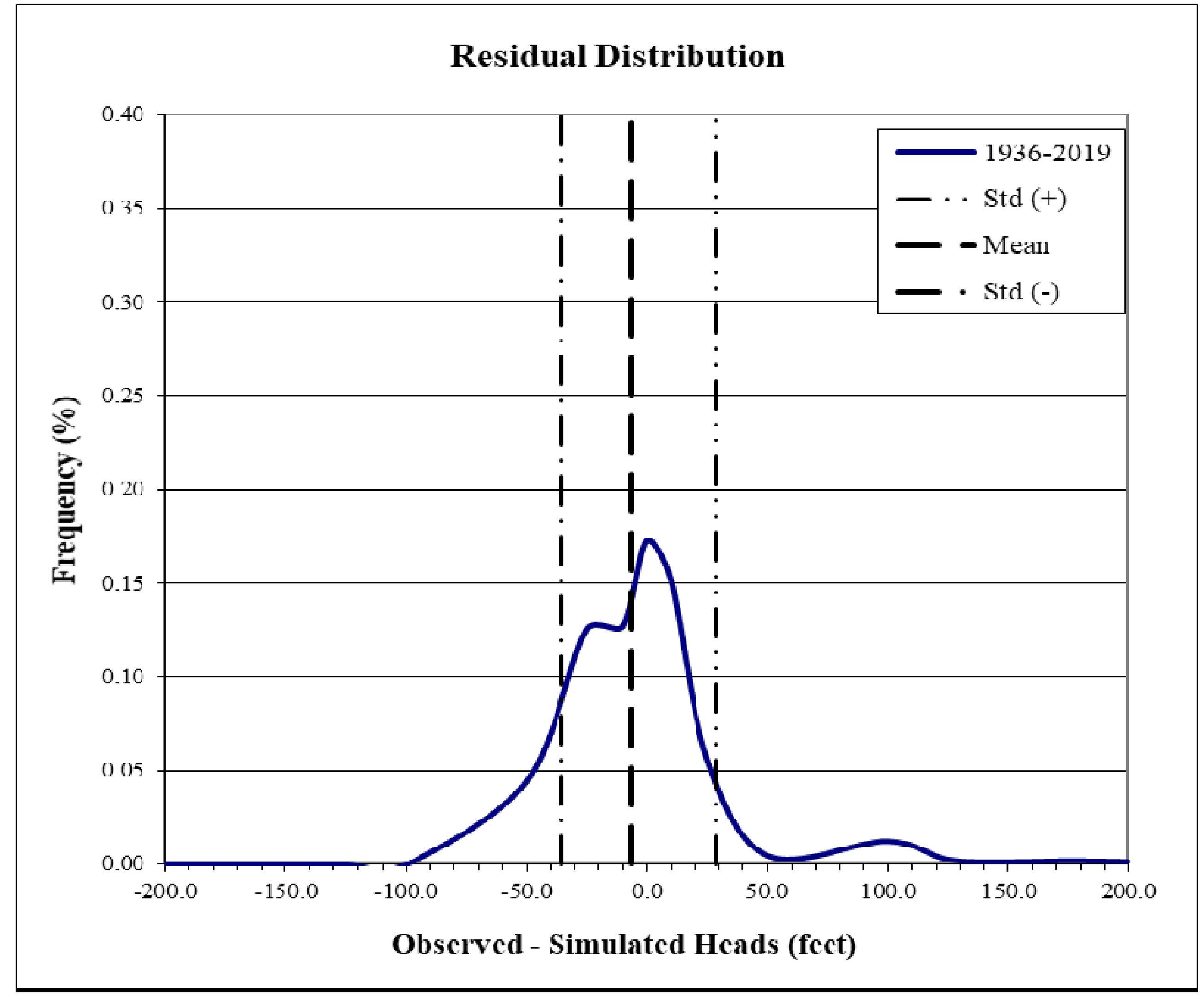
+ Target Well Locations

Target Well Locations derived from
PSOMAS, 2013 and Agency records

Calibration Target Wells
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 08/24/2021	Project No.: CM19167351
wood.	Figure	A21





Calibration Statistic	Units	All Areas	GHSA	MCSB	DHSSB
Residual Mean	ft	-6.59	-29.29	-5.50	8.03
Absolute Residual Mean	ft	18.58	20.83	15.13	18.22
Residual Std. Deviation	ft	28.68	27.83	27.60	21.94
Sum of Squares	ft^2	6172072	1452649	4109618	572060
RMS Error	ft	29.43	27.83	27.60	21.94
Min. Residual	ft	-368.17	-90.85	-368.17	-52.23
Max. Residual	ft	186.24	122.70	186.24	52.73
Number of Observations		7128	890	5190	1048
Range in Observations	ft	806.10	728.20	1178.00	398.10
Scaled Residual Std. Deviation		0.036	3.8%	2.3%	5.5%
Scaled Absolute Residual Mean		0.023	2.9%	1.3%	4.6%
Scaled RMS Error		**3.7%**	**3.8%**	**2.3%**	**5.5%**
Scaled Residual Mean		-0.008	-4.0%	-0.5%	2.0%
Correlation Coefficient		97.8%	97.0%	95.9%	98.1%

Transient Calibration Statistics and Scatter Plot

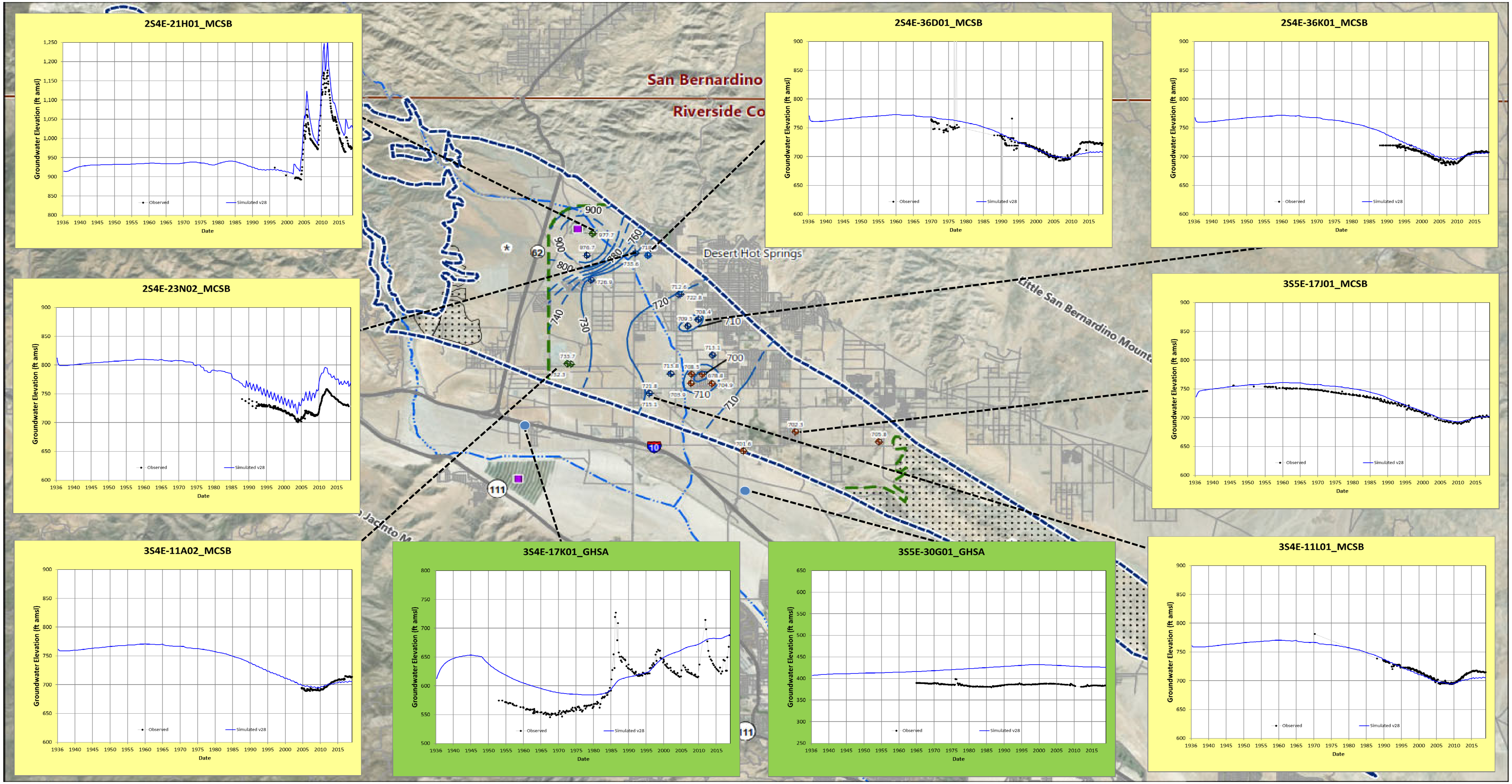
Mission Creek Subbasin Groundwater Model Update

Riverside County, California

By: dmb | Date: 08/24/2021 | Project No.: CM19167351

wood.

Figure **A22**



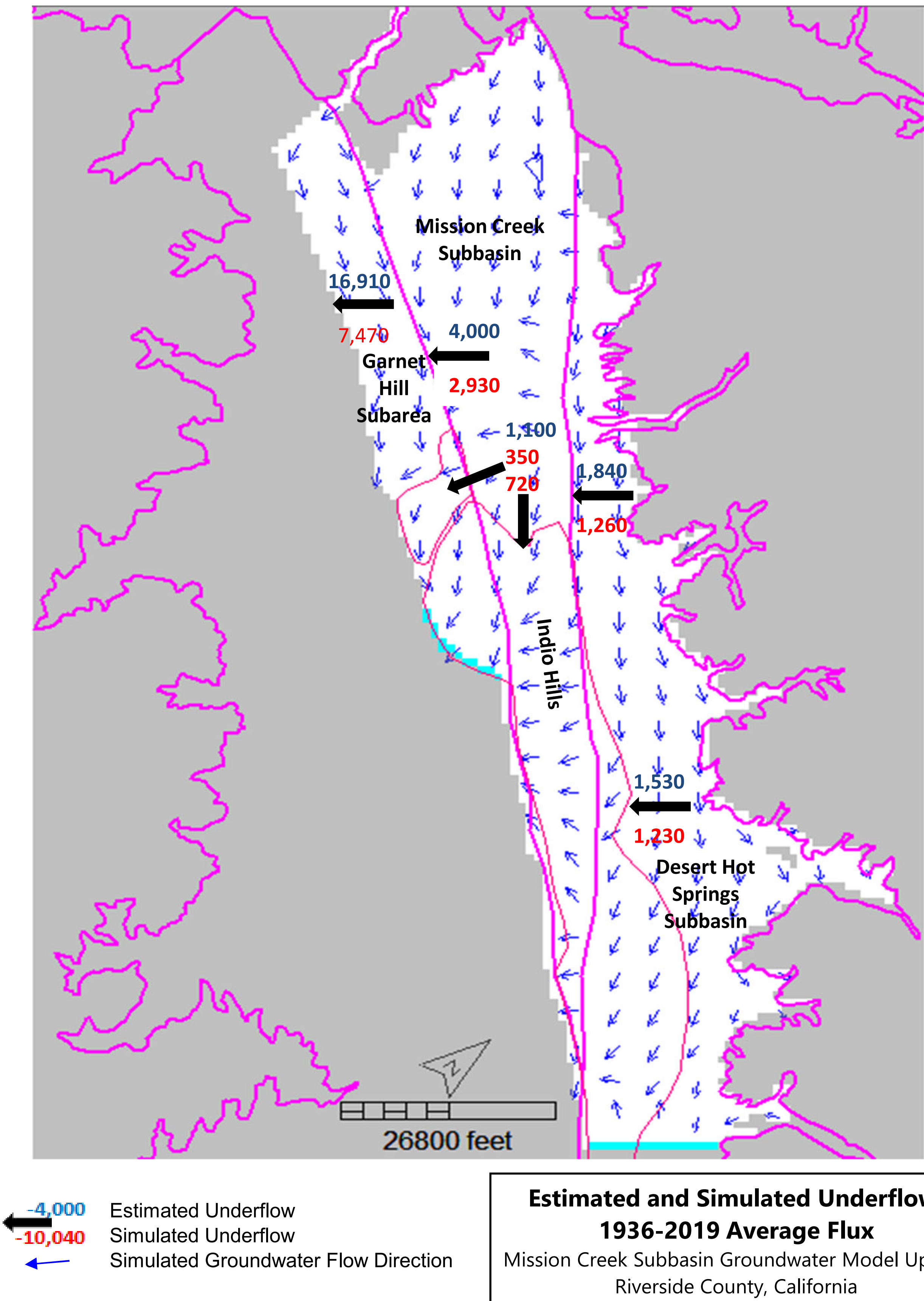
Observed Head
Simulated Head

Observed and Simulated Hydrographs of Selected Wells

Mission Creek Subbasin Groundwater Model Update

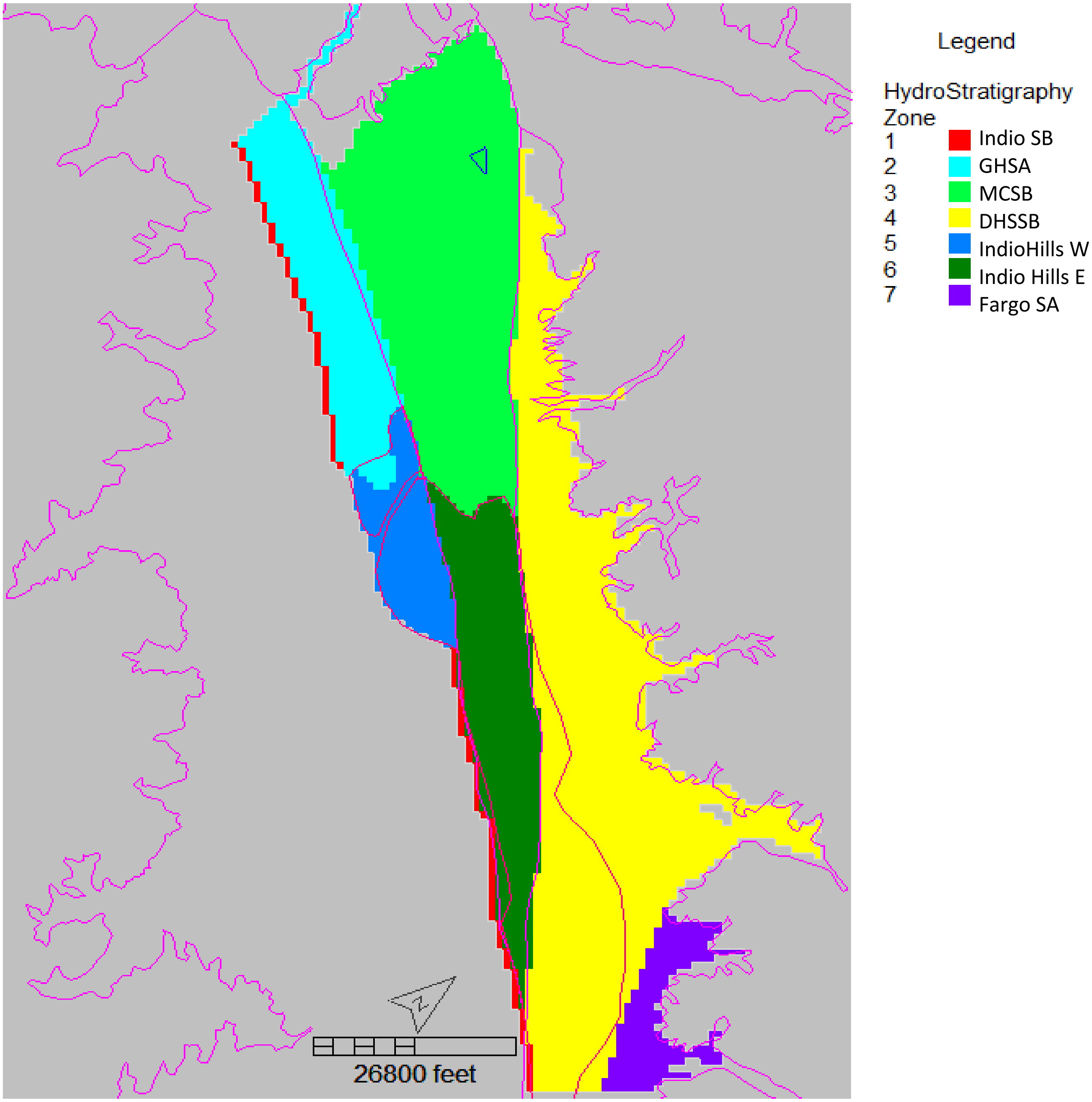
Riverside County, California

By: dmb	Date: 08/24/2021	Project No.: CM19167351
wood.	Figure	A23



Estimated and Simulated Underflow
1936-2019 Average Flux
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

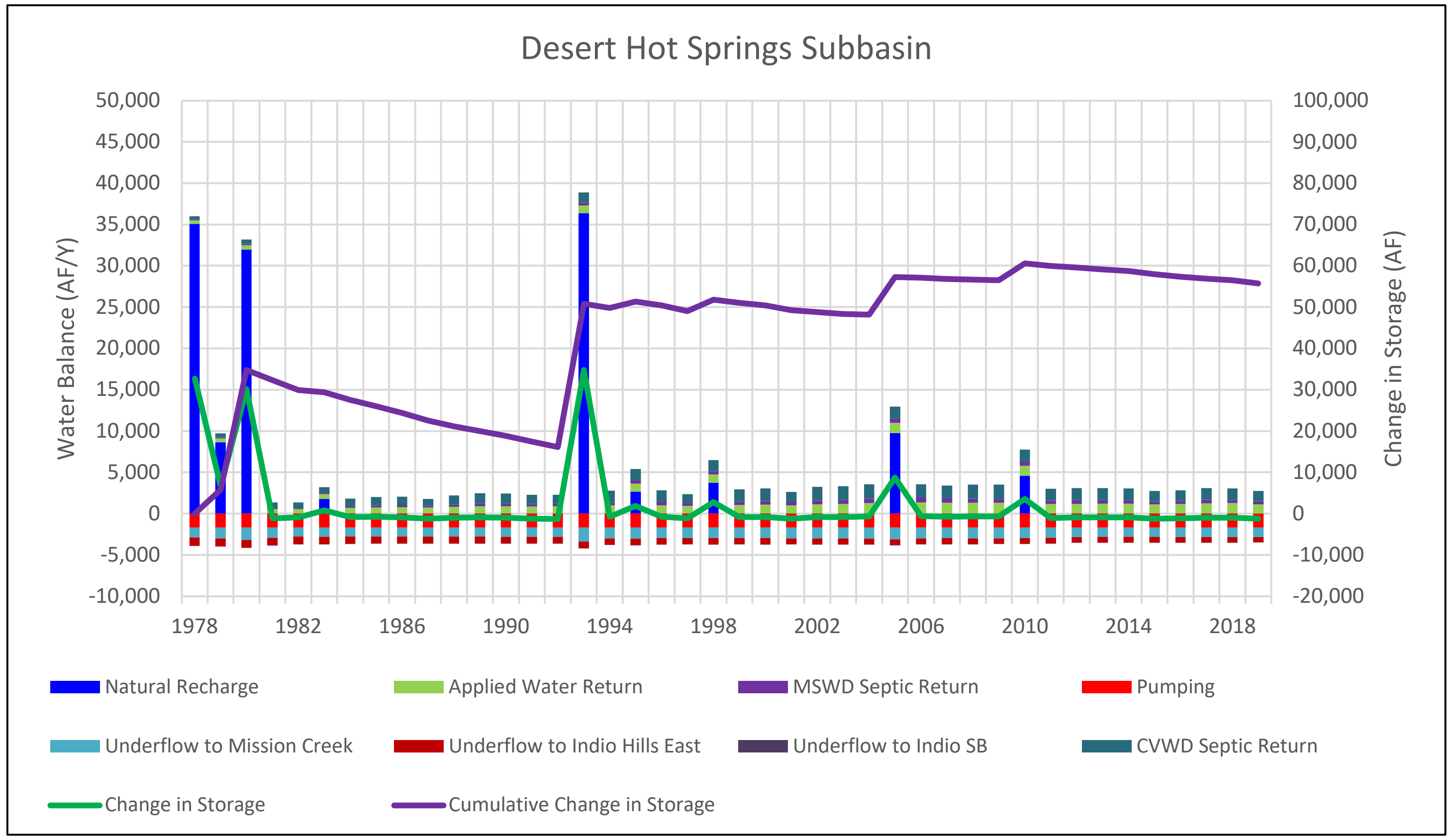
By: dmb	Date: 08/24/2021	Project No.: CM19167351
wood.		Figure **A24**

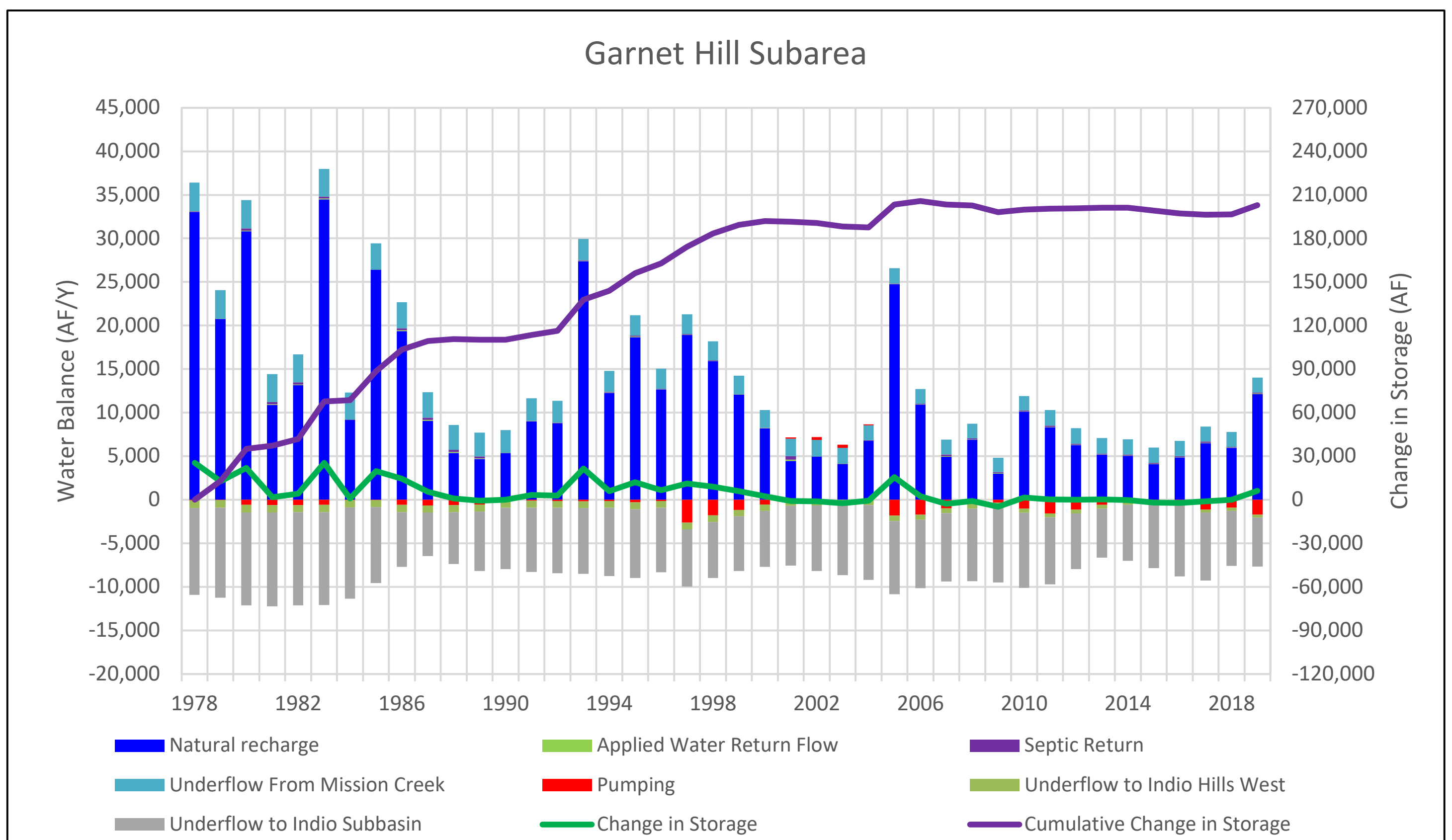


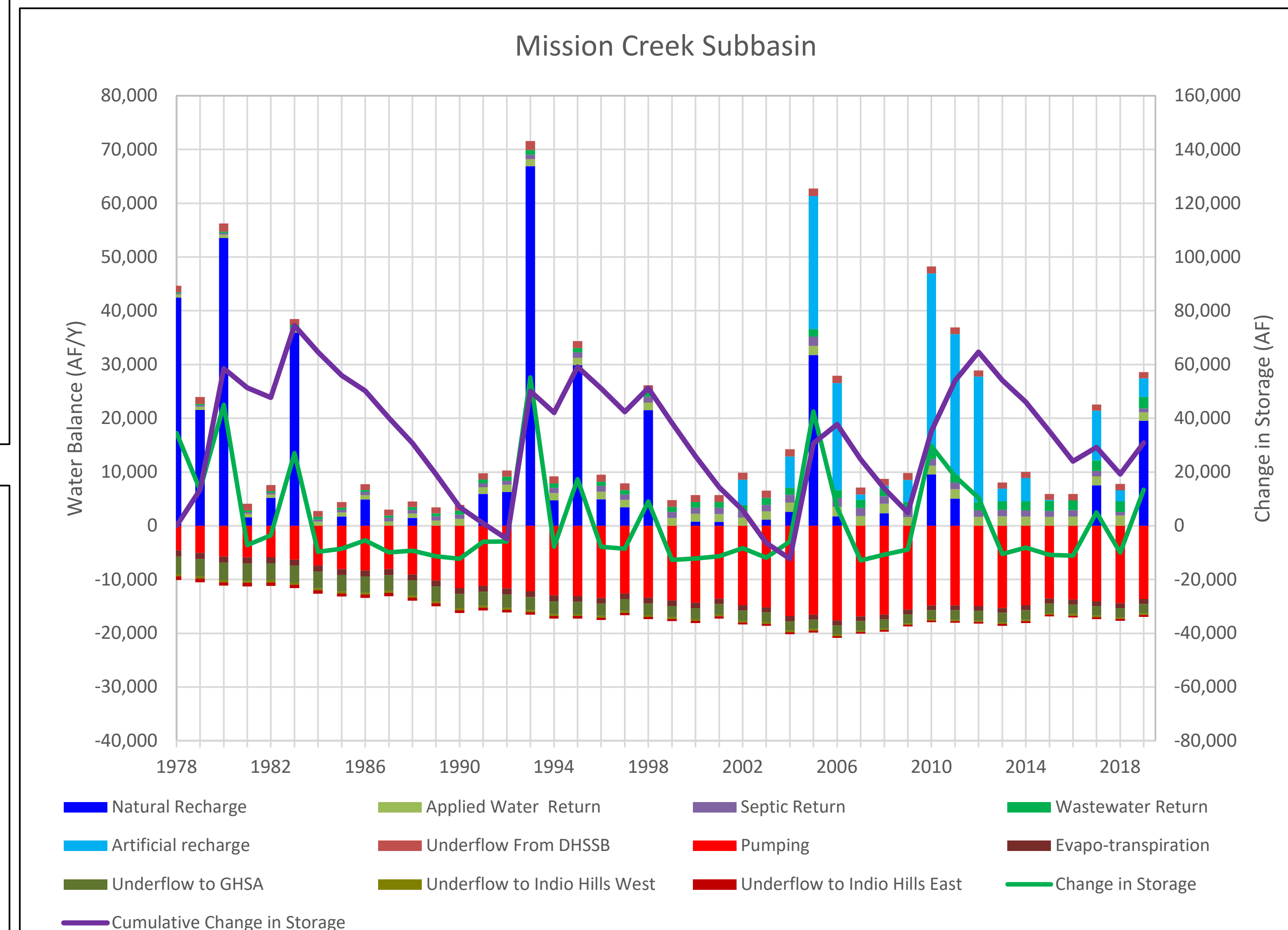
Water Balance Summary
Hydrostratigraphic Zones

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 08/24/2021	Project No.: CM19167351
wood.	Figure A25	



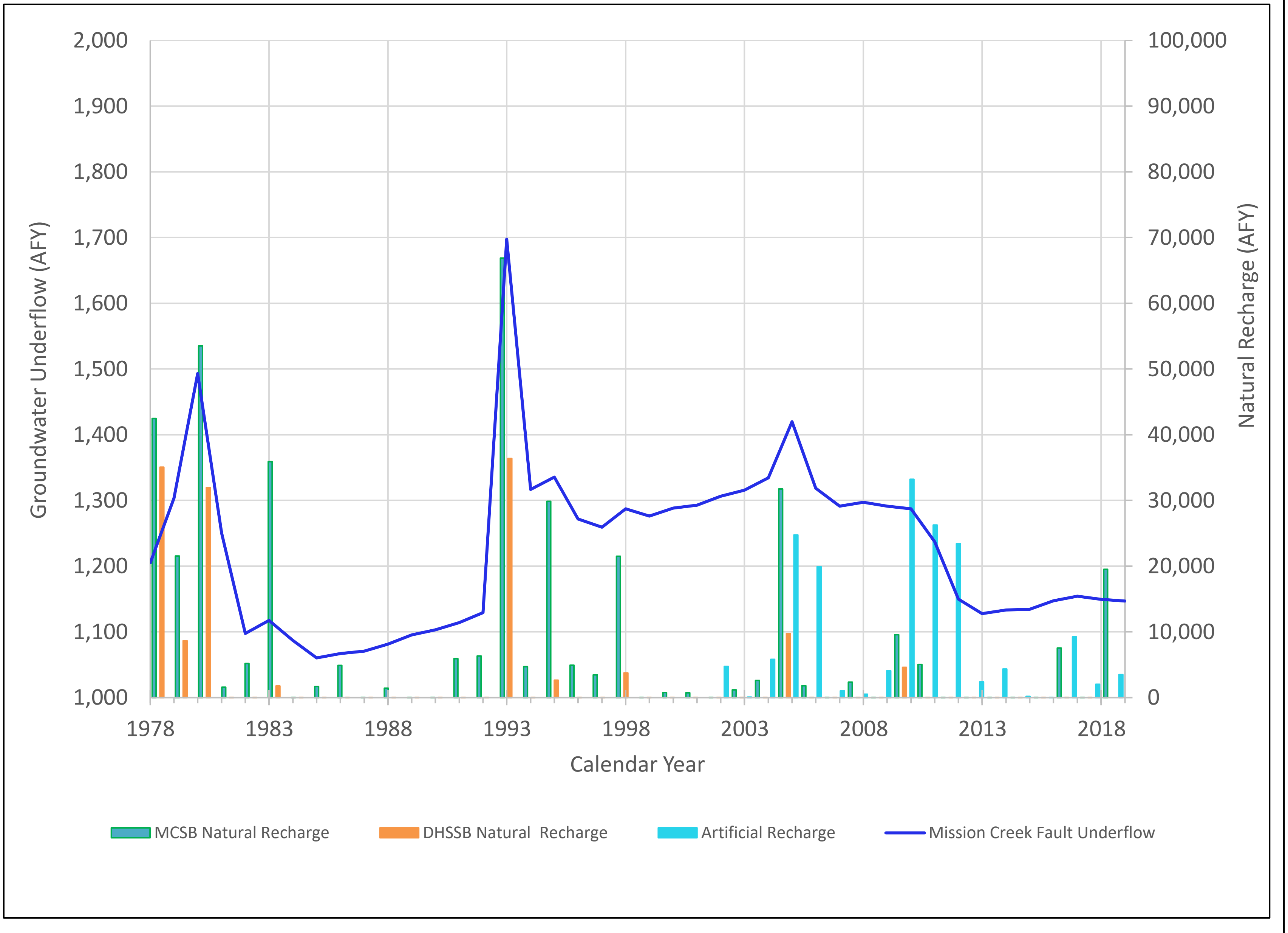


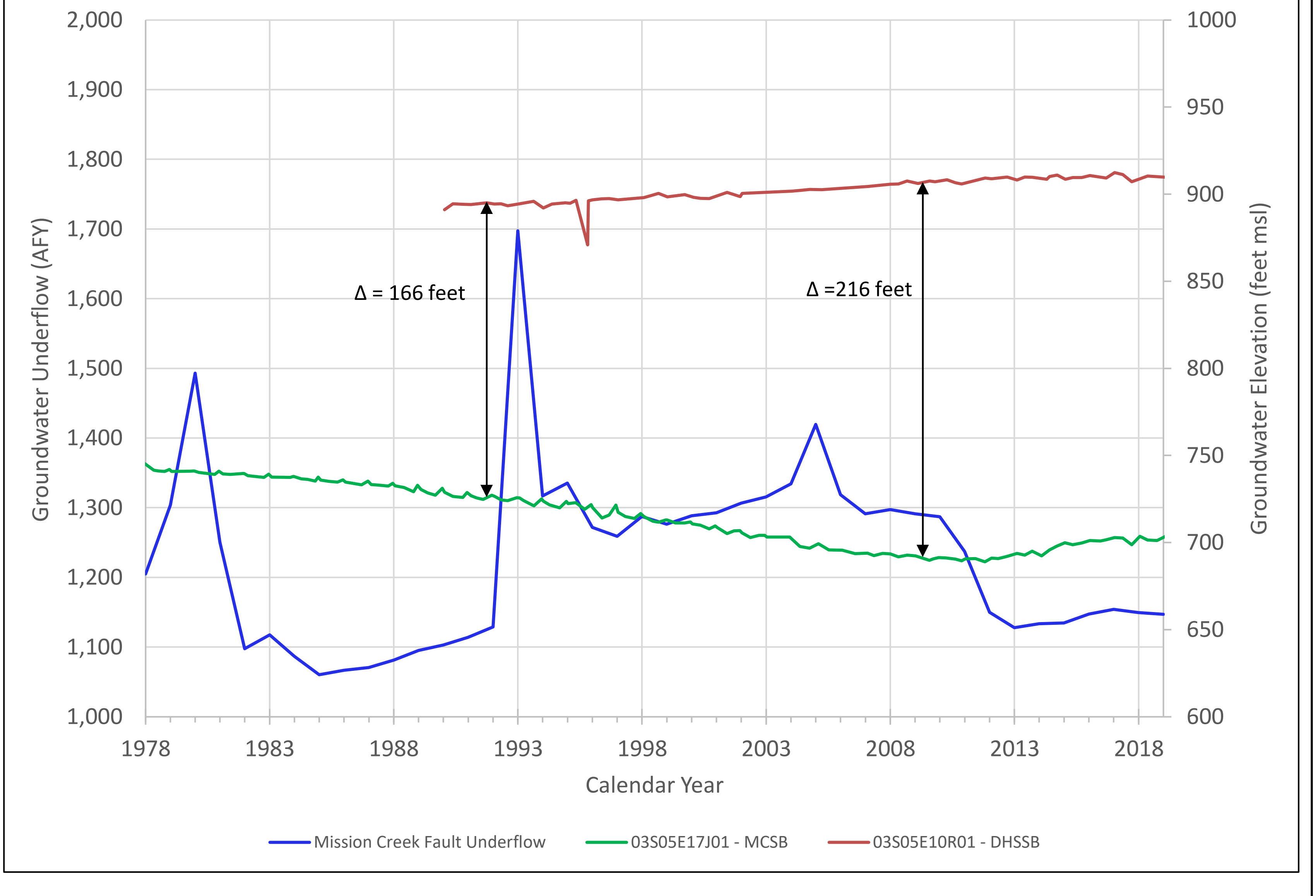


Note: Water balance inflows and outflows derived from calibrated Model

1978 - 2019 Simulated
Water Balance by Subbasin/Subarea
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 02/09/2021	Project No.: CM19167351
wood.	Figure	A26

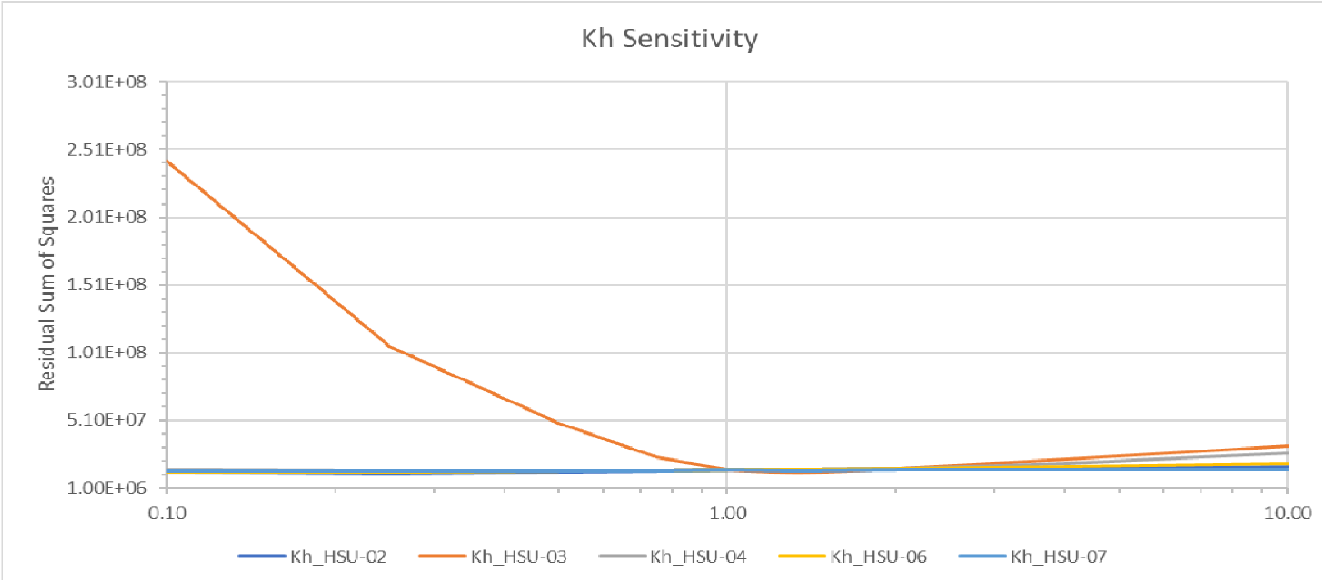


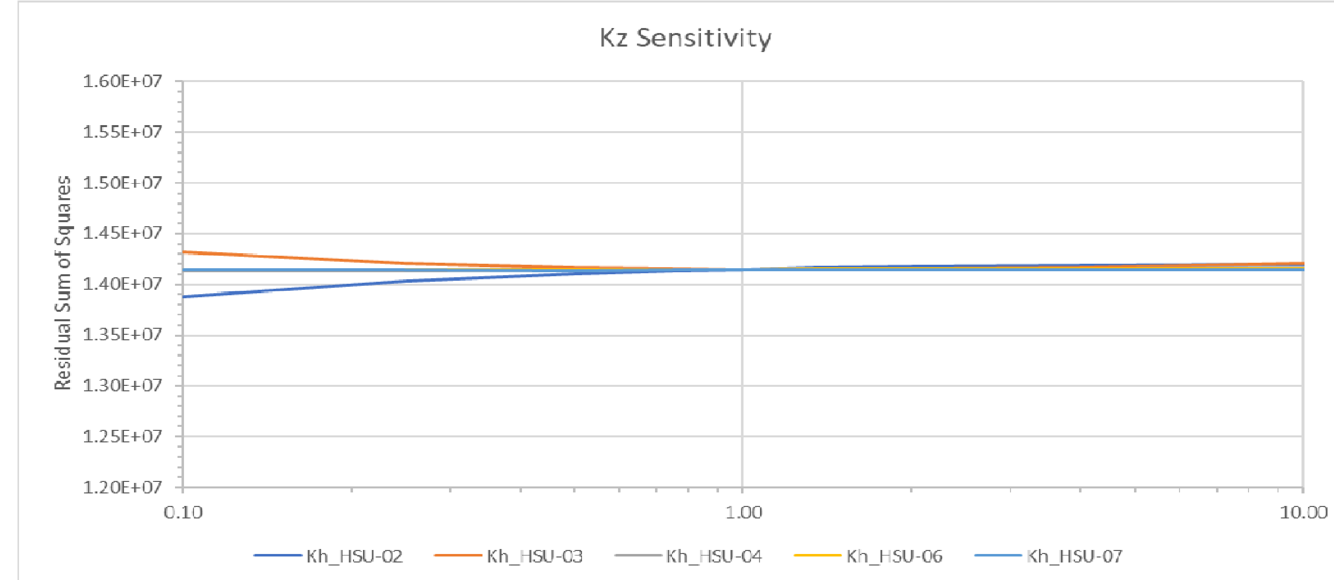


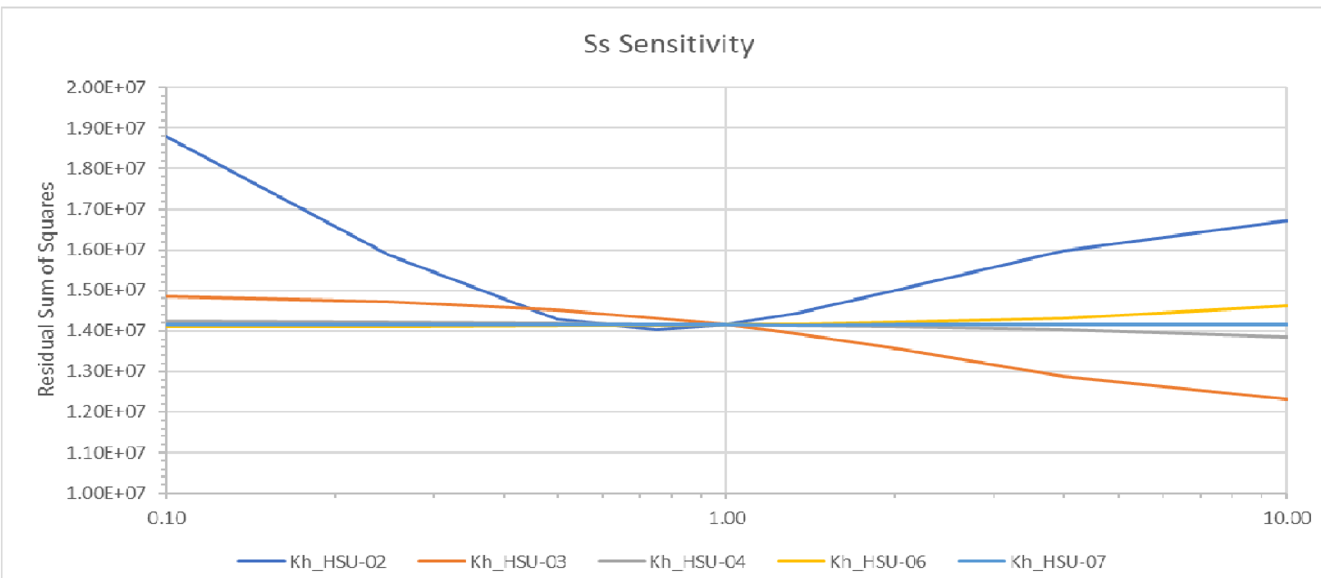
Abbreviations:
AFY = acre feet per year
DHSSB = Desert Hot Springs Subbasin
MCSB = Mission Creek Subbasin
msl = mean sea level

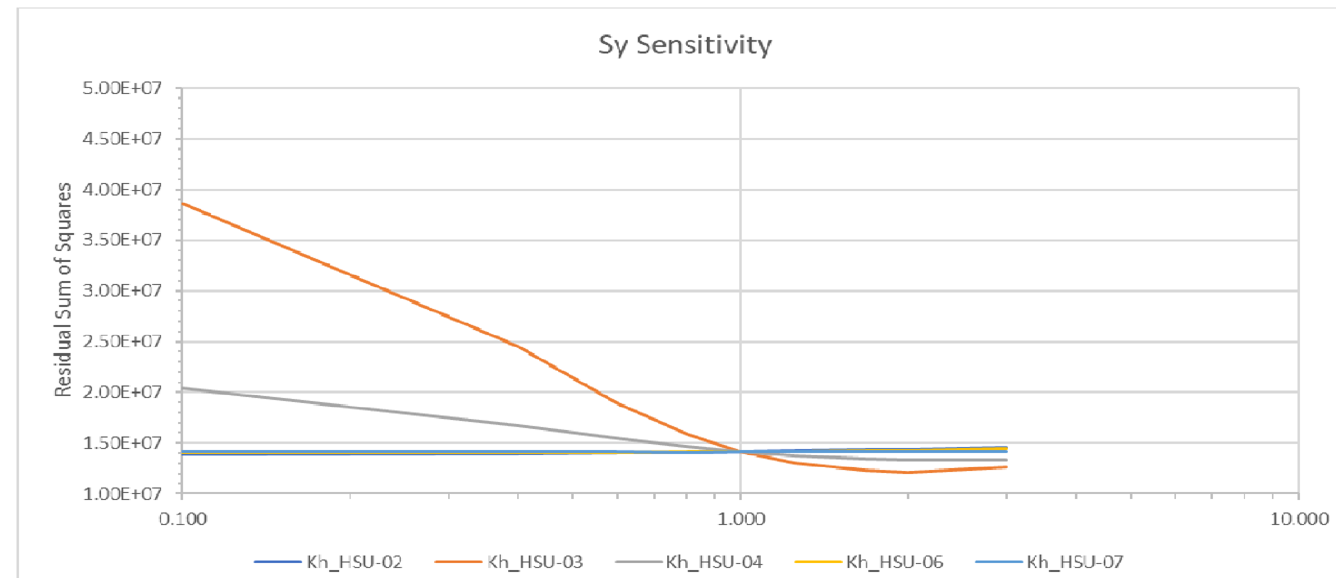
Underflow from Desert Hot Springs Subbasin to Mission Creek Subbasin
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

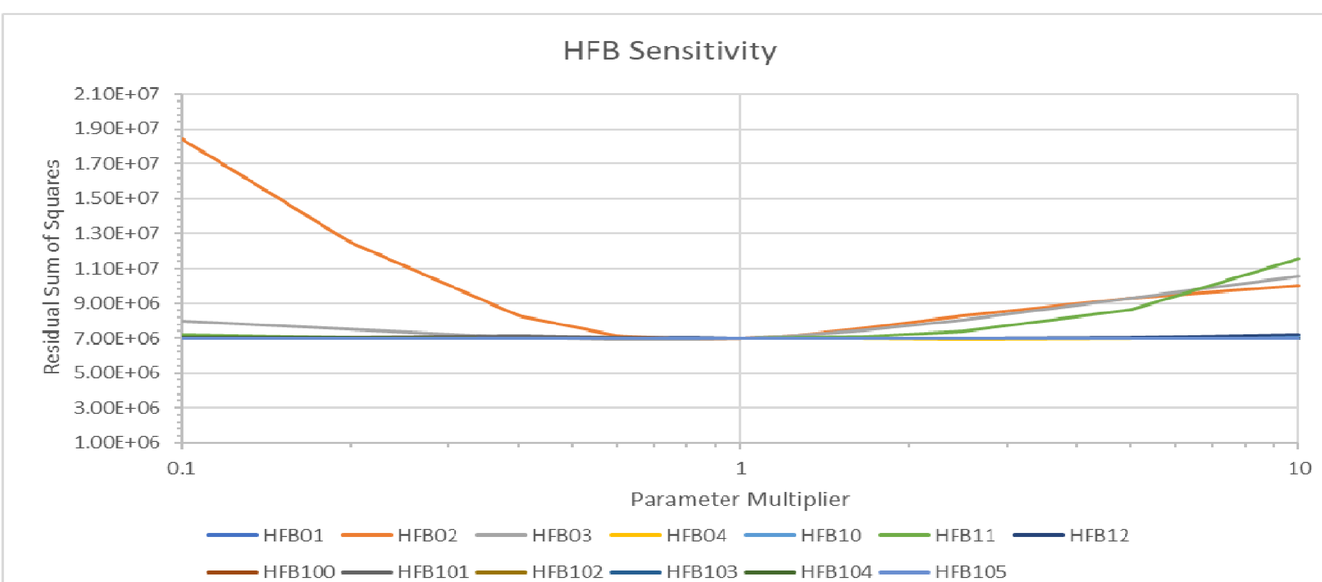
By: grr	Date: 08/27/2021	Project No.: CM19167351
wood.		Figure A27











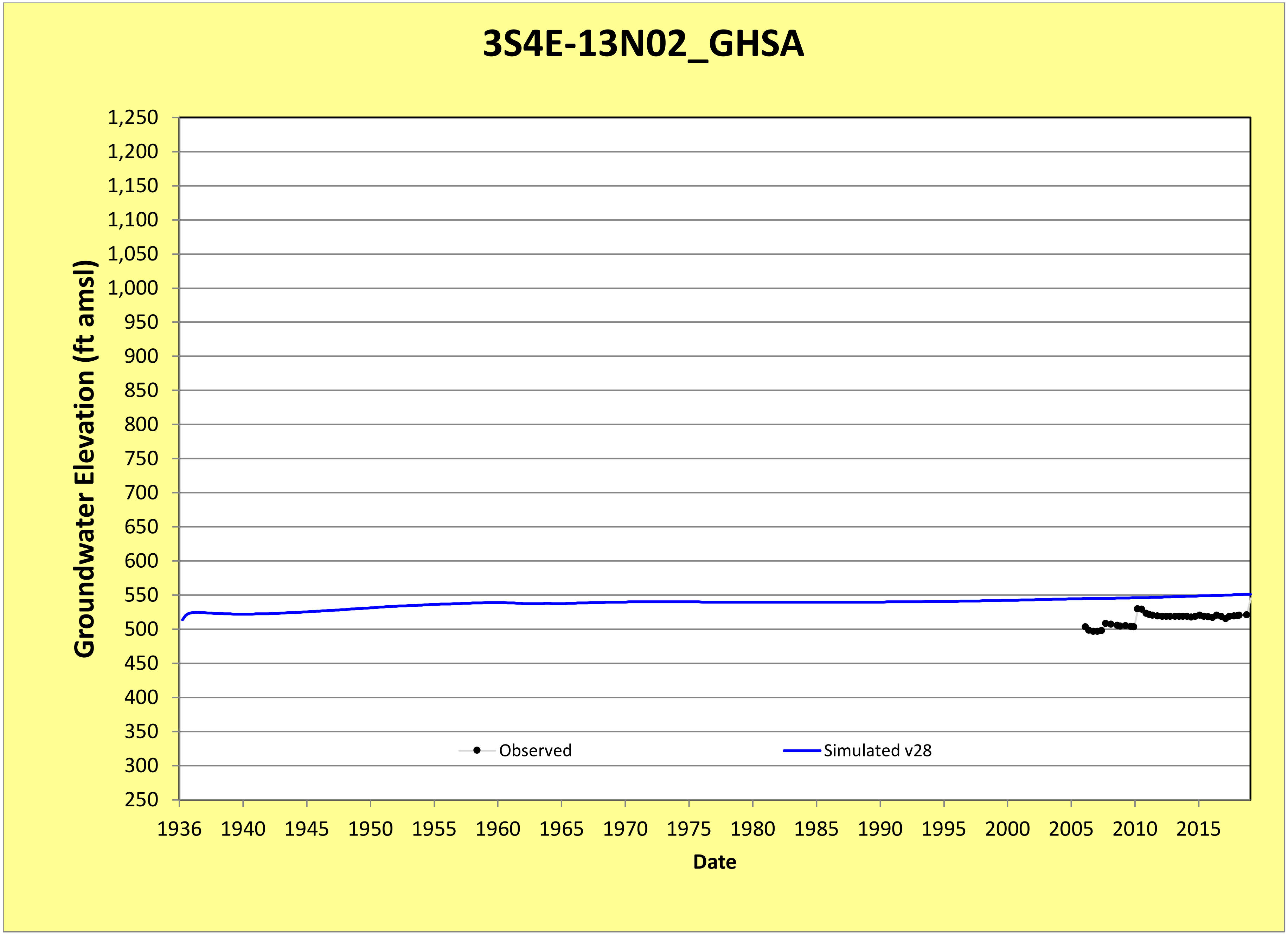
Explanation:
Kh = Horizontal Hydraulic Conductivity
Kz = Vertical Hydraulic Conductivity
Ss = Specific Storage
Sy = Specific Yield
HFB = Horizontal Flow Barrier Conductivity

Model Sensitivity Analysis
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

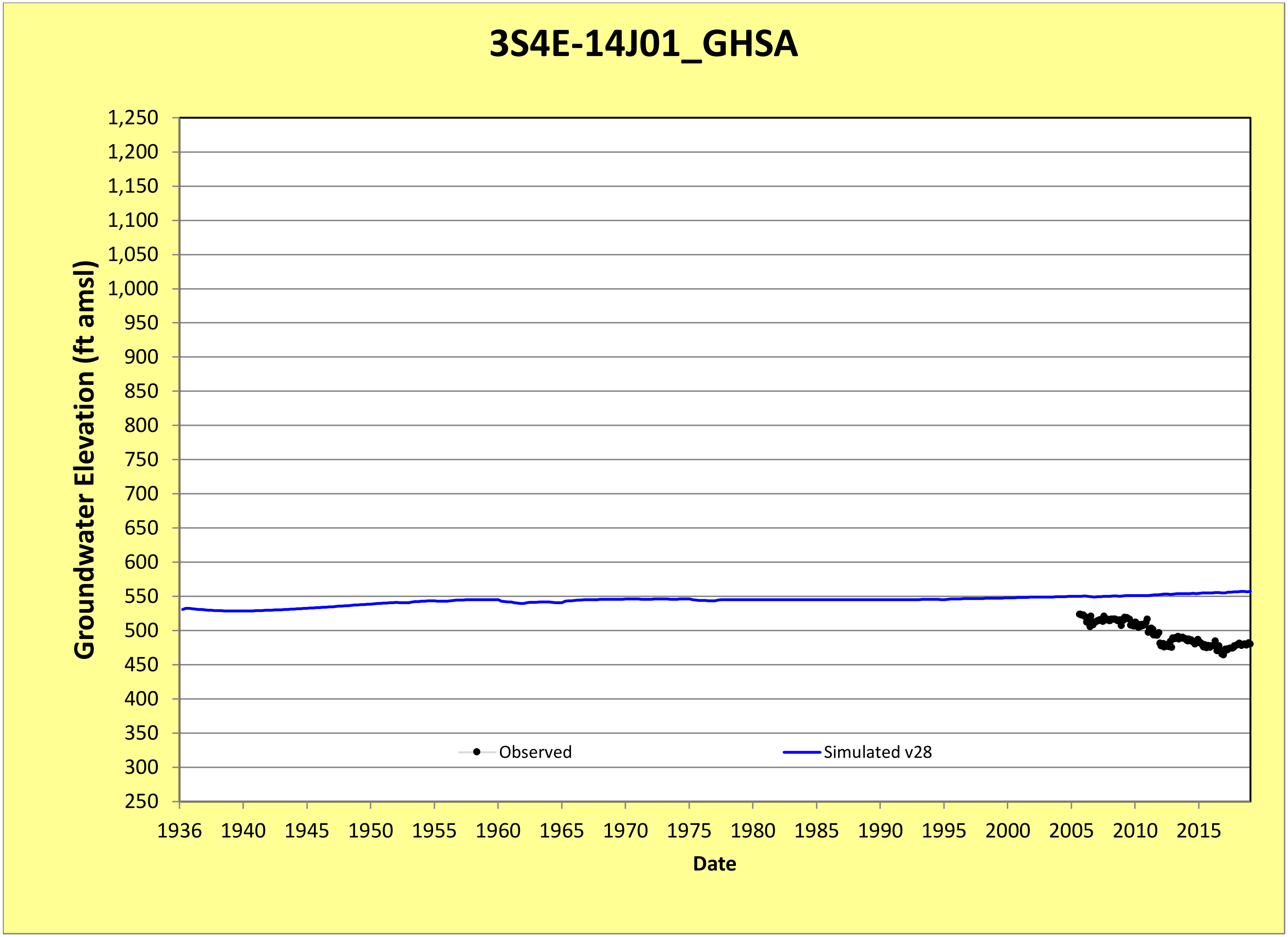
By: dmb	Date: 09/18/2020	Project No.: CM19167351
wood.	Figure	A28

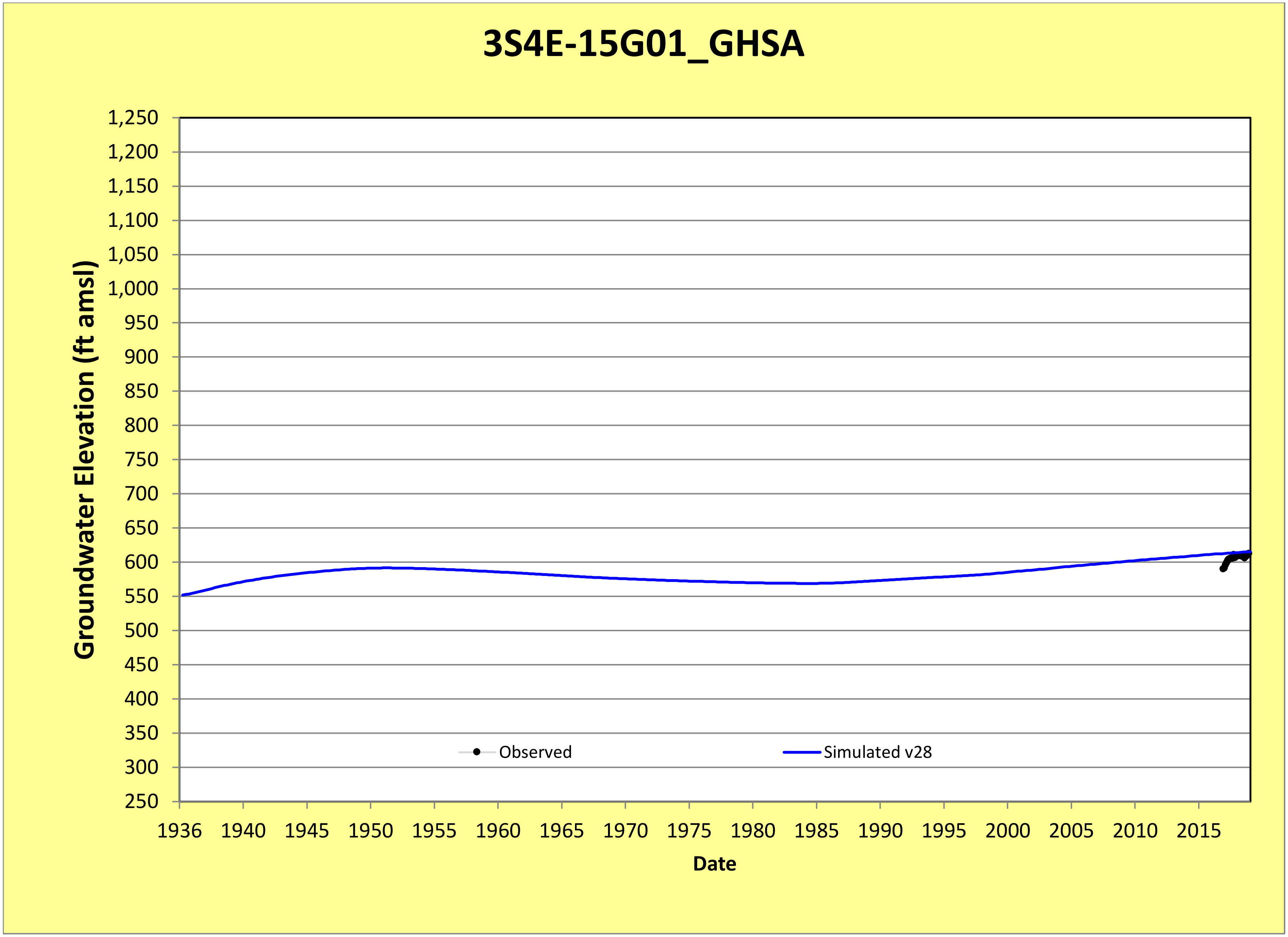
Attachment A1

Observed and Simulated Hydrographs



3S4E-13N02_GHSA
Groundwater Elevation (ft amsl)
1,250
1,200
1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
Observed
Simulated v28
1936
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Date


3S4E-14J01_GHSA
Groundwater Elevation (ft amsl)
1,250
1,200
1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
Observed
Simulated v28
1936
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Date


3S4E-15G01_GHSA
Groundwater Elevation (ft amsl)
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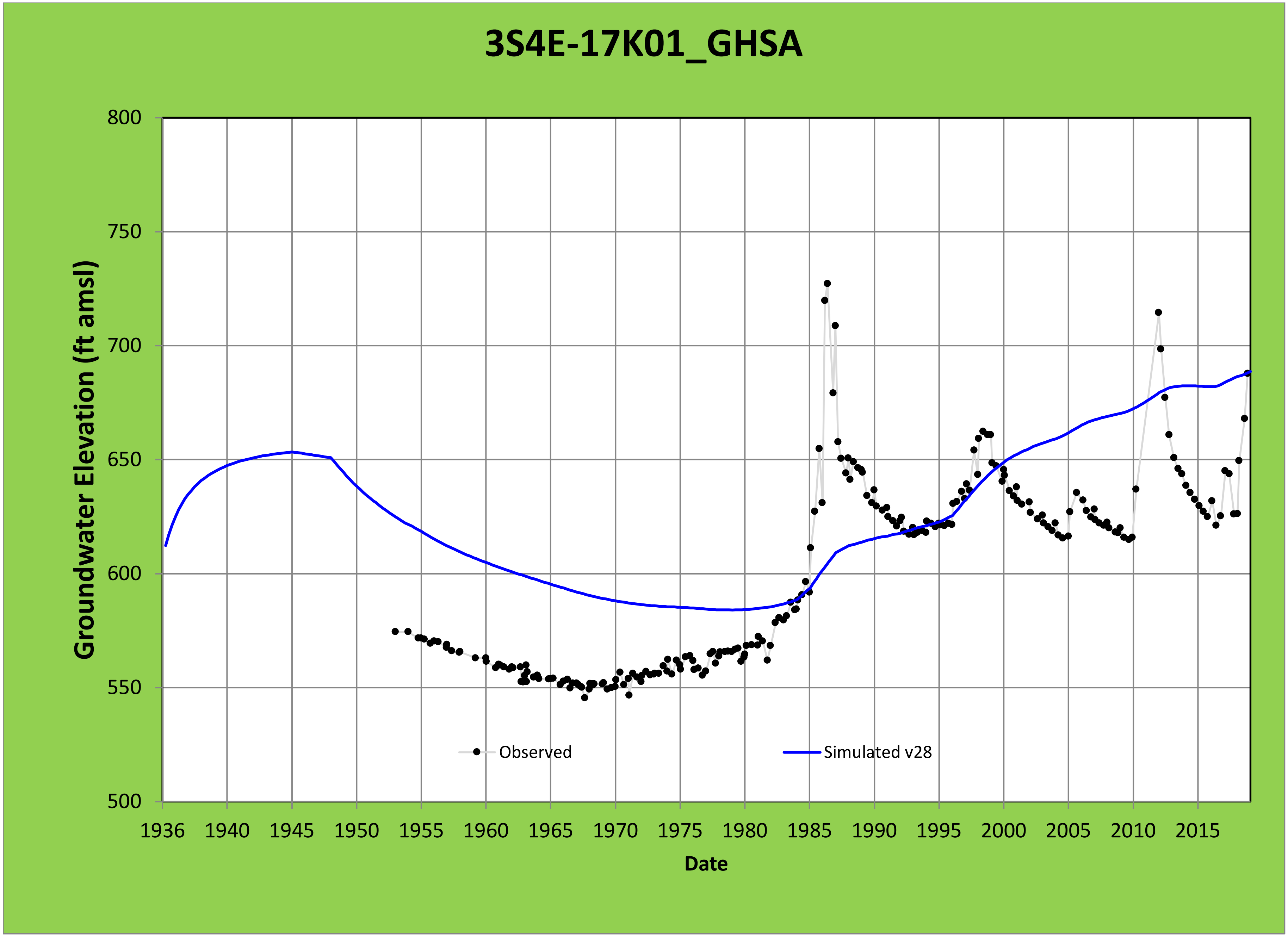
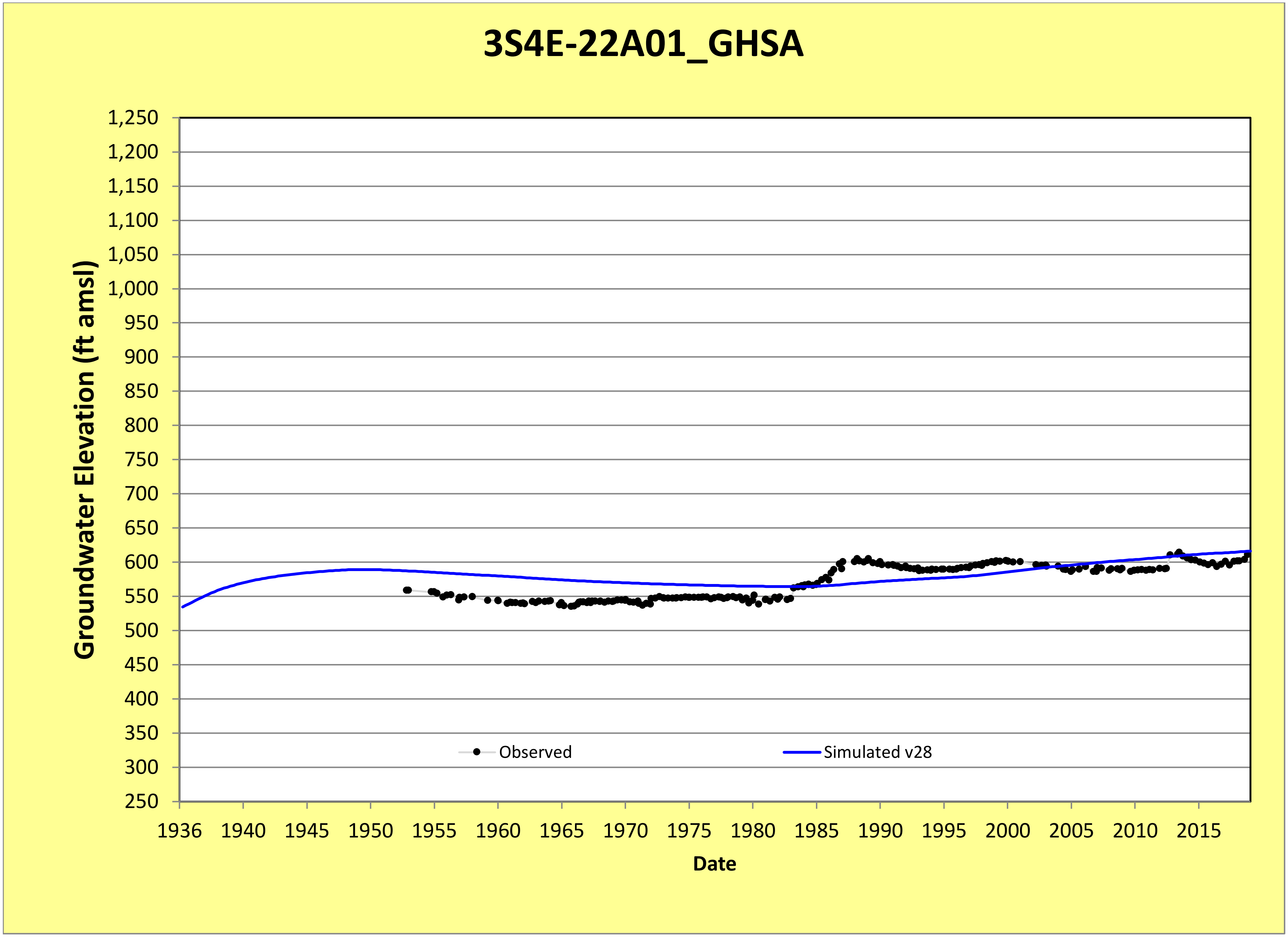
1,200
1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
1936
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Date
Observed
Simulated v28



3S4E-17K01_GHSA
800
750
700
650
600
550
500
Groundwater Elevation (ft amsl)
1936
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Date
Observed
Simulated v28


3S4E-22A01_GHSA
Groundwater Elevation (ft amsl)
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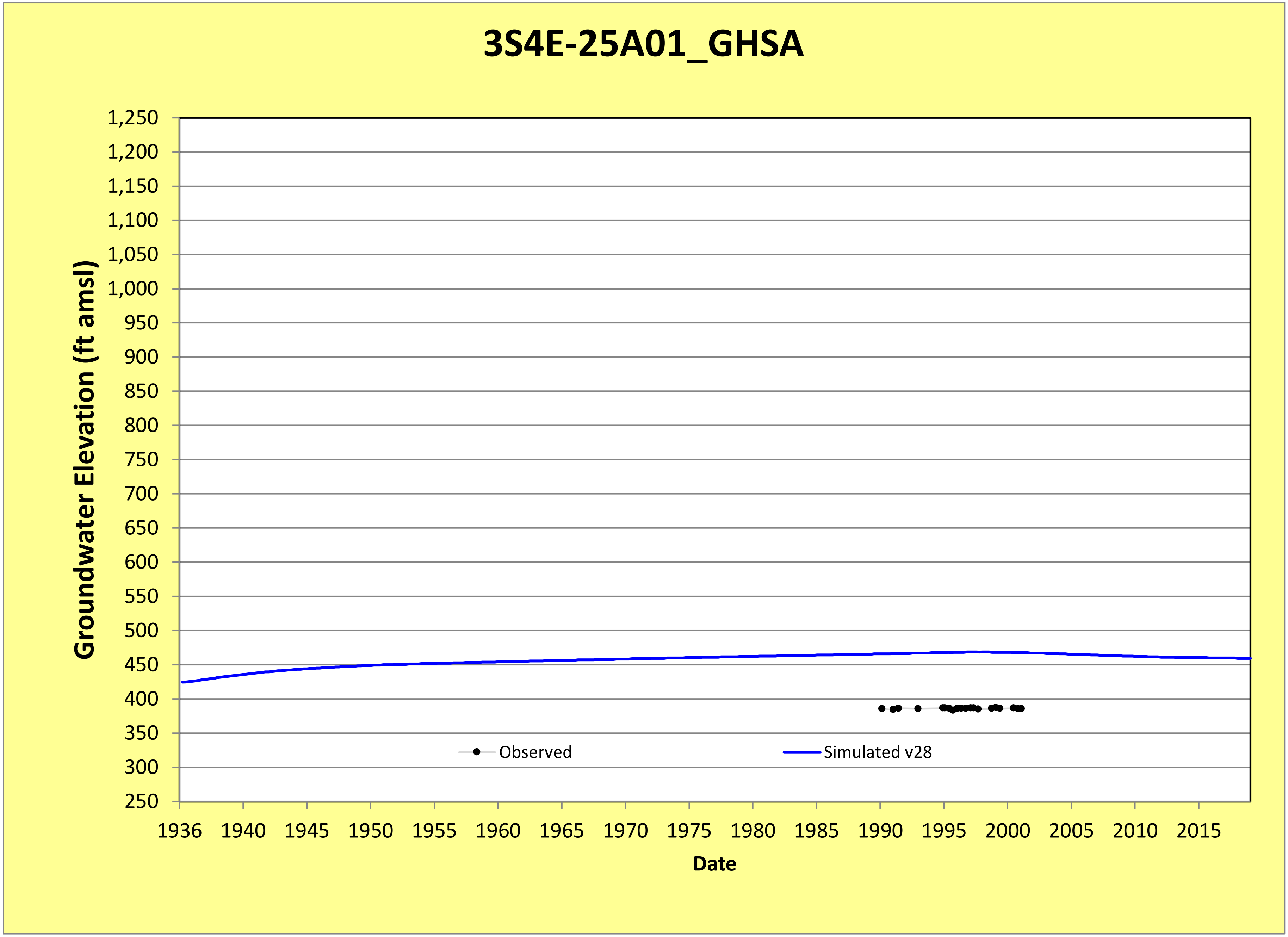
1,200
1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
Observed
Simulated v28
1936
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Date


3S4E-25A01_GHSA
Groundwater Elevation (ft amsl)
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1,200
1,150
1,100
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650
600
550
500
450
400
350
300
250
1936
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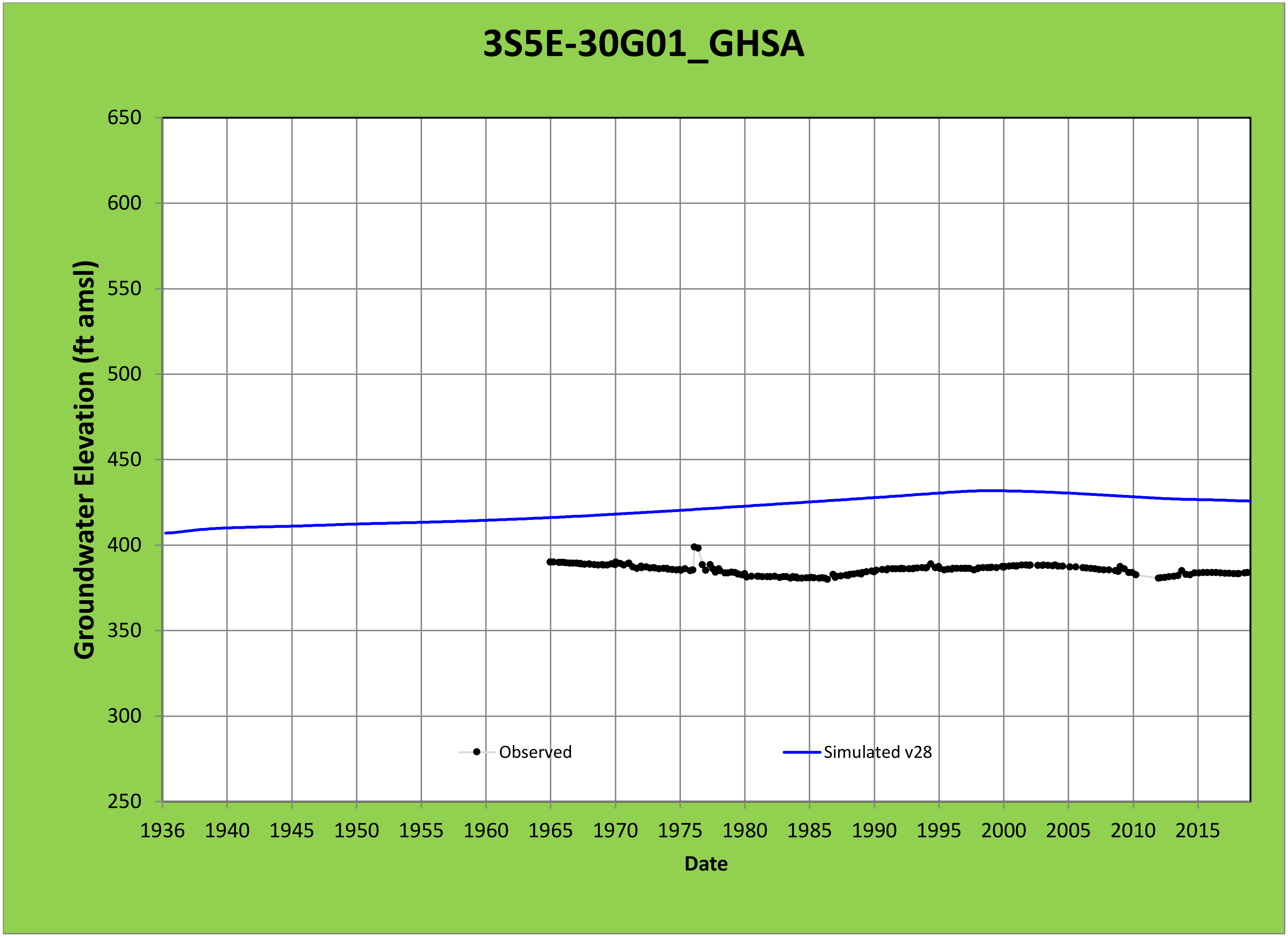
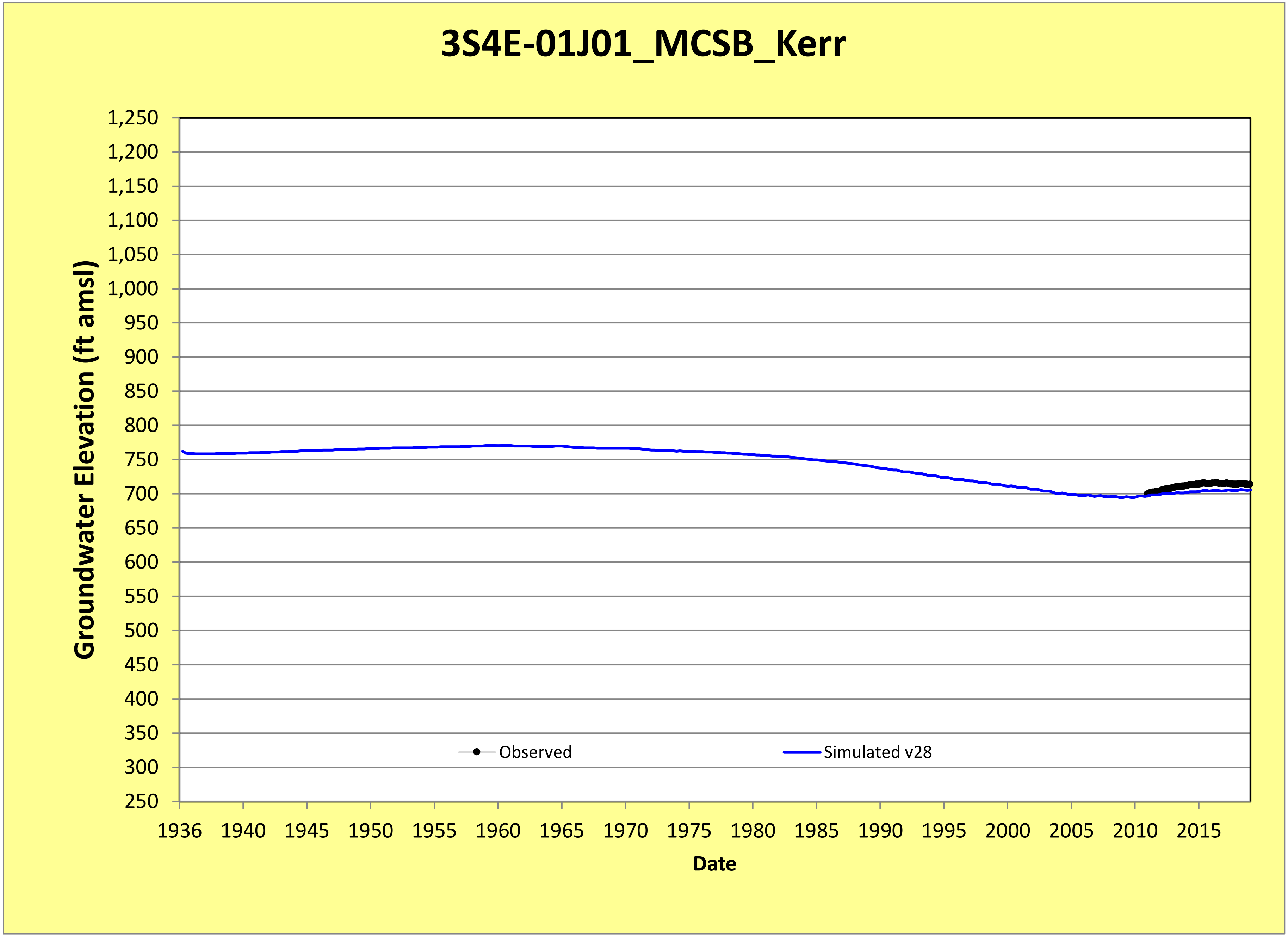
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Date
Observed
Simulated v28


3S5E-30G01_GHSA
Groundwater Elevation (ft amsl)
650
600
550
500
450
400
350
300
250
1936
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Date
Observed
Simulated v28


3S4E-01J01_MCSB_Kerr
Groundwater Elevation (ft amsl)
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1,200
1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
Observed
Simulated v28
1936
1940
1945
1950
1955
1960
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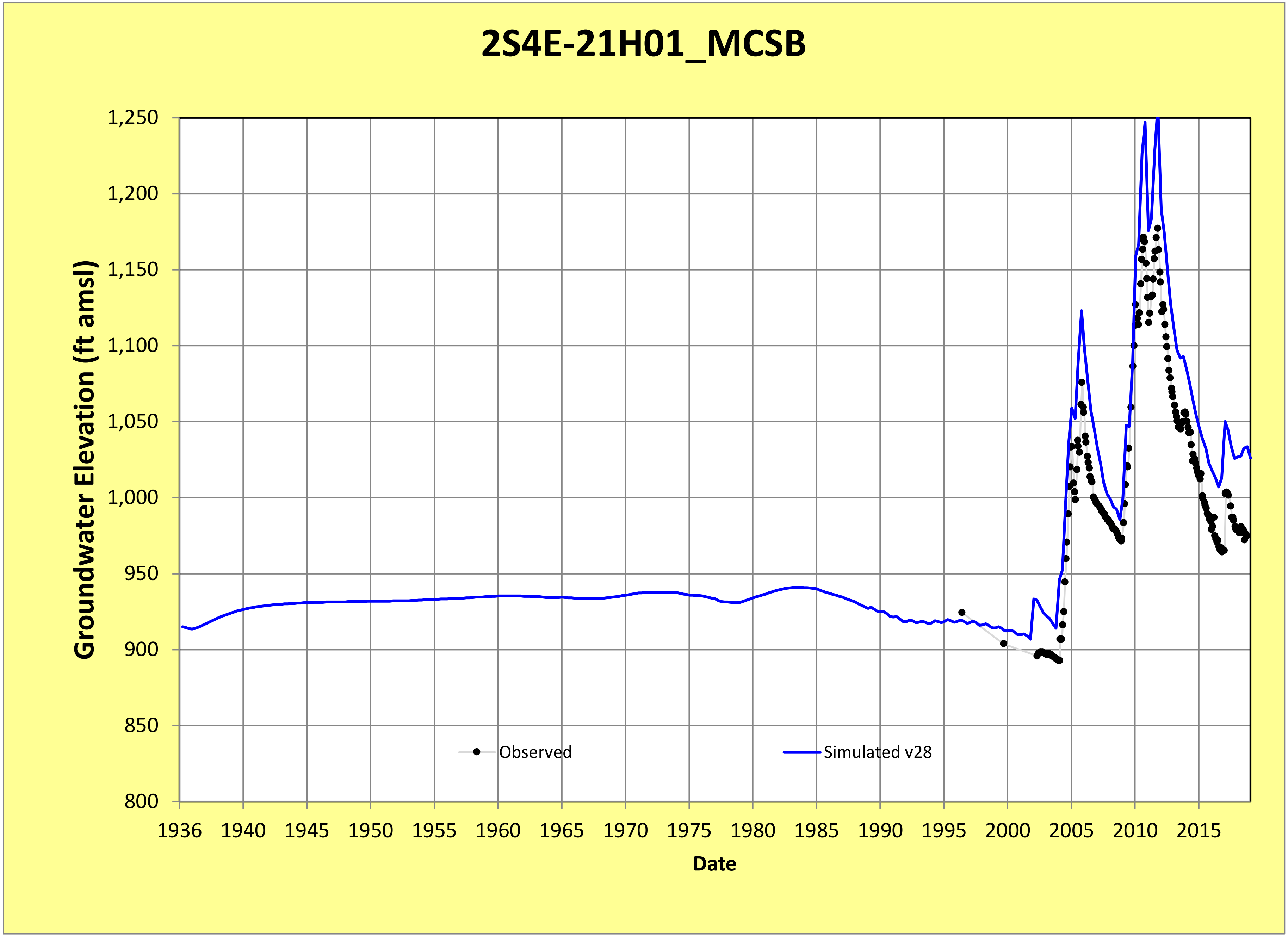
2000
2005
2010
2015
Date


2S4E-21H01_MCSB
Groundwater Elevation (ft amsl)
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1,200
1,150
1,100
1,050
1,000
950
900
850
800
1936
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
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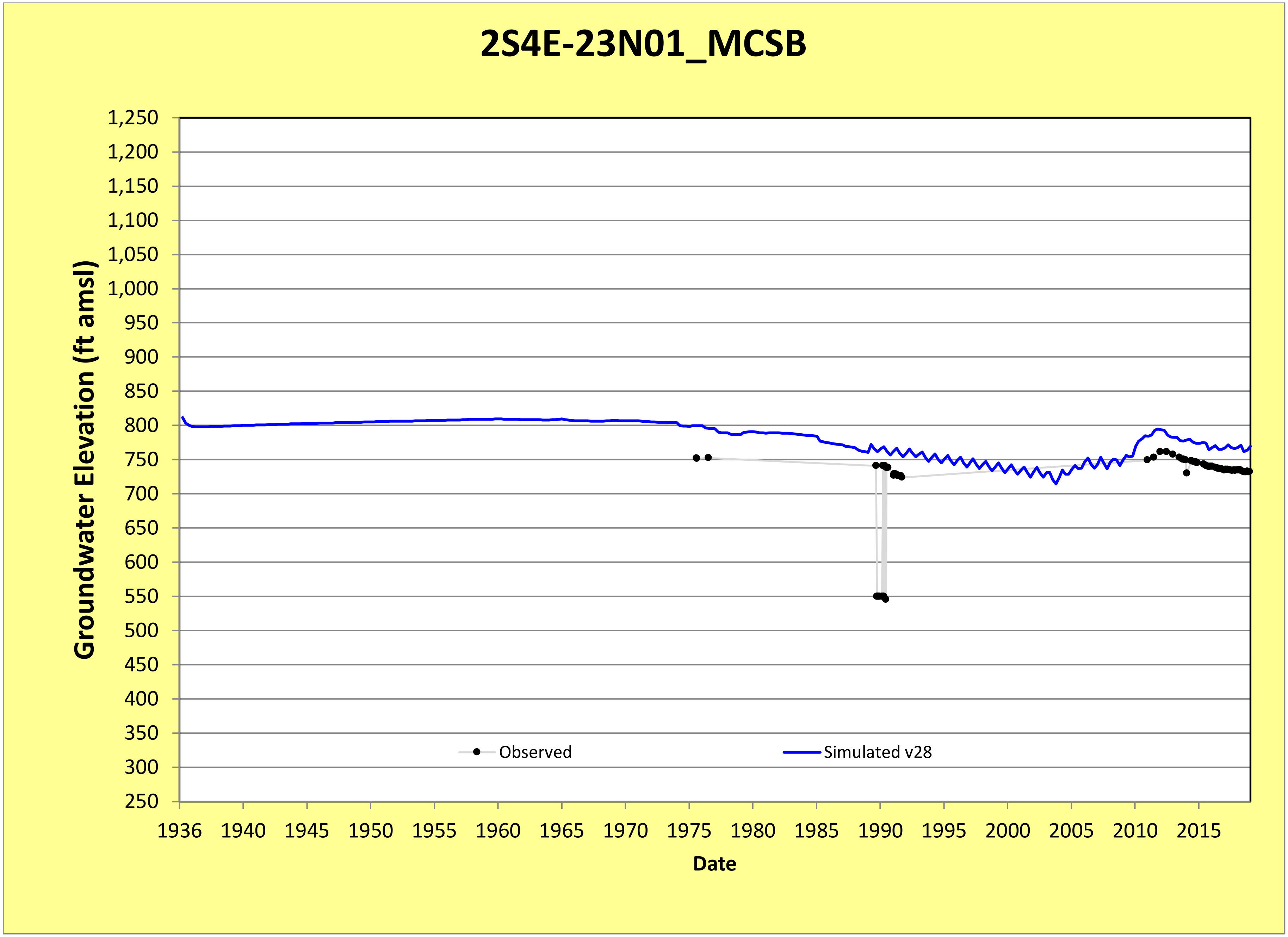
2000
2005
2010
2015
Date
Observed
Simulated v28



2S4E-23N01_MCSB
Groundwater Elevation (ft amsl)
1,250
1,200
1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
1936
1940
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1950
1955
1960
1965
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1975
1980
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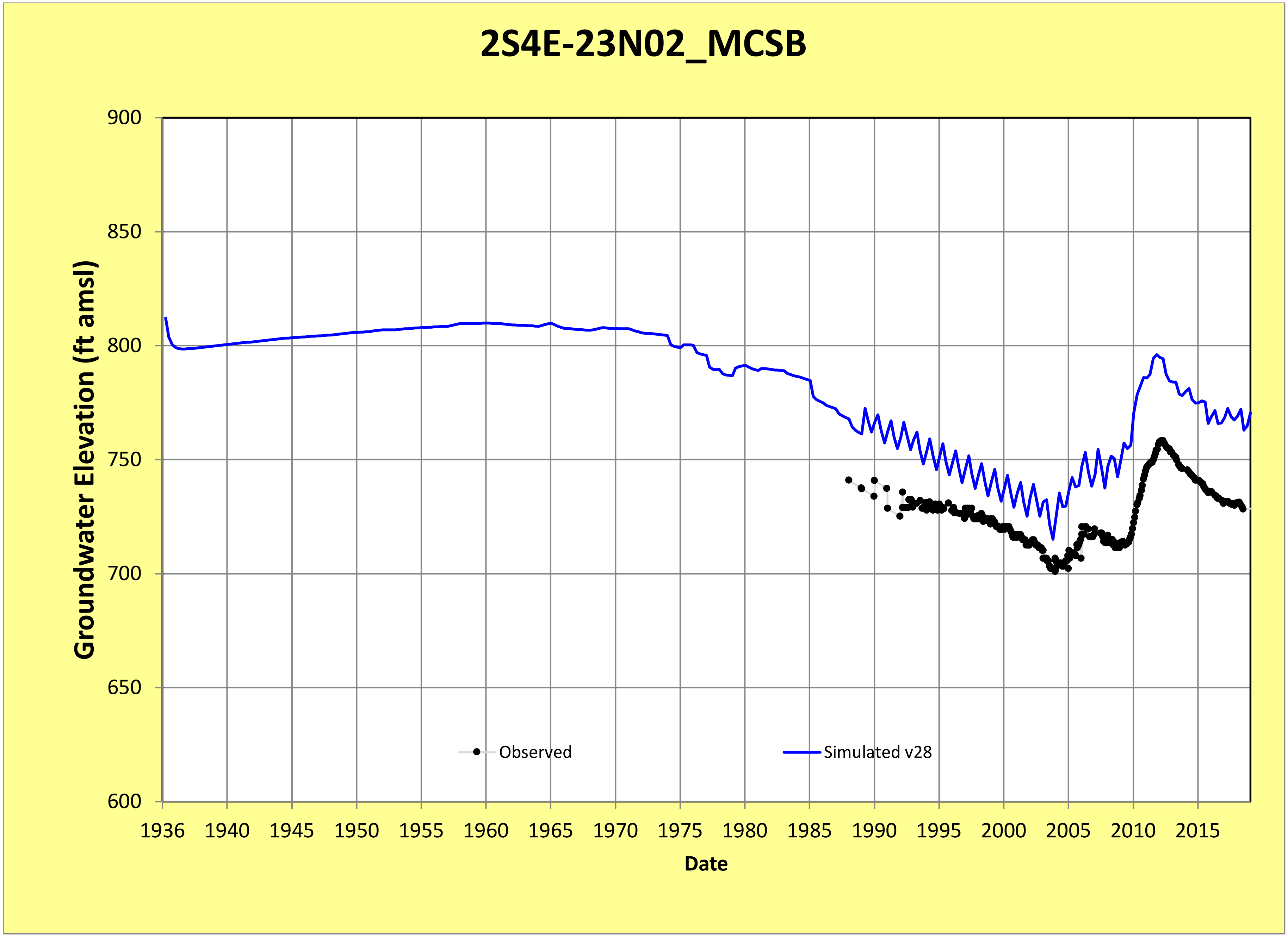
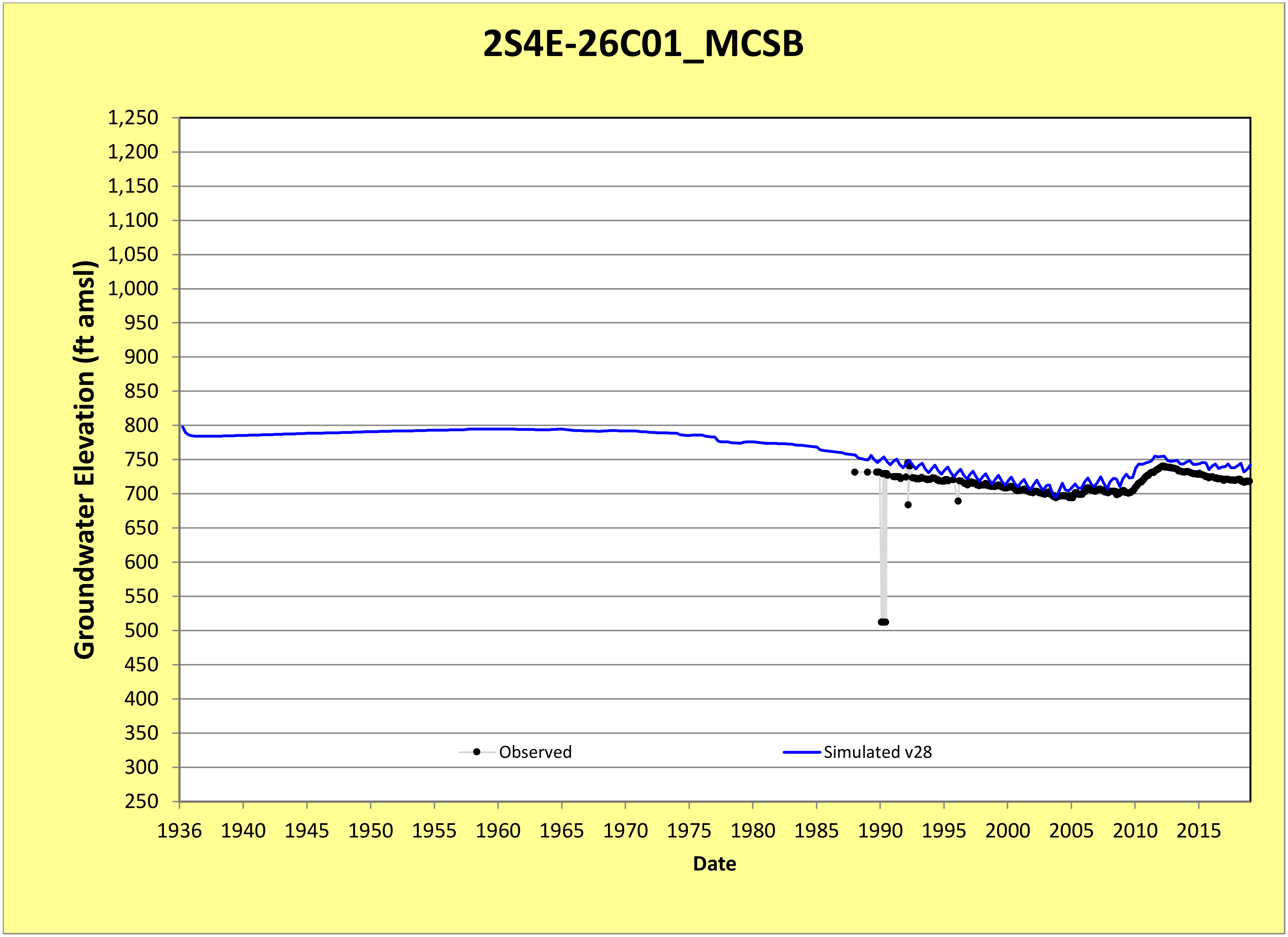
2000
2005
2010
2015
Date
Observed
Simulated v28



2S4E-23N02_MCSB
Groundwater Elevation (ft amsl)
900
850
800
750
700
650
600
1936
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Date
Observed
Simulated v28



2S4E-26C01_MCSB
Groundwater Elevation (ft amsl)
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1,150
1,100
1,050
1,000
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900
850
800
750
700
650
600
550
500
450
400
350
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250
1936
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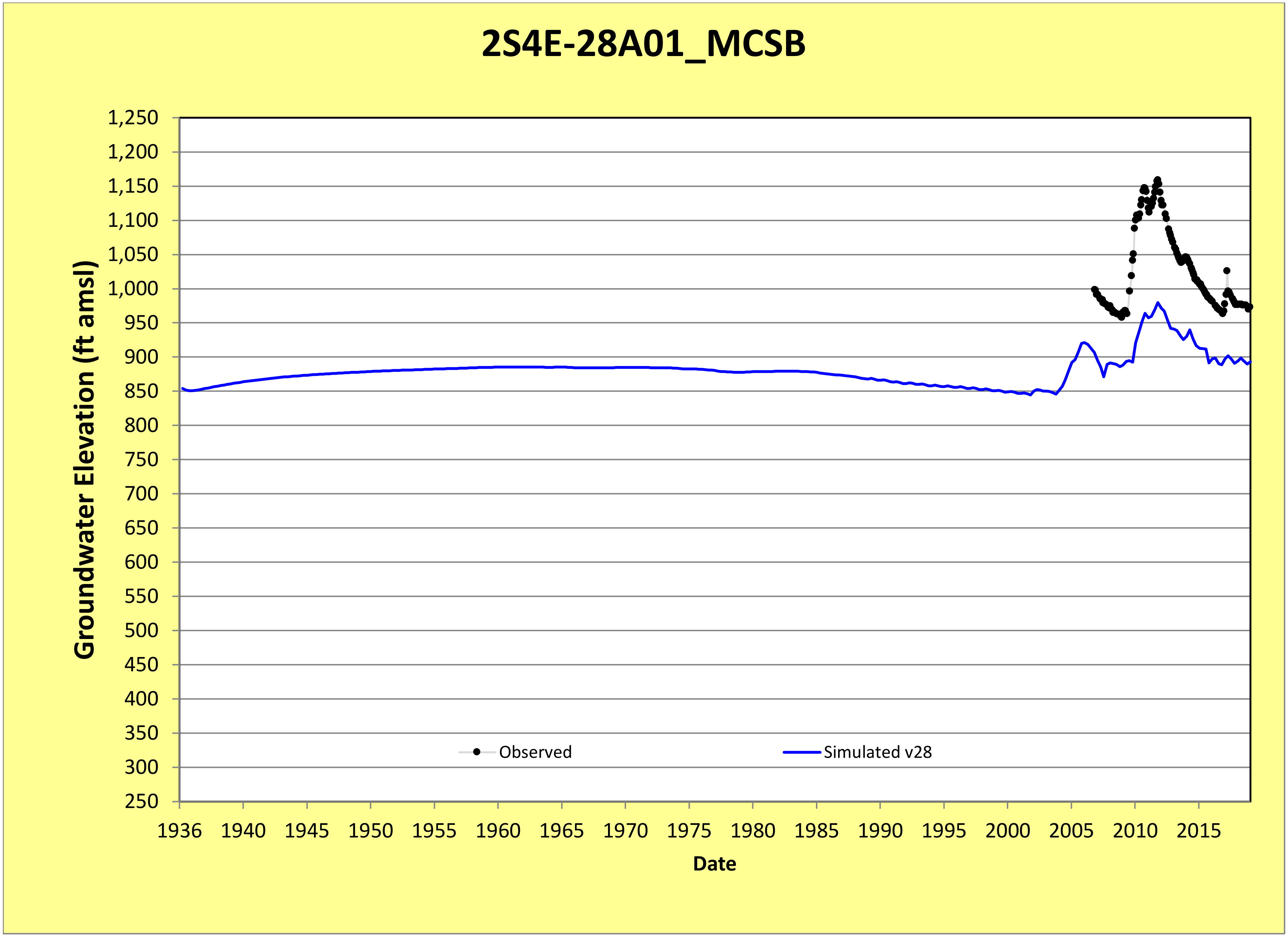
2010
2015
Date
Observed
Simulated v28


2S4E-28A01_MCSB
Groundwater Elevation (ft amsl)
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1,200
1,150
1,100
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600
550
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400
350
300
250
1936
1940
1945
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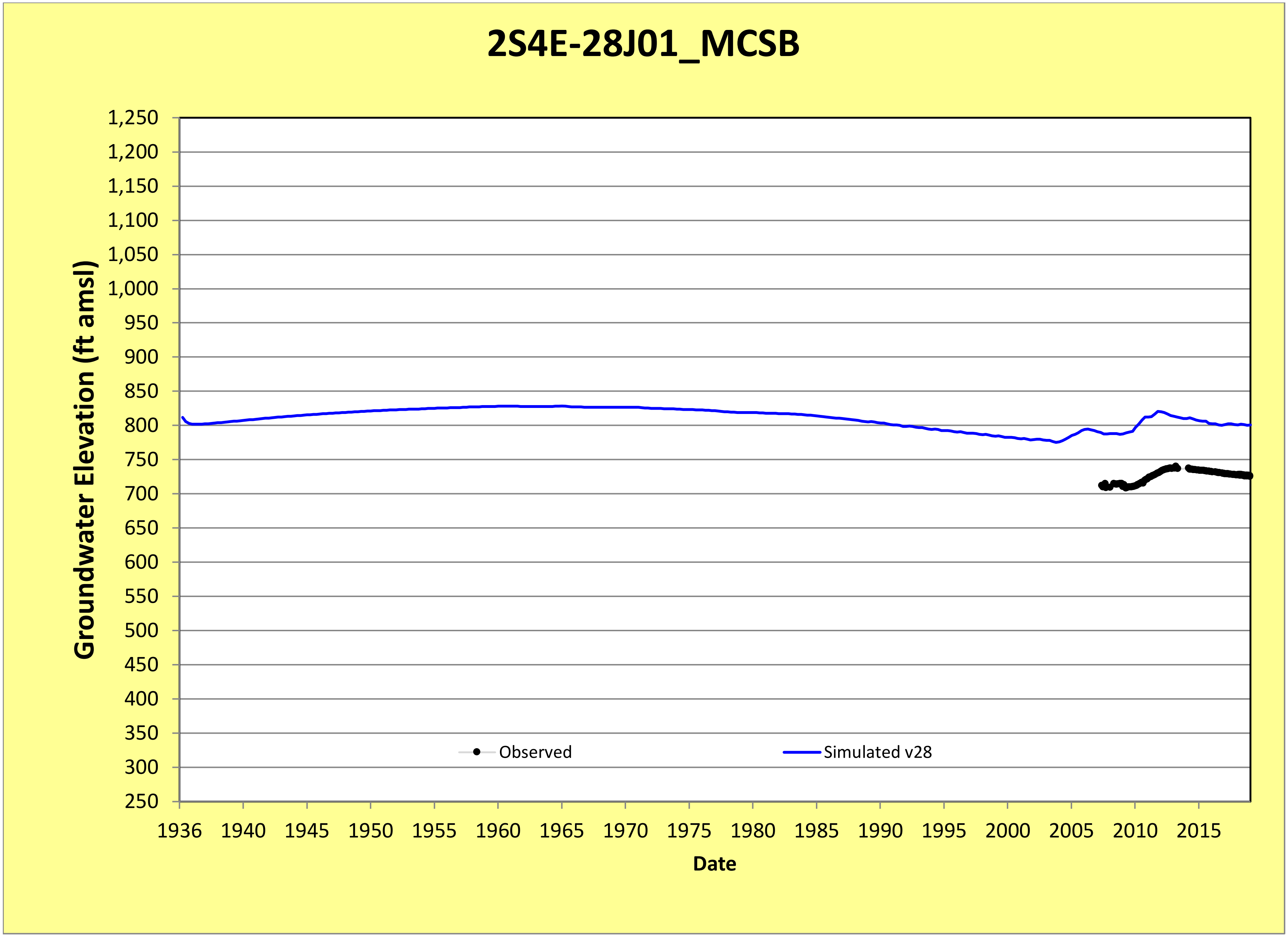
1990
1995
2000
2005
2010
2015
Date
Observed
Simulated v28


2S4E-28J01_MCSB
Groundwater Elevation (ft amsl)
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1,000
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900
850
800
750
700
650
600
550
500
450
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350
300
250
Observed
Simulated v28
1936
1940
1945
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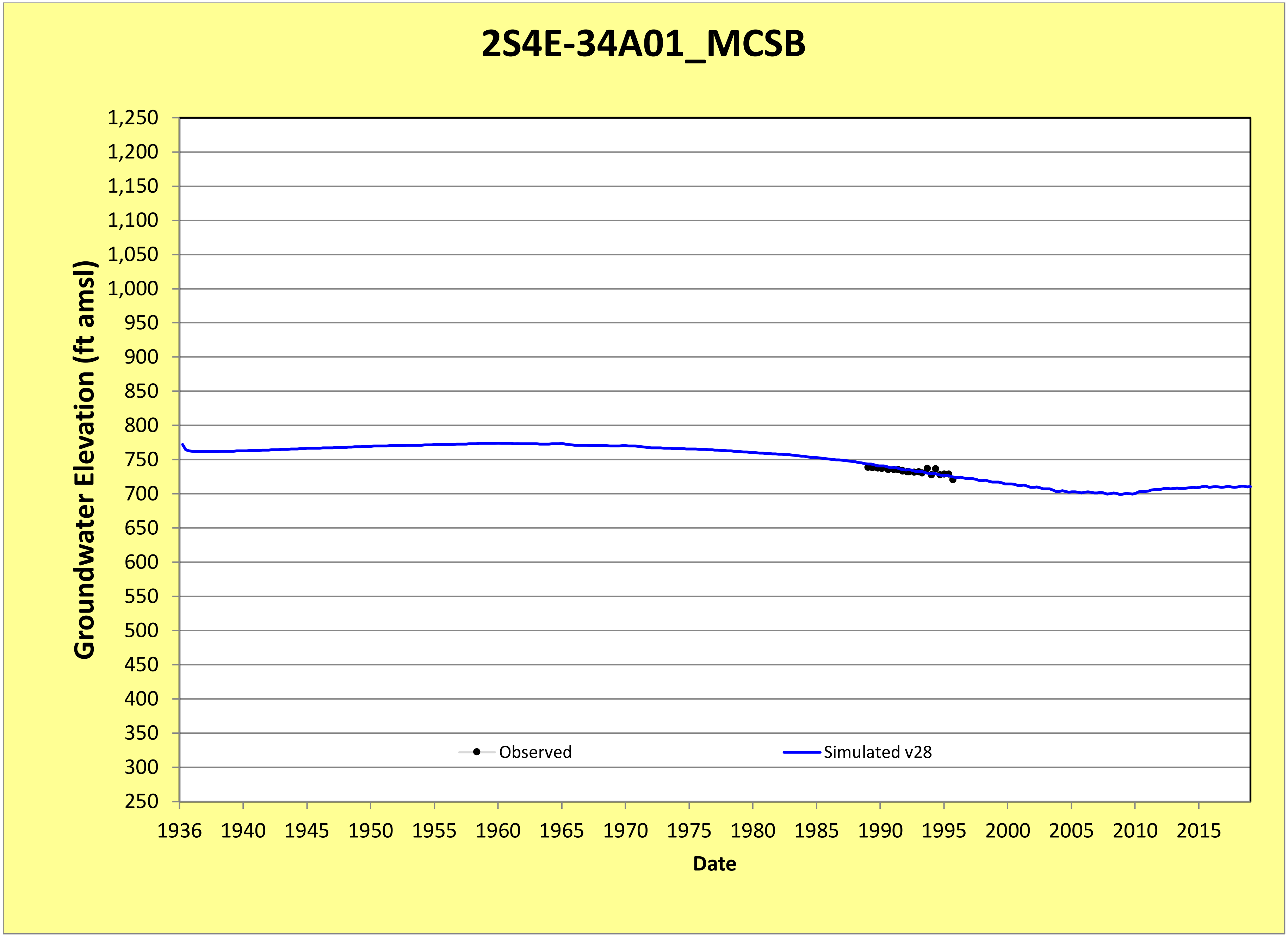
2000
2005
2010
2015
Date



2S4E-34A01_MCSB
Groundwater Elevation (ft amsl)
1,250
1,200
1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
Observed
Simulated v28
1936
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1945
1950
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1960
1965
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1975
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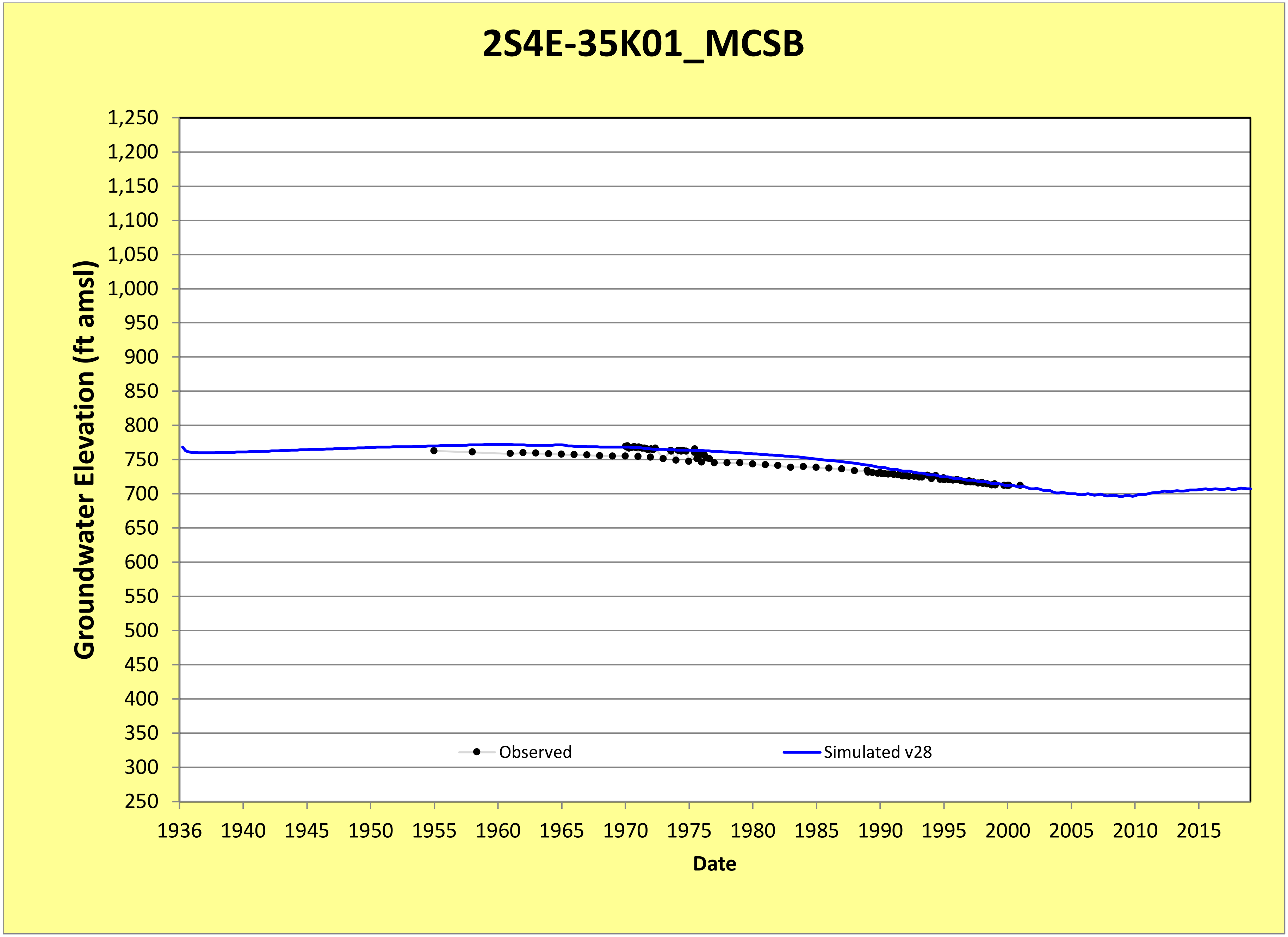
1995
2000
2005
2010
2015
Date


2S4E-35K01_MCSB
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1,150
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1,050
1,000
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800
750
700
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600
550
500
450
400
350
300
250
1936
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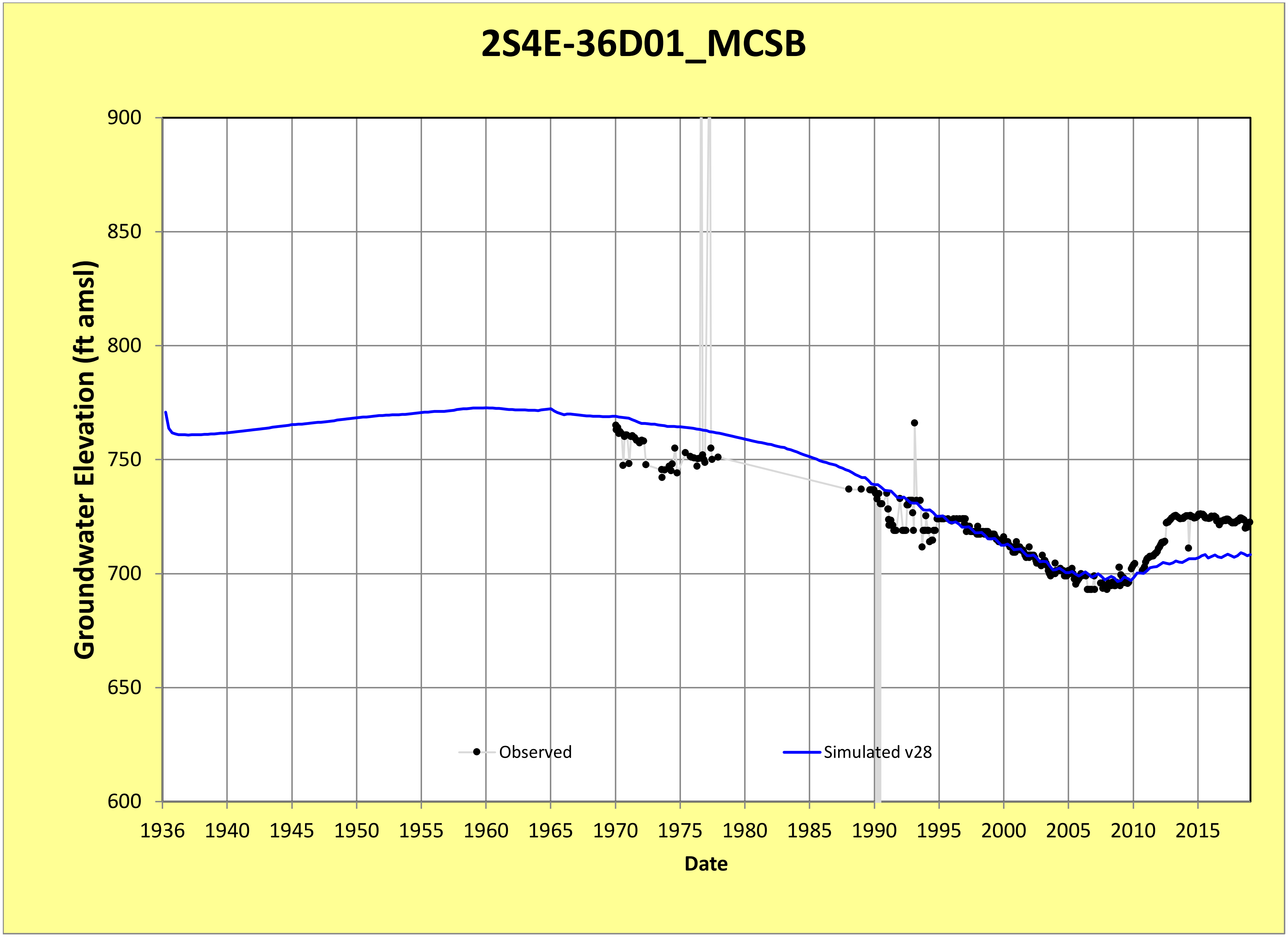
2005
2010
2015
Date
Observed
Simulated v28


2S4E-36D01_MCSB
Groundwater Elevation (ft amsl)
900
850
800
750
700
650
600
1936
1940
1945
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1960
1965
1970
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1980
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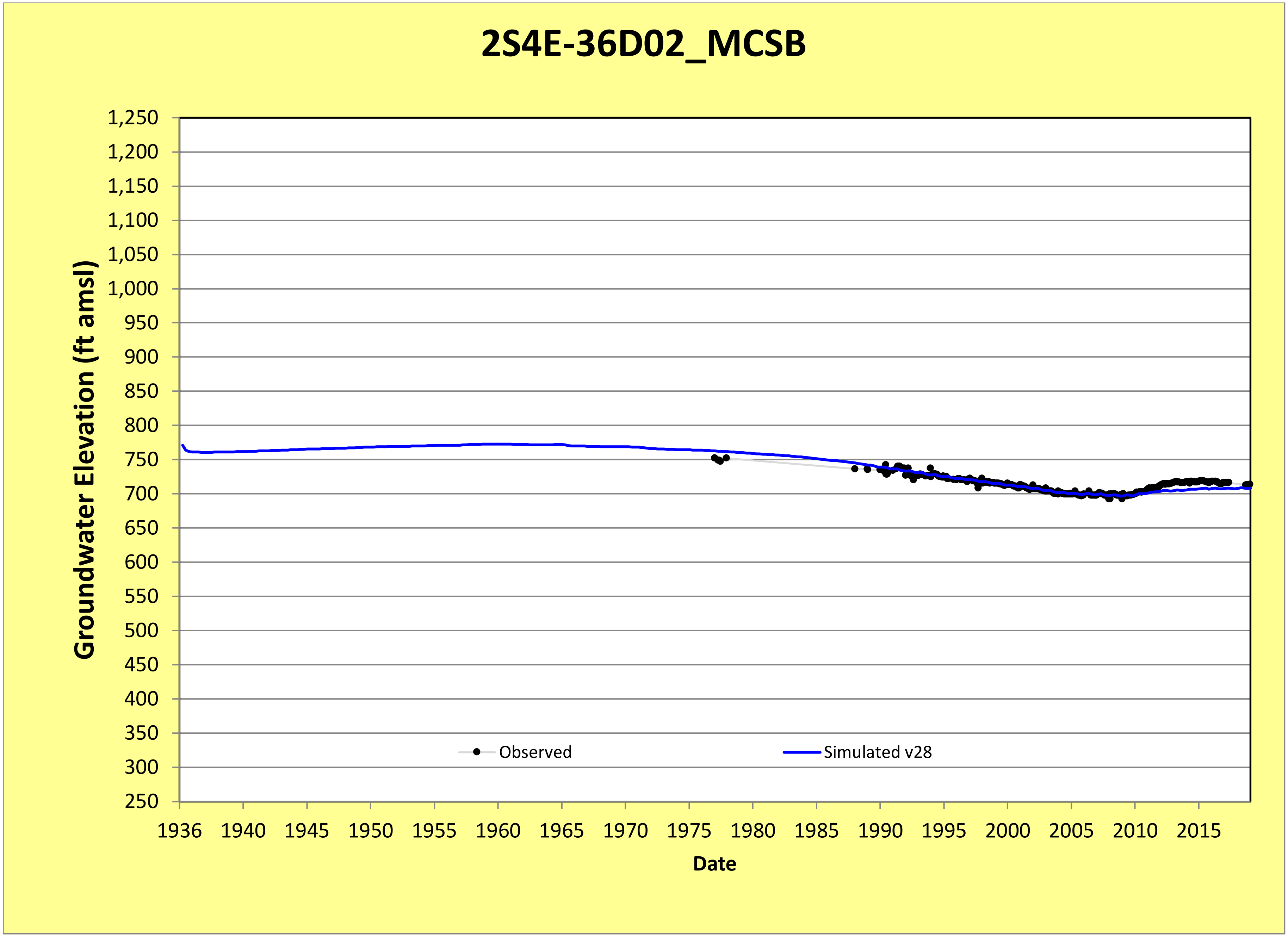
2005
2010
2015
Date
Observed
Simulated v28



2S4E-36D02_MCSB
Groundwater Elevation (ft amsl)
1,250
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1,150
1,100
1,050
1,000
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900
850
800
750
700
650
600
550
500
450
400
350
300
250
Observed
Simulated v28
1936
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1945
1950
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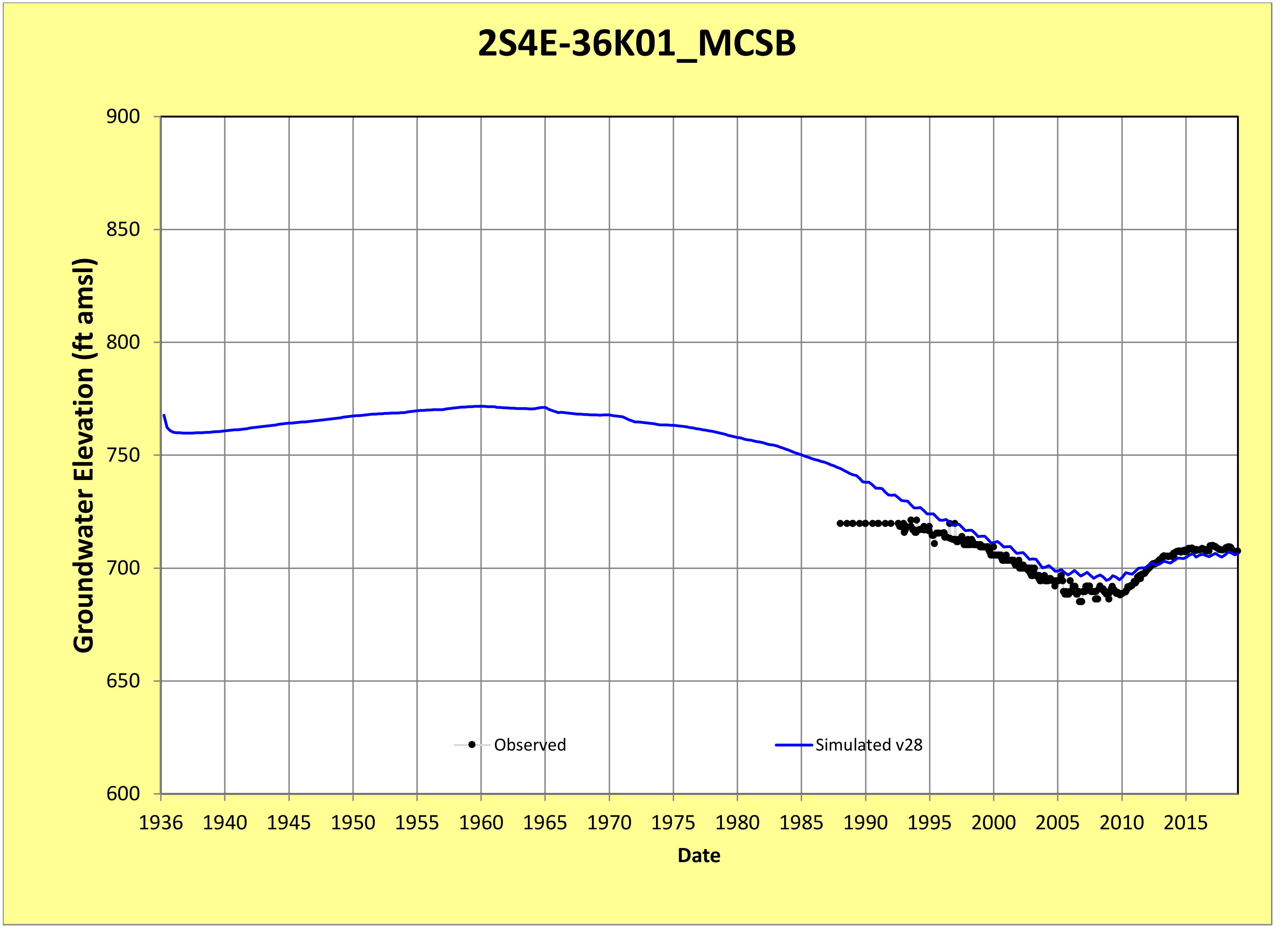
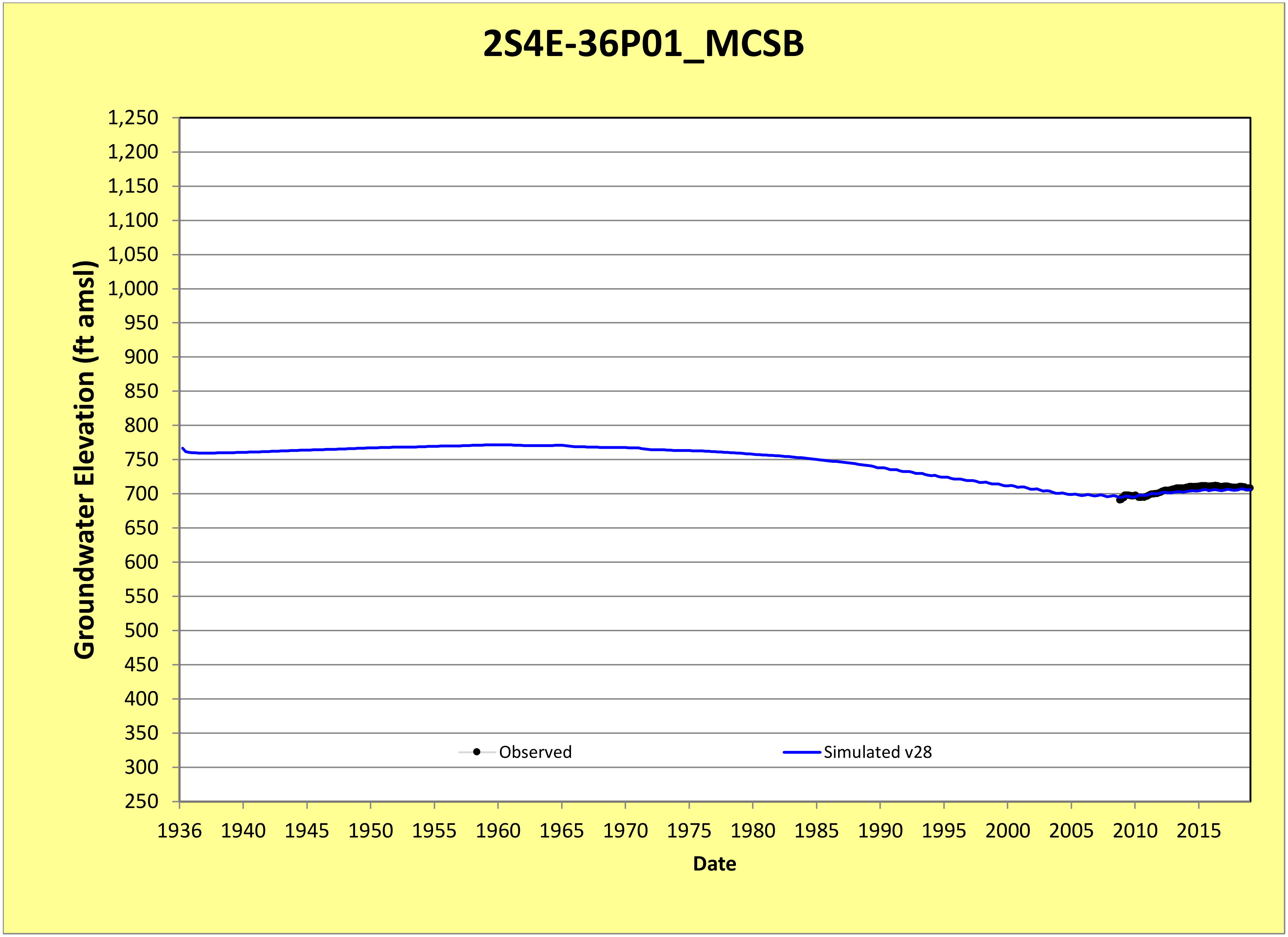
2005
2010
2015
Date



2S4E-36K01_MCSB
Groundwater Elevation (ft amsl)
900
850
800
750
700
650
600
1936
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Date
Observed
Simulated v28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Groundwater Elevation (ft amsl)
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1,150
1,100
1,050
1,000
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900
850
800
750
700
650
600
550
500
450
400
350
300
250
1936
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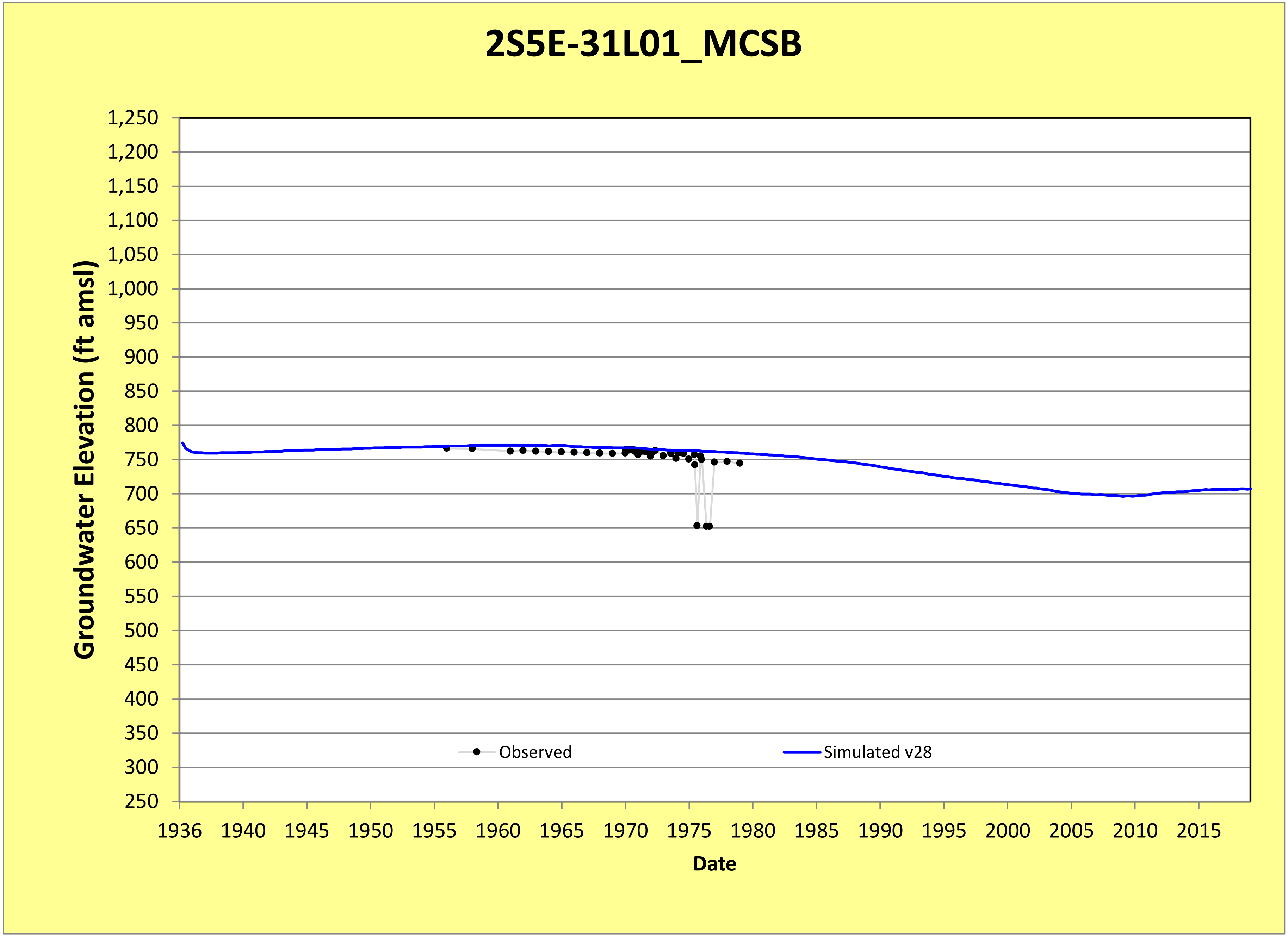
2000
2005
2010
2015
Date
Observed
Simulated v28


2S5E-31L01_MCSB
Groundwater Elevation (ft amsl)
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1,200
1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
Observed
Simulated v28
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1945
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2005
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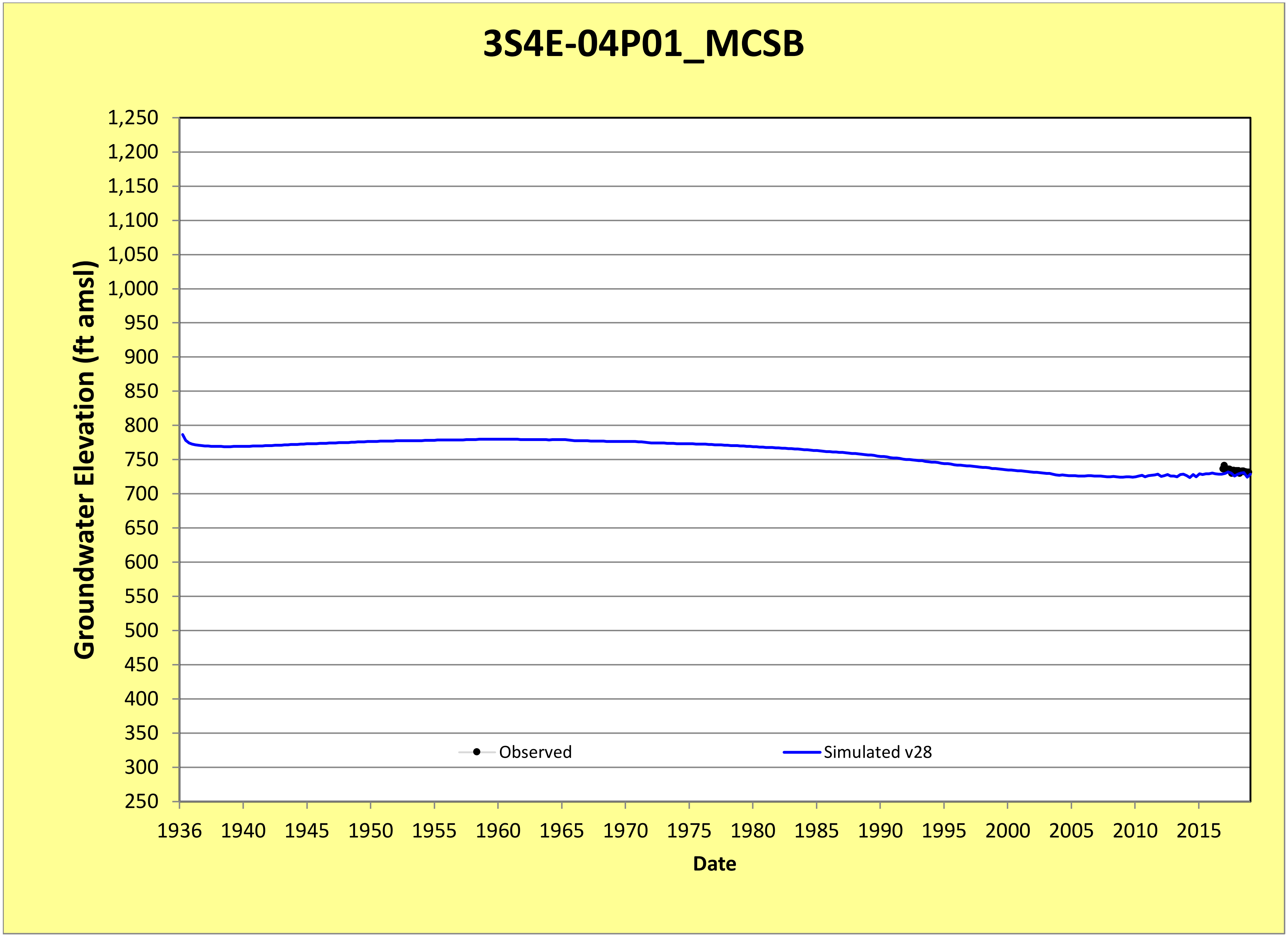
2015
Date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Groundwater Elevation (ft amsl)
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1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
Observed
Simulated v28
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1945
1950
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1960
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1990
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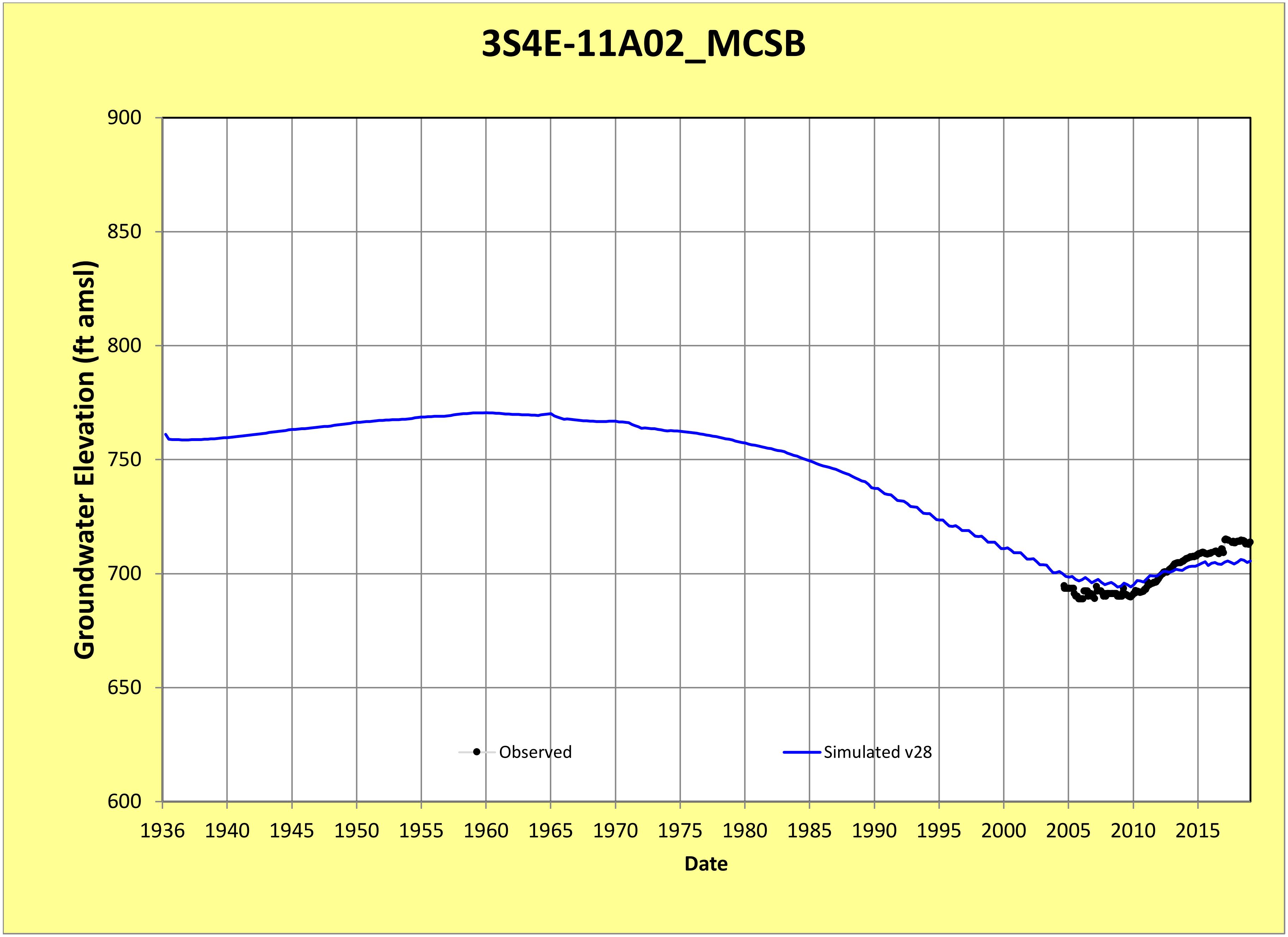
2005
2010
2015
Date


3S4E-11A02_MCSB
900
850
800
750
700
650
600
Groundwater Elevation (ft amsl)
1936
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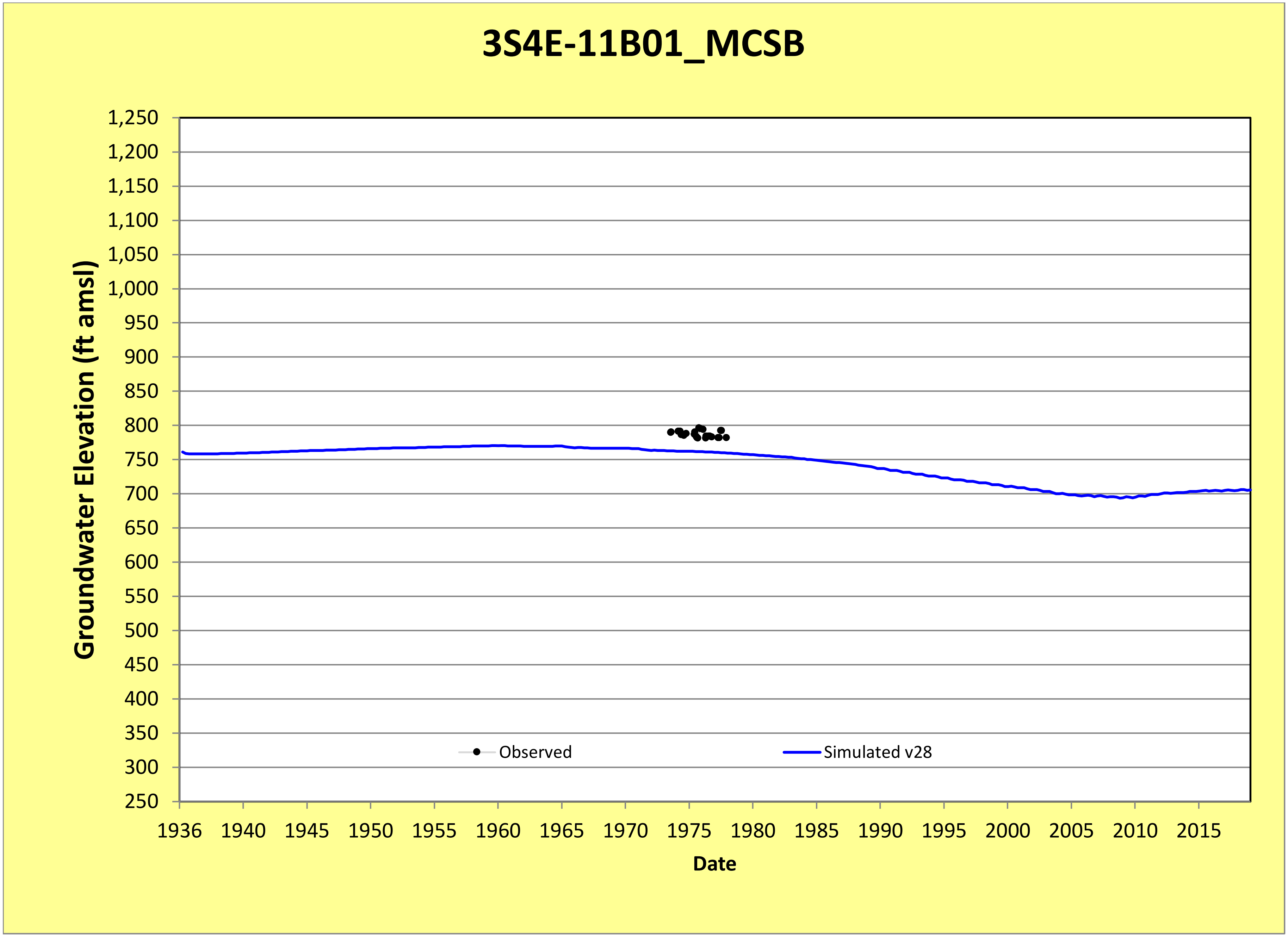
1995
2000
2005
2010
2015
Date
Observed
Simulated v28


3S4E-11B01_MCSB
Groundwater Elevation (ft amsl)
1,250
1,200
1,150
1,100
1,050
1,000
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900
850
800
750
700
650
600
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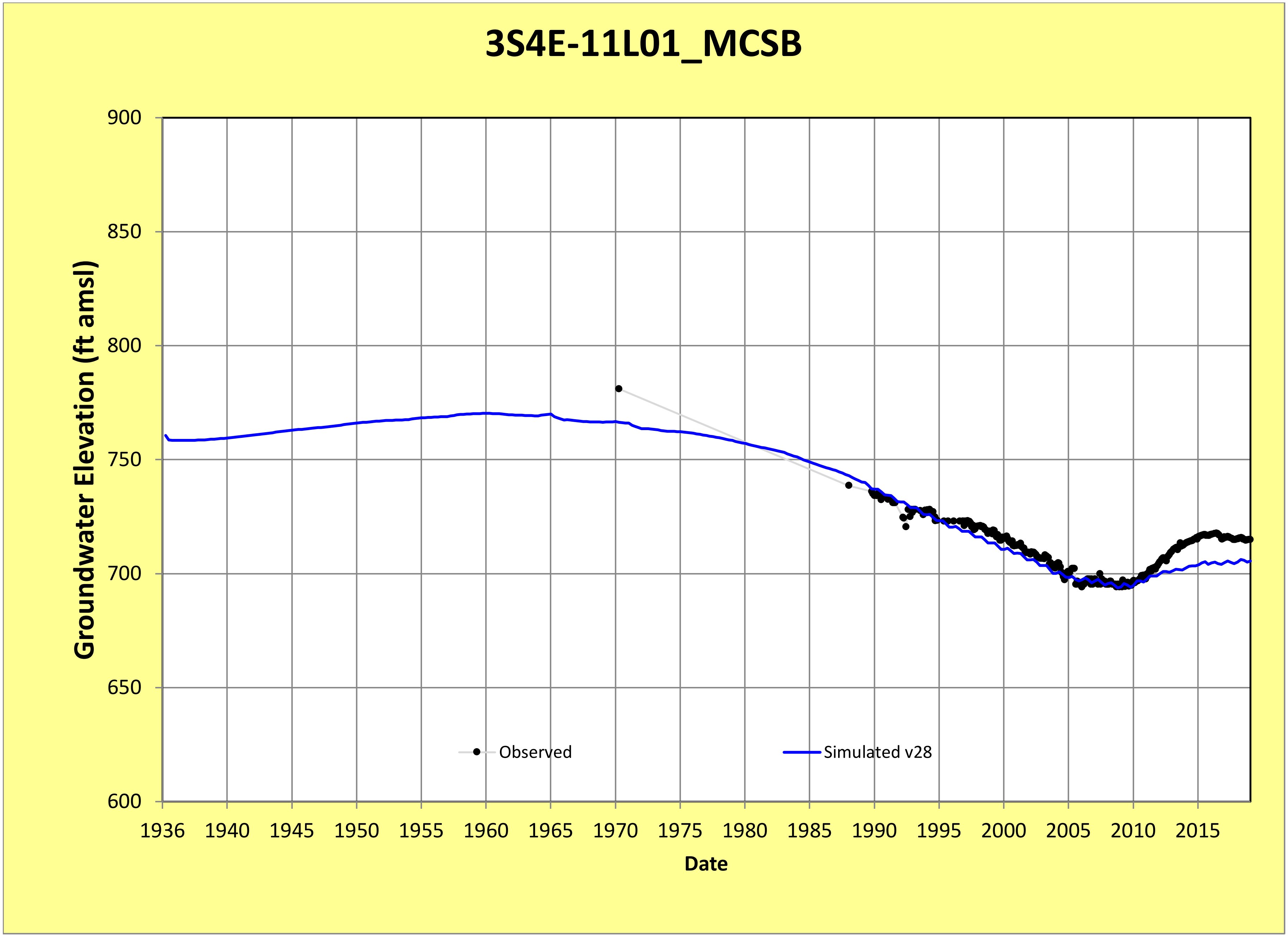
2005
2010
2015
Date
Observed
Simulated v28



3S4E-11L01_MCSB
Groundwater Elevation (ft amsl)
900
850
800
750
700
650
600
1936
1940
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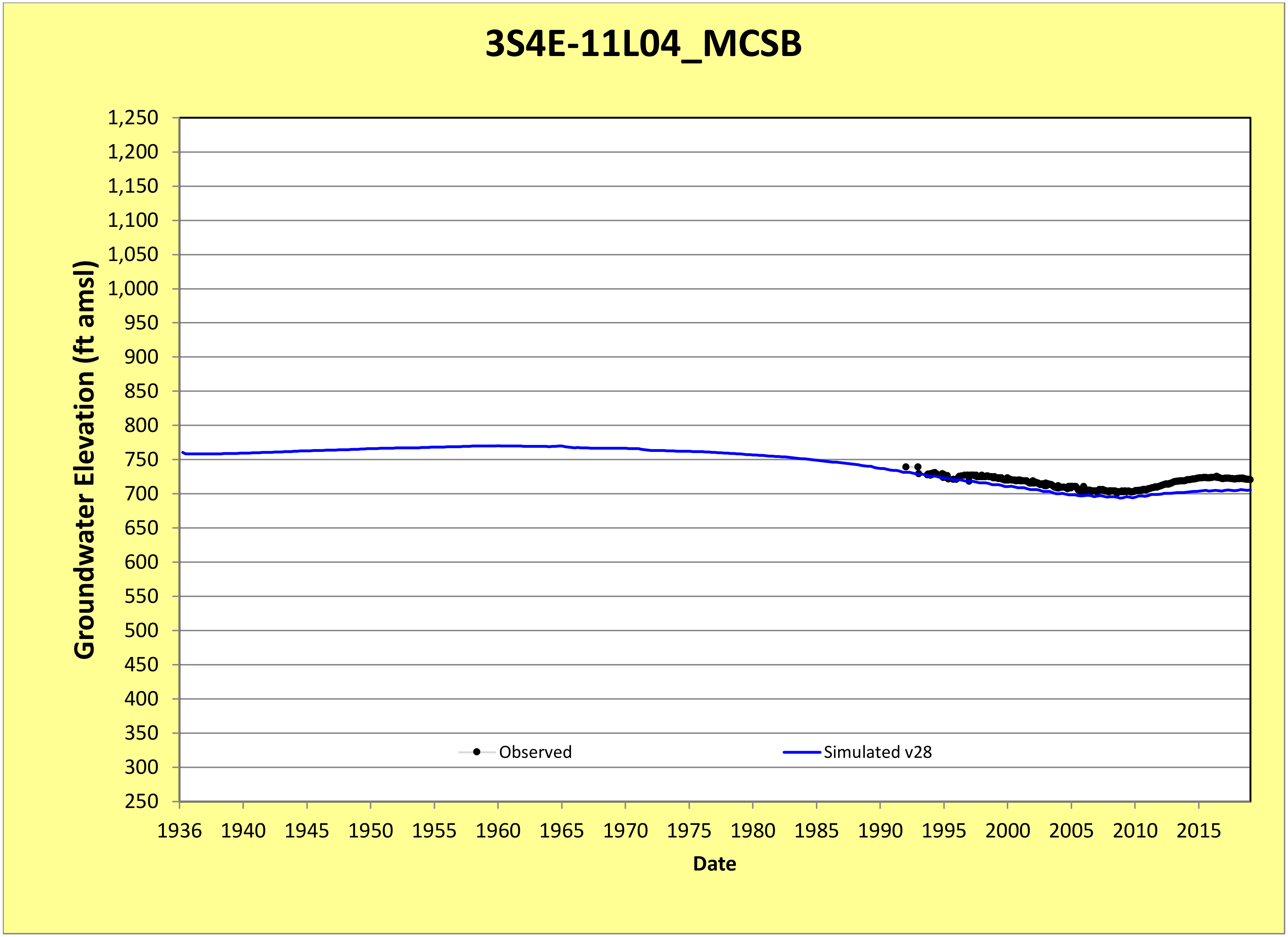
2015
Date
Observed
Simulated v28


3S4E-11L04_MCSB
Groundwater Elevation (ft amsl)
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1,150
1,100
1,050
1,000
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900
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800
750
700
650
600
550
500
450
400
350
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1936
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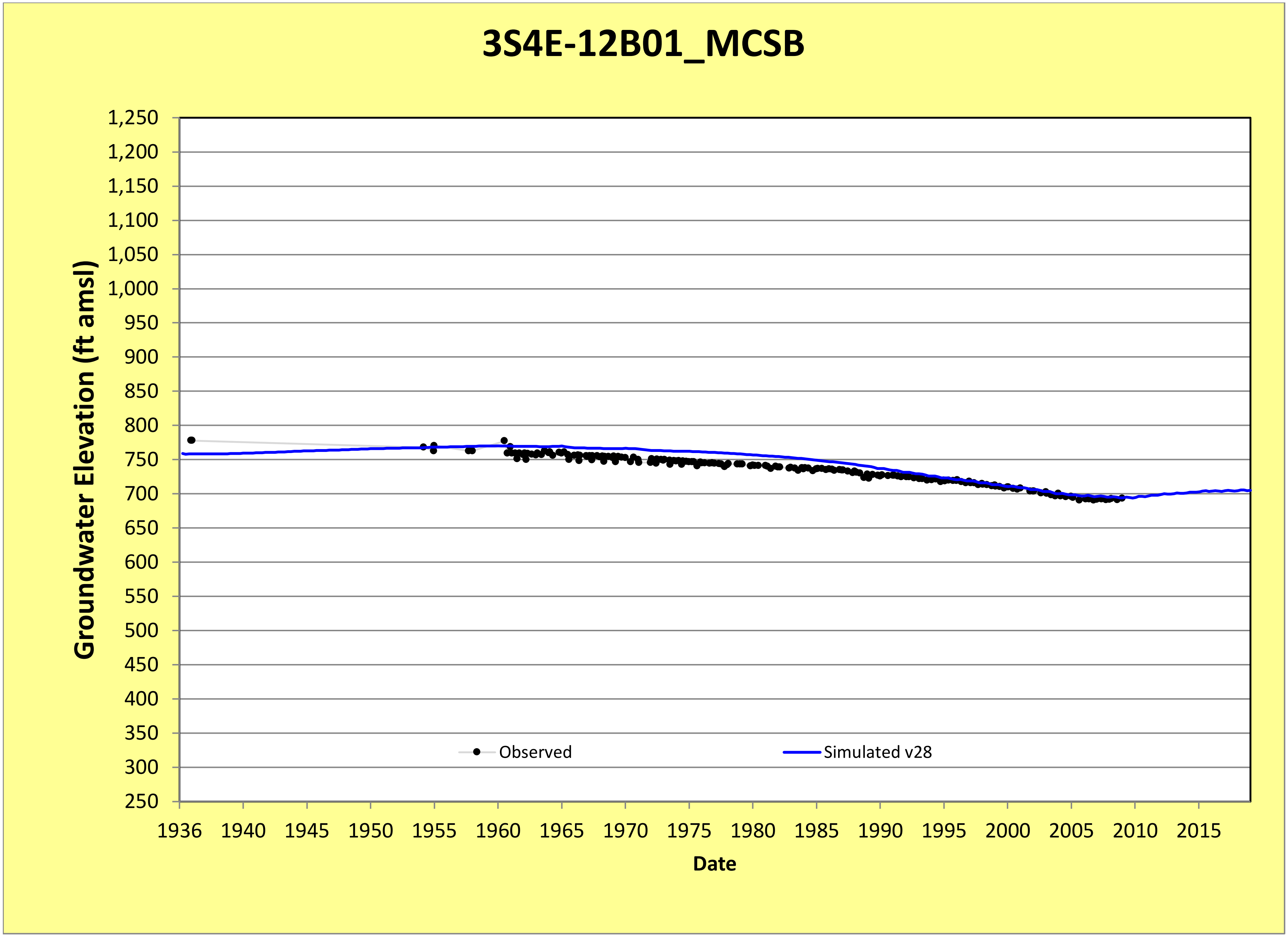
2015
Date
Observed
Simulated v28


3S4E-12B01_MCSB
Groundwater Elevation (ft amsl)
1,250
1,200
1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
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250
Observed
Simulated v28
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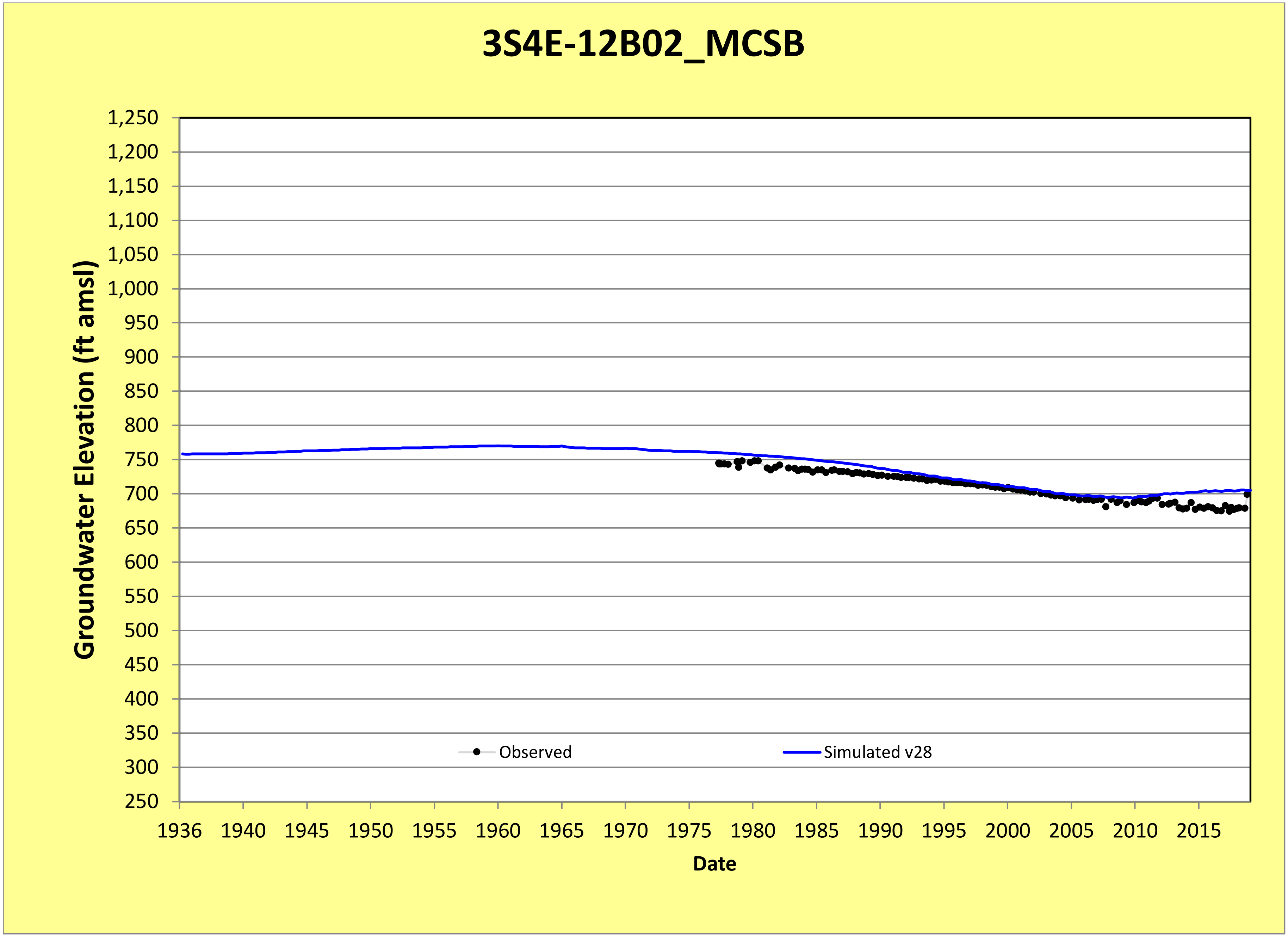
2005
2010
2015
Date


3S4E-12B02_MCSB
Groundwater Elevation (ft amsl)
1,250
1,200
1,150
1,100
1,050
1,000
950
900
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800
750
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650
600
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Observed
Simulated v28
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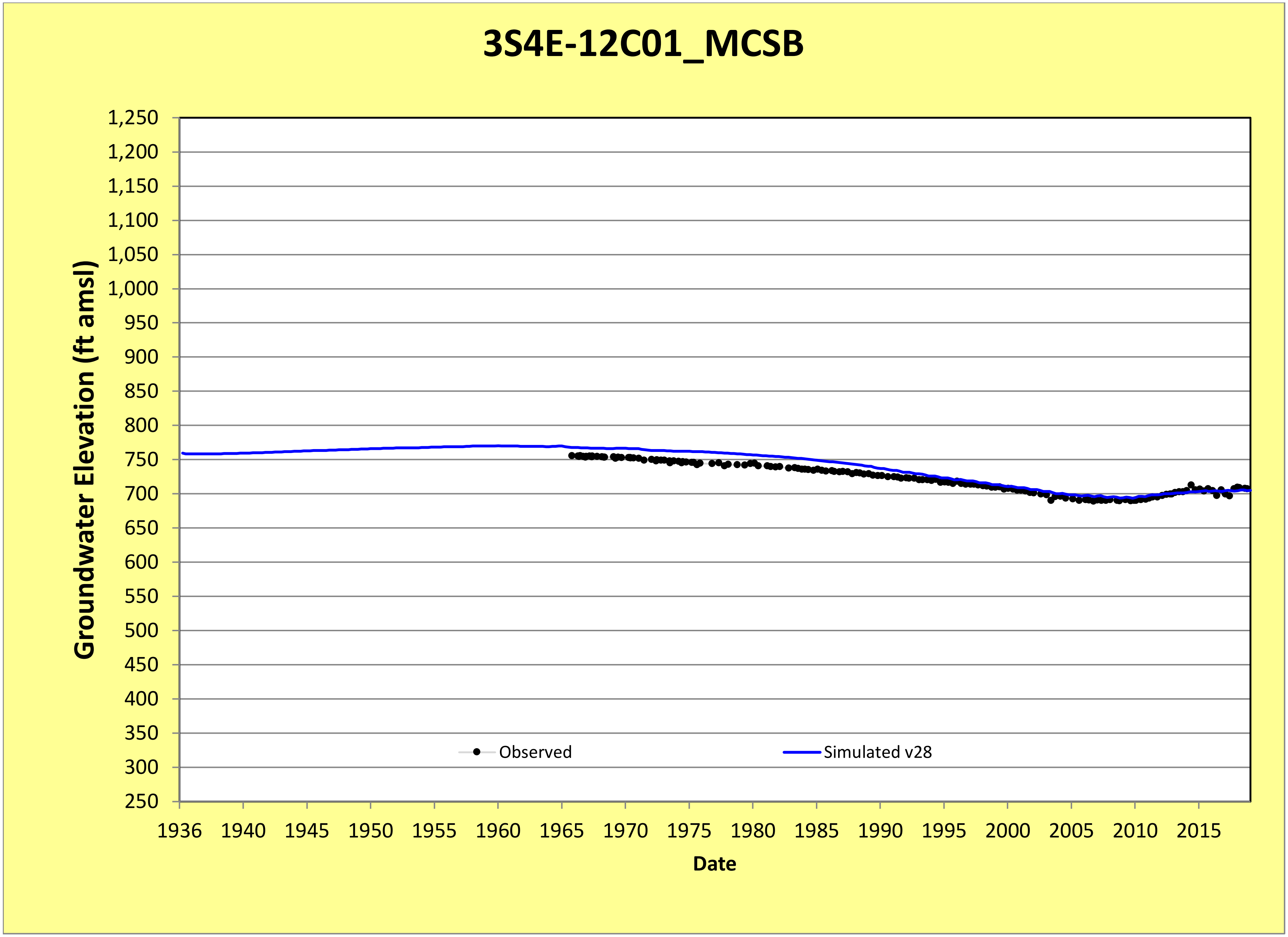
2010
2015
Date



3S4E-12C01_MCSB
Groundwater Elevation (ft amsl)
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1,200
1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
Observed
Simulated v28
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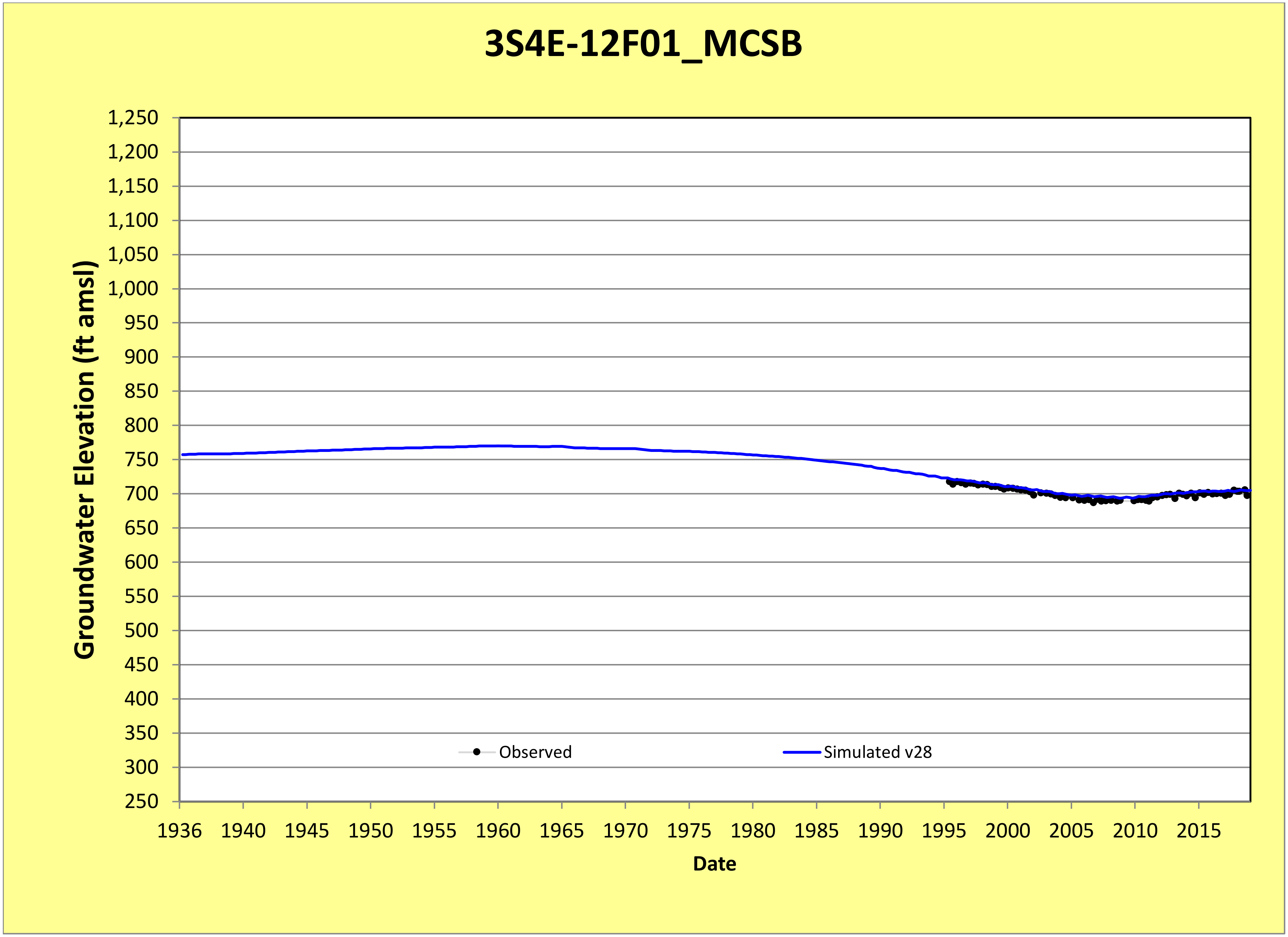
2015
Date



3S4E-12F01_MCSB
Groundwater Elevation (ft amsl)
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1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
Observed
Simulated v28
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2005
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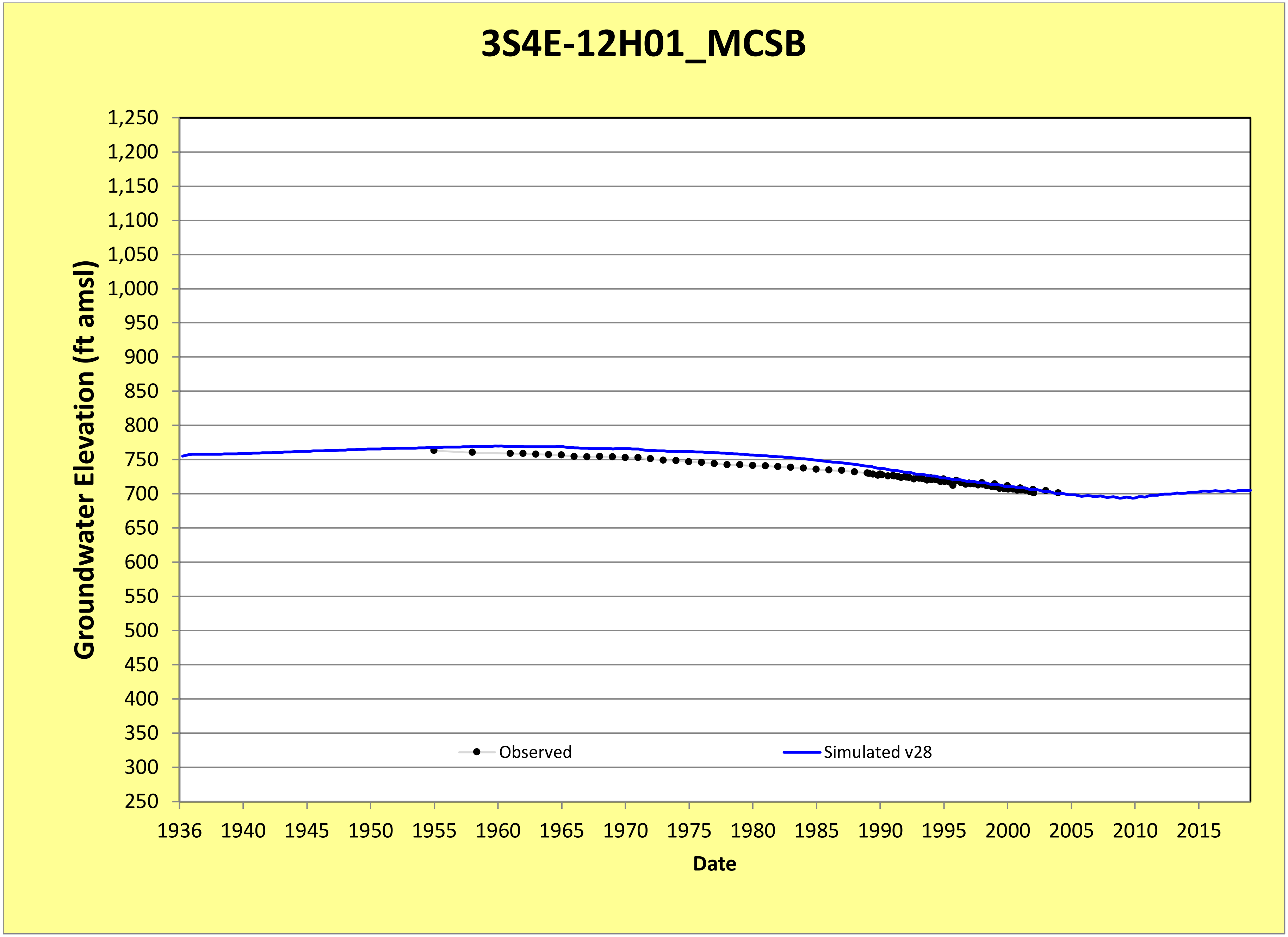
2015
Date



3S4E-12H01_MCSB
Groundwater Elevation (ft amsl)
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1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
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250
Observed
Simulated v28
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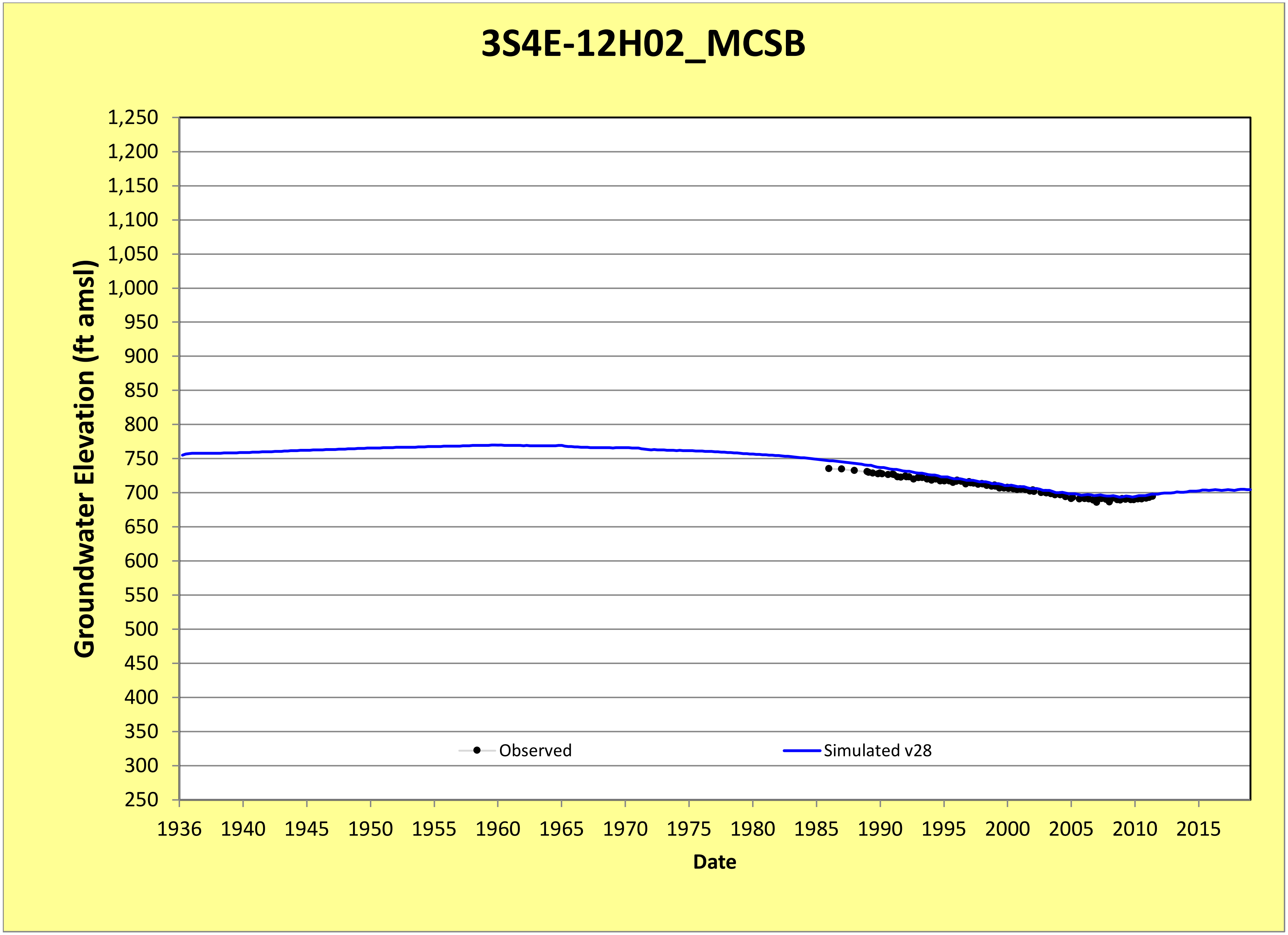
Date


3S4E-12H02_MCSB
Groundwater Elevation (ft amsl)
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1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
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1936
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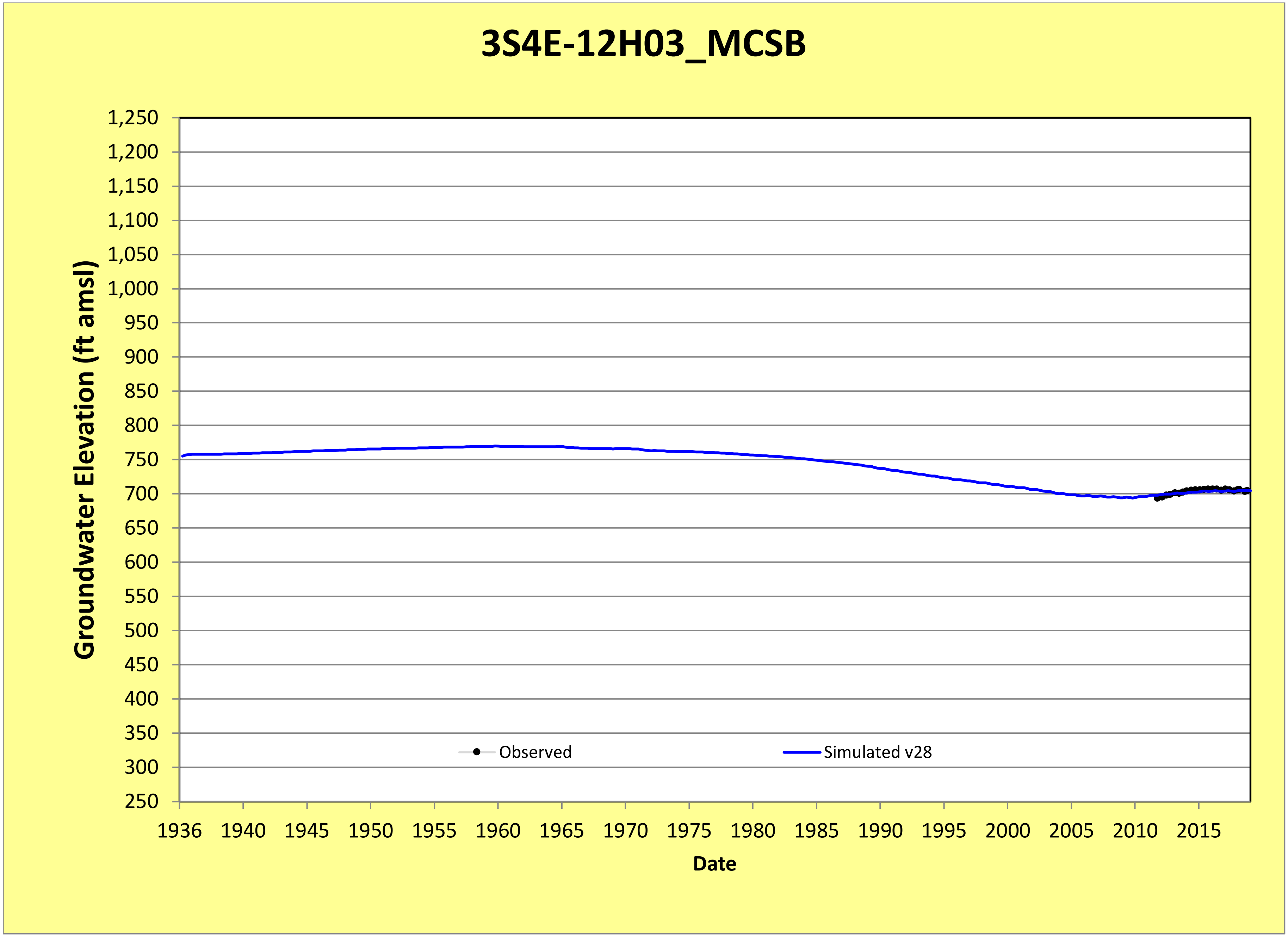
2005
2010
2015
Date
Observed
Simulated v28



3S4E-12H03_MCSB
Groundwater Elevation (ft amsl)
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1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
Observed
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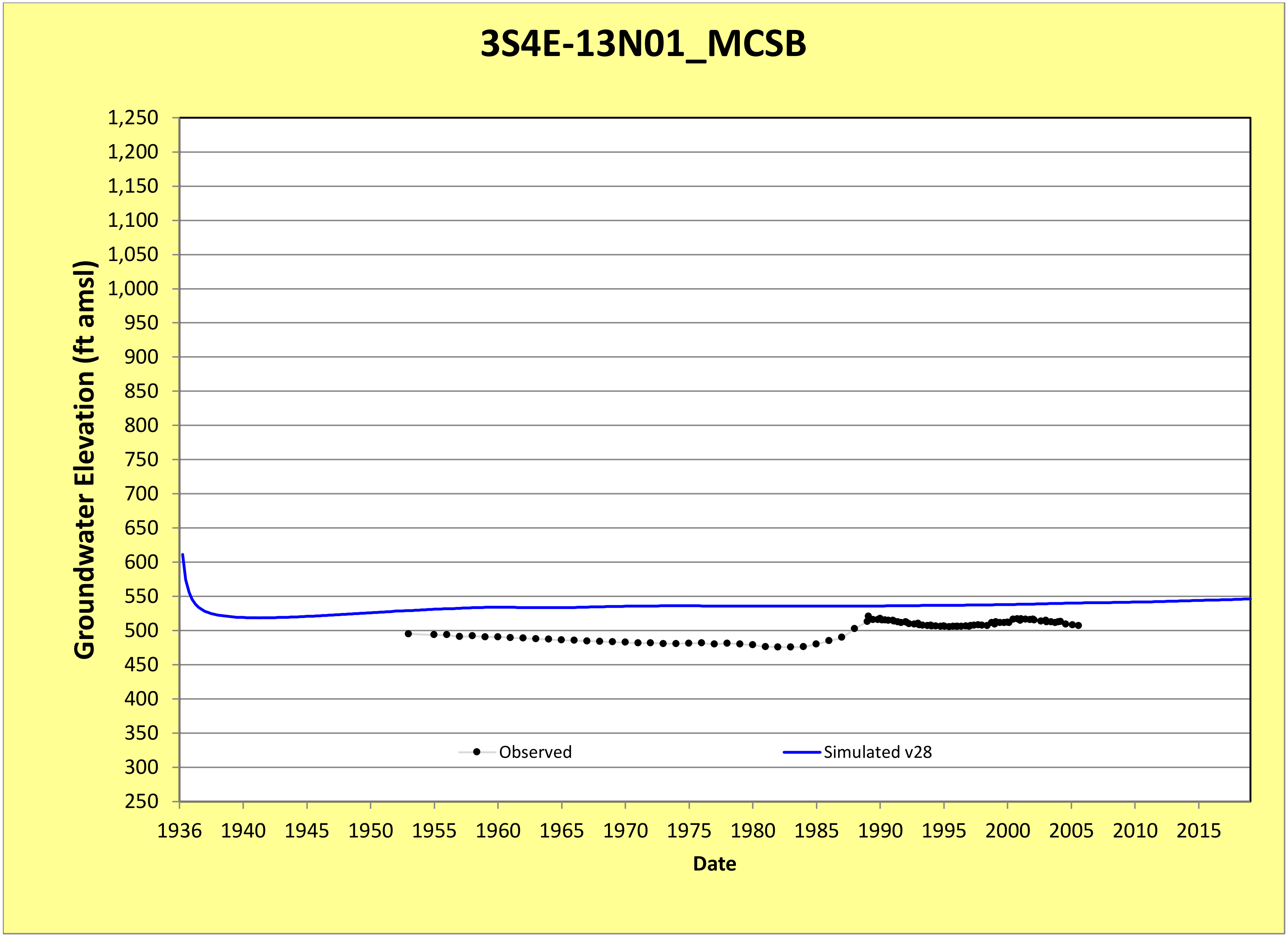
2015
Date



3S4E-13N01_MCSB
Groundwater Elevation (ft amsl)
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1,150
1,100
1,050
1,000
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800
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700
650
600
550
500
450
400
350
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1936
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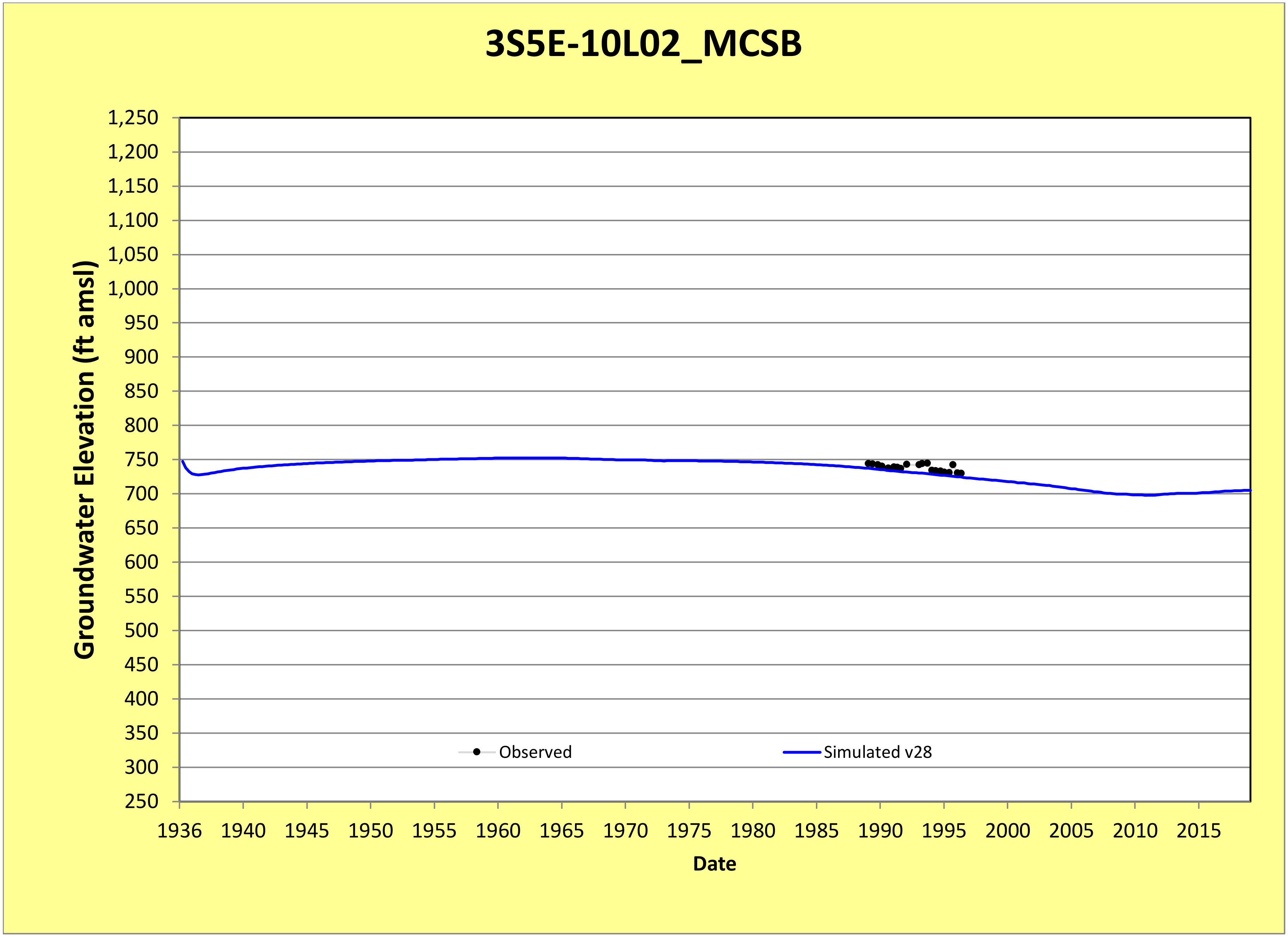
2010
2015
Date
Observed
Simulated v28


3S5E-10L02_MCSB
Groundwater Elevation (ft amsl)
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1,150
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1,050
1,000
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850
800
750
700
650
600
550
500
450
400
350
300
250
Observed
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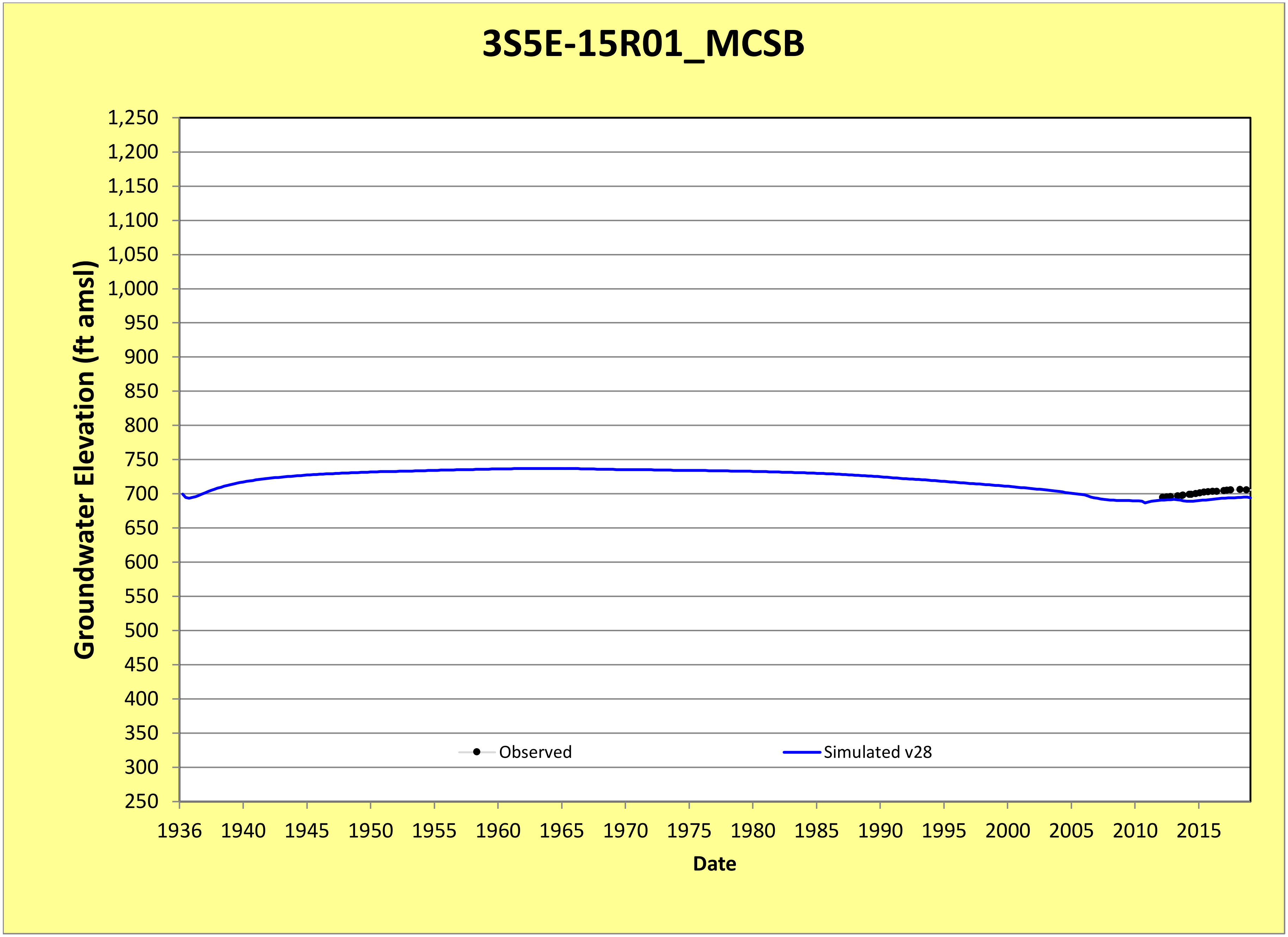
Date


3S5E-15R01_MCSB
Groundwater Elevation (ft amsl)
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1,150
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1,050
1,000
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850
800
750
700
650
600
550
500
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1936
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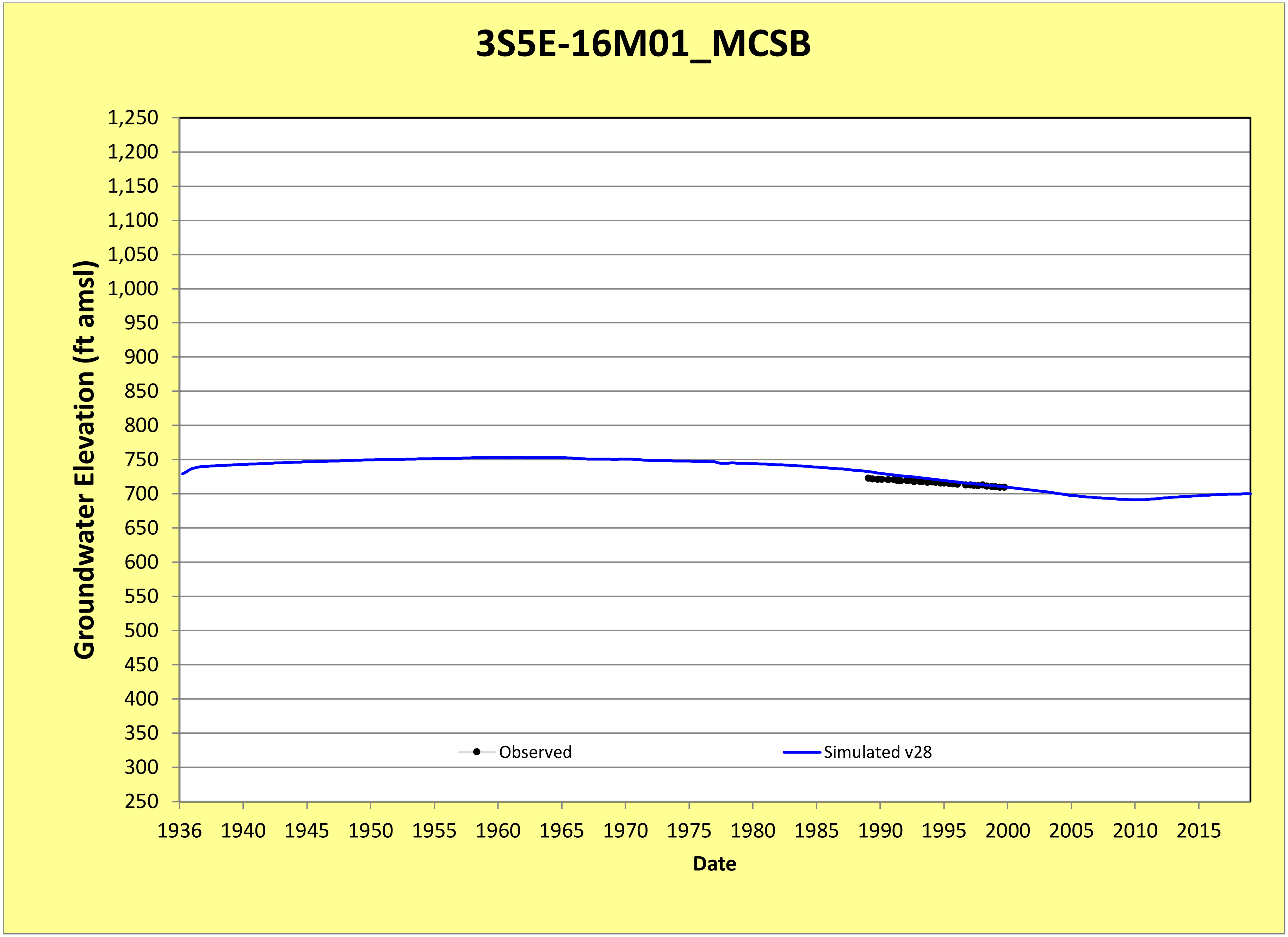
Date
Observed
Simulated v28


3S5E-16M01_MCSB
Groundwater Elevation (ft amsl)
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1,150
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1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
Observed
Simulated v28
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1945
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2005
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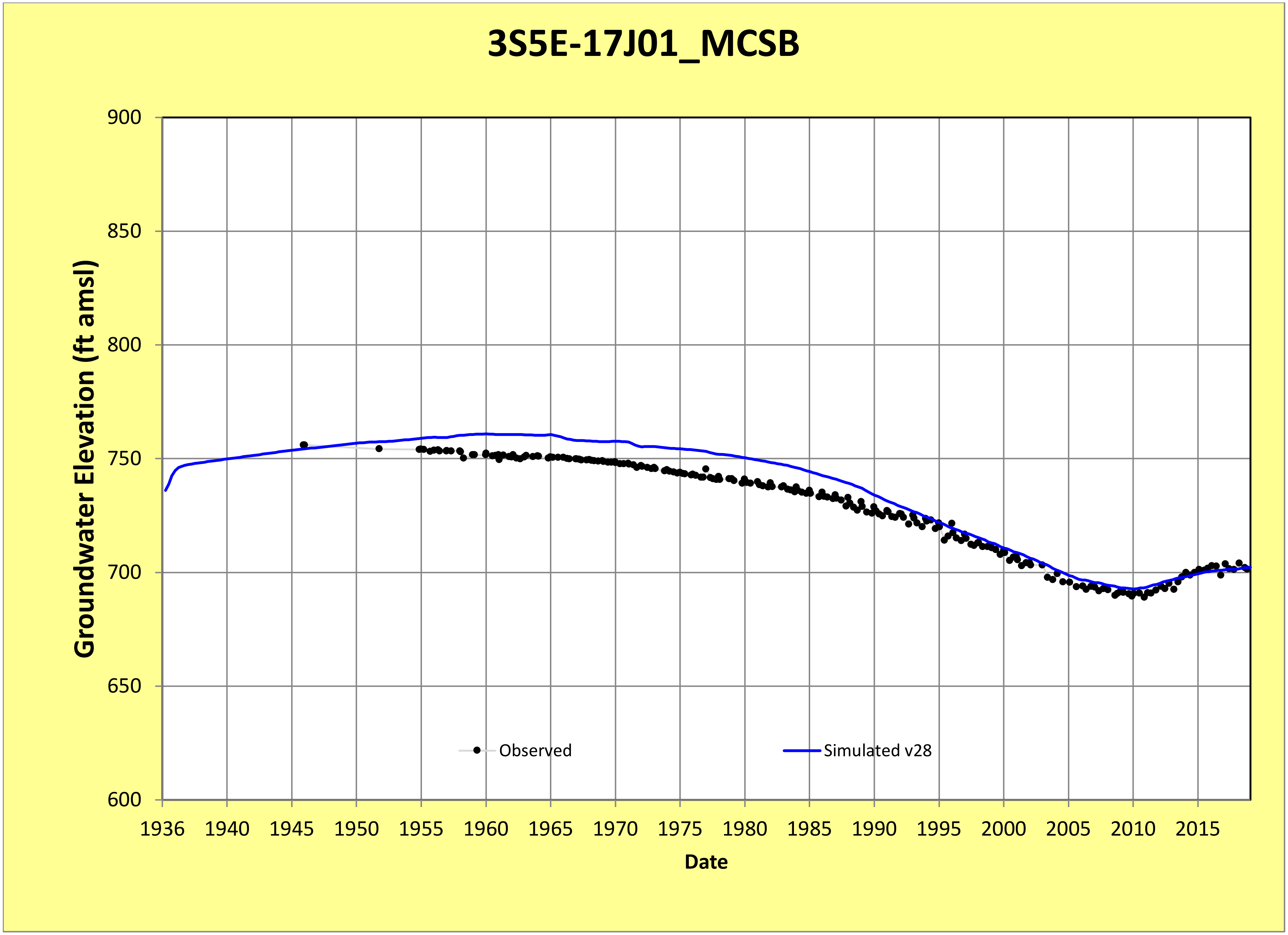
2015
Date



3S5E-17J01_MCSB
Groundwater Elevation (ft amsl)
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850
800
750
700
650
600
1936
1940
1945
1950
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1960
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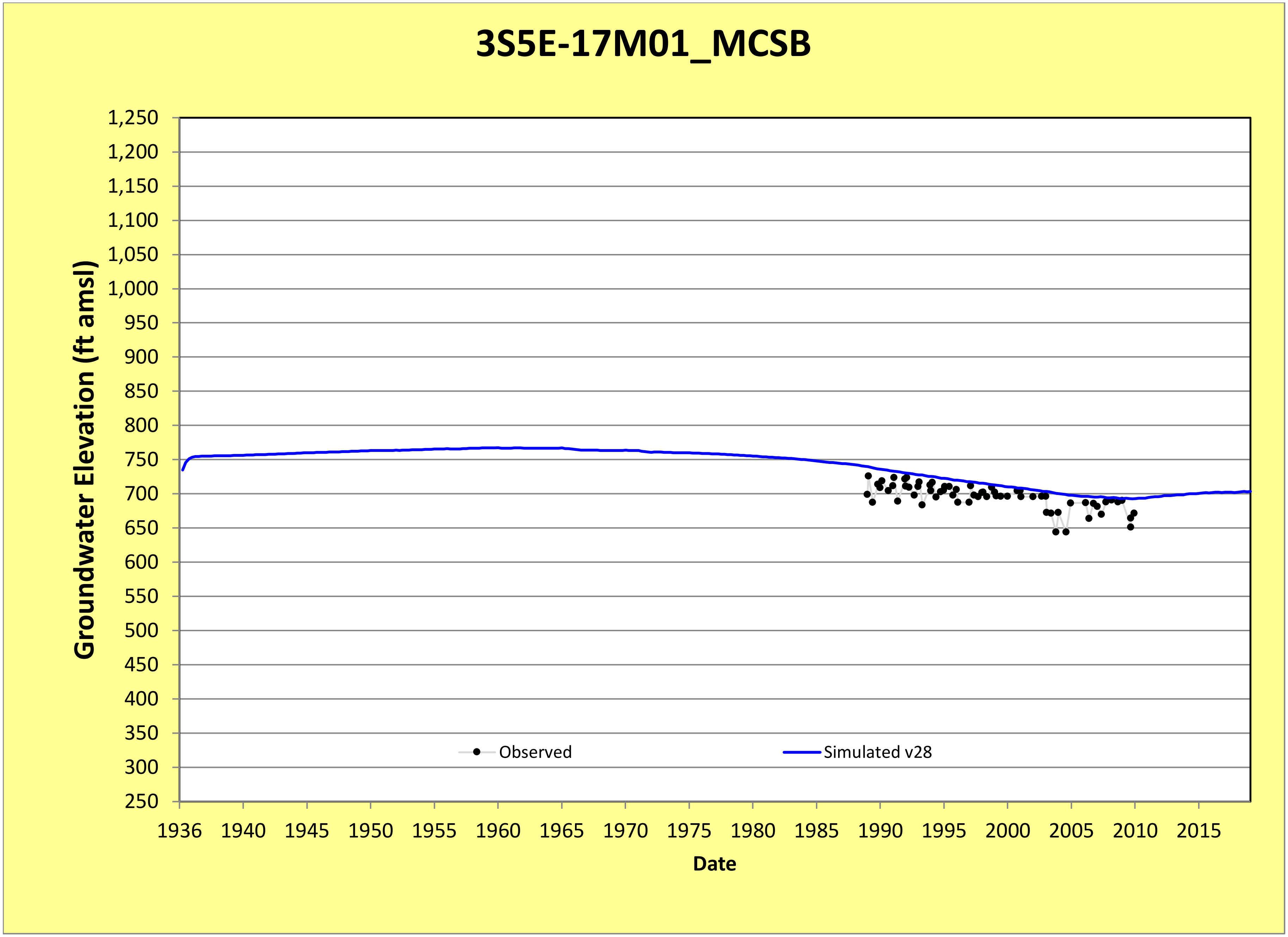
2005
2010
2015
Date
Observed
Simulated v28


3S5E-17M01_MCSB
Groundwater Elevation (ft amsl)
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1,200
1,150
1,100
1,050
1,000
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850
800
750
700
650
600
550
500
450
400
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1936
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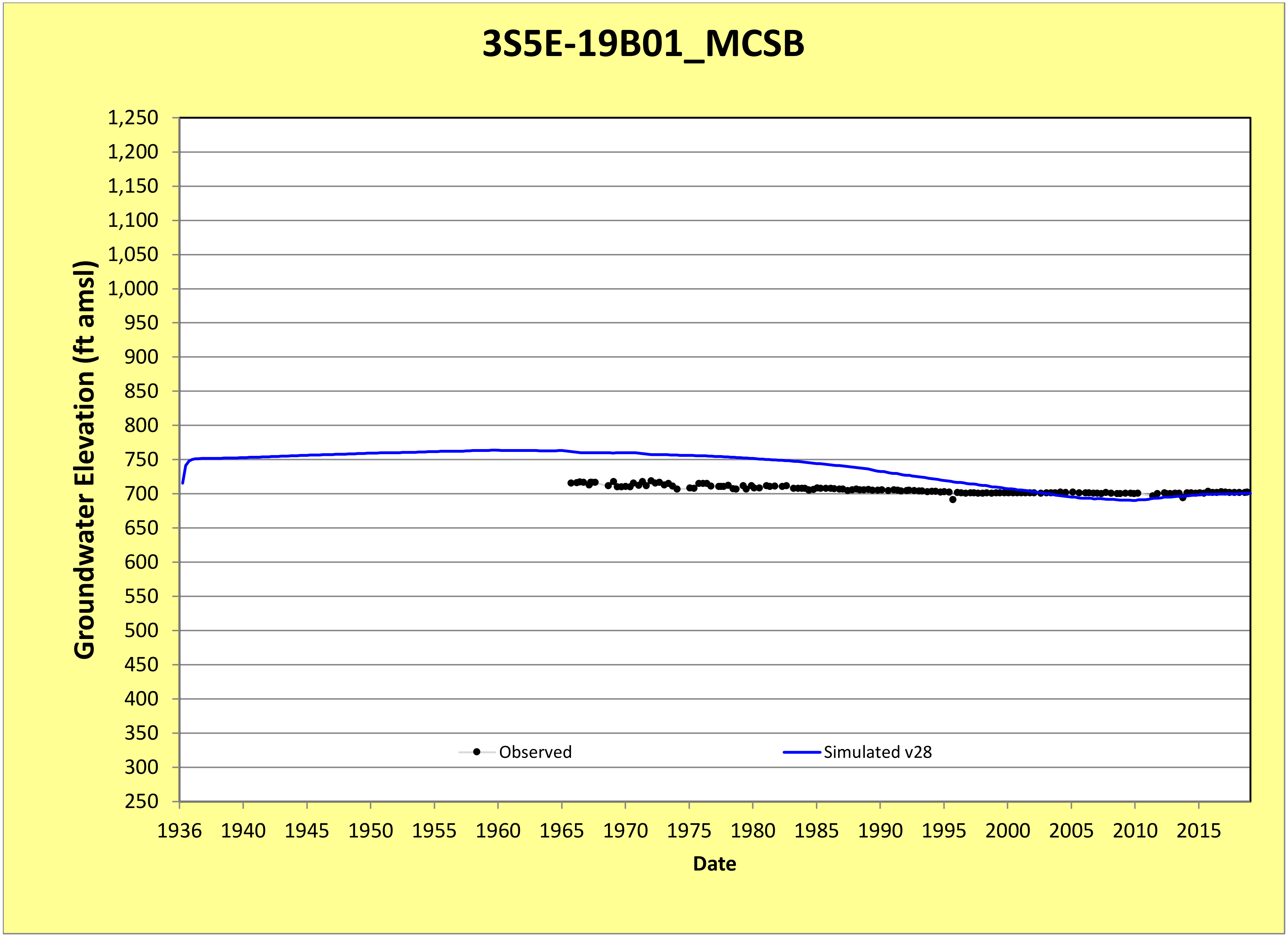
2010
2015
Date
Observed
Simulated v28


3S5E-19B01_MCSB
Groundwater Elevation (ft amsl)
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1,200
1,150
1,100
1,050
1,000
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900
850
800
750
700
650
600
550
500
450
400
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1936
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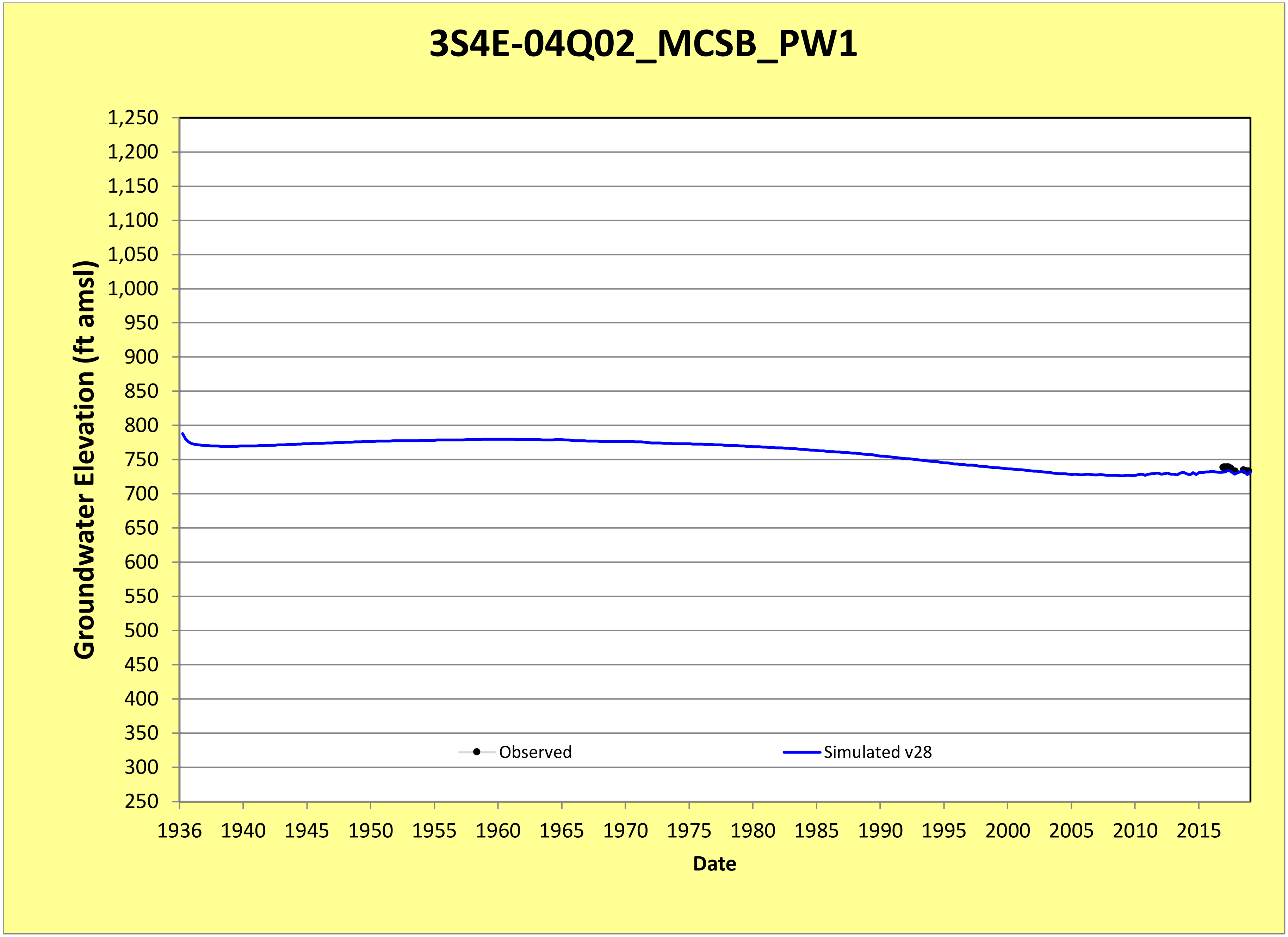
2010
2015
Date
Observed
Simulated v28


3S4E-04Q02_MCSB_PW1
Groundwater Elevation (ft amsl)
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1,200
1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
Observed
Simulated v28
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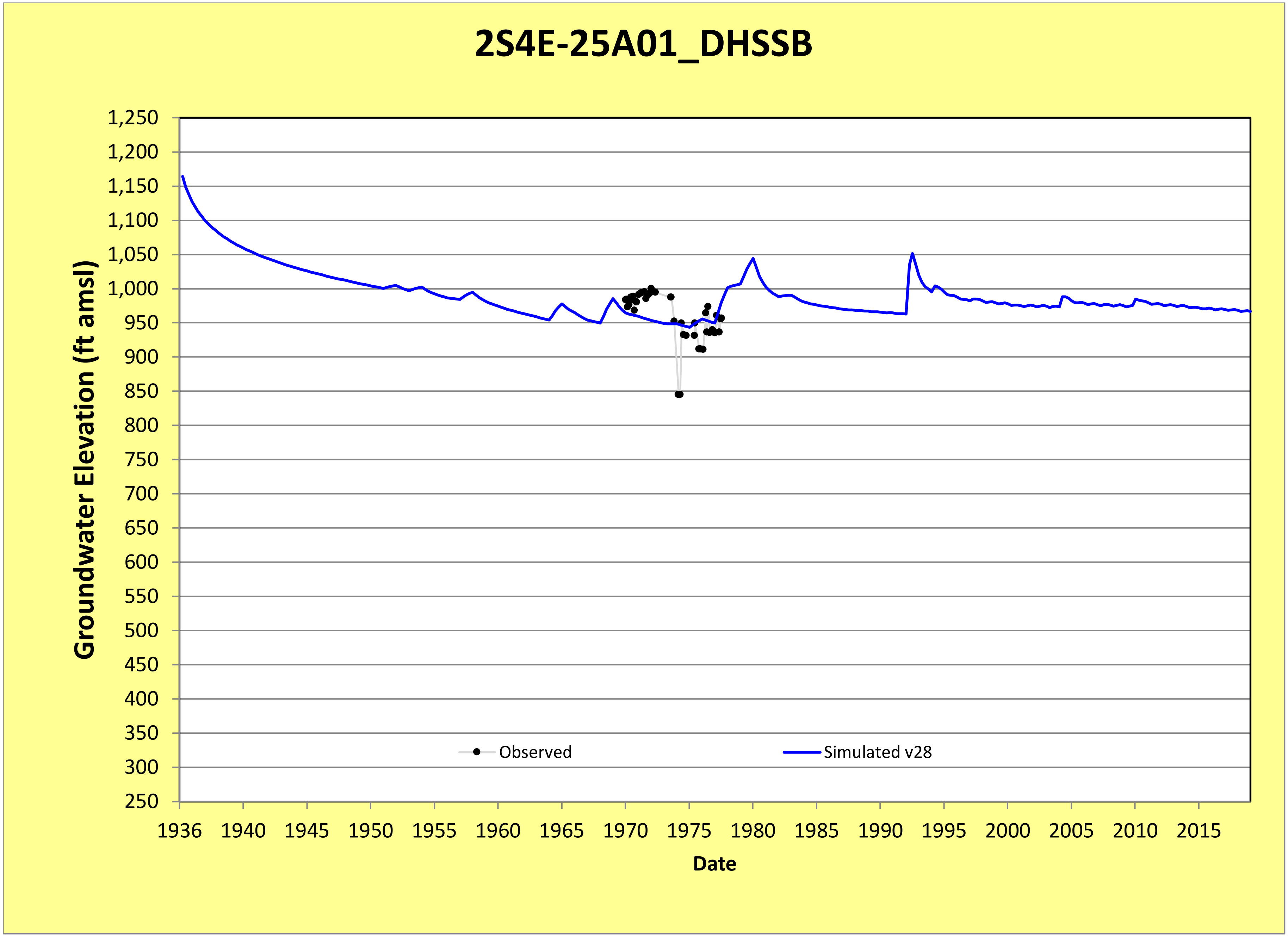
2010
2015
Date



2S4E-25A01_DHSSB
Groundwater Elevation (ft amsl)
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1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
Observed
Simulated v28
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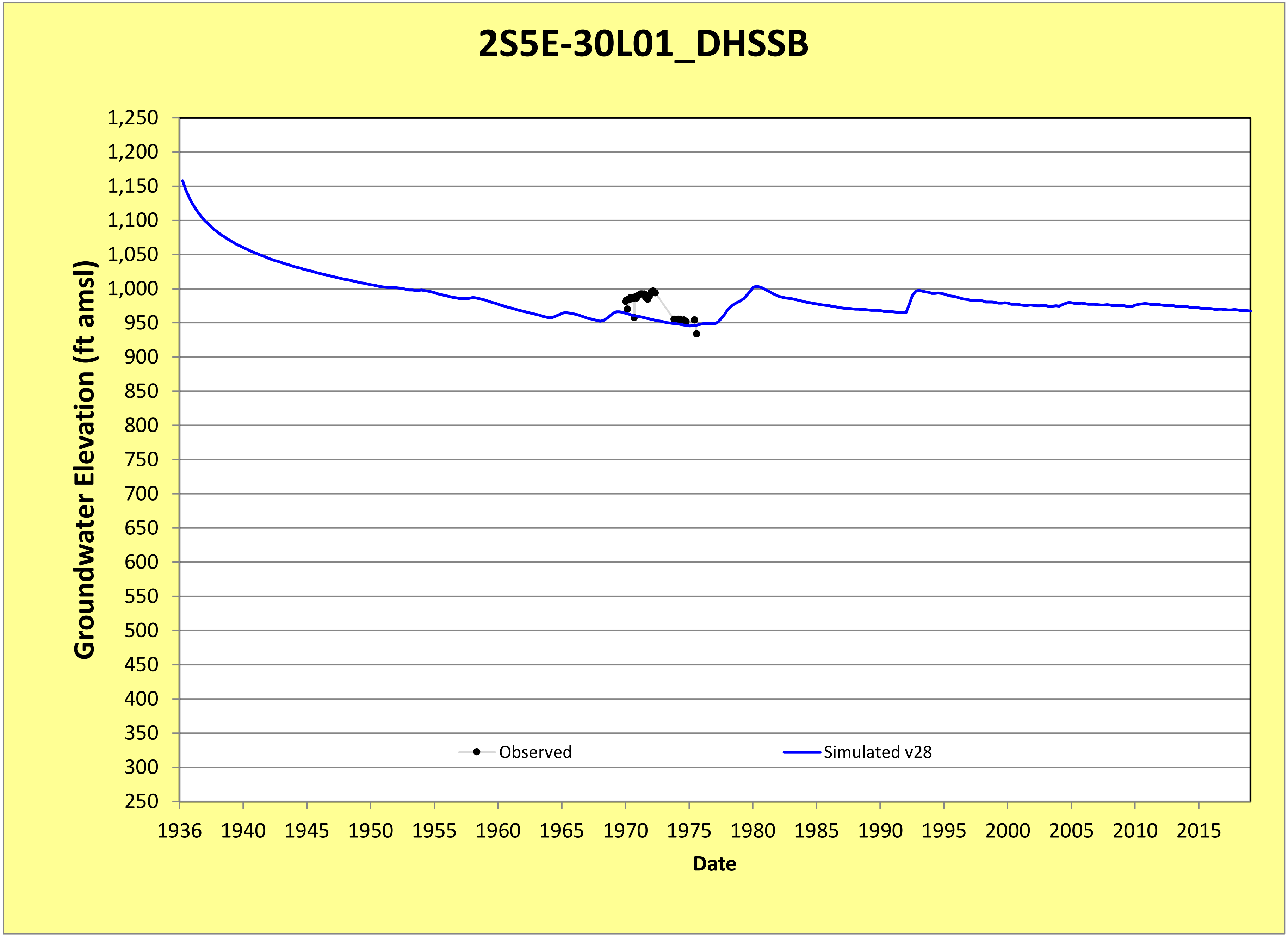
2010
2015
Date


2S5E-30L01_DHSSB
Groundwater Elevation (ft amsl)
1,250
1,200
1,150
1,100
1,050
1,000
950
900
850
800
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500
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Observed
Simulated v28
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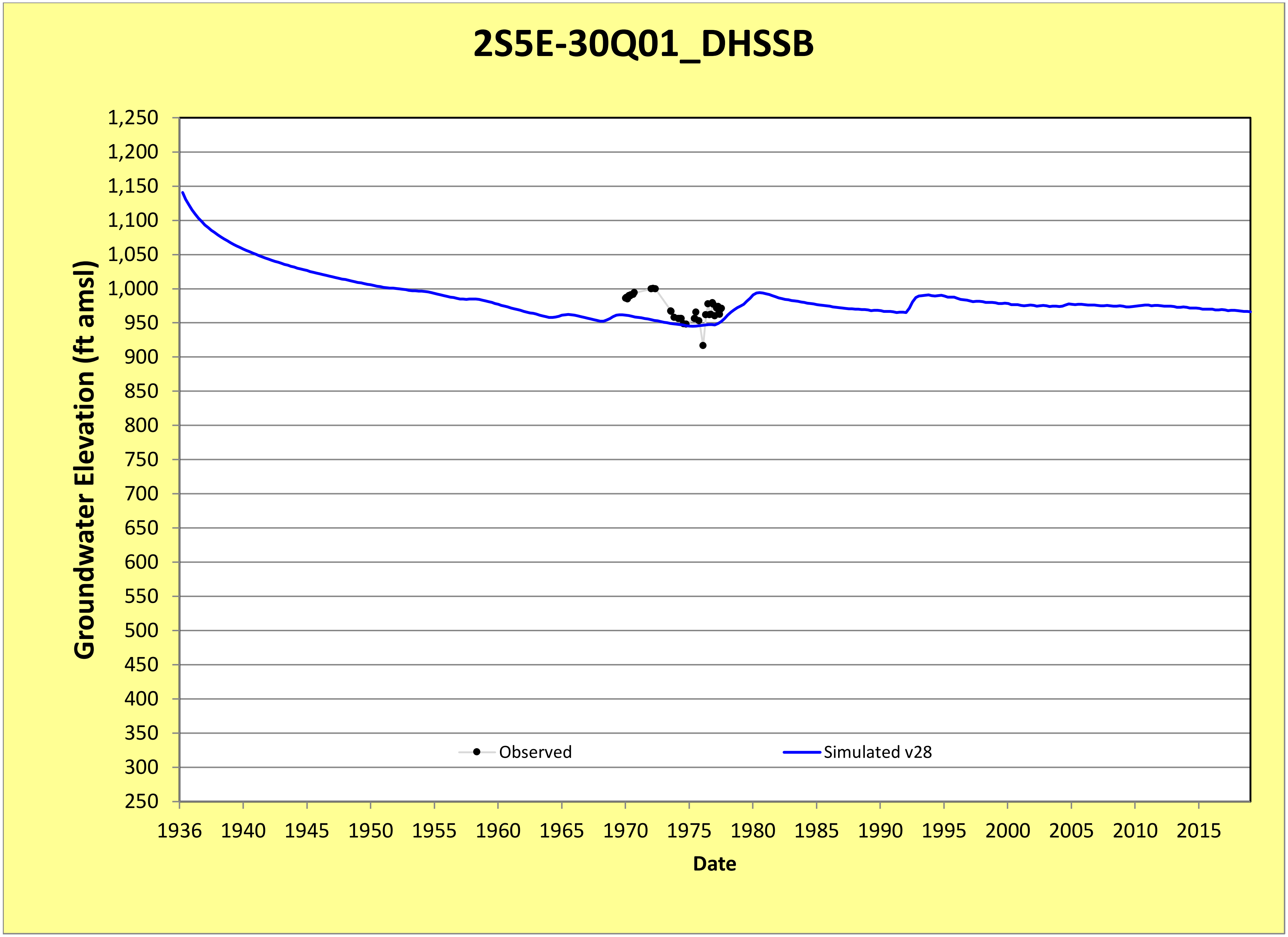
2015
Date


2S5E-30Q01_DHSSB
Groundwater Elevation (ft amsl)
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1,200
1,150
1,100
1,050
1,000
950
900
850
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650
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Observed
Simulated v28
1936
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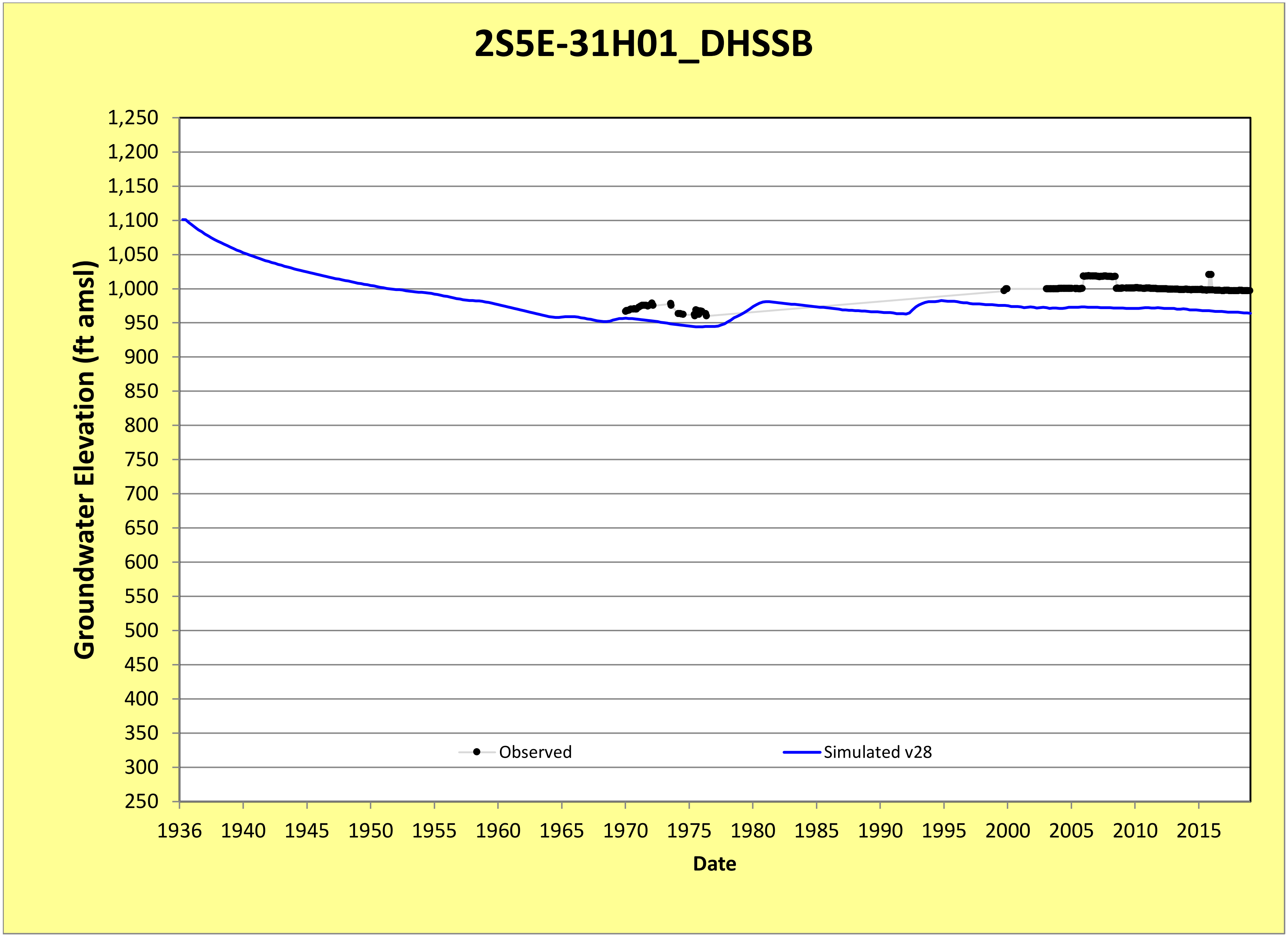
2015
Date


2S5E-31H01_DHSSB
Groundwater Elevation (ft amsl)
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1,150
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1,050
1,000
950
900
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Observed
Simulated v28
1936
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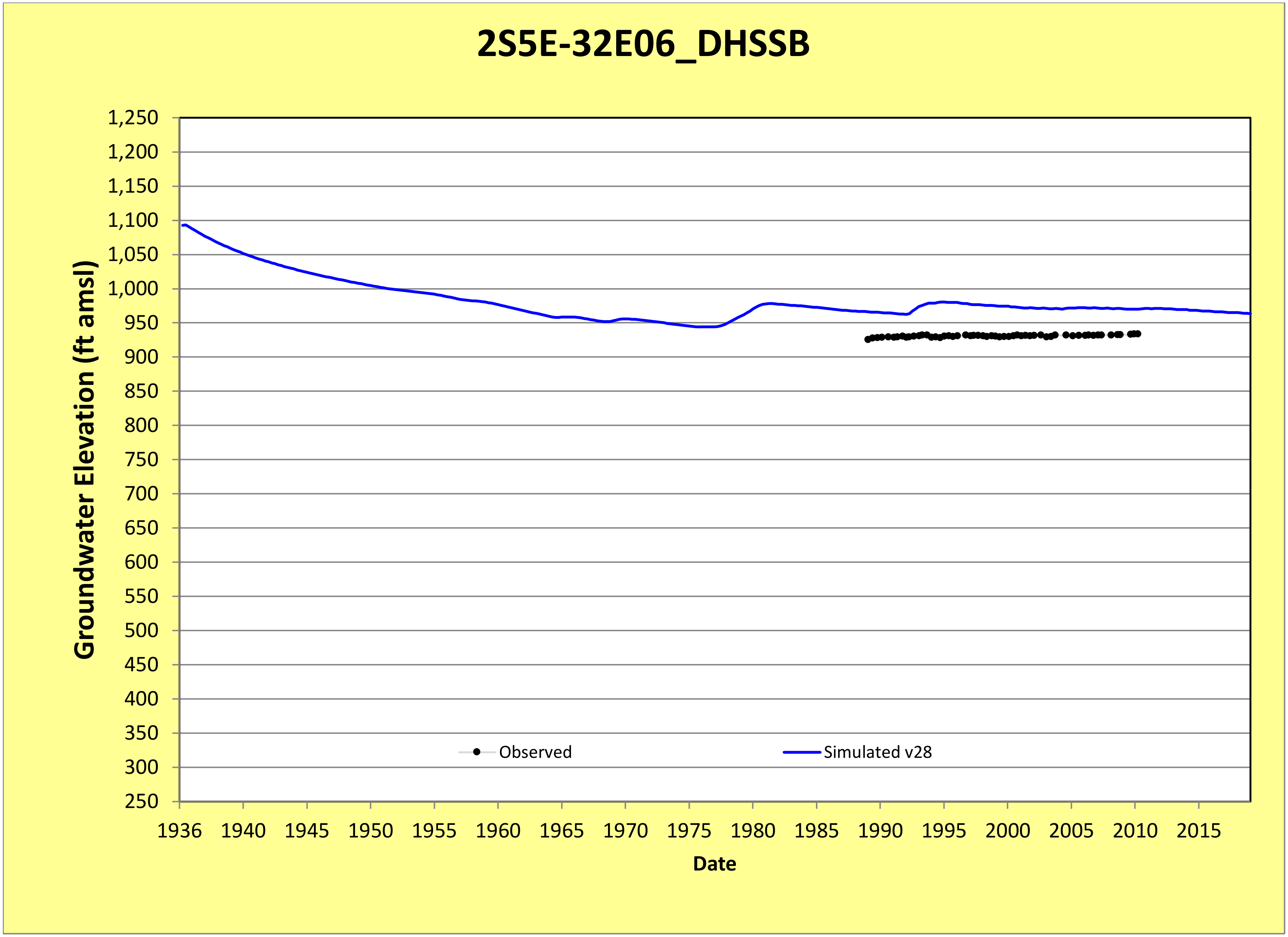
2015
Date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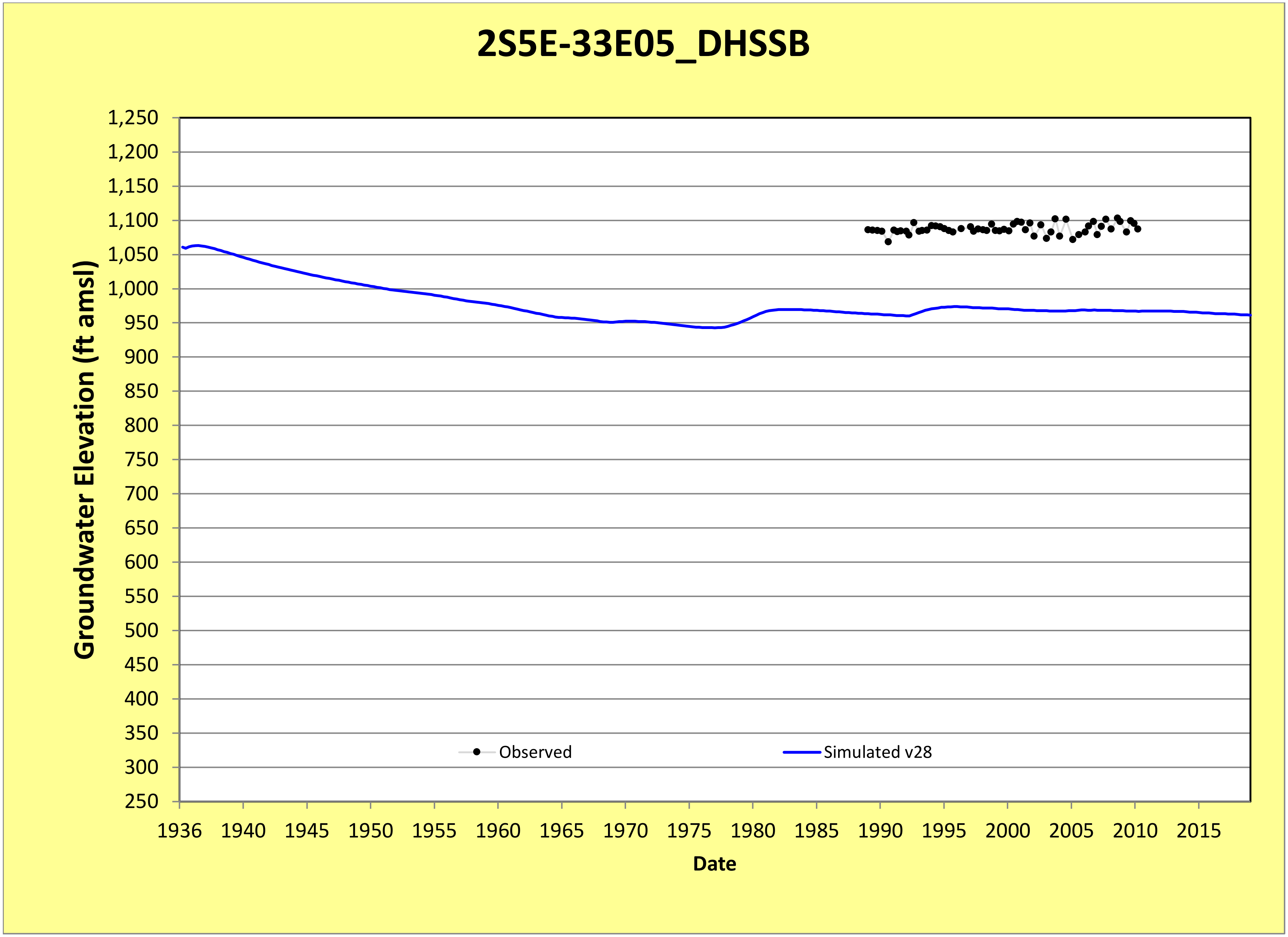
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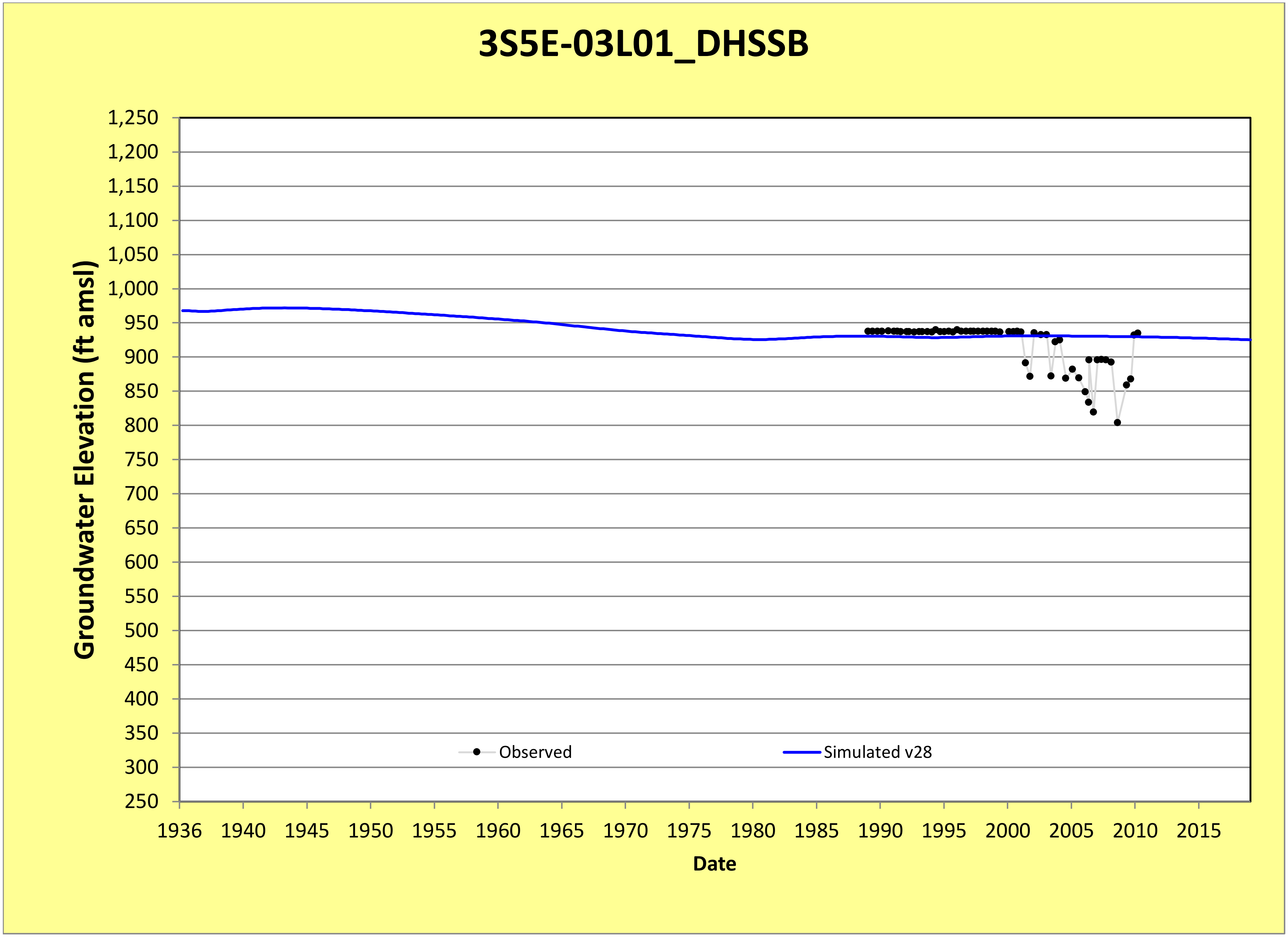
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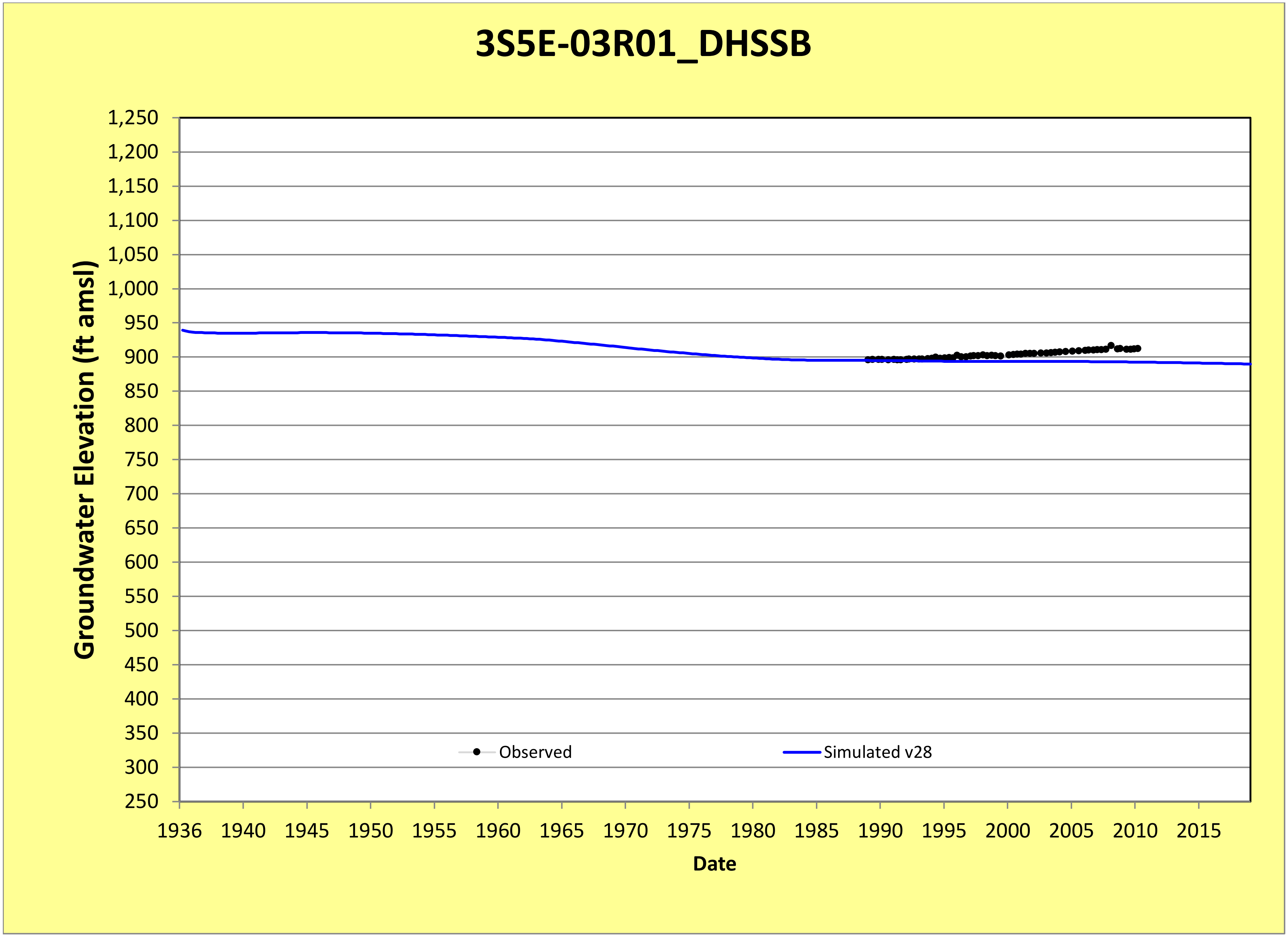

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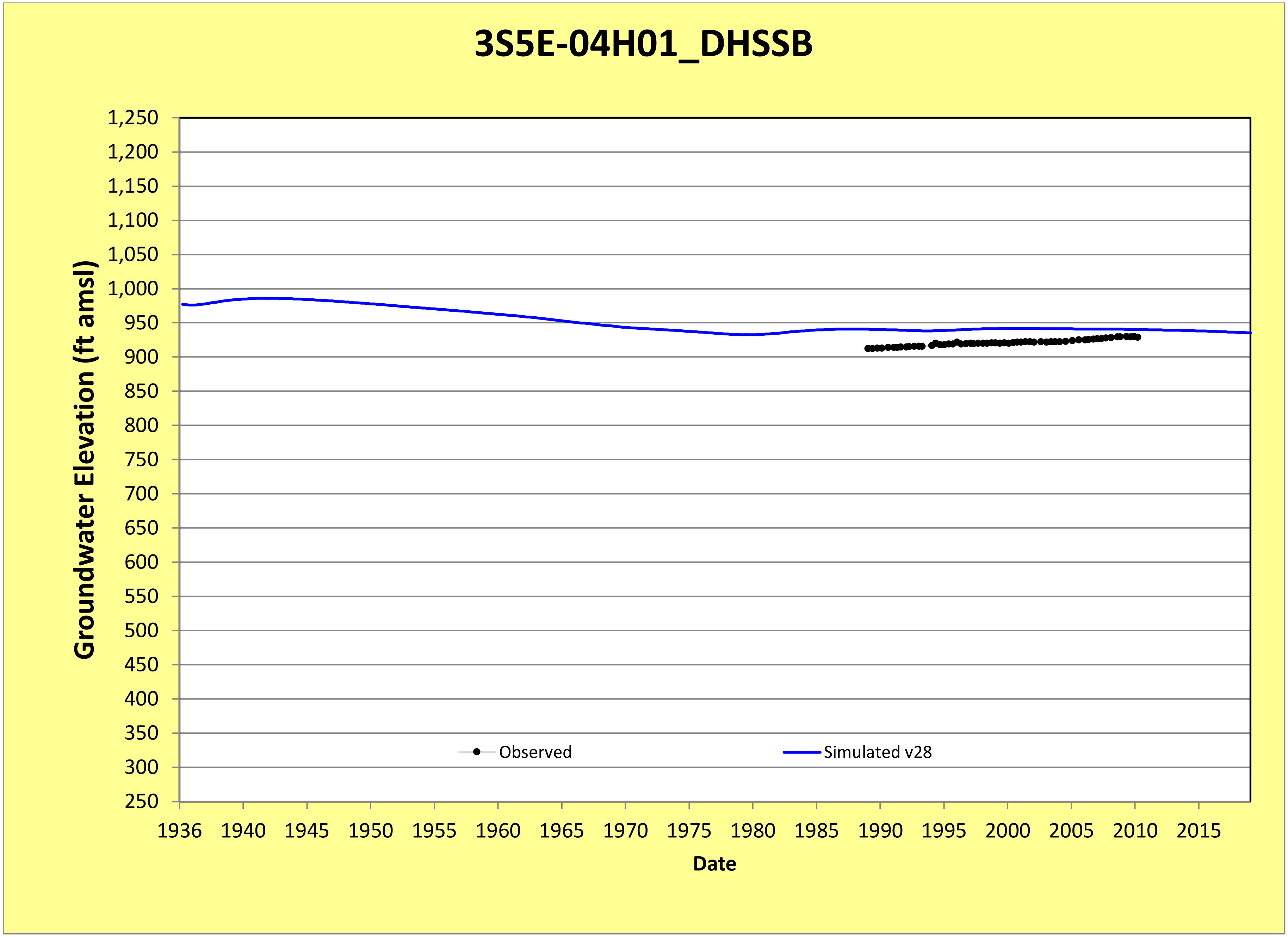

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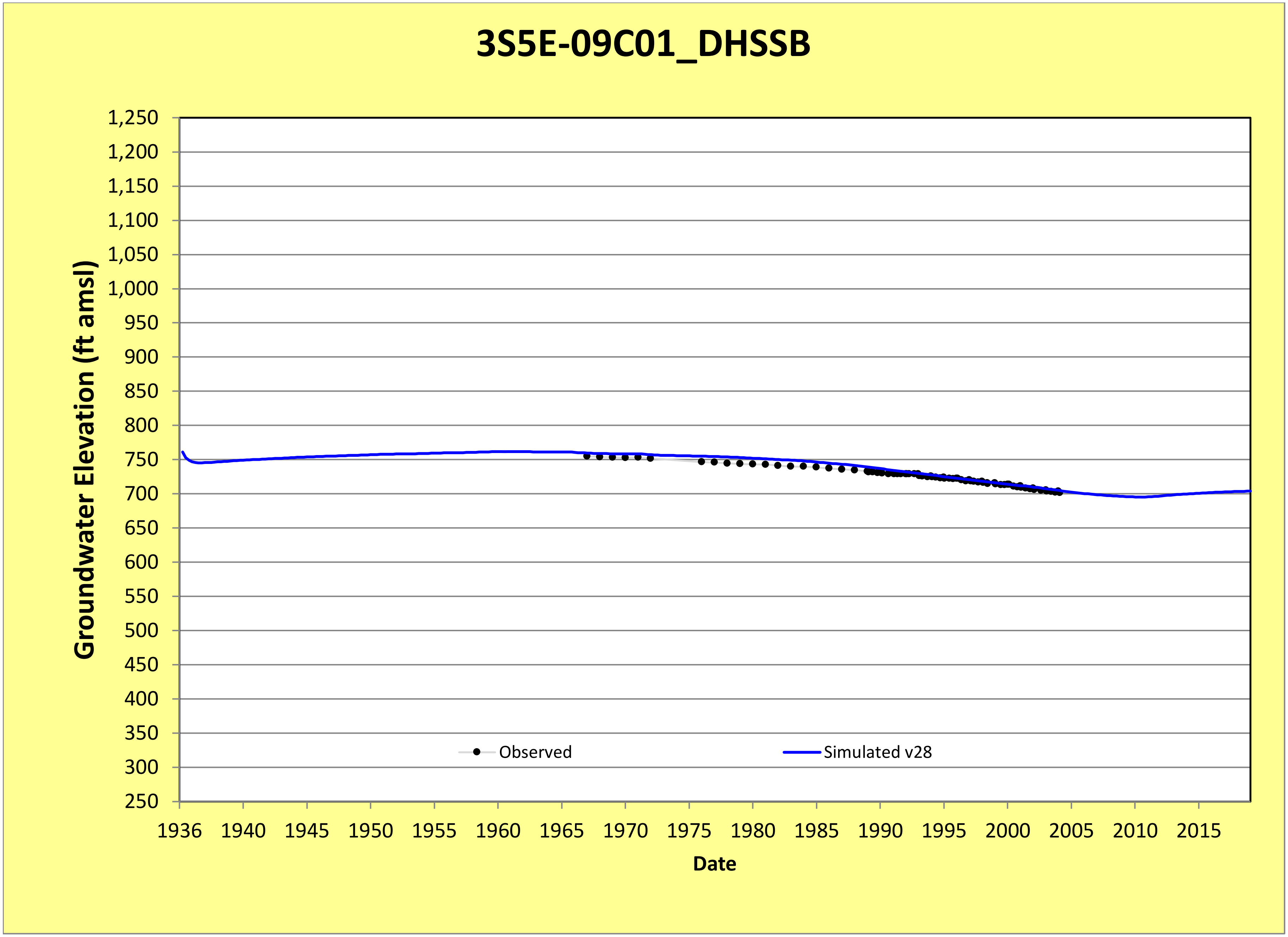
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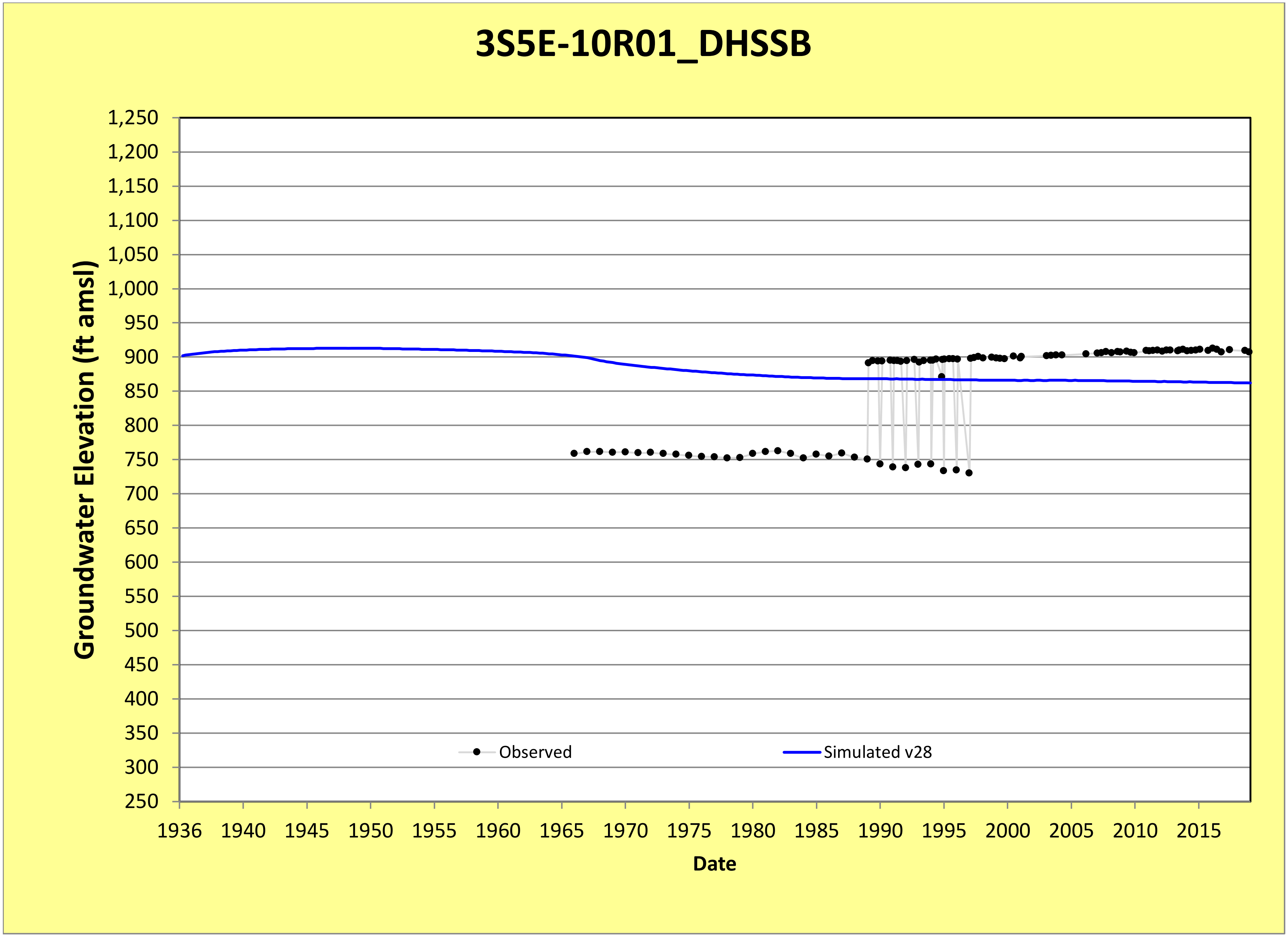
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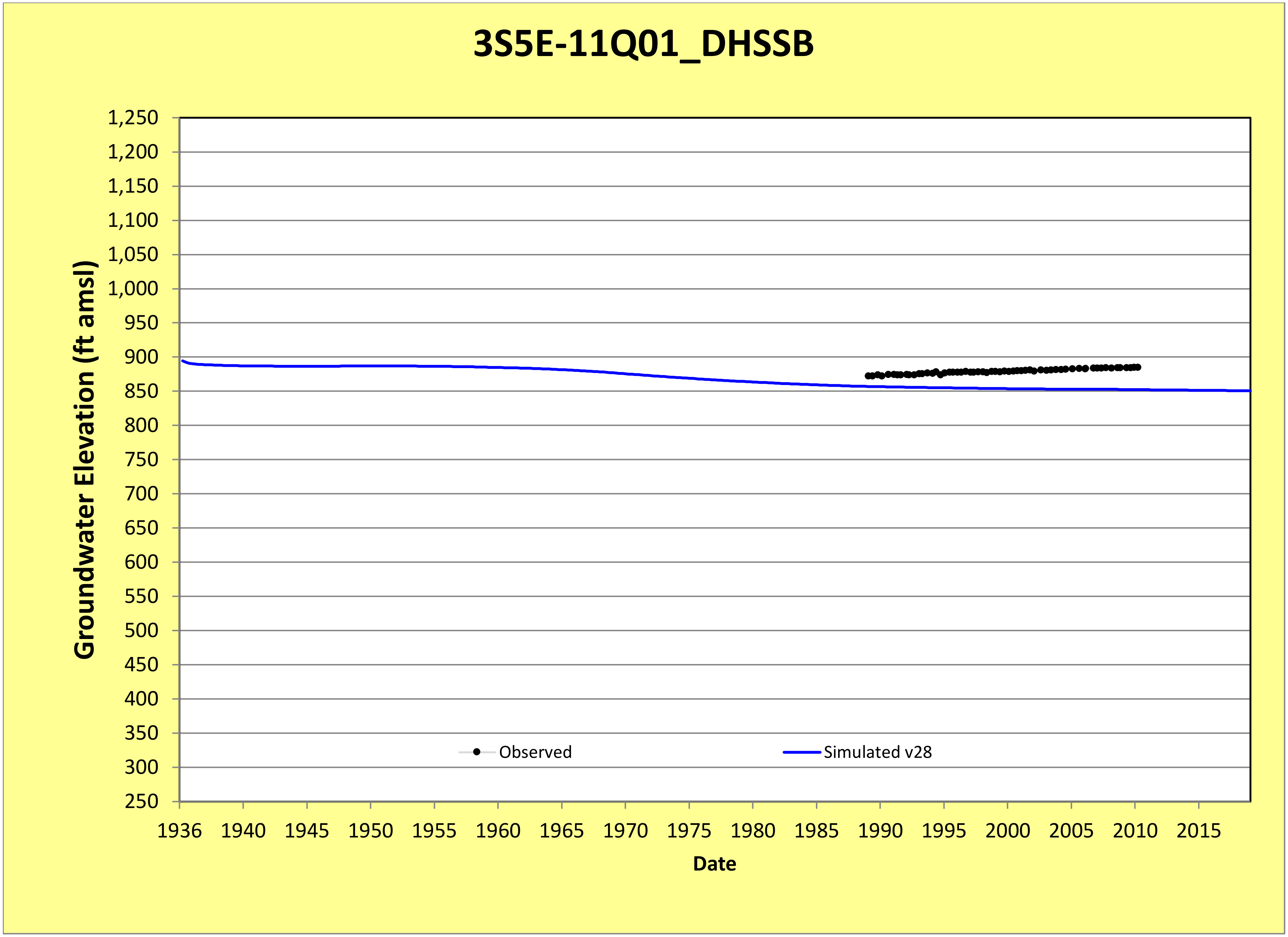
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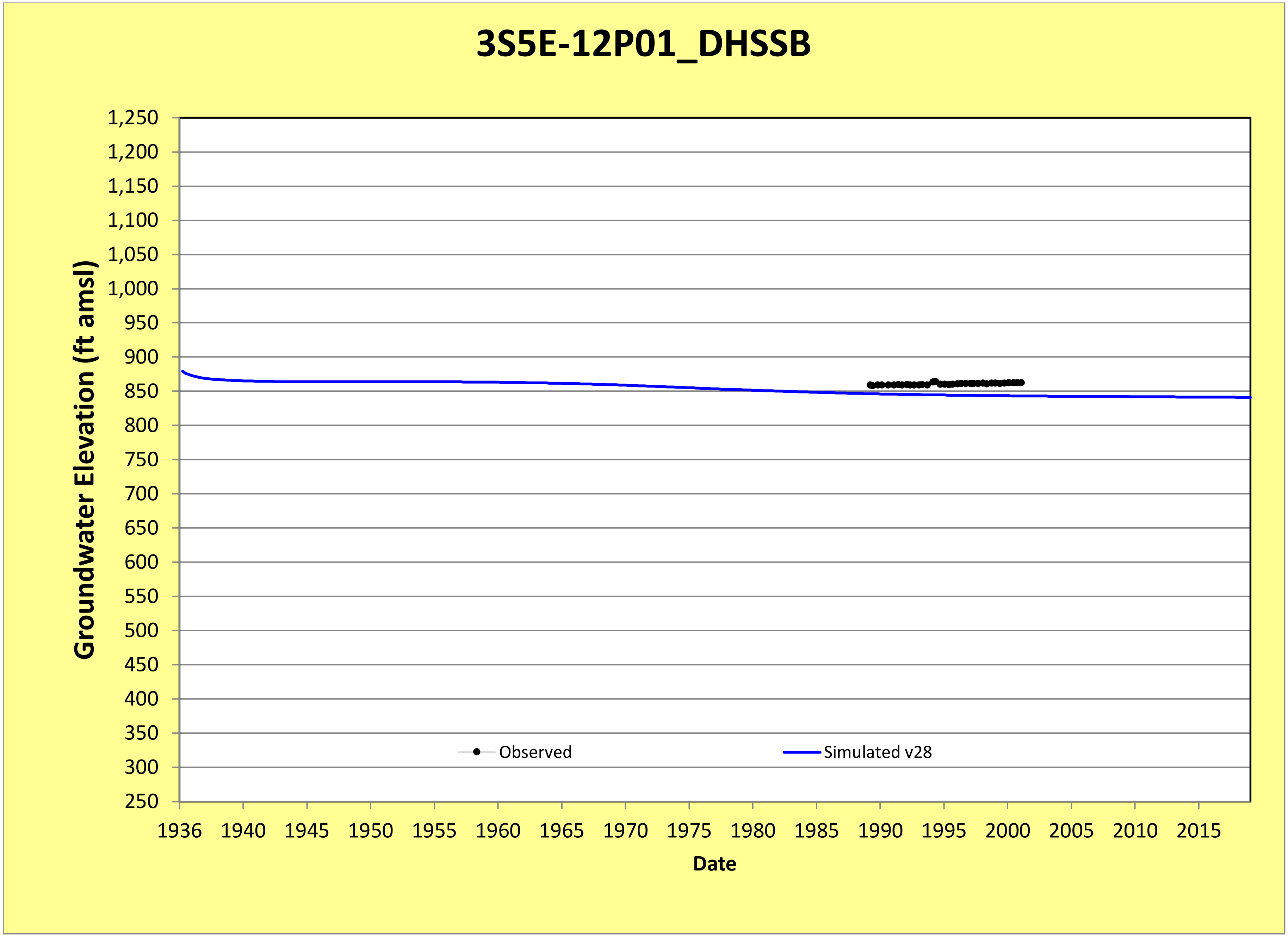

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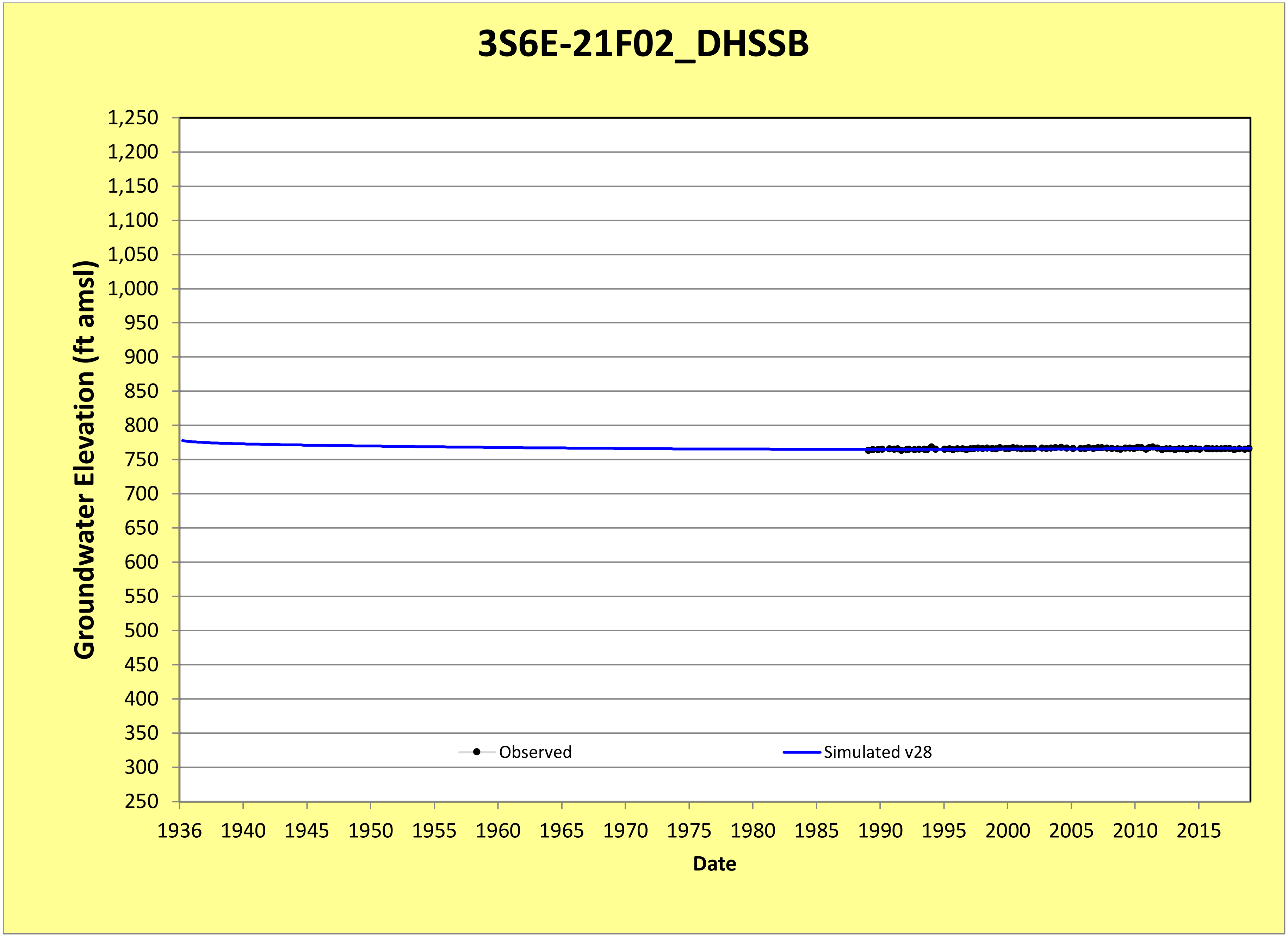
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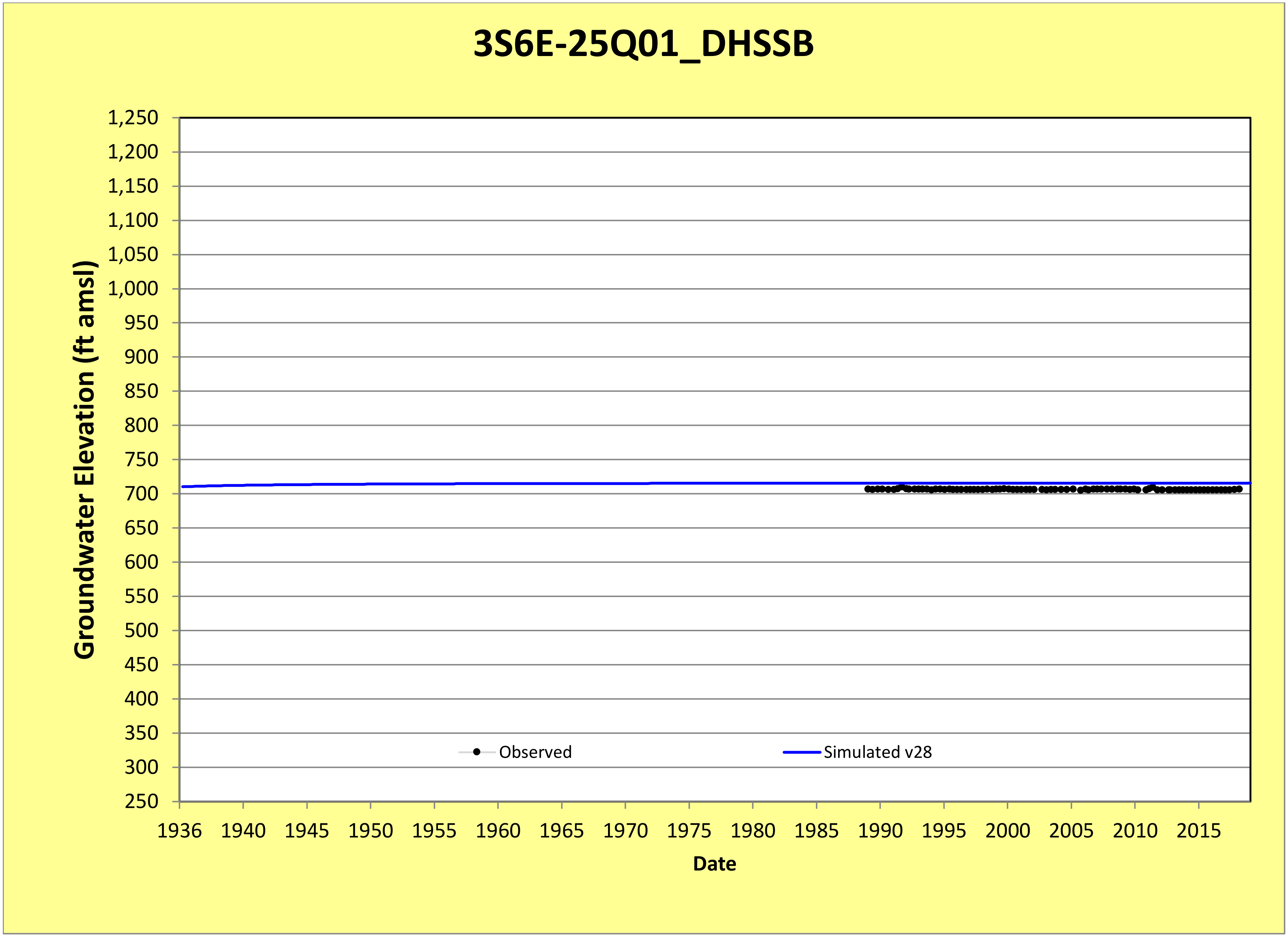

3S6E-25Q01_DHSSB
Groundwater Elevation (ft amsl)
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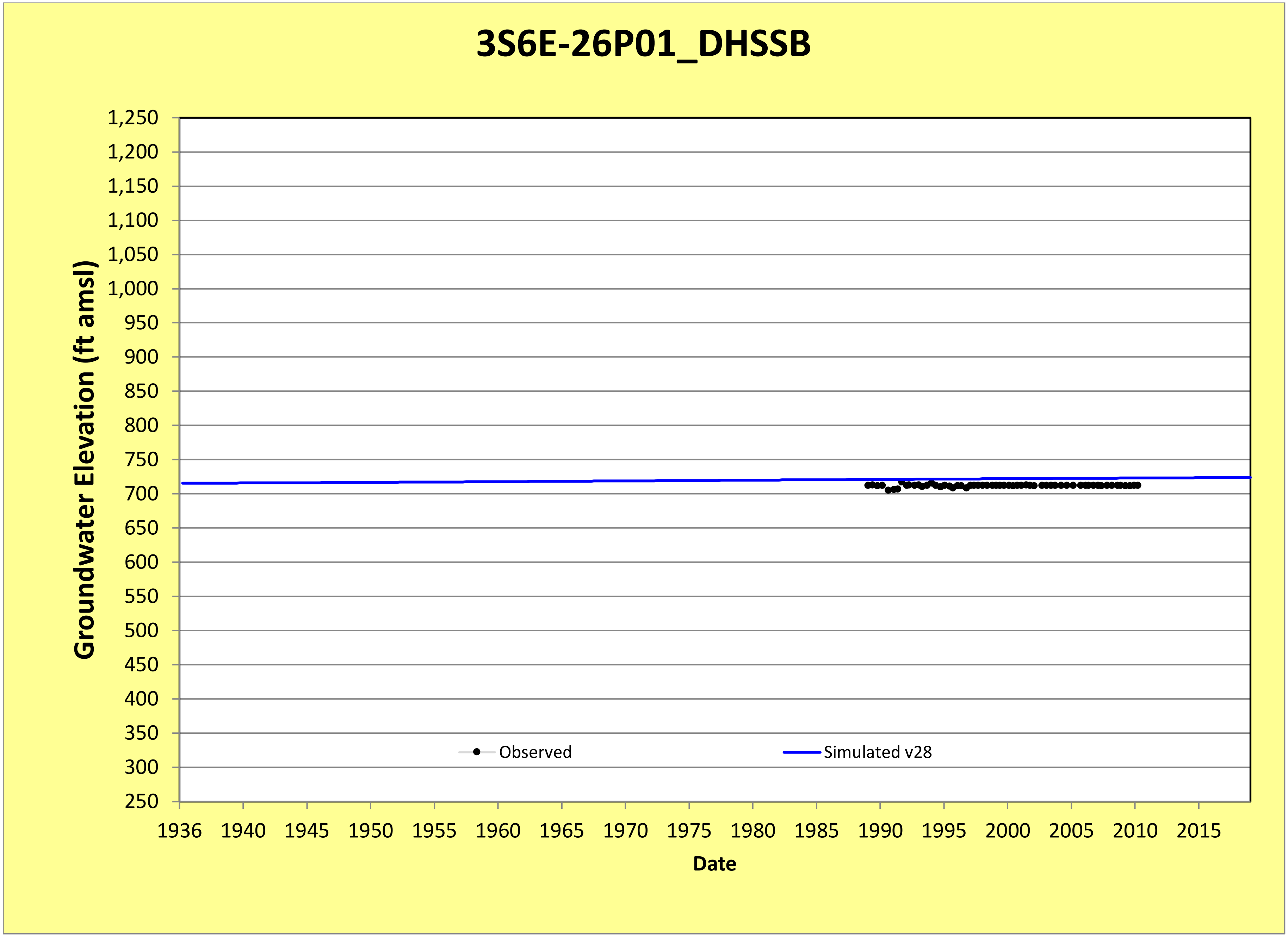

3S6E-26P01_DHSSB
Groundwater Elevation (ft amsl)
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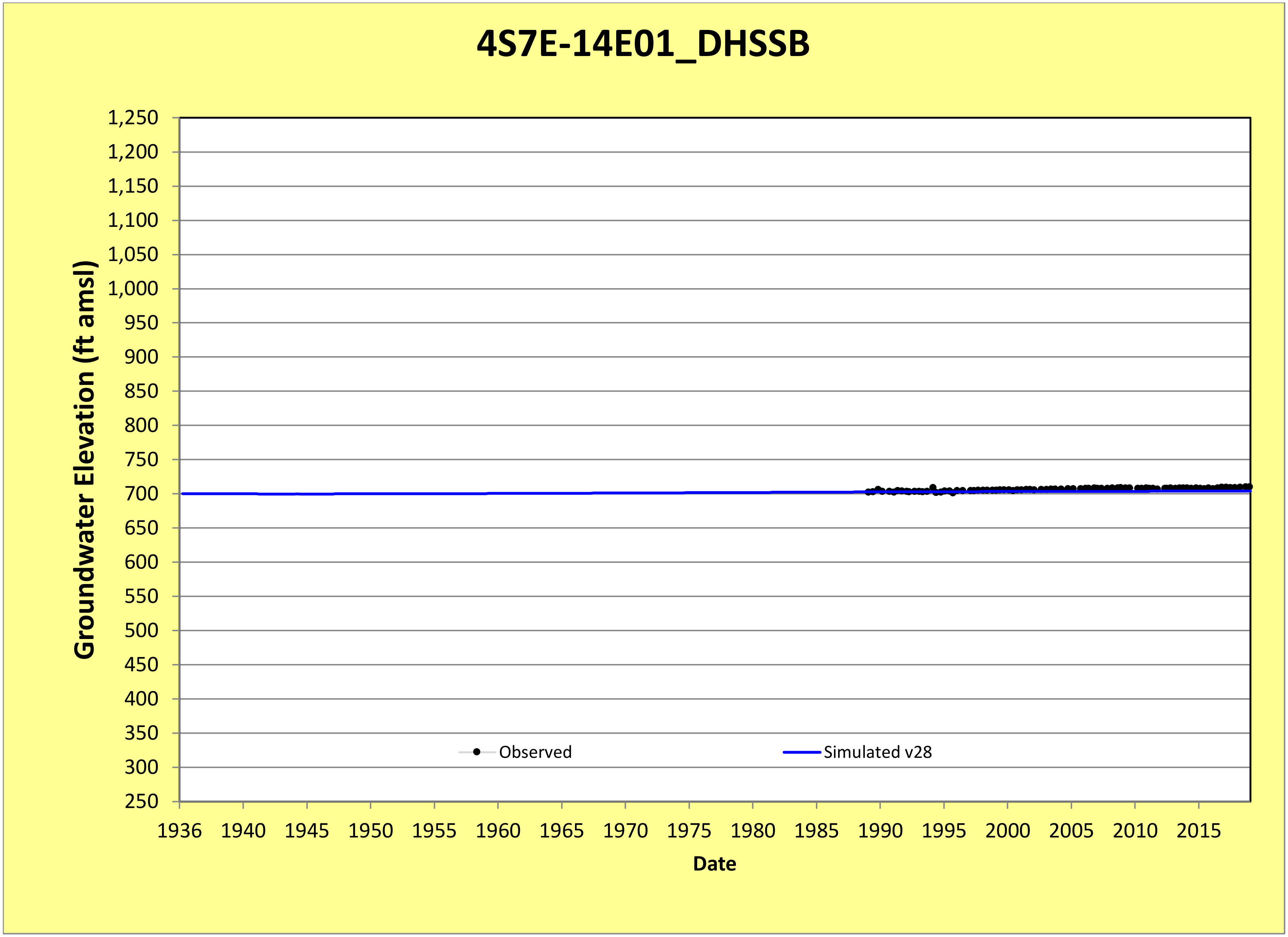

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Appendix B
Groundwater Flow Model Update Forecasts

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B.1 Introduction and Objectives

Wood Environment & Infrastructure Solutions, Inc. (Wood), has prepared this report on behalf of the Coachella Valley Water District (CVWD), Desert Water Agency (DWA), and Mission Springs Water District (MSWD), collectively the Mission Creek Subbasin (MCSB) Management Committee (Management Committee or the Agencies). This report documents a series of forecast scenarios conducted with an updated groundwater flow model (MCSB Model) of the northwestern portion of the Coachella Valley Groundwater Basin in California (**Figure B1**). The update and re-calibration of the MCSB Model is documented in **Appendix A** of the Alternative Plan Update (Alternative Update) for the MCSB. The MCSB Model was prepared to evaluate the future sustainable use of groundwater within the Mission Creek Subbasin in accordance with the 2014 Sustainable Groundwater Management Act (SGMA). In addition, the groundwater flow model will be used to support groundwater resources planning in the Garnet Hill Subarea (GHSA) of the Indio Subbasin (**Figure B2**). For SGMA compliance and reporting, however, the GHSA is part of the Indio Subbasin Water Management Plan Update (Todd Groundwater and Woodard & Curran [Todd/W&C, 2021]). The Desert Hot Springs Subbasin (DHSSB) was also included in the model because it is adjacent to the MCSB and contributes subsurface flows to the MCSB water balance. Under SGMA, the DHSSB is considered a very low-priority basin and therefore, does not have SGMA requirements.

B.1.1 Summary of the Mission Creek Subbasin Model

The MCSB Model simulates the northwestern portion of the Coachella Valley Groundwater Basin including the MCSB, the DHSSB, and the GHSSA (**Figure B2**). The subbasins/subarea are separated by faults including the Mission Creek Fault, the Banning (San Andreas) Fault, and the Garnet Hill Fault.

The model grid consists of 280 rows, 113 columns, and four layers with each model grid cell a uniform 1,000 by 1,000 feet in size. The model grid was rotated 50.4° to the west of north (counter-clockwise) to align the grid with the primary direction of groundwater flow from, the San Bernardino Mountains to the Salton Sea (**Figures B1 and B2**).

At the request of the Agencies, Wood coordinated the MCSB model update with the model update of the Indio Subbasin prepared by Todd Groundwater (1997-2019 Indio Subbasin model). Both models simulate the GHSA of the Indio Subbasin. To coordinate the models in the GHSA, Wood adopted the hydraulic properties from the 1997-2019 Indio Subbasin model into the MCSB Model in the area where the models overlap. Wood also incorporated the simulated underflow between the GHSA and main Indio Subbasin across the Garnet Hill Fault and Whitewater River recharge into the MCSB Model. As a result, the simulated groundwater flow in the GHSA was very similar in both models.

The MCSB Model simulates inflow such as mountain front recharge (MFR) from the San Bernardino and Little San Bernardino mountains, return flows from applied water, septic systems, wastewater treatment plants (WWTPs), State Water Project (SWP) surface water deliveries for recharge, and underflow between subbasins. The model also simulates outflows such as municipal and private pumping from 94 wells, evapotranspiration from phreatophytes, and underflow between subbasins/subareas.

The MCSB Model was calibrated to the period 1936 through 2019 using 164 stress periods ranging in duration from quarterly to 5 years (**Table B1**). The model was calibrated to 7,128 groundwater elevation observations in 58 wells with a normalized root mean squared error (NRMS) of 3.7 percent (%) (**Figure B3**). A model with a NRMS of less than 10% is considered well calibrated (Anderson & Woessner, 1992). Additional information on the calibration of the MCSB model is provide in Attachment A of the Alternative Plan Update.

B.1.2 MCSB Forecast Model Objectives

The objective of the MCSB forecast model was to evaluate the sustainable use of groundwater beneath the MCSB under several potential future hydrology and operational scenarios. Sustainability was evaluated using the 50-year forecasts by:

- Comparing groundwater elevations at selected “key” wells (Key Wells) within the MCSB to the Sustainable Management Criteria, Measurable Objective (MO) and Minimum Threshold (MT) for each Key Well as described in Section 6 of the Alternative Plan Update; and
- Calculating the changes in groundwater in storage in the MCSB and the adjacent DHSSB and GHSA.

Three water management forecast scenarios were evaluated, and each scenario was evaluated with and without climate change and with climate change assumptions. This resulted in a total of six scenarios. The Wood Team and the Management Committee agreed the scenarios involving climate change are both reasonable and conservative and should be the focus of MCSB planning. The Baseline scenario is presented with and without climate change for comparison of the impact of the climate change assumption.

B.1.3 MCSB Forecast Model Scenarios Overview

The following paragraphs present the nomenclature and general characteristics of the three water management forecast scenarios:

- The **Baseline** scenario provides a “benchmark” for comparison with other water management scenarios and includes the current understanding of the demand projections (pumping demand) based on population growth projections and conservation estimates described in Section 3. Population was projected through the 2045 planning horizon and held constant thereafter. The Baseline scenario includes increasing groundwater pumping to meet demands and a resulting proportional increase in the State Water Project (SWP) deliveries to the Mission Creek Groundwater Replenishment Facility (MC-GRF). The Baseline scenario also includes operation of the Regional Water Reclamation Facility (RWRF) in the GHSA, which is scheduled to begin construction by the end of 2021. This project will result in the conveyance of a portion of the wastewater treated for recharge or reuse in the MCSB to the RWRF in the GHSA. The Baseline scenario assumes that this conveyance out of MCSB is permanent and will grow as the population increases in the Planning Area. The Baseline scenario also includes longer-term programs that are within the control of the Agencies and have a high certainty of being implemented on schedule based on historical implementation of similar programs (e.g., MSWD planned septic to sewer conversions).

- The **Near-Term Projects** scenario includes the new projects factored into the Baseline scenario plus additional water management projects planned for implementation prior to 2035. Projects in the near-term category include the Lake Perris Seepage Recovery Project (described in Section 3) to augment the imported water supply starting in 2023, and construction of a pipeline to bring treated water from the RWRF back into the MCSB for use as recharge starting in 2028.
- The **Future Projects** scenario builds on the Near-Term Projects scenario with the addition of water management projects that are planned for implementation starting in 2035 and beyond. Projects in the future category include the Sites Reservoir (2035) and Delta Conveyance Facility (2045) projects that should result in increased reliability of SWP water deliveries.

The SGMA guidance requires an evaluation of the potential impacts of climate change on proposed projects and water budgets for a groundwater basin/subbasin. The CDWR climate change factors (CDWR, 2018) were initially considered for use as the basis for climate change assumptions. However, these factors resulted in only modest reductions in precipitation and SWP deliveries for the region. Based on recurring below normal precipitation conditions for more than 20 years in the Coachella Valley region, the general understanding from the Agencies and other water management agencies in the Coachella Valley is that the region is experiencing a "new normal" of ongoing below normal precipitation conditions. As such, the Indio Subbasin and MCSB technical teams and management committees agreed to use the recent observed persistent below normal precipitation from 1995 through 2019 as the **Climate Change** scenario for the region. The assumption for this scenario is that climatic conditions of this 25-year "drought period" in the Coachella Valley is duplicated to provide the full 50-year hydrologic period. The period was implemented in a reverse order (i.e., 2019 to 1995) for the first 25-year portion of the period, then forward order (i.e., 1995- 2019) for the second 25-year portion of the period. This results in a hydrologic period that starts and ends with multiple dry years. It was also assumed that climate change will impact the reliability of SWP deliveries as described in Section 4.2.4 of the Alternative Plan Update. The Technical Addendum to the 2019 SWP Delivery Capability Report (CDWR, 2020b) provides a "Future Conditions with Climate Change and 45 cm Sea Level Rise Scenario" which projects a further decrease in SWP deliveries over time. The 2019 SWP Delivery Capability Report estimates a future delivery reliability of 58% declining to 52% by 2040 (CDWR, 2020a). However, based on the average SWP deliveries since the 2007 Wanger Decision, this Alternative Plan Update recognizes the significant potential reduction in reliability associated with Delta export litigation and climate change, and therefore assumed a SWP delivery reliability of 45% through the planning horizon for all scenarios. In addition, as modeled by CDWR in its 2019 SWP Delivery Capability Report (CDWR, 2020), climate is anticipated to result in a decrease of SWP deliveries of 1.5% by 2045.The combination of the Baseline, Near-Term Projects, and Future Projects with the two hydrologic conditions results in the development and evaluation of six 50-year forecast scenarios including:

1) Baseline Forecast.
2) Near-Term Projects.
3) Future Projects.

4) Baseline Forecast with Climate Change.
5) Near-Term Projects with Climate Change.
6) Future Projects with Climate Change.

The scenario assumptions regarding potential hydrologic conditions are described in the following Section.

B.2 Common Assumptions

Several assumptions and hydrologic inputs are common to all the forecast scenarios. These are discussed in the following sections.

B.2.1 Model Domain and Simulation Period

The calibrated MCSB Model summarized above formed the hydrogeologic basis of the forecast model. There were no structural or hydrogeologic changes to the forecast model except for the addition or removal of scenario specific recharge areas or pumping wells.

As recommended by SGMA guidance documents, the forecast model simulates the 50-year period from 2020 to 2069 using 50 annual stress periods (**Table B2**). Annual stress periods were used because the majority of available historical data and forecast estimates are annualized.

B.2.2 Mountain Front Recharge

MFR within the model domain occurs from 13 watershed located in the San Bernardino and Little San Bernardino mountains (**Figure B4**). Between 1936 and 2019 (84 years) MRF within the model domain ranged from 372 to 241,935 acre-feet per year (AFY) and averaged 19,145 AFY (**Figure B5**).

The SGMA guidance requires that forecast hydrology be based on at least 50 years of historical hydrology. All forecast scenarios utilize the historical MFR from 1970 through 2019 as the basis for MFR estimates (**Table B3)**. Note that year 1993 (forecast year 2043) was an exceptionally wet year. It is unlikely that this exceptionally wet year will be repeated in the next 50 years; hence, the MFR for forecast year 2043 was decreased to bring the 50-year forecast average MFR closer to 19,145 AFY long-term average. Scenario-specific MFR is described for each scenario in the Section B.3.

B.2.3 State Water Project Deliveries for Aquifer Replenishment

Aquifer replenishment in the MCSB and Indio Subbasin is conducted through surface water deliveries by exchanging SWP water, including Table A allocation (Table A) and Yuba Accord water, for Colorado River Aqueduct (CRA) water. Table A amounts and Yuba Accord amounts for delivery are common to each scenario and each Climate Change scenario after applying the climate change factor. The Table A amount is 194,100 AFY assuming 100% SWP delivery reliability and the Yuba Accord amount is 651 AFY, both to be proportioned between Indio Subbasin and the MCSB (**Tables B4a, B4b, B4c**), as described below. As described previously, this Alternative Plan Update assumes 45% reliability through the planning horizon.

Tables B4a shows the estimated Baseline SWP Table A and Yuba Accord deliveries for 5 -year projections starting in 2020 using the 45% delivery reliability. Supplies are then split between the two groundwater replenishment facilities in the West Whitewater River Management Area (Indio Subbasin) and the Mission Creek Management Area (MCSB) based on groundwater production in these two management areas. For 2020, the split is approximately 92% of the recharge water is delivered to the WWR-GRF and approximately 8% is delivered to the MC-GRF. Based on the demand projections, the percentage of recharge water delivered to the MC-GRF increases to approximately 9% in 2030 and increases again to approximately 10% in 2045. This process was used to estimate five-year projections for the MC-GRF from 2020 to 2045. Finally, the delivery is adjusting for "takes" on advance deliveries provide by Metropolitan Water District (MWD) that are stored in the Coachella Valley and that maybe credited against future deliveries. These are referred to as Advanced Delivery Credits). The actual dates that Advanced Delivery Credits will be exercised is unknown. However, for the purpose of the model the Advanced Delivery Credit is deducted from the model from 2025 to 2035 to prevent double counting of the advanced deliveries.

Similar SWP Table A five-year projections for the MC-GRF from 2020 to 2045 were developed for the Near-Term Projects scenario (**Table B4b**) and the Future Projects Scenario (**Table B4c**). Following 2045, SWP deliveries are assumed to be the same as 2045 through the end of the simulation in 2069.

The five-year projections were then annualized over the forecast period from 2020 through 2069 using a SWP factor developed for the Indio Subbasin Water Management Plan Update (Todd/W&C, 2021) to provide variability. The factor uses historical SWP Table A reliability for the 50-year period from 1970 to 2019 as the basis for variability (**Table B5)**. Each of the forecast years is represented by a historical analog year; 1970 is the analog year for 2020, 1971 is the analog year for 2021, etc. An annual SWP reliability factor was then calculated by normalizing each annual historical SWP analog reliability to the five-year average. For example, for 2025 through 2029 (analog 1975 through 1979), the annual historical SWP reliability for each year 1975 through 1979 was 84%, 61%, 5%, 68%. and 81% respectively, and average was 60%. The period 2025 through 2029 was used because it has extreme values and because the period 2020 through 2024 has a rebalance obligation which factors into the annual SWP delivery as described in subsequent paragraphs. When normalized by 60%, the 84% historical reliability becomes a 141% SWP annual factor (84.0% / 59.7%. = 141%, additional significant figures shown for demonstrating the calculation). Calculating the SWP factors for the remaining four years, yields 141%,102%, 9%, and 113% annual SWP factors. Applying the factors to the forecasted five-year average of 6,541 AFY for the Baseline scenario results in deliveries of 9,196, 6,695, 579, 7,417 and 8,820 AFY for 2025 through 2029, respectively, and the average for these five years is 6,541 AFY, which is the same as the forecasted 5-year average. This normalization allows for a time-variant forecast tied to historical observations while still honoring the five-year average forecast precisely. Application of the annual SWP factor to the five-year average delivery for each scenario, provided in **Tables B4a, B4b,** and **B4c** is provided in **Table B5**, which also includes the analog Table A reliability, and calculated annual SWP factor. **Figure B6** shows a graphic of the five-year average deliveries and annual deliveries after applying the annual SWP factor.

SWP replenishment water for years 2020 through 2024, was tabulated separately based on known or reasonably estimated actual conditions and the contractual obligation to rebalance deliveries to the two replenishment facilities. During the 2000-2010 period, there were several years where SWP deliveries to the MC-GRF were greater than annual average based on proportional pumping. The MCSB was required to rebalance the SWP deliveries over a 20-year period beginning December 2004 and ending in December 2024. Currently, 8,096 AF of the replenishment water to MC-GRF has been delivered ahead of scheduled and will need to be consider in the balance and deliveries by December 2024.

During the forecast period, actual SWP deliveries in 2020 were 1,768 AF and SWP deliveries for 2021 were estimated to be only 476 AF. These values were used as known or estimated without application of the Annual SWP factor. The smaller volumes of replenishment water delivered to the MC-GRF in 2020 and 2021 were recharged and not used to reduce the surplus in the balance obligation. It was assumed that projected SWP deliveries averaging 7,143 AFY (**Table B5**) will begin in 2022 and that between 2022 and 2024, a corresponding total of 21,429 AF of replenishment water will be available to the MC-GRF. An additional 233 AFY is added to this total for two years of the Lake Perris Seepage starting in 2023 (466 AF). This brings the total to 21,895 AF. It was further assumed the volume needed for rebalance will be deducted at a rate of 2,699 AF each year for 2022 through 2024 (8,096 AF total deduction). The remaining balance of approximately 13,800 AF is allocated to the three years 2022, 2023 and 2024 as shown in **Table B5**.

This process of estimating the SWP supplies for replenishment based on the five-year projections was used for 2020 through 2045. SWP deliveries for years after 2045 are assumed to be identical to those of 2045 through the end of the simulation in 2069. These Baseline SWP supplies were the same for all scenarios. Additional water supply assumptions under the Near-Term Projects and Future Projects scenarios result in additional SWP supplies (**Tables B4b** and **B4c**). Changes in SWP Table A supplies as a result of climate change factors were also calculated (**Table B4a, B4b,** and **B4c**). These differences are described, where applicable for each scenario in Section B.3.

B.2.4 Population Growth and Pumping Demand

There are no potable surface water supplies within the model domain (study area). All domestic and municipal potable water supplies are from pumped groundwater. Hence, population growth can be directly related to increased pumping demand. All forecast scenarios utilize the same assumptions regarding population growth and the associated groundwater pumping demand.

B.2.4.1 Population Growth

As described in Sections 2 and 3 of the Alternative Plan Update, Planning Area demographics are based on population information from the Southern California Association of Governments' (SCAG) regional growth forecast contained in the 2020 Regional Transportation Plan and Sustainable Communities Strategy (SCAG, 2020). The forecast includes population estimates for the base year 2016 and projections for years 2020, 2035, and 2045. SCAG used the Transportation Analysis Zones (TAZ), which are similar to the Census Block Groups, in their population projections.

The projected population for each TAZ polygon within or related to the Planning Area was analyzed using graphical information system (GIS) methods to provide population estimates for the Planning Area of approximately 53,000 in 2020, 74,000 in 2035 and 88,000 in 2045 (Section 2, **Table 2-1** of the Alternative Plan Update). These projections were linearly interpolated to provide annual estimates of future population in the study area from 2020 through 2045.

B.2.4.2 Groundwater Pumping Demand

Municipal pumping, which accounts for about 75% of total pumping, is directly related to population. Historically, total pumping (municipal and private) in the Planning Area has ranged from a few thousand AFY in the 1950's to almost 20,000 AFY in 2006 (**Figure B7,** bottom left). Based on the demand projections in the Alternative Plan Update (Section 3 and Appendix C), total municipal pumping demand was estimated to increase from about 10,700 AFY in 2018 to about 16,820 AFY by 2045 (**Table B6**; **Figure B7,** upper left). The increased pumping demand was distributed to existing well fields for each municipal planning area based on the population projections by TAZ polygons (**Figure B7,** upper right). Production for existing wells was allowed to increase to the historical high groundwater production for each well in the Planning Area to accommodate the increase in demand. Based on historical performance, the currently existing wells could accommodate the increase in municipal demand, so no additional wells were added to the model.

Metered private well production, consisting of pumping for golf courses, agricultural (primarily fish farms), industrial, and domestic wells, was assumed to remain at the average 2015-2019 rate of 3,504 AFY through 2039. In 2040**,** the CPV Sentinel Energy Project is anticipated to be complete, and an average of 295 AFY will no longer be required for this industrial use. This results in metered private production declining to 3,209 AFY in 2040 and remaining at this level through the remainder of forecast simulation period.

Since the SCAG projections end in 2045 it was further assumed that all pumping demand would be held constant after 2045 (**Table B6**). Unmetered private well pumping was estimated to decrease from 474 AFY in 2020 to 466 AFY in 2045 due to passive conservation assumptions. However, because the unmetered pumping estimates are based on highly uncertain assumptions, this pumping was rounded up to 500 AFY through the planning horizon for modeling purposes.

This pumping demand described above is common to all forecast scenarios.

B.2.5 Return Flow Recharge

Return flow consists of the proportion of pumped groundwater that returns back to the water cycle as recharge to groundwater after it has been used for its intended purpose (municipal, agricultural, industrial, or golf course). The assumptions for the return flow calculations for the forecast model are the same as those used in the calibration model (**Table B7**) and are based on return flows estimated for the Coachella Valley Groundwater Basin as documented by K&SEC and Stantec (2018).

B.2.5.1 Applied Water Return Flow

Applied water return flow includes return flow from municipal and private outdoor use of pumped groundwater including agricultural, industrial, and golf course irrigation. Because private metered production remains the same for the forecast period, the return flow for this use remains the same. Return flow for municipal outdoor use increases with increasing production through the planning horizon. Return flows for the Baseline scenario are provided in **Table B7**. Return flow from applied water has been estimated to be approximately 25%. Because water use is the same for all scenarios, return flows are the same for all scenarios

B.2.5.2 Septic and Treated Wastewater Return Flows

MSWD plans to continue to convert areas currently on septic systems to the municipal sewer system. The location of the areas to be converted (A, D3, M2, etc.) are shown on **Figure B8**. An estimated 2,331 parcels will be converted in the MCSB and DHSSB from 2022 to 2035 (**Figure B9**). The top chart on **Figure B9** depicts the timeline of the conversion of septic systems to municipal sewer connections for the conversion areas. The lower chart on **Figure B9** shows the decrease in septic system flows as systems are converted and the increase in sewer system flows as septic systems are converted, and as undeveloped parcels are developed over the build-out period. Forecast WWTP flows were estimated for each WWTP (**Figure B10**, top) and by Subbasin (**Figure B10**, bottom). Septic to sewer conversions are incorporated into the Baseline return flow provided in **Table B7**. All the scenarios will have the same septic system return flows. Treated wastewater return flows, however, differ between the Baseline and the Near-Term/Future Project scenarios, as discussed under the scenarios.

Total forecast return flows were calculated for each subbasin/subarea (**Figure B11**). Total return flows are forecast to increase gradually from about 7,000 AFY to about 10,800 AFY by 2045 as a result of population growth. Forecast return flow volumes are the same for each scenario. However, the disposal locations for the treated wastewater differ between the Baseline, the Near-Term with Climate Change and Future Project with Climate Change scenarios, as discussed under each scenario.

B.2.6 Garnet Hill Fault Flux and Whitewater River Recharge

As discussed in Section B.1.1, Wood adopted the hydraulic properties from the 1997-2019 Indio Subbasin model into the MCSB Calibration model in the GHSA, where the models overlap. Wood also incorporated the simulated underflow between the GHSA and main Indio Subbasin across the Garnet Hill Fault and Whitewater River recharge into the MCSB Model. The processes for extracting the Garnet Hill Fault flux and Whitewater River recharge from the Indio Subbasin model and importing them into the MCSB Calibration model are discussed more fully in Appendix A Section A.4.5.8.

As discussed in The Indio Subbasin Water Management Plan Update (Todd/W&C, 2021), the Indio Subbasin model was also used to perform multiple forecast scenarios, including six scenarios equivalent to those discussed above in Section B.1.3. Using the same processes as described in Appendix A, the Garnet Hill Fault flux and Whitewater River recharge were extracted from the Indio Subbasin model for each of the six forecast scenarios and incorporated into the

MCSB forecast scenarios (**Figure B12**). This resulted in a consistent treatment of Whitewater River recharge and Garnet Hill Fault flux between the two models for all forecast scenarios.

B.3 Scenario Assumptions

The following sections discuss the specific assumption unique to each of the forecast scenarios.

B.3.1 Scenario 1 - Baseline Scenario Assumptions

The Baseline scenario assumptions are discussed below.

B.3.1.1 Mountain Front Recharge

Estimated MFR for the Baseline scenario was assumed to be a repeat of the MFR estimated for the calibration model for the period 1970 through 2019 (**Table B3, Figure B5** top). This 50-year period includes several drought intervals, several wet intervals, and is slightly greater than the long-term average hydrology. The year 1993 (forecast year 2043) was an exceptionally wet year, which resulted in an average MFR within the model domain of 22,603 AFY (**Table B3**). It is unlikely that this exceptionally wet year will be repeated in the next 50 years; hence, the MFR for forecast year 2043 was decreased to 28.3% of historical (1993) MFR to bring the 50-year forecast average MFR to 19,145 AFY (**Table B3, Figure B5** bottom). With this adjustment, the average MFR for the forecast period matches the long-term average annual MFR for 1935 to 2019.

B.3.1.2 State Water Project Deliveries for Groundwater Replenishment

SWP deliveries for groundwater replenishment under the Baseline scenario are listed in **Table B4a**. Under the Baseline scenario, SWP deliveries are forecast to range from 6,540 to 8,565 AFY and average about 6,510 AFY from 2020 through 2044 and 8,565 AFY from 2045 through 2069 (**Figure B6**). **Table B5** presents annualized SWP deliveries as described in Section B.2.3.

B.3.1.3 Wastewater Treatment Plant and Regional Water Reclamation Facility Return Flow

Figure B8 shows the location of the existing Horton and Desert Crest WWTPs, the proposed RWRF, and the proposed RWRF recharge location. **Figure B10**, top plot, shows MSWD projected total wastewater flows and flows to the individual WWTP/RWRF. This estimate closely matches the estimate of wastewater effluent based on the municipal sewered indoor use (**Table B7**, **Figure B10**, bottom plot). For purpose of modeling, indoor water use was used to estimate wastewater effluent to maintain the overall water balance of the model. All wastewater effluent has a 3% evaporation loss applied to calculate the return flow (See Appendix A of the Alternative Plan Update). A summary of the WWTP/RWRF return flows assumptions are provided below.

- Desert Crest WWTP -Desert Crest WWTP will continue to operate at capacity levels, using the observed return flows from 2015-2019 (ranging from approximately 40.5 to 51 AFY) on a recuring cycle through the planning horizon (**Table B7**, Zone 35). This return flow is the same for all scenarios.
- Horton WWTP - Horton WWTP will continue to operate at capacity until 2023 when the RWRF comes online. A portion of the Horton WWTP will be diverted to the RWRF

beginning in 2023. Sewer flow to the Horton WWTP will then increase until it returns to its operating capacity of about 2,500 AFY in 2035 (**Table B7**, Zone 13).

- RWRF – The RWRF comes online in 2023. A portion of the Horton WWTP is diverted to the facility for startup through 2027 and then the RWRF wastewater grows with population growth and septic to sewer conversions in the Planning Area (**Table B7**, Zone 44). For the Baseline Scenario, all the wastewater treated at the RWRF is percolated in ponds at the Facility in the GHSA. The volume of this water in 2023 is approximately 330 AF and grows to approximately 3,250 AF by the end of the planning horizon in 2045. The percolation remains constant from 2045 through the simulation period ending in 2069 because assumed population growth and water demand are held constant.

B.3.1.4 Total Return Flows

Total return flow (not including MC-GRF recharge) is shown for each of the subbasins/subareas on **Figure B11,** top graph. The graph shows that in the Baseline Scenario, return flow in the MCSB and DHSSB are relatively constant. GHSA return flow grows during the early part of the forecast due to population growth resulting in greater wastewater flows to the RWRF and subsequent percolation of this water into the GHSA.

B.3.1.5 Garnet Hill Fault Flux and Whitewater River Recharge

The Baseline scenario Garnet Hill Fault flux and Whitewater River recharge in the GHSA are shown on **Figure B12**. The Garnet Hill Fault flux is primarily negative (i.e., outflow from the GHSA into the Palm Springs Subarea of the Indio Subbasin) and averages about -14,500 AFY. Under the Baseline scenario, Whitewater River recharge in the GHSA averages about 11,100 AFY. During wet periods when, Whitewater River recharge increases, the Garnet Hill Fault flux from GHSA to the Palm Springs Subarea of the Indio Subbasin also tends to increase.

B.3.2 Scenario 2 – Near-Term Projects Scenario Assumptions

The Near-Term Projects scenario assumptions are identical to Scenario 1, Baseline scenario assumptions discussed in Section B.3.1 with two differences as discussed below.

B.3.2.1 Additional State Water Project Supply

The Near-Term Projects scenario SWP supplies are identical to the Baseline scenario except for the addition of the Lake Perris Seepage supply beginning in 2023. The details of this project are provided in Section 4 of the Alternative Plan Update. This Lake Perris project is assumed to provide additional SWP water for groundwater replenishment at the MC-GRF with volumes estimated at 233 AFY starting in 2023, increasing to 242 AFY in 2030, and ultimately increasing to 265 AFY in 2045 and beyond (**Table B4b**). **Table B5** presents annualized SWP deliveries as described in Section B.2.3.

B.3.2.2 Regional Water Reclamation Facility Return Flow Location

The RWRF is currently under construction in the GHSA (**Figure B8**). The RWRF will initially discharge treated water into percolation ponds located at the facility and the Baseline Scenario maintains that condition though the simulation period. Under the Near-Term Projects Scenario, it is assumed that the Regional WWPT discharge will be transported via pipeline to the MCSB for percolation and/or groundwater recharge into new ponds shown at the RWRF disposal/recharge location. Intentional recharge of the treated effluent to replenish groundwater would involve different permitting and regulatory approval steps than would disposal of the treated effluent in percolation ponds. From a water balance standpoint, however, this project will result in an increase in return flow to the MCSB regardless of whether the treated effluent is considered to be disposed of by percolation and evaporation or used for groundwater recharge. The proposed treated water pipeline and percolation ponds are in the design phase and are scheduled to be completed by 2028. Hence it is assumed that under the Near-Term Project scenario, the discharge from the RWRF will shift to the MCSB in 2028.

B.3.2.3 Total Return Flows

Total return flow for the Near-Term Scenario (not including MC-GRF recharge) is shown for each of the subbasins/subareas on **Figure B11**, bottom graph**.** The graph shows that in the Near-Term scenario, return flow in the DHSSB remains relatively constant. GHSA return flow grows from 2023 to 2027 when the RWRF is percolating treated wastewater into the GHSA. Starting in 2028, treated wastewater from the RWRF is transported via pipeline to a percolation facility in the MCSB, resulting in increasing return flows in MCSB over time.

B.3.2.4 Garnet Hill Fault Flux and Whitewater River Recharge

The Near-Term Projects scenario Garnet Hill Fault flux and Whitewater River recharge in the GHSA are shown on **Figure B12**. The Garnet Hill Fault flux is primarily negative and averages about -13,550 AFY from GHSA to the main Indio Subbasin. Under the Near-Term Projects scenario, Whitewater River recharge in the GHSA averages about 11,100 AFY. During wet periods when, Whitewater River recharge increases, the Garnet Hill Fault flux from GHSA to the main Indio Subbasin also tends to increase.

B.3.3 Scenario 3 – Future Projects Scenario Assumptions

The Future Projects scenario assumptions are identical to the Scenario 2, Near-Term scenario assumptions discussed in Section B.3.2 with the differences discussed below.

B.3.3.1 Sites Reservoir and Delta Conveyance Facility

The Future Projects scenario SWP supplies are identical to the Near-Term scenario except for the addition of the Sites Reservoir project and the Delta Conveyance Facility project. The details of these two projects are provided in Section 4 of the Alternative Plan Update. For the purposes of the model forecast, these two projects increase the SWP deliveries to the MC-GRF for groundwater replenishment. The Sites Reservoir project increases SWP deliveries starting in 2035 by approximately 1,040 AFY. In 2045, the increase in deliveries becomes 1,155 AFY (**Table B4c**). The Delta Conveyance project increases SWP deliveries in 2045 by approximately 2,385 AFY. **Table B5** presents annualized SWP deliveries as described in Section B.2.3.

B.3.3.2 Garnet Hill Fault Flux and Whitewater River Recharge

The Future Projects scenario Garnet Hill Fault flux and Whitewater River recharge in the GHSA are shown on **Figure B12**. The Garnet Hill Fault flux is primarily negative and averages about -12,600 AFY from GHSA to the main Indio Subbasin. Under the Future Projects scenario, Whitewater River recharge in the GHSA averages about 11,100 AFY. During wet periods when, Whitewater River recharge increases, the Garnet Hill Fault flux from GHSA to the main Indio Subbasin also tends to increase.

B.3.4 Scenario 4 – Baseline with Climate Change Assumption

The Baseline with Climate Change scenario assumptions are identical to Scenario 1, Baseline scenario assumptions discussed in Section B.3.1 with difference as discussed below.

B.3.4.1 Mountain Front Recharge

MFR for the Climate Change scenario utilizes a 25-year drought cycle based on data from 1995 through 2019 (**Table B8** and **Figure B5**, bottom chart). For the 50-year forecast period, this cycle was first simulated in reverse order (2019 to 1995) and then repeated in forward order (1995 to 2019). This resulted in four notably dry periods: the first occurring between 2023 and 2027, the second between 2035 and 2040, the third between 2049 and 2054, and the fourth between 2062 and 2066 (**Figure B5**, bottom chart). The resulting Climate Change scenario has a significantly lower average annual MFR of 14,735 AFY (**Table B8**) compared to 19,145 AFY for the Baseline scenario (**Table B6**). This drought cycle forecast of MFR more closely represents the recent historical conditions in the Coachella Valley and is more conservative than the CDWR climate change forecast. The Agencies considered the drought cycle MFR as the most appropriate scenario to use for planning purposes. This change in MFR is the same for all Climate Change Scenarios.

B.3.4.2 State Water Project Deliveries for Groundwater Replenishment

As described in Section B.2.3, the five-year estimates of SWP deliveries (**Table B4a**) were annualized using the annual SWP delivery reliability factors for the forecast period analog years of 1970 through 2019 (**Table B5**). SWP deliveries for the Baseline with Climate Change scenario were based on the annual SWP delivery reliability factors and an added climate change factor based on CDWR modeling (CDWR climate change factor). Under anticipated climate conditions, reliability is assumed to be reduced by an additional 1.5% as compared to Baseline by 2045, as modeled by CDWR in its 2019 SWP Delivery Capability Report (CDWR, 2020). The CDWR climate change factor is applied to each five-year delivery period starting at 0.3% in 2025 and increasing by 0.3% each year until 2045 when the CDWR climate change factor is 1.5% (**Table B4a**). The climate change scenarios average deliveries from **Table B4a** are used to calculate annual deliveries for these scenarios in **Table B5.** Consequently, CDWR climate change factors are incorporated into the annual delivery for the climate change scenario in **Table B5**. These deliveries are shown graphically on **Figure B6**. The effects of climate change do not significantly reduce SWP supplies.

B.3.4.3 Garnet Hill Fault Flux and Whitewater River Recharge

The Baseline with Climate Change scenario Garnet Hill Fault flux and Whitewater River recharge in the GHSA are shown on **Figure B12**. The Garnet Hill Fault flux is primarily negative and averages about -12,190 AFY from GHSA to the main Indio Subbasin. Under the Baseline with Climate Change scenario, Whitewater River recharge in the GHSA decreases significantly (about 45%) and averages about 6,080 AFY. During dry periods, when Whitewater River recharge decreases, the Garnet Hill Fault flux from GHSA to the Palm Springs Subarea of the Indio Subbasin also tends to decrease.

B.3.5 Scenario 5 – Near-Term Projects with Climate Change Assumptions

The Near-Term Projects with Climate Change scenario assumptions are identical to Scenario 2, Near-team scenario assumptions discussed in Section B.3.2 with the application of climate change assumptions for MFR (**Table B8**) and Table A climate change factors applied as described in Section B.3.4, Scenario 4, Baseline with climate change assumptions. The SWP deliveries under Scenario 5 are annualized in **Table B5** and shown on **Figure B6**. The effects of climate change pronounced with time, decreasing the Near-Term Projects 2020-2069 annual average SWP delivery from 7,265 AFY to 7,180 AFY (**Table B4b, Table 5, Figure B6**).

The Near-Term Projects with Climate Change scenario Garnet Hill Fault flux and Whitewater River recharge in the GHSA are shown on **Figure B12**. The Garnet Hill Fault flux is primarily negative and averages about -12,250 AFY from GHSA to the main Indio Subbasin. Under the Near-Term Projects with Climate Change scenario, Whitewater River recharge in the GHSA decreases significantly and averages about 6,080 AFY. During dry periods, when Whitewater River recharge decreases, the Garnet Hill Fault flux from GHSA to the Palm Springs Subarea of the Indio Subbasin also tends to decrease.

B.3.6 Scenario 6 – Future Projects with Climate Change Scenario Assumptions

The Future Projects with Climate Change scenario assumptions are identical to Scenario 3, Future Projects scenario assumptions discussed in Section B.3.3 with the application of climate change assumptions for MFR (**Table B8**) and Table A climate change factors applied as described in Section B.3.4, Scenario 4, Baseline with Climate Change assumptions. The SWP deliveries under Scenario 6 are annualized in **Table B5** and shown on **Figure B6**. The effects of climate change pronounced with time, decreasing the Future Projects 2020-2069 annual average SWP delivery from 9,330 AFY to 9,225 AFY (**Table B4c, Table 5, Figure B6**).

The Future Projects with Climate Change scenario Garnet Hill Fault flux and Whitewater River recharge in the GHSA are shown on **Figure B12**. The Garnet Hill Fault flux is primarily negative and averages about -11,190 AFY from GHSA to the main Indio Subbasin. Under the Future Projects with Climate Change scenario, Whitewater River recharge in the GHSA decreases significantly and averages about 6,080 AFY. During dry periods, when Whitewater River recharge decreases, the Garnet Hill Fault flux from GHSA to the Palm Springs Subarea of the Indio Subbasin also tends to decrease.

B.4 Scenario Simulation Results

Forecast scenario groundwater elevations for the MSCB and water balances for the MCSB, DHSSB, and GHSA are discussed in the following sections. Hydrographs are presented for nine Key Wells in the MCSB. Hydrographs for wells in the DHSSB are not presented because it is a very low priority subbasin that does not have requirements under SGMA. Hydrographs for wells in the GHSA are not presented because the GHSA is part of the Indio Subbasin and forecast scenarios for the GHSA are included in the Indio Subbasin Water Management Plan Update (Todd/W&C, 2021). Underflow from DHSSB to MCSB is discussed below due to concerns about potential water quality impacts resulting from increased flows of poor-quality groundwater from DHSSB to MCSB.

B.4.1 Simulated Groundwater Levels

Hydrographs of observed 2009-2019 groundwater elevations and 2020-2069 forecast groundwater elevations were prepared for the nine Key Wells in the MCSB (**Figure B13** and **Attachment B1**). The forecast water levels were modified as needed to match measured groundwater levels in the wells. Each hydrograph shows the Measurable Objective based on 2009 groundwater levels (2009 was a time of generally low groundwater levels through much of the subbasin) and the Minimum Threshold described in Section 6 of the Alterative Plan Update.

Simulated groundwater elevations are shown for the Baseline scenario and Baseline with Climate Change scenario (**Figure B13**). Also shown are hydrographs for the Near-Term Projects scenario and Future Projects scenario with and without climate change.

The hydrographs show that under Baseline conditions, groundwater levels in all the Key Wells fall below their Measurable Objectives. By the end of the planning horizon (2045) groundwater levels in five Key Wells fall below their Minimum Thresholds; these include wells 02S04E36K01 (36K01), 3S4E11L04 (11L04), 03S04E12C01 (12C01), 03S05E15R01 (15R01), and 03S05E17J01 (17J01). Groundwater levels in the remaining Key Wells stay above their Minimum Thresholds through the planning horizon of 2045.

Under the Baseline with Climate Change scenario, groundwater levels in all Key Wells fall below their respective Measurable Objectives during the planning horizon. Six of the nine Key Wells also fall below their respective Minimum Thresholds during the planning horizon (36K01, 11L04, 03S04E04P01 [4P01], 12C01, 15R01, and 17J01).

The hydrographs show that under the Near-Term Projects scenario, all the Key Wells stay above their respective Measurable Objectives through the forecast period. Under the Near-Term Projects with Climate Change scenario, six of the nine Key Wells stay above their Measurable Objectives and three Key Wells (4P01, 15R01, and 17J01) fall below their respective Measurable Objectives. All Key Wells stay above their Minimum Thresholds.

The hydrographs show that under the Future Projects scenario, all the Key Wells stay above their respective Measurable Objectives. Under the Future Projects with Climate Change scenario, the hydrographs show that six of nine Key Wells stay above their Measurable Objectives and three of the Key Wells (4P01, 15R01, and 17J01) fall below their respective Measurable Objectives. Wells that drop below the Measurable Objective during the planning horizon only drop below this level by a maximum of 3.1 feet. The well with the greatest decline (4P01) eventually recovers and rises above its Measurable Objective by the middle of 2041. The remaining two wells, 15R01 and 17J01, only drop below their Measurable Objectives during the planning horizon by 1.6 feet and 0.4 feet, respectively. Wells 4P01 and 15R01 have limited historical records and the Measurable Objectives for these wells are considered provisional (see Section 6.3.2 of the Alternative Update). All Key Wells stay above their Minimum Thresholds.

The forecast hydrographs indicate that the Baseline scenario is not sustainable under normal nor climate change conditions. The Baseline scenarios are only shown for comparison purposes and are not scenarios that are planned for implementation. The Near-Term Projects and Future Projects are necessary to maintain groundwater elevations in the MCSB under normal and climate change conditions.

B.4.2 Simulated Water Balance and Change in Storage

The simulated water balance and change in groundwater in storage (calculated as the cumulative change since 2009) for each scenario for the MCSB, GHSA, and DHSSB are provided in the subsections below. Water balances are provided for the DHSSB and GHSA because of the inter-basin underflow between them and the MCSB.

Water balance and change in storage simulated by the calibrated and forecast groundwater model includes storage for the entire subbasin/subarea. These areas are larger than the area developed for water supply and monitored by the Agencies. For example, in the MCSB, the northwestern portion of the subbasin comprises a relatively remote area without monitoring wells. This area is also where nearly all MFR entering the subbasin occurs. Under drought conditions, mountain front recharge will decline along with groundwater levels; the reverse is true under wet conditions. This is part of the natural hydrogeologic cycle of the subbasin. Because this northwestern area is more than a mile upgradient from the nearest monitored area, there will be a significant time lag for the decrease or increase in MFR to impact groundwater levels in monitoring wells. Consequently, the simulated water balance and change in storage will not directly reflect groundwater levels in some portions of the MCSB under some hydrologic conditions. Therefore, simulated subbasin wide water balances and changes in storage cannot be used for direct comparison with the Measurable Objective and Minimum Threshold for groundwater levels in representative monitoring wells. As described in Section 6.4.3, the Measurable Objective for groundwater in storage is based on 2009 groundwater conditions. Hence, the cumulative change in storage discussed below, which is relative to the 2009 conditions, is a useful measure in evaluating long term trends for groundwater storage and water balance.

B.4.2.1 MCSB Water Balance and Change in Storage

A simulated water balance was prepared for the MCSB for each forecast scenario. The water balance for the Baseline scenario shows that there is significantly more MFR in the Baseline scenario compared to the Baseline Scenario with Climate Change (**Table B9** and **B10, Figures B14** and **B15**). All the other water balance components remain the same. The water balance shows that the long-term cumulative change in storage under the Baseline scenario is positive at 85,820 AF in 2045. Under the Baseline with Climate Change scenario, the cumulative change in storage becomes negative in the mid-2020s, decreasing to about -65,780 AF in 2040 and then rising to about -9,910 AF in 2045.

Similarly, the water balance for the Near-Term Project scenarios shows significantly more MFR in the Near-Term Projects scenario compared to the Near-Term Projects with Climate Change scenario (**Table B11** and **B12, Figure B16** and **B17**). All the other water balance components remain the same. The water balance shows that the cumulative change in storage under the Near-Term Projects scenario decreases to about -26,930 AF by 2027 and then starts to increase in 2028 with higher natural recharge in 2028 through 2033 and the initiation of percolation of the RWRF treated wastewater in the MCSB in 2028. The long-term cumulative change in storage under the Near-Term Projects scenario remains positive at 126,830 AF in 2045. Under the Near-Term Projects with Climate Change scenario, the cumulative change in storage becomes negative in the mid-2020s, then rises to about 30,870 AF in 2045. Initiation of percolation of the

RWRF treated wastewater in the MCSB in 2028 reduces the impacts of drought conditions through increased recharge from wastewater return flow.

The water balance for the Future Projects scenario also shows significantly more MFR in the Future Projects scenario compared to Future Projects with Climate Change scenario (**Table B13** and **B14, Figure B18** and **B19**). All the other water balance components remain the same. The water balance shows that the cumulative change in storage under the Future Projects scenario is positive into the early 2020s then negative through 2027. In 2028 storage increases with the increased natural recharge and initiation of percolation of the RWRF treated wastewater in the MCSB and the importation of more SWP water for recharge at the MC-GRF. The water balance shows that the long-term cumulative change in storage under the Future Projects scenario increases to around 140,900 AF in 2045. Under the Future Projects with Climate Change scenario, the cumulative change in storage becomes negative in the mid-2020s and increases to about 44,910 AF in 2045.

B.4.2.2 GHSA Water Balance and Change in Storage

A simulated water balance was prepared for the Garnet Hill Subarea for each forecast scenario. The water balance for the Baseline scenario shows that there is significantly more MFR in the Baseline scenario compared to the Baseline with Climate Change scenario (**Table B15** and **B16, Figure B20** and **B21**). All the other water balance components remain the same. The water balance shows that the long-term cumulative change in storage under the Baseline scenario is positive and is around 257,990 AF in 2045. Under the Baseline with Climate Change scenario, the cumulative change in storage increases slowly and is about 82,740 AF in 2045.

Similarly, the water balance for the Near-Term Project scenarios shows significantly more MFR in the Near-Term Projects scenario compared to the Near-Term Projects with Climate Change scenario (**Table B17** and **B18, Figure B22** and **B23**). All the other water balance components remain the same. The water balance shows that the cumulative change in storage under the Near-Term Projects scenario increases at a high rate starting in 2028 with the initiation of percolation of the RWRF treated wastewater in the MCSB and starts to plateau after 2033. The long-term cumulative change in storage under the Near-Term scenario remains positive at around 226,550 AF in 2045. Under the Near-Term Projects with Climate Change scenario, the cumulative change in storage rises more slowly and reaches about 39,150 AF in 2045.

The water balance for the Future Projects scenario also shows significantly more MFR in the Future Projects scenario compared to Future Projects with Climate Change scenario (**Table B19** and **B20, Figure B24** and **B25**). All the other water balance components remain the same. The water balance shows that the cumulative change in storage under the Future Project scenario is generally positive at about 226,760 AF in 2045. Under the Future Projects with Climate Change scenario, the cumulative change in storage is about 39,360 AF in 2045.

B.4.2.3 DHSSB Water Balance and Change in Storage

A simulated water balance was prepared for the DHSSB for each forecast scenario. The water balance for the Baseline scenario shows that there is significantly more MFR in the Baseline scenario compared to the Baseline with Climate Change scenario (**Table B21** and **B22, Figure B26** and **B27**). All the other water balance components remain the same. The water balance shows that the long-term cumulative change in storage under the Baseline scenario is positive at around 87,510 AF in 2045. Under the Baseline with Climate Change scenario the cumulative change in storage continues to be negative in the early 2020s and 2030s and is about -7,950 AF in 2045. The cumulative change in storage is forecast to remain slightly negative over time.

Similarly, the water balance for the Near-Term Project scenarios shows significantly more MFR in the Near-Term Projects scenario compared to the Near-Term Projects with Climate Change scenario (**Table B23** and **B24, Figure B28** and **B29**). All the other water balance components remain the same. The water balance shows that the cumulative change in storage under the Near-Term Projects scenario remains positive and starts to increase in the 2020s with a brief wet period. The long-term cumulative change in storage under the Near-Term scenario remains positive at around 88,590 AF in 2045. Under the Near-Term Projects with Climate Change scenario, the cumulative change in storage is about -6,900 AF in 2045.

The water balance for the Future Projects scenario also shows significantly more MFR in the Future Projects scenario compared to Future Projects with Climate Change scenario (**Table B25** and **B26, Figure B30** and **B31**). All the other water balance components remain the same. The water balance shows that the cumulative change in storage under the Future Projects scenario remains slightly negative and starts to increase in the late 2020s with a brief wet period. The water balance shows that the long-term cumulative change in storage under the Future Projects scenario increases to 88,740 AF in 2045. Under the Future Projects with Climate Change scenario the cumulative change in storage remains negative and is approximately -6,760 AF in 2045.

B.4.3 Underflow from DHSSB to MCSB

Underflow from DHSSB to MCSB is discussed below due to concerns about potential water quality impacts resulting from increased flows of poor-quality groundwater from DHSSB to MCSB under the forecast scenarios. Mission Creek Fault underflows are compared to the average underflow from 1978 through 2001, which was about 1,220 AFY. This period was selected because it is prior to artificial recharge that began in 2002, which could affect the underflow.

The water balance for the Baseline scenario (**Table B21)** shows that simulated 2020 to 2045 underflow from DHSSB to MCSB ranges between approximately 1,150 and 1,840 AFY and averages about 1,360 AFY, slightly more than the 1978 to 2001 AFY average of about 1,220 AFY. The Baseline with Climate Change scenario (**Table B22)** shows that simulated 2020 to 2045 underflow from DHSSB to MCSB ranges between approximately 1,130 and 1,230 AFY and averages about 1,160 AFY, slightly less than the 1978 to 2001 average of about 1,220 AFY.

The water balance for the Near-Term Projects scenario (**Table B23)** shows that simulated 2020 to 2045 underflow from DHSSB to MCSB ranges between approximately 1,150 and 1,820 AFY and averages about 1,320 AFY, slightly more than the 1978 to 2001 AFY average of about 1,220 AFY. The Near-Term Projects with Climate Change scenario (**Table B24)** shows that simulated 2020 to 2045 underflow from DHSSB to MCSB ranges between approximately 1,050 and 1,170 AFY and averages about 1,120 AFY, slightly less than the 1978 to 2001 average of about 1,220 AFY.

The water balance for the Future Projects scenario (**Table B25)** shows that simulated 2020 to 2045 underflow from DHSSB to MCSB ranges between approximately 1,150 and 1,820 AFY and averages about 1,310 AFY, slightly more than the 1978 to 2001 average of about 1,220 AFY. The Future Projects with Climate Change scenario (**Table B26)** shows that simulated 2020 to 2045 AFY underflow from DHSSB to MCSB ranges between approximately 1,030 and 1,170 AFY and averages about 1,110 AFY, slightly less than the 1978 to 2001 average of about 1,220 AFY.

The water balance results show that the simulated underflow from DHSSB to the MCSB is slightly greater under the non-climate change scenarios due to increased natural recharge that affects the DHSSB storage in the late 2020s. Under the climate change scenarios, the simulated underflow from DHSSB to MCSB is slightly less than the 1978 through 2001 average underflow. This is because natural recharge has less of an impact under the climate change scenarios. In addition, the Near-Term Projects and Future Projects scenarios, with or without climate change, have additional recharge of increased SWP deliveries at the MC-GRF that results in increasing groundwater levels in the MCSB, reducing the groundwater elevation difference between DHSSB and MCSB, and thus reducing underflow from DHSSB to MCSB. Under the non-climate change scenarios, this additional recharge is not great enough to offset the difference that occurs based on natural recharge.

B.5 Summary and Conclusions

The calibrated 1936-2019 MCSB model was modified to simulate the 50-year period 2020 through 2069. Forecasts of future population growth were utilized to estimate future groundwater pumping demand and WWTP effluent. Forecasts of MFR were prepared based on 50 years of historical MFR from 1970 through 2019 and a 25-year drought cycle from 1995-2019.

Six forecast scenarios were developed and simulated. The first three scenarios assume a continuation of long-term historical hydrology and build on one another. The second three scenarios assume drier climate change conditions and also build on one another.

1) Baseline Forecast – Existing SWP supplies with population growth.
2) Near-Term Projects – Baseline Forecast with RWRF recharge in MCSB.
3) Future Projects – Near-Term Forecast with additional SWP supplies.
4) Baseline Forecast with Climate Change – Scenario 1 with drought MFR.
5) Near-Term Projects with Climate Change - Scenario 2 with drought MFR.
6) Future Projects with Climate Change – Scenario 3 with drought MFR.

The forecasts were evaluated using simulated hydrographs for nine Key Wells in the MCSB and water balances. Under the Baseline scenario, groundwater levels in all of the nine Key Wells fall below their respective Measurable Objective through the planning horizon of 2045. Groundwater levels in five wells (36K01, 11L04, 12C01, 15R01, and 17J01) fall below the Minimum Threshold. Under the Baseline with Climate Change scenario, all wells fall below their respective Measurable Objectives, and six of the Key Wells fall below their Minimum Thresholds during the planning horizon. The long-term cumulative water balance is negative (**Figure B32**). Consequently, the assumptions used for the Baseline scenario result in unsustainable conditions when combined with assumed climate change. The Baseline scenarios are only shown for comparison purposes and are not a scenario that is planned for implementation.

Under the Near-Term Projects scenario, all wells remain above the Measurable Objective within the planning horizon and the long-term cumulative water balance in MCSB remains positive. Under the Near-Term Projects with Climate Change scenario, all but three Key Wells stay above their respective Measurable Objectives, and all Key Wells stay above their Minimum Thresholds. The long-term cumulative water balance is slightly positive (**Figure B32**). The Near-Term Project scenario conditions are sustainable, even under climate change conditions.

Under the Future Projects scenario, all wells remain above the Measurable Objective within the planning horizon and the long-term cumulative water balance in MCSB remains positive. Under the Future Projects with Climate Change scenario, all but three Key Wells stay above their respective Measurable Objectives within the planning horizon and the long-term cumulative water balance is positive (**Figure B32**). The maximum water level decline below a Measurable Objective is 3.1 feet. All wells stay above their Minimum Thresholds. The Future Projects scenario conditions are sustainable and show increases in groundwater in storage even under assumed climate change conditions.

B.6 Summary of Forecast Reliability and Uncertainty

As with any model, there are inherent uncertainties in the model results due to uncertainties in model inputs. All the forecast scenarios are based on an assumed future population growth and assumed future hydrology conditions constructed from the historical records along with assumptions and projections. Use of the historical record may put a reasonable bracket around the likely future hydrologic conditions; but does constrain the variability that may occur within the historical record. For example, new record highs and new record low precipitation events or periods are reasonable given the historical variability. Additional uncertainty is posed by the unknown effects of future climate change on regional and local hydrology. Hence, the forecasts of future MFR and SWP deliveries may be optimistic or pessimistic. Likewise, the assumed future population growth may be less or greater than assumed. Overall, the model reflects our understanding of current and reasonably likely potential future conditions for the MCSB but the uncertainties inherent in the model and its results should be considered in using the model as a management tool and should be reviewed and refined as more information becomes available for future updates.

B.7 References

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Tables

Table B1
Calibration Model Stress Periods 1936 - 2019

Misson Creek Subbasin Groundwater Model Update
Riverside County, California

Stress Period	Date	Stress Period	Date	Stress Period	Date
1	1936-1940	35	1980	69	1st Q 1996
2	1941-1945	36	1981	70	2nd Q 1996
3	1948-1948	37	1982	71	3rd Q 1996
4	1949	38	1983	72	4th Q 1996
5	1950	39	1984	73	1st Q 1997
6	1951	40	1985	74	2nd Q 1997
7	1952	41	1986	75	3rd Q 1997
8	1953	42	1987	76	4th Q 1997
9	1954	43	1988	77	1st Q 1998
10	1955	44	1989	78	2nd Q 1998
11	1956	45	1st Q 1990	79	3rd Q 1998
12	1957	46	2nd Q 1990	80	4th Q 1998
13	1958	47	3rd Q 1990	81	1st Q 1999
14	1959	48	4th Q 1990	82	2nd Q 1999
15	1960	49	1st Q 1991	83	3rd Q 1999
16	1961	50	2nd Q 1991	84	4th Q 1999
17	1962	51	3rd Q 1991	85	1st Q 2000
18	1963	52	4th Q 1991	86	2nd Q 2000
19	1964	53	1st Q 1992	87	3rd Q 2000
20	1965	54	2nd Q 1992	88	4th Q 2000
21	1966	55	3rd Q 1992	89	1st Q 2001
22	1967	56	4th Q 1992	90	2nd Q 2001
23	1968	57	1st Q 1993	91	3rd Q 2001
24	1969	58	2nd Q 1993	92	4th Q 2001
25	1970	59	3rd Q 1993	93	1st Q 2002
26	1971	60	4th Q 1993	94	2nd Q 2002
27	1972	61	1st Q 1994	95	3rd Q 2002
28	1973	62	2nd Q 1994	96	4th Q 2002
29	1974	63	3rd Q 1994	97	1st Q 2003
30	1975	64	4th Q 1994	98	2nd Q 2003
31	1976	65	1st Q 1995	99	3rd Q 2003
32	1977	66	2nd Q 1995	100	4th Q 2003
33	1978	67	3rd Q 1995	101	1st Q 2004
34	1979	68	4th Q 1995	102	2nd Q 2004

Table B1
Calibration Model Stress Periods 1936 - 2019

Stress Period	Date	Stress Period	Date	Stress Period	Date
103	3rd Q 2004	137	1st Q 2013		
104	4th Q 2004	138	2nd Q 2013		
105	1st Q 2005	139	3rd Q 2013		
106	2nd Q 2005	140	4th Q 2013		
107	3rd Q 2005	141	1st Q 2014		
108	4th Q 2005	142	2nd Q 2014		
109	1st Q 2006	143	3rd Q 2014		
110	2nd Q 2006	144	4th Q 2014		
111	3rd Q 2006	145	1st Q 2015		
112	4th Q 2006	146	2nd Q 2015		
113	1st Q 2007	147	3rd Q 2015		
114	2nd Q 2007	148	4th Q 2015		
115	3rd Q 2007	149	1st Q 2016		
116	4th Q 2007	150	2nd Q 2016		
117	1st Q 2008	151	3rd Q 2016		
118	2nd Q 2008	152	4th Q 2016		
119	3rd Q 2008	153	1st Q 2017		
120	4th Q 2008	154	2nd Q 2017		
121	1st Q 2009	155	3rd Q 2017		
122	2nd Q 2009	156	4th Q 2017		
123	3rd Q 2009	157	1st Q 2018		
124	4th Q 2009	158	2nd Q 2018		
125	1st Q 2010	159	3rd Q 2018		
126	2nd Q 2010	160	4th Q 2018		
127	3rd Q 2010	161	1st Q 2019		
128	4th Q 2010	162	2nd Q 2019		
129	1st Q 2011	163	3rd Q 2019		
130	2nd Q 2011	164	4th Q 2019		
131	3rd Q 2011				
132	4th Q 2011				
133	1st Q 2012				
134	2nd Q 2012				
135	3rd Q 2012				
136	4th Q 2012				

Notes
1. AF = acre-feet.
2. BCM = USGS Basin Characterization Model, discussed in Section 4.5.5 of the Text

Table B2

Forecast Model Stress Periods 2020 - 2070

Misson Creek Subbasin Groundwater Model Update
Riverside County, California

Stress Period	Date	Stress Period	Date
1	2020	35	2054
2	2021	36	2055
3	2022	37	2056
4	2023	38	2057
5	2024	39	2058
6	2025	40	2059
7	2026	41	2060
8	2027	42	2061
9	2028	43	2062
10	2029	44	2063
11	2030	45	2064
12	2031	46	2065
13	2032	47	2066
14	2033	48	2067
15	2034	49	2068
16	2035	50	2069
17	2036		
18	2037		
19	2038		
20	2039		
21	2040		
22	2041		
23	2042		
24	2043		
25	2044		
26	2045		
27	2046		
28	2047		
29	2048		
30	2049		
31	2050		
32	2051		
33	2052		
34	2053		

Table B3
Annual Mountain Front Recharge by Watershed from BCM 2020 - 2069[1]

Misson Creek Subbasin Groundwater Model Update
Riverside County, California

SP	Forecast Year	Analog Year	Whitewater River[2] (AFY)	MCSB Total[3] (AFY)	Reach 51 MissionCreekGage (AFY)	Reach 52 ChinoCanyon (AFY)	Reach 53 GarnetWash (AFY)	Reach 54 BigMorongoCreek (AFY)	DHSSB Total[4] (AFY)	Reach 55 LittleMorongoCreek (AFY)	Reach 56 MorongoWash (AFY)	Reach 57 LongCanyon (AFY)	Reach 58 EastWideCanyon (AFY)	Reach 59 1kPalmCanyon (AFY)	Reach 60 FanCanyon (AFY)	Reach 61 PushawallaCanyon (AFY)	Reach 62 BerdooCanyon (AFY)	Total (AFY)	Cumulative (AFY)
1	Jan-20	1970	23,114.46	199.34	3.27	3.27	189.54	3.27	20.43	0.82	3.27	3.27	3.27	2.45	2.45	2.45	2.45	23,334.23	23,334.23
2	Jan-21	1971	14,874.00	917.53	3.27	49.77	120.41	744.08	2,098.23	311.71	271.49	464.21	3.27	274.00	437.40	333.70	2.45	17,889.76	41,223.99
3	Jan-22	1972	9,777.74	13.10	3.27	3.28	3.28	3.28	20.48	0.82	3.28	3.28	3.28	2.46	2.45	2.46	2.46	9,811.32	51,035.31
4	Jan-23	1973	11,730.95	5,087.63	5,077.82	3.27	3.27	3.27	20.43	0.82	3.27	3.27	3.27	2.45	2.45	2.45	2.45	16,839.00	67,874.31
5	Jan-24	1974	8,506.39	3,378.26	2,282.51	53.29	124.93	917.53	2,445.82	344.39	278.19	452.48	3.27	311.71	369.52	350.67	335.59	14,330.47	82,204.79
6	Jan-25	1975	4,705.79	13.07	3.27	3.27	3.27	3.27	20.43	0.82	3.27	3.27	3.27	2.45	2.45	2.45	2.45	4,739.28	86,944.07
7	Jan-26	1976	3,366.78	4,807.66	1,658.60	136.87	340.29	2,671.90	9,980.77	1,191.01	1,055.32	1,663.64	1,216.64	1,126.74	1,411.57	1,253.40	1,062.46	18,155.21	105,099.28
8	Jan-27	1977	4,146.89	1,830.53	904.96	40.47	188.78	696.32	1,580.94	280.29	234.62	3.27	3.27	296.63	417.29	343.13	2.45	7,558.36	112,657.63
9	Jan-28	1978	51,034.15	42,472.73	28,204.55	487.67	1,186.50	12,594.01	35,044.11	4,424.24	3,066.80	6,033.06	5,463.27	3,443.87	4,826.45	3,996.90	3,789.51	128,550.98	241,208.61
10	Jan-29	1979	24,599.79	21,546.81	16,339.53	84.21	397.18	4,725.90	8,625.39	2,966.25	616.71	1,223.37	925.07	629.70	844.63	742.82	676.83	54,772.00	295,980.61
11	Jan-30	1980	42,111.58	53,526.24	36,801.65	383.14	738.55	15,602.89	31,951.48	5,545.45	2,671.90	5,125.34	4,738.84	2,898.76	4,335.54	3,459.61	3,176.03	127,589.30	423,569.91
12	Jan-31	1981	18,269.27	1,558.29	1,548.48	3.27	3.27	3.27	20.43	0.82	3.27	3.27	3.27	2.45	2.45	2.45	2.45	19,847.99	443,417.90
13	Jan-32	1982	22,611.17	5,188.18	5,178.37	3.27	3.27	3.27	20.43	0.82	3.27	3.27	3.27	2.45	2.45	2.45	2.45	27,819.78	471,237.68
14	Jan-33	1983	45,539.53	35,903.23	31,723.83	3.27	3.27	4,172.87	1,765.51	911.24	3.27	3.27	837.92	2.45	2.45	2.45	2.45	83,208.27	554,445.94
15	Jan-34	1984	18,834.03	13.10	3.27	3.28	3.28	3.28	20.48	0.82	3.28	3.28	3.28	2.46	2.45	2.46	2.46	18,867.61	573,313.55
16	Jan-35	1985	11,052.23	1,689.00	1,679.20	3.27	3.27	3.27	20.43	0.82	3.27	3.27	3.27	2.45	2.45	2.45	2.45	12,761.66	586,075.21
17	Jan-36	1986	13,366.23	4,896.58	4,886.78	3.27	3.27	3.27	20.43	0.82	3.27	3.27	3.27	2.45	2.45	2.45	2.45	18,283.23	604,358.45
18	Jan-37	1987	6,307.90	13.07	3.27	3.27	3.27	3.27	20.43	0.82	3.27	3.27	3.27	2.45	2.45	2.45	2.45	6,341.40	610,699.84
19	Jan-38	1988	2,857.32	1,431.48	1,421.65	3.28	3.28	3.28	20.48	0.82	3.28	3.28	3.28	2.46	2.45	2.46	2.46	4,309.29	615,009.13
20	Jan-39	1989	1,507.43	13.07	3.27	3.27	3.27	3.27	20.43	0.82	3.27	3.27	3.27	2.45	2.45	2.45	2.45	1,540.93	616,550.06
21	Jan-40	1990	1,187.23	13.07	3.27	3.27	3.27	3.27	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	1,220.74	617,770.79
22	Jan-41	1991	8,466.39	5,922.67	5,362.65	3.27	3.27	553.48	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	14,409.50	632,180.29
23	Jan-42	1992	10,182.46	6,303.71	6,293.92	3.26	3.26	3.26	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	16,506.60	648,686.89
24	Jan-43	1993	30,016.98	18,951.08	12,061.56	127.85	269.41	6,492.26	36,406.02	1,823.16	3,181.47	8,880.11	8,364.65	3,284.56	4,440.76	3,250.56	3,180.76	85,374.08	734,060.97
25	Jan-44	1994	16,630.48	4,711.16	4,701.36	3.27	3.27	3.27	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	21,362.08	755,423.05
26	Jan-45	1995	16,768.55	29,866.62	24,844.61	3.27	94.80	4,923.94	2,650.21	939.66	237.16	849.57	614.02	2.45	2.45	2.45	2.45	49,285.38	804,708.43
27	Jan-46	1996	14,749.15	4,934.93	4,925.13	3.26	3.26	3.26	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	19,704.51	824,412.94
28	Jan-47	1997	10,075.21	3,433.74	3,423.94	3.27	3.27	3.27	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	13,529.38	837,942.32
29	Jan-48	1998	17,137.98	21,509.33	17,891.44	66.91	133.23	3,417.74	3,737.82	326.03	3.27	1,184.28	1,457.00	370.64	391.71	2.45	2.45	42,385.12	880,327.44
30	Jan-49	1999	5,578.06	13.07	3.27	3.27	3.27	3.27	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	5,611.57	885,939.01
31	Jan-50	2000	3,789.93	768.07	758.28	3.26	3.26	3.26	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	4,578.43	890,517.44
32	Jan-51	2001	5,137.32	730.48	720.67	3.27	3.27	3.27	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	5,888.23	896,405.67
33	Jan-52	2002	619.24	13.07	3.27	3.27	3.27	3.27	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	652.75	897,058.42
34	Jan-53	2003	1,209.13	1,153.99	1,144.19	3.27	3.27	3.27	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	2,383.55	899,441.97
35	Jan-54	2004	7,479.32	2,614.03	2,604.24	3.26	3.26	3.26	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	10,113.78	909,555.74
36	Jan-55	2005	15,571.15	31,753.20	25,381.39	185.92	344.60	5,841.29	9,741.24	1,203.09	676.00	3,039.65	3,324.77	556.59	658.86	2.45	279.83	57,065.60	966,621.34
37	Jan-56	2006	4,743.88	1,779.61	1,769.81	3.27	3.27	3.27	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	6,543.93	973,165.27
38	Jan-57	2007	4,173.70	13.07	3.27	3.27	3.27	3.27	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	4,207.21	977,372.48
39	Jan-58	2008	5,506.00	2,340.33	2,330.53	3.26	3.26	3.26	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	7,866.76	985,239.23
40	Jan-59	2009	1,887.84	13.07	3.27	3.27	3.27	3.27	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	1,921.35	987,160.58
41	Jan-60	2010	7,383.86	9,561.17	6,925.61	120.94	250.19	2,264.43	4,602.60	767.28	576.92	919.08	593.82	432.69	518.86	420.02	373.92	21,547.63	1,008,708.21
42	Jan-61	2011	5,174.19	5,047.66	5,037.86	3.27	3.27	3.27	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	10,242.28	1,018,950.50
43	Jan-62	2012	2,754.26	13.06	3.27	3.26	3.26	3.26	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	2,787.75	1,021,738.25
44	Jan-63	2013	2,011.86	13.07	3.27	3.27	3.27	3.27	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	2,045.36	1,023,783.61

Table B3

Annual Mountain Front Recharge by Watershed from BCM 2020 - 2069[1]

Misson Creek Subbasin Groundwater Model Update
Riverside County, California

SP	Forecast Year	Analog Year	Whitewater River[2] (AFY)	MCSB Total[3] (AFY)	Reach 51 MissionCreekGage (AFY)	Reach 52 ChinoCanyon (AFY)	Reach 53 GarnetWash (AFY)	Reach 54 BigMorongoCreek (AFY)	DHSSB Total[4] (AFY)	Reach 55 LittleMorongoCreek (AFY)	Reach 56 MorongoWash (AFY)	Reach 57 LongCanyon (AFY)	Reach 58 EastWideCanyon (AFY)	Reach 59 1kPalmCanyon (AFY)	Reach 60 FanCanyon (AFY)	Reach 61 PushawallaCanyon (AFY)	Reach 62 BerdooCanyon (AFY)	Total (AFY)	Cumulative (AFY)
45	Jan-64	2014	1,655.23	13.07	3.27	3.27	3.27	3.27	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	1,688.74	1,025,472.35
46	Jan-65	2015	703.86	13.07	3.27	3.27	3.27	3.27	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	737.36	1,026,209.71
47	Jan-66	2016	1,442.07	13.06	3.27	3.26	3.26	3.26	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	1,475.56	1,027,685.27
48	Jan-67	2017	3,020.72	7,530.03	6,733.86	3.27	3.27	789.64	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	10,571.18	1,038,256.45
49	Jan-68	2018	2,577.80	13.07	3.27	3.27	3.27	3.27	20.43	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	2,611.30	1,040,867.76
50	Jan-69	2019	9,110.76	19,525.95	19,518.87	2.45	2.45	2.18	15.33	0.61	2.45	2.46	2.45	1.84	1.84	1.84	1.84	28,652.03	1,069,519.79
Average 1936-2019			7,586.52	7,081.22	5,554.29	42.48	98.36	1,386.09	2,514.55	766.10	376.04	933.40	864.26	362.01	482.79	348.53	334.83	19,145.70	762,391.27
Average 1978-2019			11,305.60	8,257.94	6,672.85	37.39	83.92	1,463.78	3,218.90	450.79	265.25	651.55	629.20	278.62	383.38	284.76	275.35	22,782.43	793,834.50
Average 2020-2069			11,101.16	7,261.61	5,803.93	37.27	89.97	1,330.43	3,027.62	421.28	259.86	599.23	553.32	274.42	374.95	285.01	259.55	21,390.40	678,228.45

Notes

1. BCM = Basin Characterization Model, AFY = acre-feet per year, MCSB = Mission Creek Subbasin, and DHSSB = Desert Hot Springs Subbasin.
2. Whitewater River recharge extracted from Indio Subbasin Baseline Forecast model
3. MCSB Total = Sum of Reaches 51 through 54 in Mission Creek Subbasin.
4. DHSSB Total = Sum of Reached 55 through 62 in Desert Hot Springs Subbasin.

Table B4a

Estimated State Water Project Annual Deliveries for Artificial Recharge 2020 - 2069 - Baseline Scenarios

Misson Creek Subbasin Groundwater Model Update
Riverside County, California

SWP Supplies to WWR-GRF and MC-GRF - BASELINE

SWP Supplies (AFY)	2020 - 2024	2025 - 2029	2030 - 2034	2035	2036 - 2039	2040 - 2044	2045 - 2069
Table A Amount (AFY)	194,100	194,100	194,100	194,100	194,100	194,100	194,100
Assumed SWP Reliability	45%	45%	45%	45%	45%	45%	45%
Average Table A Deliveries w/Assumed SWP Reliability	87,345	87,345	87,345	87,345	87,345	87,345	87,345
Assumed Advanced Delivery Credit WWR-GRF	0	11,199	11,199	11,199	0	0	0
Assumed Advanced Delivery Credit MC-GRF	0	909	909	909	0	0	0
Average Table A Deliveries	**87,345**	**87,345**	**87,345**	**87,345**	**87,345**	**87,345**	**87,345**
Yuba Accord (AFY)	651	651	651	651	651	651	651
~~Lake Perris Seepage (AFY)~~	0	0	0	0	0	0	0
~~Sites Reservoir (AFY)~~	0	0	0	0	0	0	0
~~Delta Conveyance Facility (Add'l Table A/Article 21)~~	0	0	0	0	0	0	0
Sum of SWP Supplies	**87,996**	**87,996**	**87,996**	**87,996**	**87,996**	**87,996**	**87,996**
Estimated Production (AFY)							
% West WWR Management Area	92%	92%	91%	91%	91%	91%	90%
% Mission Creek Management Area	8%	8%	9%	9%	9%	9%	10%
Estimated Replenishment (AFY)							
Table A Only							
WWR-GRF Replenishment (AFY)	80,255	79,950	79,679	79,427	79,427	79,134	78,843
MC-GRF Replenishment (AFY)	7,090	7,395	7,666	7,918	7,918	8,211	8,502
Yuba Accord							
WWR-GRF Replenishment (AFY)	598	596	594	592	592	590	588
MC-GRF Replenishment (AFY)	53	55	57	59	59	61	63
TOTALS							
WWR-GRF Replenishment	80,853	80,546	80,273	80,019	80,019	79,724	79,431
MC-GRF Replenishment	7,143	7,450	7,723	7,977	7,977	8,272	8,565

BASELINE FOR APPENDIX B - Includes assumed Advanced Delivery Credit

TOTALS							
Table A Minus Adv Credit to							
WWR-GRF Replenishment	80,853	69,347	69,074	68,821	80,019	79,724	79,431
MC-GRF Replenishment	7,143	6,541	6,814	7,068	7,977	8,272	8,565

SWP Supplies to WWR-GRF and MC-GRF - Baseline with Climate Change (w/CC)

Assumes only Table A and Yuba

SWP Supplies (AFY)	2020 - 2024	2025 - 2029	2030 - 2034	2035	2036 - 2039	2040 - 2044	2045 - 2069
Average Table A Deliveries	87,345	87,345	87,345	87,345	87,345	87,345	87,345
Assumed Advanced Delivery Credit WWR-GRF	0	11,199	11,199	11,199	0	0	0
Assumed Advanced Delivery Credit MC-GRF	0	909	909	909	0	0	0
Climate Change Factor	100.0%	99.7%	99.4%	99.1%	99.1%	98.8%	98.5%
Average Table A + CC	**87,345**	**87,083**	**86,821**	**86,559**	**86,559**	**86,297**	**86,035**
Table A w/CC							
WWR-GRF Replenishment (AFY)	80,255	79,710	79,201	78,713	78,713	78,185	77,661
MC-GRF Replenishment (AFY)	7,090	7,373	7,620	7,846	7,846	8,112	8,374
TOTALS w/CC							
WWR-GRF Replenishment	80,853	80,306	79,795	79,305	79,305	78,775	78,248
MC-GRF Replenishment	7,143	7,428	7,677	7,905	7,905	8,173	8,437

BASELINE FOR APPENDIX B - Includes assumed Advanced Delivery Credit

TOTALS							
Table A Minus Adv Credit to							
WWR-GRF Replenishment	80,853	69,107	68,596	68,106	79,305	78,775	78,248
MC-GRF Replenishment	7,143	6,519	6,768	6,996	7,905	8,173	8,437

Abbreviations:
AFY = Acre feet per year.
wCC = with climate change.
MC-GRF = Mission Creek Groundwater Replenishment Facility
SWP = State Water Project.
WWR-GRF = Whitewater River Groundwater Replenishment Facility.

Table B4b
Estimated State Water Project Annual Deliveries for Artificial Recharge 2020 - 2069 - Near-Term Project Scenarios

Misson Creek Subbasin Groundwater Model Update
Riverside County, California

SWP Supplies to WWR-GRF and MC-GRF - Near-term Projects

SWP Supplies (AFY)	2020 - 2024	2025 - 2029	2030 - 2034	2035	2036 - 2039	2040 - 2044	2045 - 2069
Table A Amount (AFY)	194,100	194,100	194,100	194,100	194,100	194,100	194,100
Assumed SWP Reliability	45%	45%	45%	45%	45%	45%	45%
Average Table A Deliveries w/Assumed SWP Reliability	87,345	87,345	87,345	87,345	87,345	87,345	87,345
Assumed Advanced Delivery Credit WWR-GRF	0	11,199	11,199	11,199	0	0	0
Assumed Advanced Delivery Credit MC-GRF	0	909	909	909	0	0	0
Average Table A Deliveries	**87,345**	**87,345**	**87,345**	**87,345**	**87,345**	**87,345**	**87,345**
Yuba Accord (AFY)	651	651	651	651	651	651	651
Lake Perris Seepage (AFY)	0	2,752	2,752	2,752	2,752	2,752	2,752
Table A Only							
WWR-GRF Replenishment (AFY)	80,255	79,950	79,679	79,427	79,427	79,134	78,843
MC-GRF Replenishment (AFY)	7,090	7,395	7,666	7,918	7,918	8,211	8,502
Yuba Accord							
WWR-GRF Replenishment (AFY)	598	596	594	592	592	590	588
MC-GRF Replenishment (AFY)	53	55	57	59	59	61	63
Perris							
WWR-GRF Replenishment	0	2,519	2,510	2,503	2,493	2,493	2,484
MC-GRF Replenishment	0	233	242	249	259	259	268
TOTALS							
WWR-GRF Replenishment	80,853	83,065	82,783	82,522	82,513	82,217	81,915
MC-GRF Replenishment	7,143	7,683	7,965	8,226	8,235	8,531	8,833

NEAR-TERM FOR APPENDIX B - Includes assumed Advanced Delivery Credit

TOTALS							
WWR-GRF Replenishment	80,853	71,866	71,585	71,323	82,513	82,217	81,915
MC-GRF Replenishment	7,143	6,774	7,056	7,317	8,235	8,531	8,833

SWP Supplies to WWR-GRF and MC-GRF - Near-term Projects with Climate Change (w/CC)

5-YEAR PLAN w/CC

SWP Supplies (AFY)	2020 - 2024	2025 - 2029	2030 - 2034	2035	2036 - 2039	2040 - 2044	2045 - 2069
Table A w/CC							
Advanced Delivery Credit (22,122 AFY 2020-2035)	0	909	909	909	0	0	0
WWR-GRF Replenishment (AFY)	80,255	79,710	79,201	78,713	78,713	78,185	77,661
MC-GRF Replenishment (AFY)	7,090	7,373	7,620	7,846	7,846	8,112	8,374
Yuba Accord							
WWR-GRF Replenishment (AFY)	598	596	594	592	592	590	588
MC-GRF Replenishment (AFY)	53	55	57	59	59	61	63
Perris							
WWR-GRF Replenishment	0	2,519	2,510	2,503	2,493	2,493	2,484
MC-GRF Replenishment	0	233	242	249	259	259	268
TOTALS							
WWR-GRF Replenishment	80,853	82,825	82,305	81,807	81,798	81,268	80,733
MC-GRF Replenishment	7,143	7,661	7,919	8,155	8,164	8,432	8,705

NEAR-TERM FOR APPENDIX B - Includes assumed Advanced Delivery Credit

TOTALS							
WWR-GRF Replenishment	80,853	71,626	71,107	70,609	81,798	81,268	80,733
MC-GRF Replenishment	7,143	6,752	7,010	7,246	8,164	8,432	8,705

Abbreviations:
AFY = Acre feet per year.
wCC = with climate change.
MC-GRF = Mission Creek Groundwater Replenishment Facility.
SWP = State Water Project.
WWR-GRF = Whitewater River Groundwater Replenishment Facility.

Table B4c

Estimated State Water Project Annual Deliveries for Artificial Recharge 2020 - 2069 - Future Projects Scenarios

Misson Creek Subbasin Groundwater Model Update
Riverside County, California

SWP Supplies to WWR-GRF and MC-GRF - Future Projects

SWP Component	2020 - 2024	2025 - 2029	2030 - 2034	2035	2036 - 2039	2040 - 2044	2045 - 2069
Table A Amount	194,100	194,100	194,100	194,100	194,100	194,100	194,100
Assumed SWP Reliability	45%	45%	45%	45%	45%	45%	45%
Average Table A Deliveries w/Assumed SWP Reliability	87,345	87,345	87,345	87,345	87,345	87,345	87,345
Assumed Advanced Delivery Credit WWR-GRF	0	11,199	11,199	11,199	0	0	0
Assumed Advanced Delivery Credit MC-GRF	0	909	909	909	0	0	0
Average Table A Deliveries After Credit	**87,345**	**87,345**	**87,345**	**87,345**	**87,345**	**87,345**	**87,345**
Yuba Accord	651	651	651	651	651	651	651
Lake Perris Seepage	0	2,752	2,752	2,752	2,752	2,752	2,752
Sites Reservoir (30% conveyance losses)	0	0	0	11,550	11,550	11,550	11,550
Delta Conveyance Facility (Add'l SWP Table A/Article 21)	0	0	0	0	0	0	26,500
Sum of SWP Supplies	**87,996**	**90,748**	**90,748**	**102,298**	**102,298**	**102,298**	**128,798**
Estimated Production (AFY)							
West WWR Management Area Production (AFY)	150,336	155,338	160,640	165,955	165,955	170,754	175,202
% West WWR Management Area	92%	92%	91%	91%	91%	91%	90%
Mission Creek Management Area Production (AFY)	13,281	14,369	15,455	16,543	16,543	17,717	18,892
% Mission Creek Management Area	8%	8%	9%	9%	9%	9%	10%
Sum of West WWR and Mission Creek MAs (AFY)	163,617	169,707	176,095	182,498	182,498	188,471	194,093
Estimated Replenishment (AFY)							
Estimated Replenishment (AFY)							
Table A w/CC							
WWR-GRF Replenishment (AFY)	80,255	79,710	79,201	78,713	78,713	78,185	77,661
MC-GRF Replenishment (AFY)	7,090	7,373	7,620	7,846	7,846	8,112	8,374
DCF w/CC					0		
WWR-GRF Replenishment (AFY)	0	0	0	0	0	0	23,562
MC-GRF Replenishment (AFY)	0	0	0	0	0	0	2,541
TOTALS					0		
WWR-GRF Replenishment	80,853	82,825	82,305	92,310	92,310	91,732	114,720
MC-GRF Replenishment	7,143	7,661	7,919	9,202	9,202	9,518	12,370

FUTURE PROJECTS FOR APPENDIX B - Includes assumed Advanced Delivery Credit

TOTALS							
WWR-GRF Replenishment	80,853	71,866	71,585	81,826	93,025	92,682	116,262
MC-GRF Replenishment	7,143	6,774	7,056	8,364	9,273	9,616	12,536

SWP Supplies to WWR-GRF and MC-GRF - Future Projects with Climate Change (w/CC)

SWP Component	2020 - 2024	2025 - 2029	2030 - 2034	2035	2036 - 2039	2040 - 2044	2045 - 2069
Estimated Replenishment (AFY)	87,345	87,345	87,345	87,345	87,345	87,345	87,345
Advanced Delivery Credit (22,122 AFY 2020-2035)	0	909	909	909	0	0	0
Climate Change Factor	100.0%	99.7%	99.4%	99.1%	99.1%	98.8%	98.5%
Average Table A After Credit + CC	**87,345**	**87,083**	**86,821**	**86,559**	**86,559**	**86,297**	**86,035**
Yuba Accord	651	651	651	651	651	651	651
Lake Perris Seepage	0	2,752	2,752	2,752	2,752	2,752	2,752
Sites Reservoir	0	0	0	11,550	11,550	11,550	11,550
Delta Conveyance Facility (Add'l SWP Table A/Article 21)	0	0	0	0	0	0	26,103
Sum of SWP Supplies	**87,996**	**90,486**	**90,224**	**101,512**	**101,512**	**101,250**	**127,090**
Estimated Replenishment (AFY)					0		
Table A w/CC					0		
WWR-GRF Replenishment (AFY)	80,255	79,710	79,201	78,713	78,713	78,185	77,661
MC-GRF Replenishment (AFY)	7,090	7,373	7,620	7,846	7,846	8,112	8,374
DCF w/CC					0		
WWR-GRF Replenishment (AFY)	0	0	0	0	0	0	23,562
MC-GRF Replenishment (AFY)	0	0	0	0	0	0	2,541
TOTALS					0		
WWR-GRF Replenishment	80,853	82,825	82,305	92,310	92,310	91,732	114,720
MC-GRF Replenishment	7,143	7,661	7,919	9,202	9,202	9,518	12,370

FUTURE PROJECTS FOR APPENDIX B - Includes assumed Advanced Delivery Credit

TOTALS							
WWR-GRF Replenishment	80,853	71,626	71,107	81,112	92,310	91,732	114,720
MC-GRF Replenishment	7,143	6,752	7,010	8,293	9,202	9,518	12,370

Abbreviations:
AFY = Acre feet per year.
wCC = with climate change.
MC-GRF = Mission Creek Groundwater Replenishment Facility.
SWP = State Water Project.
WWR-GRF = Whitewater River Groundwater Replenishment Facility.

Table B5

Estimated State Water Project Annual Deliveries for Artificial Recharge 2020 - 2069

Misson Creek Subbasin Groundwater Model Update

Riverside County, California

Forecast Year	Analog Year	Historical Average SWP Reliability	Annual SWP Factor[1]	Baseline Deliveries (AFY)	Baseline 5-Yr Avg (AFY)	Near-Term Projects Deliveries (AFY)	Near-Term Projects 5-Yr Avg (AFY)	Future Projects Deliveries (AFY)	Future Projects 5-Yr Avg (AFY)	SWP Baseline w/ Climate Change Deliveries (AFY)	Baseline w/ Climate Change 5-Yr Avg (AFY)	Near-Term Projects w/ Climate Change Deliveries (AFY)	Near-Term Projects w/ Climate Change 5-Yr Avg (AFY)	Future Projects w/ Climate Change Deliveries (AFY)	Future Projects w/ Climate Change 5-Yr Avg (AFY)
2020	1970	80%	118%	1,768		1,768		1,768		1,768		1,768		1,768	
2021	1971	51%	76%	476		476		476		476		476		476	
2022	1972	64%	95%	4,067	--	4,067	--	4,067	--	4,067	--	4,067	--	4,067	--
2023	1973	64%	95%	4,082	--	4,082	--	4,082	--	4,082	--	4,082	--	4,082	--
2024	1974	79%	117%	5,655	3,209	5,655	3,209	5,655	3,209	5,655	3,209	5,655	3,209	5,655	3,209
2025	1975	84%	141%	9,196	--	9,524	--	9,524	--	9,165	--	9,492	--	9,492	--
2026	1976	61%	102%	6,695	--	6,933	--	6,933	--	6,672	--	6,910	--	6,910	--
2027	1977	5%	9%	579	--	600	--	600	--	577	--	598	--	598	--
2028	1978	68%	113%	7,417	--	7,681	--	7,681	--	7,392	--	7,656	--	7,656	--
2029	1979	81%	135%	8,820	6,541	9,134	6,774	9,134	6,774	8,790	6,519	9,104	6,752	9,104	6,752
2030	1980	71%	88%	6,015	--	6,228	--	6,228	--	5,974	--	6,188	--	6,188	--
2031	1981	74%	91%	6,191	--	6,411	--	6,411	--	6,149	--	6,369	--	6,369	--
2032	1982	83%	102%	6,977	--	7,224	--	7,224	--	6,930	--	7,177	--	7,177	--
2033	1983	100%	124%	8,418	--	8,717	--	8,717	--	8,362	--	8,660	--	8,660	--
2034	1984	77%	95%	6,469	6,814	6,699	7,056	6,699	7,056	6,426	6,768	6,655	7,010	6,655	7,010
2035	1985	73%	146%	10,303	7,068	10,667	7,317	12,193	8,364	10,199	6,996	10,563	7,246	12,089	8,293
2036	1986	67%	135%	10,743	--	11,092	--	12,489	--	10,647	--	10,996	--	12,393	--
2037	1987	41%	83%	6,589	--	6,803	--	7,660	--	6,530	--	6,744	--	7,601	--
2038	1988	11%	21%	1,710	--	1,766	--	1,988	--	1,695	--	1,750	--	1,973	--
2039	1989	58%	115%	9,212	7,977	9,511	8,235	10,710	9,273	9,130	7,905	9,429	8,164	10,627	9,202
2040	1990	14%	45%	3,732		3,848	--	4,338	--	3,687	--	3,804	--	4,294	--
2041	1991	26%	85%	6,997	--	7,216	--	8,134	--	6,914	--	7,132	--	8,051	--
2042	1992	17%	55%	4,548	--	4,690	--	5,287	--	4,494	--	4,636	--	5,233	--
2043	1993	64%	211%	17,413	--	17,958	--	20,244	--	17,206	--	17,751	--	20,036	--
2044	1994	32%	105%	8,669	8,272	8,941	8,531	10,078	9,616	8,566	8,173	8,837	8,432	9,975	9,518
2045	1995	83%	104%	8,882	--	9,160	--	13,001	--	8,750	--	9,028	--	12,828	--
2046	1996	72%	91%	7,763	--	8,006	--	11,362	--	7,647	--	7,890	--	11,212	--
2047	1997	73%	92%	7,853	--	8,099	--	11,494	--	7,736	--	7,982	--	11,342	--
2048	1998	86%	107%	9,188	--	9,475	--	13,448	--	9,051	--	9,339	--	13,270	--
2049	1999	85%	107%	9,138	8,565	9,424	8,833	13,375	12,536	9,002	8,437	9,288	8,705	13,198	12,370
2050	2000	72%	122%	10,407	--	10,733	--	15,233	--	10,252	--	10,578	--	15,031	--
2051	2001	37%	62%	5,295	--	5,461	--	7,750	--	5,216	--	5,382	--	7,648	--
2052	2002	42%	70%	6,019	--	6,208	--	8,810	--	5,930	--	6,118	--	8,693	--
2053	2003	81%	136%	11,689	--	12,054	--	17,109	--	11,515	--	11,880	--	16,882	--
2054	2004	65%	110%	9,414	8,565	9,708	8,833	13,779	12,536	9,274	8,437	9,568	8,705	13,596	12,370
2055	2005	90%	138%	11,859	--	12,230	--	17,358	--	11,682	--	12,053	--	17,128	--
2056	2006	100%	154%	13,177	--	13,589	--	19,287	--	12,981	--	13,393	--	19,031	--
2057	2007	60%	92%	7,906	--	8,153	--	11,572	--	7,788	--	8,036	--	11,418	--
2058	2008	35%	54%	4,612	--	4,756	--	6,750	--	4,543	--	4,687	--	6,661	--
2059	2009	40%	62%	5,271	8,565	5,436	8,833	7,715	12,536	5,192	8,437	5,357	8,705	7,612	12,370
2060	2010	50%	106%	9,112	--	9,397	--	13,336	--	8,976	--	9,261	--	13,160	--
2061	2011	80%	170%	14,579	--	15,034	--	21,338	--	14,361	--	14,817	--	21,055	--
2062	2012	65%	138%	11,845	--	12,215	--	17,337	--	11,669	--	12,039	--	17,107	--
2063	2013	35%	74%	6,378	--	6,578	--	9,335	--	6,283	--	6,483	--	9,212	--

Table B5
Estimated State Water Project Annual Deliveries for Artificial Recharge 2020 - 2069

Forecast Year	Analog Year	Historical Average SWP Reliability	Annual SWP Factor[1]	Baseline Deliveries (AFY)	Baseline 5-Yr Avg (AFY)	Near-Term Projects Deliveries (AFY)	Near-Term Projects 5-Yr Avg (AFY)	Future Projects Deliveries (AFY)	Future Projects 5-Yr Avg (AFY)	SWP Baseline w/ Climate Change Deliveries (AFY)	Baseline w/ Climate Change 5-Yr Avg (AFY)	Near-Term Projects w/ Climate Change Deliveries (AFY)	Near-Term Projects w/ Climate Change 5-Yr Avg (AFY)	Future Projects w/ Climate Change Deliveries (AFY)	Future Projects w/ Climate Change 5-Yr Avg (AFY)
2064	2014	5%	11%	911	8,565	940	8,833	1,334	12,536	898	8,437	926	8,705	1,316	12,370
2065	2015	20%	36%	3,114	--	3,212	--	4,559	--	3,068	--	3,166	--	4,498	--
2066	2016	60%	109%	9,343	--	9,636	--	13,676	--	9,204	--	9,497	--	13,495	--
2067	2017	85%	155%	13,237	--	13,651	--	19,374	--	13,040	--	13,454	--	19,117	--
2068	2018	35%	64%	5,450	--	5,621	--	7,978	--	5,369	--	5,540	--	7,872	--
2069	2019	75%	136%	11,679	8,565	12,045	8,833	17,095	12,536	11,505	8,437	11,871	8,705	16,868	12,370
2020-2044		**58%**	**100%**	**6,510**	**6,647**	**6,708**	**6,854**	**7,133**	**7,382**	**6,462**	**6,595**	**6,660**	**6,802**	**7,085**	**7,331**
2045-2069		**61%**	**100%**	**8,565**	**8,565**	**8,833**	**8,833**	**12,536**	**12,536**	**8,437**	**8,437**	**8,705**	**8,705**	**12,370**	**12,370**

Note

1. Annual SWP Factor based on the historical reliability for the analog year devided by the five-year average of the historical SWP reliability for each five year period.

Table B6

50-Year Forecast of Annual Pumping Demands

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Well ID	MCSB_2S4E-23L01_P32	MCSB_2S4E-23L02_P29	MCSB_2S4E-23L03_P28	MCSB_2S4E-23N01_23	MCSB_2S4E-23N02_30	MCSB_2S4E-26C01_28
Subbasin	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Mission Creek
Agency	DWA	DWA	DWA	MSWD	MSWD	MSWD
Use	Golf Course	Golf Course	Golf Course	Muni	Muni	Muni
Date	**MCSB_2S4E-23L01_P32**	**MCSB_2S4E-23L02_P29**	**MCSB_2S4E-23L03_P28**	**MCSB_2S4E-23N01_23**	**MCSB_2S4E-23N02_30**	**MCSB_2S4E-26C01_28**
1/1/2020	369.70	0.00	637.43	0.00	0.00	576.66
1/1/2021	445.78	0.00	622.25	0.00	0.00	587.28
1/1/2022	491.41	0.00	514.78	0.00	0.00	597.90
1/1/2023	194.87	0.00	818.15	0.00	0.00	608.52
1/1/2024	272.42	0.00	511.30	0.00	0.00	619.13
1/1/2025	369.70	0.00	637.43	0.00	0.00	629.75
1/1/2026	445.78	0.00	622.25	0.00	0.00	640.37
1/1/2027	491.41	0.00	514.78	0.00	0.00	650.98
1/1/2028	194.87	0.00	818.15	0.00	0.00	661.60
1/1/2029	272.42	0.00	511.30	0.00	0.00	672.22
1/1/2030	369.70	0.00	637.43	0.00	0.00	682.83
1/1/2031	445.78	0.00	622.25	0.00	0.00	693.45
1/1/2032	491.41	0.00	514.78	0.00	0.00	704.07
1/1/2033	194.87	0.00	818.15	0.00	0.00	714.69
1/1/2034	272.42	0.00	511.30	0.00	0.00	725.30
1/1/2035	369.70	0.00	637.43	0.00	0.00	735.92
1/1/2036	445.78	0.00	622.25	0.00	0.00	749.79
1/1/2037	491.41	0.00	514.78	0.00	0.00	763.66
1/1/2038	194.87	0.00	818.15	0.00	0.00	777.53
1/1/2039	272.42	0.00	511.30	0.00	0.00	791.40
1/1/2040	369.70	0.00	637.43	0.00	0.00	805.27
1/1/2041	445.78	0.00	622.25	0.00	0.00	819.14
1/1/2042	491.41	0.00	514.78	0.00	0.00	833.01
1/1/2043	194.87	0.00	818.15	0.00	0.00	846.88
1/1/2044	272.42	0.00	511.30	0.00	0.00	860.75
1/1/2045	369.70	0.00	637.43	0.00	0.00	874.62
1/1/2046	445.78	0.00	622.25	0.00	0.00	874.62
1/1/2047	491.41	0.00	514.78	0.00	0.00	874.62
1/1/2048	194.87	0.00	818.15	0.00	0.00	874.62
1/1/2049	272.42	0.00	511.30	0.00	0.00	874.62
1/1/2050	369.70	0.00	637.43	0.00	0.00	874.62
1/1/2051	445.78	0.00	622.25	0.00	0.00	874.62
1/1/2052	491.41	0.00	514.78	0.00	0.00	874.62
1/1/2053	194.87	0.00	818.15	0.00	0.00	874.62
1/1/2054	272.42	0.00	511.30	0.00	0.00	874.62
1/1/2055	369.70	0.00	637.43	0.00	0.00	874.62
1/1/2056	445.78	0.00	622.25	0.00	0.00	874.62
1/1/2057	491.41	0.00	514.78	0.00	0.00	874.62
1/1/2058	194.87	0.00	818.15	0.00	0.00	874.62
1/1/2059	272.42	0.00	511.30	0.00	0.00	874.62
1/1/2060	369.70	0.00	637.43	0.00	0.00	874.62
1/1/2061	445.78	0.00	622.25	0.00	0.00	874.62
1/1/2062	491.41	0.00	514.78	0.00	0.00	874.62
1/1/2063	194.87	0.00	818.15	0.00	0.00	874.62
1/1/2064	272.42	0.00	511.30	0.00	0.00	874.62
1/1/2065	369.70	0.00	637.43	0.00	0.00	874.62
1/1/2066	445.78	0.00	622.25	0.00	0.00	874.62
1/1/2067	491.41	0.00	514.78	0.00	0.00	874.62
1/1/2068	194.87	0.00	818.15	0.00	0.00	874.62
1/1/2069	272.42	0.00	511.30	0.00	0.00	874.62

Table B6
50-Year Forecast of Annual Pumping Demands
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Well ID	MCSB_2S4E-28A01_34	MCSB_2S4E-36D01_22	MCSB_2S4E-36D02_24	MCSB_2S4E-36K01_29	MCSB_2S4E-36P01_37	DHSSB_2S5E-30Q01_10
Subbasin	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Desert Hot Springs
Agency	MSWD	MSWD	MSWD	MSWD	MSWD	Private
Use	Muni	Muni	Muni	Muni	Muni	
Date	**MCSB_2S4E-28A01_34**	**MCSB_2S4E-36D01_22**	**MCSB_2S4E-36D02_24**	**MCSB_2S4E-36K01_29**	**MCSB_2S4E-36P01_37**	**DHSSB_2S5E-30Q01_10**
1/1/2020	411.90	1,070.95	1,070.95	1,153.33	1,153.33	0.00
1/1/2021	419.49	1,090.67	1,090.67	1,174.56	1,174.56	0.00
1/1/2022	427.07	1,110.38	1,110.38	1,195.80	1,195.80	0.00
1/1/2023	434.65	1,130.10	1,130.10	1,217.03	1,217.03	0.00
1/1/2024	442.24	1,149.82	1,149.82	1,238.27	1,238.27	0.00
1/1/2025	449.82	1,169.53	1,169.53	1,259.50	1,259.50	0.00
1/1/2026	457.40	1,189.25	1,189.25	1,280.73	1,280.73	0.00
1/1/2027	464.99	1,208.97	1,208.97	1,301.97	1,301.97	0.00
1/1/2028	472.57	1,228.69	1,228.69	1,323.20	1,323.20	0.00
1/1/2029	480.16	1,248.40	1,248.40	1,344.44	1,344.44	0.00
1/1/2030	487.74	1,268.12	1,268.12	1,365.67	1,365.67	0.00
1/1/2031	495.32	1,287.84	1,287.84	1,386.90	1,386.90	0.00
1/1/2032	502.91	1,307.56	1,307.56	1,408.14	1,408.14	0.00
1/1/2033	510.49	1,327.27	1,327.27	1,429.37	1,429.37	0.00
1/1/2034	518.07	1,346.99	1,346.99	1,450.61	1,450.61	0.00
1/1/2035	525.66	1,366.71	1,366.71	1,471.84	1,471.84	0.00
1/1/2036	535.56	1,392.47	1,392.47	1,499.58	1,499.58	0.00
1/1/2037	545.47	1,418.23	1,418.23	1,527.32	1,527.32	0.00
1/1/2038	555.38	1,443.99	1,443.99	1,555.06	1,555.06	0.00
1/1/2039	565.29	1,469.74	1,469.74	1,582.80	1,582.80	0.00
1/1/2040	575.19	1,495.50	1,495.50	1,610.54	1,610.54	0.00
1/1/2041	585.10	1,521.26	1,521.26	1,638.28	1,638.28	0.00
1/1/2042	595.01	1,547.02	1,547.02	1,666.02	1,666.02	0.00
1/1/2043	604.92	1,572.78	1,572.78	1,693.76	1,693.76	0.00
1/1/2044	614.82	1,598.54	1,598.54	1,721.51	1,721.51	0.00
1/1/2045	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2046	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2047	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2048	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2049	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2050	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2051	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2052	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2053	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2054	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2055	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2056	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2057	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2058	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2059	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2060	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2061	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2062	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2063	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2064	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2065	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2066	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2067	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2068	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00
1/1/2069	624.73	1,624.30	1,624.30	1,749.25	1,749.25	0.00

Table B6
50-Year Forecast of Annual Pumping Demands
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Well ID	DHSSB_2S5E-31H01_5	GHSA_3S3E-07D01_25A	GHSA_3S3E-07M01_25	GHSA_3S3E-08A01_26A	GHSA_3S3E-08M01_26	MCSB_3S4E-04P01_PW2
Subbasin	Desert Hot Springs	Garnet Hill	Garnet Hill	Garnet Hill	Garnet Hill	Mission Creek
Agency	MSWD	MSWD	MSWD	MSWD	MSWD	DWA
Use						
Date	**DHSSB_2S5E-31H01_5**	**GHSA_3S3E-07D01_25A**	**GHSA_3S3E-07M01_25**	**GHSA_3S3E-08A01_26A**	**GHSA_3S3E-08M01_26**	**MCSB_3S4E-04P01_PW2**
1/1/2020	0.00	0.00	0.00	0.00	0.00	207.70
1/1/2021	0.00	0.00	0.00	0.00	0.00	188.42
1/1/2022	0.00	0.00	0.00	0.00	0.00	218.09
1/1/2023	0.00	0.00	0.00	0.00	0.00	51.54
1/1/2024	0.00	0.00	0.00	0.00	0.00	186.61
1/1/2025	0.00	0.00	0.00	0.00	0.00	207.70
1/1/2026	0.00	0.00	0.00	0.00	0.00	188.42
1/1/2027	0.00	0.00	0.00	0.00	0.00	218.09
1/1/2028	0.00	0.00	0.00	0.00	0.00	51.54
1/1/2029	0.00	0.00	0.00	0.00	0.00	186.61
1/1/2030	0.00	0.00	0.00	0.00	0.00	207.70
1/1/2031	0.00	0.00	0.00	0.00	0.00	188.42
1/1/2032	0.00	0.00	0.00	0.00	0.00	218.09
1/1/2033	0.00	0.00	0.00	0.00	0.00	51.54
1/1/2034	0.00	0.00	0.00	0.00	0.00	186.61
1/1/2035	0.00	0.00	0.00	0.00	0.00	207.70
1/1/2036	0.00	0.00	0.00	0.00	0.00	188.42
1/1/2037	0.00	0.00	0.00	0.00	0.00	218.09
1/1/2038	0.00	0.00	0.00	0.00	0.00	51.54
1/1/2039	0.00	0.00	0.00	0.00	0.00	186.61
1/1/2040	0.00	0.00	0.00	0.00	0.00	207.70
1/1/2041	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2042	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2043	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2044	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2045	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2046	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2047	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2048	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2049	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2050	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2051	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2052	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2053	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2054	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2055	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2056	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2057	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2058	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2059	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2060	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2061	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2062	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2063	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2064	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2065	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2066	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2067	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2068	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2069	0.00	0.00	0.00	0.00	0.00	0.00

Table B6
50-Year Forecast of Annual Pumping Demands
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Well ID	MCSB_3S4E-04Q02_PW1	MCSB_3S4E-11A02_32	MCSB_3S4E-11L01_27	MCSB_3S4E-11L04_31	MCSB_3S4E-12B02_3408	MCSB_3S4E-12C01_3405
Subbasin	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Mission Creek
Agency	DWA	MSWD	MSWD	MSWD	CVWD	CVWD
Use		Muni	Muni	Muni	Muni	Muni
Date	**MCSB_3S4E-04Q02_PW1**	**MCSB_3S4E-11A02_32**	**MCSB_3S4E-11L01_27**	**MCSB_3S4E-11L04_31**	**MCSB_3S4E-12B02_3408**	**MCSB_3S4E-12C01_3405**
1/1/2020	142.20	988.57	741.43	1,070.95	726.64	0.00
1/1/2021	57.39	1,006.77	755.08	1,090.67	743.76	0.00
1/1/2022	52.99	1,024.97	768.73	1,110.38	760.87	0.00
1/1/2023	224.36	1,043.17	782.38	1,130.10	777.99	0.00
1/1/2024	147.92	1,061.37	796.03	1,149.82	795.10	0.00
1/1/2025	142.20	1,079.57	809.68	1,169.53	812.22	0.00
1/1/2026	57.39	1,097.77	823.33	1,189.25	829.33	0.00
1/1/2027	52.99	1,115.97	836.98	1,208.97	846.45	0.00
1/1/2028	224.36	1,134.17	850.63	1,228.69	863.56	0.00
1/1/2029	147.92	1,152.37	864.28	1,248.40	880.68	0.00
1/1/2030	142.20	1,170.57	877.93	1,268.12	897.79	0.00
1/1/2031	57.39	1,188.77	891.58	1,287.84	914.90	0.00
1/1/2032	52.99	1,206.98	905.23	1,307.56	932.02	0.00
1/1/2033	224.36	1,225.18	918.88	1,327.27	949.13	0.00
1/1/2034	147.92	1,243.38	932.53	1,346.99	966.25	0.00
1/1/2035	142.20	1,261.58	946.18	1,366.71	983.36	0.00
1/1/2036	57.39	1,285.35	964.02	1,392.47	993.22	0.00
1/1/2037	52.99	1,309.13	981.85	1,418.23	1,003.07	0.00
1/1/2038	224.36	1,332.91	999.68	1,443.99	1,012.93	0.00
1/1/2039	147.92	1,356.69	1,017.52	1,469.74	1,022.78	0.00
1/1/2040	142.20	1,380.47	1,035.35	1,495.50	1,032.63	0.00
1/1/2041	0.00	1,404.24	1,053.18	1,521.26	1,042.49	0.00
1/1/2042	0.00	1,428.02	1,071.02	1,547.02	1,052.34	0.00
1/1/2043	0.00	1,451.80	1,088.85	1,572.78	1,062.20	0.00
1/1/2044	0.00	1,475.58	1,106.68	1,598.54	1,072.05	0.00
1/1/2045	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2046	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2047	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2048	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2049	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2050	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2051	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2052	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2053	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2054	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2055	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2056	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2057	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2058	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2059	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2060	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2061	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2062	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2063	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2064	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2065	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2066	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2067	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2068	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00
1/1/2069	0.00	1,499.35	1,124.52	1,624.30	1,081.90	0.00

Table B6

50-Year Forecast of Annual Pumping Demands

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Well ID	MCSB_3S4E-12C2S	MCSB_3S4E-12F01_3410	MCSB_3S4E-12H01_3407-1	MCSB_3S4E-12H02_3409-1	MCSB_3S4E-12H03_3409-2
Subbasin	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Mission Creek
Agency	CVWD	CVWD	CVWD	CVWD	CVWD
Use	Muni	Muni	Muni	Muni	Muni
Date	**MCSB_3S4E-12C2S**	**MCSB_3S4E-12F01_3410**	**MCSB_3S4E-12H01_3407-1**	**MCSB_3S4E-12H02_3409-1**	**MCSB_3S4E-12H03_3409-2**
1/1/2020	610.38	901.04	0.00	0.00	668.51
1/1/2021	624.76	922.26	0.00	0.00	684.26
1/1/2022	639.13	943.48	0.00	0.00	700.00
1/1/2023	653.51	964.70	0.00	0.00	715.75
1/1/2024	667.88	985.93	0.00	0.00	731.49
1/1/2025	682.26	1,007.15	0.00	0.00	747.24
1/1/2026	696.64	1,028.37	0.00	0.00	762.98
1/1/2027	711.01	1,049.59	0.00	0.00	778.73
1/1/2028	725.39	1,070.81	0.00	0.00	794.48
1/1/2029	739.77	1,092.04	0.00	0.00	810.22
1/1/2030	754.14	1,113.26	0.00	0.00	825.97
1/1/2031	768.52	1,134.48	0.00	0.00	841.71
1/1/2032	782.90	1,155.70	0.00	0.00	857.46
1/1/2033	797.27	1,176.93	0.00	0.00	873.20
1/1/2034	811.65	1,198.15	0.00	0.00	888.95
1/1/2035	826.03	1,219.37	0.00	0.00	904.69
1/1/2036	834.30	1,231.59	0.00	0.00	913.76
1/1/2037	842.58	1,243.81	0.00	0.00	922.83
1/1/2038	850.86	1,256.03	0.00	0.00	931.89
1/1/2039	859.14	1,268.25	0.00	0.00	940.96
1/1/2040	867.41	1,280.47	0.00	0.00	950.02
1/1/2041	875.69	1,292.69	0.00	0.00	959.09
1/1/2042	883.97	1,304.90	0.00	0.00	968.15
1/1/2043	892.24	1,317.12	0.00	0.00	977.22
1/1/2044	900.52	1,329.34	0.00	0.00	986.29
1/1/2045	908.80	1,341.56	0.00	0.00	995.35
1/1/2046	908.80	1,341.56	0.00	0.00	995.35
1/1/2047	908.80	1,341.56	0.00	0.00	995.35
1/1/2048	908.80	1,341.56	0.00	0.00	995.35
1/1/2049	908.80	1,341.56	0.00	0.00	995.35
1/1/2050	908.80	1,341.56	0.00	0.00	995.35
1/1/2051	908.80	1,341.56	0.00	0.00	995.35
1/1/2052	908.80	1,341.56	0.00	0.00	995.35
1/1/2053	908.80	1,341.56	0.00	0.00	995.35
1/1/2054	908.80	1,341.56	0.00	0.00	995.35
1/1/2055	908.80	1,341.56	0.00	0.00	995.35
1/1/2056	908.80	1,341.56	0.00	0.00	995.35
1/1/2057	908.80	1,341.56	0.00	0.00	995.35
1/1/2058	908.80	1,341.56	0.00	0.00	995.35
1/1/2059	908.80	1,341.56	0.00	0.00	995.35
1/1/2060	908.80	1,341.56	0.00	0.00	995.35
1/1/2061	908.80	1,341.56	0.00	0.00	995.35
1/1/2062	908.80	1,341.56	0.00	0.00	995.35
1/1/2063	908.80	1,341.56	0.00	0.00	995.35
1/1/2064	908.80	1,341.56	0.00	0.00	995.35
1/1/2065	908.80	1,341.56	0.00	0.00	995.35
1/1/2066	908.80	1,341.56	0.00	0.00	995.35
1/1/2067	908.80	1,341.56	0.00	0.00	995.35
1/1/2068	908.80	1,341.56	0.00	0.00	995.35
1/1/2069	908.80	1,341.56	0.00	0.00	995.35

Table B6
50-Year Forecast of Annual Pumping Demands
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Well ID	GHSA_3S4E-14J01_33	MCSB_3S5E-05Q01_P27	MCSB_3S5E-08B01_P26	MCSB_3S5E-08P01	MCSB_3S5E-08P02	MCSB_3S5E-15L01
Subbasin	Garnet Hill	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Mission Creek
Agency	CVWD	DWA	DWA	CVWD	CVWD	Private
Use		Golf Course		Ag	Ag	Ag
Date	**GHSA_3S4E-14J01_33**	**MCSB_3S5E-05Q01_P27**	**MCSB_3S5E-08B01_P26**	**MCSB_3S5E-08P01**	**MCSB_3S5E-08P02**	**MCSB_3S5E-15L01**
1/1/2020	461.54	469.86	309.47	1.20	473.50	0.00
1/1/2021	430.76	482.37	455.80	0.00	469.10	0.00
1/1/2022	604.54	402.13	363.60	0.30	514.30	0.00
1/1/2023	307.43	424.96	413.72	0.00	474.20	0.00
1/1/2024	419.70	468.47	282.78	0.00	525.20	0.00
1/1/2025	461.54	469.86	309.47	1.20	473.50	0.00
1/1/2026	430.76	482.37	455.80	0.00	469.10	0.00
1/1/2027	604.54	402.13	363.60	0.30	514.30	0.00
1/1/2028	307.43	424.96	413.72	0.00	474.20	0.00
1/1/2029	419.70	468.47	282.78	0.00	525.20	0.00
1/1/2030	461.54	469.86	309.47	1.20	473.50	0.00
1/1/2031	430.76	482.37	455.80	0.00	469.10	0.00
1/1/2032	604.54	402.13	363.60	0.30	514.30	0.00
1/1/2033	307.43	424.96	413.72	0.00	474.20	0.00
1/1/2034	419.70	468.47	282.78	0.00	525.20	0.00
1/1/2035	461.54	469.86	309.47	1.20	473.50	0.00
1/1/2036	430.76	482.37	455.80	0.00	469.10	0.00
1/1/2037	604.54	402.13	363.60	0.30	514.30	0.00
1/1/2038	307.43	424.96	413.72	0.00	474.20	0.00
1/1/2039	419.70	468.47	282.78	0.00	525.20	0.00
1/1/2040	461.54	469.86	309.47	1.20	473.50	0.00
1/1/2041	430.76	482.37	455.80	0.00	469.10	0.00
1/1/2042	604.54	402.13	363.60	0.30	514.30	0.00
1/1/2043	307.43	424.96	413.72	0.00	474.20	0.00
1/1/2044	419.70	468.47	282.78	0.00	525.20	0.00
1/1/2045	461.54	469.86	309.47	1.20	473.50	0.00
1/1/2046	430.76	482.37	455.80	0.00	469.10	0.00
1/1/2047	604.54	402.13	363.60	0.30	514.30	0.00
1/1/2048	307.43	424.96	413.72	0.00	474.20	0.00
1/1/2049	419.70	468.47	282.78	0.00	525.20	0.00
1/1/2050	461.54	469.86	309.47	1.20	473.50	0.00
1/1/2051	430.76	482.37	455.80	0.00	469.10	0.00
1/1/2052	604.54	402.13	363.60	0.30	514.30	0.00
1/1/2053	307.43	424.96	413.72	0.00	474.20	0.00
1/1/2054	419.70	468.47	282.78	0.00	525.20	0.00
1/1/2055	461.54	469.86	309.47	1.20	473.50	0.00
1/1/2056	430.76	482.37	455.80	0.00	469.10	0.00
1/1/2057	604.54	402.13	363.60	0.30	514.30	0.00
1/1/2058	307.43	424.96	413.72	0.00	474.20	0.00
1/1/2059	419.70	468.47	282.78	0.00	525.20	0.00
1/1/2060	461.54	469.86	309.47	1.20	473.50	0.00
1/1/2061	430.76	482.37	455.80	0.00	469.10	0.00
1/1/2062	604.54	402.13	363.60	0.30	514.30	0.00
1/1/2063	307.43	424.96	413.72	0.00	474.20	0.00
1/1/2064	419.70	468.47	282.78	0.00	525.20	0.00
1/1/2065	461.54	469.86	309.47	1.20	473.50	0.00
1/1/2066	430.76	482.37	455.80	0.00	469.10	0.00
1/1/2067	604.54	402.13	363.60	0.30	514.30	0.00
1/1/2068	307.43	424.96	413.72	0.00	474.20	0.00
1/1/2069	419.70	468.47	282.78	0.00	525.20	0.00

Table B6
50-Year Forecast of Annual Pumping Demands
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Well ID	MCSB_3S5E-15N01	MCSB_3S5E-15N03	MCSB_3S5E-15R01	MCSB_3S5E-15R02	MCSB_3S5E-17M01	MCSB_3S5E-17N01	MCSB_3S5E-18J01
Subbasin	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Mission Creek
Agency	Private	Private	CVWD	CVWD	CVWD	CVWD	CVWD
Use	Ag	Ag	Ag	Ag	Golf Course	Golf Course	Golf Course
Date	**MCSB_3S5E-15N01**	**MCSB_3S5E-15N03**	**MCSB_3S5E-15R01**	**MCSB_3S5E-15R02**	**MCSB_3S5E-17M01**	**MCSB_3S5E-17N01**	**MCSB_3S5E-18J01**
1/1/2020	0.00	0.00	208.20	0.30	592.10	248.10	0.00
1/1/2021	0.00	0.00	153.00	0.30	714.80	166.70	4.50
1/1/2022	0.00	0.00	106.40	0.30	571.30	171.60	0.20
1/1/2023	0.00	0.00	101.10	0.30	637.80	169.60	0.40
1/1/2024	0.00	0.00	138.80	0.30	505.50	161.20	0.40
1/1/2025	0.00	0.00	208.20	0.30	592.10	248.10	0.00
1/1/2026	0.00	0.00	153.00	0.30	714.80	166.70	4.50
1/1/2027	0.00	0.00	106.40	0.30	571.30	171.60	0.20
1/1/2028	0.00	0.00	101.10	0.30	637.80	169.60	0.40
1/1/2029	0.00	0.00	138.80	0.30	505.50	161.20	0.40
1/1/2030	0.00	0.00	208.20	0.30	592.10	248.10	0.00
1/1/2031	0.00	0.00	153.00	0.30	714.80	166.70	4.50
1/1/2032	0.00	0.00	106.40	0.30	571.30	171.60	0.20
1/1/2033	0.00	0.00	101.10	0.30	637.80	169.60	0.40
1/1/2034	0.00	0.00	138.80	0.30	505.50	161.20	0.40
1/1/2035	0.00	0.00	208.20	0.30	592.10	248.10	0.00
1/1/2036	0.00	0.00	153.00	0.30	714.80	166.70	4.50
1/1/2037	0.00	0.00	106.40	0.30	571.30	171.60	0.20
1/1/2038	0.00	0.00	101.10	0.30	637.80	169.60	0.40
1/1/2039	0.00	0.00	138.80	0.30	505.50	161.20	0.40
1/1/2040	0.00	0.00	208.20	0.30	592.10	248.10	0.00
1/1/2041	0.00	0.00	153.00	0.30	714.80	166.70	4.50
1/1/2042	0.00	0.00	106.40	0.30	571.30	171.60	0.20
1/1/2043	0.00	0.00	101.10	0.30	637.80	169.60	0.40
1/1/2044	0.00	0.00	138.80	0.30	505.50	161.20	0.40
1/1/2045	0.00	0.00	208.20	0.30	592.10	248.10	0.00
1/1/2046	0.00	0.00	153.00	0.30	714.80	166.70	4.50
1/1/2047	0.00	0.00	106.40	0.30	571.30	171.60	0.20
1/1/2048	0.00	0.00	101.10	0.30	637.80	169.60	0.40
1/1/2049	0.00	0.00	138.80	0.30	505.50	161.20	0.40
1/1/2050	0.00	0.00	208.20	0.30	592.10	248.10	0.00
1/1/2051	0.00	0.00	153.00	0.30	714.80	166.70	4.50
1/1/2052	0.00	0.00	106.40	0.30	571.30	171.60	0.20
1/1/2053	0.00	0.00	101.10	0.30	637.80	169.60	0.40
1/1/2054	0.00	0.00	138.80	0.30	505.50	161.20	0.40
1/1/2055	0.00	0.00	208.20	0.30	592.10	248.10	0.00
1/1/2056	0.00	0.00	153.00	0.30	714.80	166.70	4.50
1/1/2057	0.00	0.00	106.40	0.30	571.30	171.60	0.20
1/1/2058	0.00	0.00	101.10	0.30	637.80	169.60	0.40
1/1/2059	0.00	0.00	138.80	0.30	505.50	161.20	0.40
1/1/2060	0.00	0.00	208.20	0.30	592.10	248.10	0.00
1/1/2061	0.00	0.00	153.00	0.30	714.80	166.70	4.50
1/1/2062	0.00	0.00	106.40	0.30	571.30	171.60	0.20
1/1/2063	0.00	0.00	101.10	0.30	637.80	169.60	0.40
1/1/2064	0.00	0.00	138.80	0.30	505.50	161.20	0.40
1/1/2065	0.00	0.00	208.20	0.30	592.10	248.10	0.00
1/1/2066	0.00	0.00	153.00	0.30	714.80	166.70	4.50
1/1/2067	0.00	0.00	106.40	0.30	571.30	171.60	0.20
1/1/2068	0.00	0.00	101.10	0.30	637.80	169.60	0.40
1/1/2069	0.00	0.00	138.80	0.30	505.50	161.20	0.40

Table B6
50-Year Forecast of Annual Pumping Demands
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Well ID	MCSB_3S5E-20H02	DHSSB_2S4E-24Q01	MCSB_2S4E-25P01	MCSB_2S4E-26D01	MCSB_2S4E-35B01	MCSB_2S4E-35J01	DHSSB_2S5E-30F03
Subbasin	Mission Creek	Desert Hot Springs	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Desert Hot Springs
Agency	CVWD	Private	Private	Private	Private	Private	Private
Use	Domestic						
Date	**MCSB_3S5E-20H02**	**2S4E-24Q01_DHSSB**	**2S4E-25P_MCSB**	**2S4E-26D1_MCSB**	**2S4E-35B1_MCSB**	**2S4E-35J_MCSB**	**2S5E-30F03_DHSSB**
1/1/2020	16.00	1.00	0.00	308.39	0.00	0.00	0.00
1/1/2021	17.90	1.00	0.00	309.12	0.00	0.00	0.00
1/1/2022	18.10	1.00	0.00	308.72	0.00	0.00	0.00
1/1/2023	26.00	1.00	0.00	308.95	0.00	0.00	0.00
1/1/2024	20.30	1.00	0.00	309.15	0.00	0.00	0.00
1/1/2025	16.00	1.00	0.00	308.39	0.00	0.00	0.00
1/1/2026	17.90	1.00	0.00	309.12	0.00	0.00	0.00
1/1/2027	18.10	1.00	0.00	308.72	0.00	0.00	0.00
1/1/2028	26.00	1.00	0.00	308.95	0.00	0.00	0.00
1/1/2029	20.30	1.00	0.00	309.15	0.00	0.00	0.00
1/1/2030	16.00	1.00	0.00	308.39	0.00	0.00	0.00
1/1/2031	17.90	1.00	0.00	309.12	0.00	0.00	0.00
1/1/2032	18.10	1.00	0.00	308.72	0.00	0.00	0.00
1/1/2033	26.00	1.00	0.00	308.95	0.00	0.00	0.00
1/1/2034	20.30	1.00	0.00	309.15	0.00	0.00	0.00
1/1/2035	16.00	1.00	0.00	308.39	0.00	0.00	0.00
1/1/2036	17.90	1.00	0.00	309.12	0.00	0.00	0.00
1/1/2037	18.10	1.00	0.00	308.72	0.00	0.00	0.00
1/1/2038	26.00	1.00	0.00	308.95	0.00	0.00	0.00
1/1/2039	20.30	1.00	0.00	309.15	0.00	0.00	0.00
1/1/2040	16.00	1.00	0.00	308.39	0.00	0.00	0.00
1/1/2041	17.90	1.00	0.00	309.12	0.00	0.00	0.00
1/1/2042	18.10	1.00	0.00	308.72	0.00	0.00	0.00
1/1/2043	26.00	1.00	0.00	308.95	0.00	0.00	0.00
1/1/2044	20.30	1.00	0.00	309.15	0.00	0.00	0.00
1/1/2045	16.00	1.00	0.00	308.39	0.00	0.00	0.00
1/1/2046	17.90	1.00	0.00	309.12	0.00	0.00	0.00
1/1/2047	18.10	1.00	0.00	308.72	0.00	0.00	0.00
1/1/2048	26.00	1.00	0.00	308.95	0.00	0.00	0.00
1/1/2049	20.30	1.00	0.00	309.15	0.00	0.00	0.00
1/1/2050	16.00	1.00	0.00	308.39	0.00	0.00	0.00
1/1/2051	17.90	1.00	0.00	309.12	0.00	0.00	0.00
1/1/2052	18.10	1.00	0.00	308.72	0.00	0.00	0.00
1/1/2053	26.00	1.00	0.00	308.95	0.00	0.00	0.00
1/1/2054	20.30	1.00	0.00	309.15	0.00	0.00	0.00
1/1/2055	16.00	1.00	0.00	308.39	0.00	0.00	0.00
1/1/2056	17.90	1.00	0.00	309.12	0.00	0.00	0.00
1/1/2057	18.10	1.00	0.00	308.72	0.00	0.00	0.00
1/1/2058	26.00	1.00	0.00	308.95	0.00	0.00	0.00
1/1/2059	20.30	1.00	0.00	309.15	0.00	0.00	0.00
1/1/2060	16.00	1.00	0.00	308.39	0.00	0.00	0.00
1/1/2061	17.90	1.00	0.00	309.12	0.00	0.00	0.00
1/1/2062	18.10	1.00	0.00	308.72	0.00	0.00	0.00
1/1/2063	26.00	1.00	0.00	308.95	0.00	0.00	0.00
1/1/2064	20.30	1.00	0.00	309.15	0.00	0.00	0.00
1/1/2065	16.00	1.00	0.00	308.39	0.00	0.00	0.00
1/1/2066	17.90	1.00	0.00	309.12	0.00	0.00	0.00
1/1/2067	18.10	1.00	0.00	308.72	0.00	0.00	0.00
1/1/2068	26.00	1.00	0.00	308.95	0.00	0.00	0.00
1/1/2069	20.30	1.00	0.00	309.15	0.00	0.00	0.00

Table B6
50-Year Forecast of Annual Pumping Demands
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Well ID	DHSSB_2S5E-30J02	DHSSB_2S5E-30K03	DHSSB_2S5E-30L01	DHSSB_2S5E-32B03	DHSSB_2S5E-32E01	DHSSB_2S5E-32H02	DHSSB_2S5E-32K02
Subbasin	Desert Hot Springs	Desert Hot Springs	Desert Hot Springs	Desert Hot Springs	Desert Hot Springs	Desert Hot Springs	Desert Hot Springs
Agency	Private	Private	Private	Private	Private	Private	Private
Use							
Date	**2S5E-30J02_DHSSB**	**2S5E-30K03_DHSSB**	**2S5E-30L01_DHSSB**	**2S5E-32B03_DHSSB**	**2S5E-32E01_DHSSB**	**2S5E-32H02_DHSSB**	**2S5E-32K02_DHSSB**
1/1/2020	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2021	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2022	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2023	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2024	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2025	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2026	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2027	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2028	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2029	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2030	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2031	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2032	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2033	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2034	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2035	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2036	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2037	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2038	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2039	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2040	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2041	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2042	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2043	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2044	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2045	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2046	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2047	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2048	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2049	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2050	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2051	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2052	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2053	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2054	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2055	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2056	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2057	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2058	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2059	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2060	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2061	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2062	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2063	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2064	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2065	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2066	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2067	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2068	1.00	85.00	7.00	6.00	90.00	28.00	24.00
1/1/2069	1.00	85.00	7.00	6.00	90.00	28.00	24.00

Table B6
50-Year Forecast of Annual Pumping Demands
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Well ID	DHSSB_2S5E-32L01	MCSB_2S5E-32N01	DHSSB_2S5E-32P02	DHSSB_2S5E-32R02	DHSSB_2S5E-33E01	DHSSB_2S5E-33M01	DHSSB_2S5E-33N01
Subbasin	Desert Hot Springs	Mission Creek	Desert Hot Springs	Desert Hot Springs	Desert Hot Springs	Desert Hot Springs	Desert Hot Springs
Agency	Private	Private	Private	Private	Private	Private	Private
Use							
Date	**2S5E-32L01_DHSSB**	**2S5E-32N01_DHSSB**	**2S5E-32P02_DHSSB**	**2S5E-32R02_DHSSB**	**2S5E-33E01_DHSSB**	**2S5E-33M01_DHSSB**	**2S5E-33N01_DHSSB**
1/1/2020	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2021	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2022	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2023	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2024	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2025	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2026	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2027	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2028	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2029	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2030	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2031	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2032	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2033	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2034	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2035	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2036	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2037	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2038	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2039	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2040	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2041	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2042	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2043	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2044	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2045	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2046	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2047	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2048	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2049	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2050	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2051	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2052	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2053	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2054	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2055	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2056	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2057	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2058	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2059	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2060	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2061	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2062	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2063	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2064	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2065	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2066	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2067	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2068	115.00	0.00	14.00	10.00	38.00	45.00	34.00
1/1/2069	115.00	0.00	14.00	10.00	38.00	45.00	34.00

Table B6
50-Year Forecast of Annual Pumping Demands
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Well ID	GHSA_3S3E-02B01	GHSA_3S3E-02C01	GHSA_3S3E-02P01&P02	GHSA_3S3E-11K01	GHSA_3S3E-24J01	GHSA_3S4E-07M01	MCSB_3S4E-11B02
Subbasin	Garnet Hill	Garnet Hill	Garnet Hill	Garnet Hill	Garnet Hill	Garnet Hill	Mission Creek
Agency	Private	Private	Private	Private	Private	Private	Private
Use							
Date	**3S3E-02B_GHSA**	**3S3E-02C_GHSA**	**3S3E-02P1&2_GHSA**	**3S3E-11K1_GHSA**	**3S3E-24J1_GHSA**	**3S4E-07M1_GHSA**	**3S4E-11B2_MCSB**
1/1/2020	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2021	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2022	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2023	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2024	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2025	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2026	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2027	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2028	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2029	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2030	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2031	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2032	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2033	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2034	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2035	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2036	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2037	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2038	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2039	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2040	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2041	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2042	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2043	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2044	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2045	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2046	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2047	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2048	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2049	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2050	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2051	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2052	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2053	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2054	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2055	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2056	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2057	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2058	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2059	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2060	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2061	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2062	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2063	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2064	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2065	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2066	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2067	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2068	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/1/2069	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table B6
50-Year Forecast of Annual Pumping Demands
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Well ID	MCSB_3S4E-11L02	MCSB_3S4E-11L03	MCSB_3S4E-11M01	MCSB_3S4E-11P01	MCSB_3S4E-13N01	GHSA_3S4E-13Q01	GHSA_3S4E-17K02
Subbasin	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Garnet Hill	Garnet Hill
Agency	Private	Private	Private	Private	CVWD	Private	Private
Use							
Date	**3S4E-11L2_MCSB**	**3S4E-11L3_MCSB**	**3S4E-11M1_MCSB**	**3S4E-11P1_MCSB**	**3S4E-13N1_MCSB**	**3S4E-13Q1_GHSA**	**3S4E-17K2_GHSA**
1/1/2020	0.00	102.62	0.00	0.00	0.00	0.00	0.00
1/1/2021	0.00	102.87	0.00	0.00	0.00	0.00	0.00
1/1/2022	0.00	102.73	0.00	0.00	0.00	0.00	0.00
1/1/2023	0.00	102.81	0.00	0.00	0.00	0.00	0.00
1/1/2024	0.00	102.88	0.00	0.00	0.00	0.00	0.00
1/1/2025	0.00	102.62	0.00	0.00	0.00	0.00	0.00
1/1/2026	0.00	102.87	0.00	0.00	0.00	0.00	0.00
1/1/2027	0.00	102.73	0.00	0.00	0.00	0.00	0.00
1/1/2028	0.00	102.81	0.00	0.00	0.00	0.00	0.00
1/1/2029	0.00	102.88	0.00	0.00	0.00	0.00	0.00
1/1/2030	0.00	102.62	0.00	0.00	0.00	0.00	0.00
1/1/2031	0.00	102.87	0.00	0.00	0.00	0.00	0.00
1/1/2032	0.00	102.73	0.00	0.00	0.00	0.00	0.00
1/1/2033	0.00	102.81	0.00	0.00	0.00	0.00	0.00
1/1/2034	0.00	102.88	0.00	0.00	0.00	0.00	0.00
1/1/2035	0.00	102.62	0.00	0.00	0.00	0.00	0.00
1/1/2036	0.00	102.87	0.00	0.00	0.00	0.00	0.00
1/1/2037	0.00	102.73	0.00	0.00	0.00	0.00	0.00
1/1/2038	0.00	102.81	0.00	0.00	0.00	0.00	0.00
1/1/2039	0.00	102.88	0.00	0.00	0.00	0.00	0.00
1/1/2040	0.00	102.62	0.00	0.00	0.00	0.00	0.00
1/1/2041	0.00	102.87	0.00	0.00	0.00	0.00	0.00
1/1/2042	0.00	102.73	0.00	0.00	0.00	0.00	0.00
1/1/2043	0.00	102.81	0.00	0.00	0.00	0.00	0.00
1/1/2044	0.00	102.88	0.00	0.00	0.00	0.00	0.00
1/1/2045	0.00	102.62	0.00	0.00	0.00	0.00	0.00
1/1/2046	0.00	102.87	0.00	0.00	0.00	0.00	0.00
1/1/2047	0.00	102.73	0.00	0.00	0.00	0.00	0.00
1/1/2048	0.00	102.81	0.00	0.00	0.00	0.00	0.00
1/1/2049	0.00	102.88	0.00	0.00	0.00	0.00	0.00
1/1/2050	0.00	102.62	0.00	0.00	0.00	0.00	0.00
1/1/2051	0.00	102.87	0.00	0.00	0.00	0.00	0.00
1/1/2052	0.00	102.73	0.00	0.00	0.00	0.00	0.00
1/1/2053	0.00	102.81	0.00	0.00	0.00	0.00	0.00
1/1/2054	0.00	102.88	0.00	0.00	0.00	0.00	0.00
1/1/2055	0.00	102.62	0.00	0.00	0.00	0.00	0.00
1/1/2056	0.00	102.87	0.00	0.00	0.00	0.00	0.00
1/1/2057	0.00	102.73	0.00	0.00	0.00	0.00	0.00
1/1/2058	0.00	102.81	0.00	0.00	0.00	0.00	0.00
1/1/2059	0.00	102.88	0.00	0.00	0.00	0.00	0.00
1/1/2060	0.00	102.62	0.00	0.00	0.00	0.00	0.00
1/1/2061	0.00	102.87	0.00	0.00	0.00	0.00	0.00
1/1/2062	0.00	102.73	0.00	0.00	0.00	0.00	0.00
1/1/2063	0.00	102.81	0.00	0.00	0.00	0.00	0.00
1/1/2064	0.00	102.88	0.00	0.00	0.00	0.00	0.00
1/1/2065	0.00	102.62	0.00	0.00	0.00	0.00	0.00
1/1/2066	0.00	102.87	0.00	0.00	0.00	0.00	0.00
1/1/2067	0.00	102.73	0.00	0.00	0.00	0.00	0.00
1/1/2068	0.00	102.81	0.00	0.00	0.00	0.00	0.00
1/1/2069	0.00	102.88	0.00	0.00	0.00	0.00	0.00

Table B6
50-Year Forecast of Annual Pumping Demands
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Well ID	DHSSB_3S5E-05A01	DHSSB_3S5E-05B04	DHSSB_3S5E-10F01	DHSSB_3S5E-10G01	DHSSB_3S5E-10H05	MCSB_3S5E-10L02	DHSSB_3S5E-10R03
Subbasin	Desert Hot Springs	Desert Hot Springs	Desert Hot Springs	Desert Hot Springs	Desert Hot Springs	Mission Creek	Desert Hot Springs
Agency	Private	Private	Private	Private	Private	Private	Private
Use						Domestic	
Date	**3S5E-05A01_DHSSB**	**3S5E-05B04_DHSSB**	**3S5E-10F01_DHSSB**	**3S5E-10G01_DHSSB**	**3S5E-10H05_DHSSB**	**3S5E-10L02_DHSSB**	**3S5E-10R03_DHSSB**
1/1/2020	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2021	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2022	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2023	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2024	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2025	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2026	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2027	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2028	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2029	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2030	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2031	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2032	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2033	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2034	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2035	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2036	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2037	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2038	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2039	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2040	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2041	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2042	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2043	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2044	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2045	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2046	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2047	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2048	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2049	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2050	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2051	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2052	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2053	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2054	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2055	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2056	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2057	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2058	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2059	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2060	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2061	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2062	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2063	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2064	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2065	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2066	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2067	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2068	2.00	7.00	255.00	60.00	35.00	100.00	338.00
1/1/2069	2.00	7.00	255.00	60.00	35.00	100.00	338.00

Table B6
50-Year Forecast of Annual Pumping Demands
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Well ID	DHSSB_3S5E-11K01	DHSSB_3S5E-11M04	DHSSB_3S5E-11R01	DHSSB_3S5E-13N01	DHSSB_3S5E-14C01	DHSSB_3S5E-14G03	MCSB_3S5E-16M01
Subbasin	Desert Hot Springs	Desert Hot Springs	Desert Hot Springs	Desert Hot Springs	Desert Hot Springs	Desert Hot Springs	Mission Creek
Agency	Private	Private	Private	Private	Private	Private	Private
Use							Domestic
Date	**3S5E-11K01_DHSSB**	**3S5E-11M04_DHSSB**	**3S5E-11R01_DHSSB**	**3S5E-13N01_DHSSB**	**3S5E-14C01_DHSSB**	**3S5E-14G03_DHSSB**	**3S5E-16M1_MCSB**
1/1/2020	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2021	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2022	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2023	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2024	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2025	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2026	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2027	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2028	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2029	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2030	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2031	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2032	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2033	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2034	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2035	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2036	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2037	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2038	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2039	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2040	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2041	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2042	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2043	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2044	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2045	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2046	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2047	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2048	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2049	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2050	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2051	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2052	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2053	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2054	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2055	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2056	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2057	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2058	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2059	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2060	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2061	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2062	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2063	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2064	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2065	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2066	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2067	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2068	0.00	50.00	2.00	10.00	240.00	100.00	0.00
1/1/2069	0.00	50.00	2.00	10.00	240.00	100.00	0.00

Table B6
50-Year Forecast of Annual Pumping Demands
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Well ID	MCSB_3S5E-17K01	MCSB_3S5E-18L01	MCSB_3S5E-18N01	MCSB_3S5E-18P01	MCSB_3S5E-21K01	MCSB_Well144	MCSB_Well159
Subbasin	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Mission Creek	Mission Creek
Agency	Private	Private	Private	Private	Private	Private	Private
Use							
Date	**3S5E-17K1_MCSB**	**3S5E-18L1_MCSB**	**3S5E-18N_MCSB**	**3S5E-18P_MCSB**	**3S5E-21K1_MCSB**	**Well144_DHSSB**	**Well159_MCSB**
1/1/2020	0.00	0.00	0.00	0.00	0.00	0.00	87.79
1/1/2021	0.00	0.00	0.00	0.00	0.00	0.00	88.00
1/1/2022	0.00	0.00	0.00	0.00	0.00	0.00	87.89
1/1/2023	0.00	0.00	0.00	0.00	0.00	0.00	87.95
1/1/2024	0.00	0.00	0.00	0.00	0.00	0.00	88.01
1/1/2025	0.00	0.00	0.00	0.00	0.00	0.00	87.79
1/1/2026	0.00	0.00	0.00	0.00	0.00	0.00	88.00
1/1/2027	0.00	0.00	0.00	0.00	0.00	0.00	87.89
1/1/2028	0.00	0.00	0.00	0.00	0.00	0.00	87.95
1/1/2029	0.00	0.00	0.00	0.00	0.00	0.00	88.01
1/1/2030	0.00	0.00	0.00	0.00	0.00	0.00	87.79
1/1/2031	0.00	0.00	0.00	0.00	0.00	0.00	88.00
1/1/2032	0.00	0.00	0.00	0.00	0.00	0.00	87.89
1/1/2033	0.00	0.00	0.00	0.00	0.00	0.00	87.95
1/1/2034	0.00	0.00	0.00	0.00	0.00	0.00	88.01
1/1/2035	0.00	0.00	0.00	0.00	0.00	0.00	87.79
1/1/2036	0.00	0.00	0.00	0.00	0.00	0.00	88.00
1/1/2037	0.00	0.00	0.00	0.00	0.00	0.00	87.89
1/1/2038	0.00	0.00	0.00	0.00	0.00	0.00	87.95
1/1/2039	0.00	0.00	0.00	0.00	0.00	0.00	88.01
1/1/2040	0.00	0.00	0.00	0.00	0.00	0.00	87.79
1/1/2041	0.00	0.00	0.00	0.00	0.00	0.00	88.00
1/1/2042	0.00	0.00	0.00	0.00	0.00	0.00	87.89
1/1/2043	0.00	0.00	0.00	0.00	0.00	0.00	87.95
1/1/2044	0.00	0.00	0.00	0.00	0.00	0.00	88.01
1/1/2045	0.00	0.00	0.00	0.00	0.00	0.00	87.79
1/1/2046	0.00	0.00	0.00	0.00	0.00	0.00	88.00
1/1/2047	0.00	0.00	0.00	0.00	0.00	0.00	87.89
1/1/2048	0.00	0.00	0.00	0.00	0.00	0.00	87.95
1/1/2049	0.00	0.00	0.00	0.00	0.00	0.00	88.01
1/1/2050	0.00	0.00	0.00	0.00	0.00	0.00	87.79
1/1/2051	0.00	0.00	0.00	0.00	0.00	0.00	88.00
1/1/2052	0.00	0.00	0.00	0.00	0.00	0.00	87.89
1/1/2053	0.00	0.00	0.00	0.00	0.00	0.00	87.95
1/1/2054	0.00	0.00	0.00	0.00	0.00	0.00	88.01
1/1/2055	0.00	0.00	0.00	0.00	0.00	0.00	87.79
1/1/2056	0.00	0.00	0.00	0.00	0.00	0.00	88.00
1/1/2057	0.00	0.00	0.00	0.00	0.00	0.00	87.89
1/1/2058	0.00	0.00	0.00	0.00	0.00	0.00	87.95
1/1/2059	0.00	0.00	0.00	0.00	0.00	0.00	88.01
1/1/2060	0.00	0.00	0.00	0.00	0.00	0.00	87.79
1/1/2061	0.00	0.00	0.00	0.00	0.00	0.00	88.00
1/1/2062	0.00	0.00	0.00	0.00	0.00	0.00	87.89
1/1/2063	0.00	0.00	0.00	0.00	0.00	0.00	87.95
1/1/2064	0.00	0.00	0.00	0.00	0.00	0.00	88.01
1/1/2065	0.00	0.00	0.00	0.00	0.00	0.00	87.79
1/1/2066	0.00	0.00	0.00	0.00	0.00	0.00	88.00
1/1/2067	0.00	0.00	0.00	0.00	0.00	0.00	87.89
1/1/2068	0.00	0.00	0.00	0.00	0.00	0.00	87.95
1/1/2069	0.00	0.00	0.00	0.00	0.00	0.00	88.01

Table B6

50-Year Forecast of Annual Pumping Demands

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Well ID	MCSB_Well160_P27	3S4E-15G01_GHSA
Subbasin	Mission Creek	Garnet Hill
Agency	Private	Power Plant
Use		
Date	**Well160-P27_DHSSB**	**3S4E-15G01_GHSA**
1/1/2020	0.00	18.11
1/1/2021	0.00	11.69
1/1/2022	0.00	21.65
1/1/2023	0.00	10.46
1/1/2024	0.00	7.79
1/1/2025	0.00	18.11
1/1/2026	0.00	11.69
1/1/2027	0.00	21.65
1/1/2028	0.00	10.46
1/1/2029	0.00	7.79
1/1/2030	0.00	18.11
1/1/2031	0.00	11.69
1/1/2032	0.00	21.65
1/1/2033	0.00	10.46
1/1/2034	0.00	7.79
1/1/2035	0.00	18.11
1/1/2036	0.00	11.69
1/1/2037	0.00	21.65
1/1/2038	0.00	10.46
1/1/2039	0.00	7.79
1/1/2040	0.00	18.11
1/1/2041	0.00	11.69
1/1/2042	0.00	21.65
1/1/2043	0.00	10.46
1/1/2044	0.00	7.79
1/1/2045	0.00	18.11
1/1/2046	0.00	11.69
1/1/2047	0.00	21.65
1/1/2048	0.00	10.46
1/1/2049	0.00	7.79
1/1/2050	0.00	18.11
1/1/2051	0.00	11.69
1/1/2052	0.00	21.65
1/1/2053	0.00	10.46
1/1/2054	0.00	7.79
1/1/2055	0.00	18.11
1/1/2056	0.00	11.69
1/1/2057	0.00	21.65
1/1/2058	0.00	10.46
1/1/2059	0.00	7.79
1/1/2060	0.00	18.11
1/1/2061	0.00	11.69
1/1/2062	0.00	21.65
1/1/2063	0.00	10.46
1/1/2064	0.00	7.79
1/1/2065	0.00	18.11
1/1/2066	0.00	11.69
1/1/2067	0.00	21.65
1/1/2068	0.00	10.46
1/1/2069	0.00	7.79

Table B7
50-Year Forecast of Annual Return Flows
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Zone #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Date	No Flow Zone (AFY)	Whitewater Headwater (AFY)	Farm (AFY)	Farm (AFY)	Farm (AFY)	Whitewater Riverbed (AFY)	Equestrian Area (AFY)	Farm (AFY)	Farm (AFY)	MCSB Septic (AFY)	Unknown Septic (AFY)	Mission Lakes Golf Course (AFY)	Horton WWTP (AFY)	Hidden Springs Golf Course (AFY)	The Sands Golf Course (AFY)	House & Landscape (AFY)
2020	--	--	0.00	0.00	0.00	0.00	4.00	0.00	0.00	1,222.25	277.91	241.71	2,168.14	112.77	74.27	21.03
2021	--	--	0.00	0.00	0.00	0.00	4.48	0.00	0.00	1,232.34	278.67	256.33	2,162.22	115.77	109.39	21.09
2022	--	--	0.00	0.00	0.00	0.00	4.53	0.00	0.00	1,173.40	277.91	241.49	2,162.22	96.51	87.26	21.03
2023	--	--	0.00	0.00	0.00	0.00	6.50	0.00	0.00	1,182.93	277.91	243.13	1,847.12	101.99	99.29	21.03
2024	--	--	0.00	0.00	0.00	0.00	3.68	0.00	0.00	1,192.45	277.91	188.09	2,066.45	112.43	67.87	21.03
2025	--	--	0.00	0.00	0.00	0.00	4.00	0.00	0.00	1,201.98	277.91	241.71	2,274.49	112.77	74.27	21.03
2026	--	--	0.00	0.00	0.00	0.00	4.48	0.00	0.00	1,211.51	278.67	256.33	2,308.17	115.77	109.39	21.09
2027	--	--	0.00	0.00	0.00	0.00	4.53	0.00	0.00	1,185.12	277.91	241.49	2,341.86	96.51	87.26	21.03
2028	--	--	0.00	0.00	0.00	0.00	6.50	0.00	0.00	1,194.37	277.91	243.13	2,382.05	101.99	99.29	21.03
2029	--	--	0.00	0.00	0.00	0.00	3.68	0.00	0.00	1,203.61	277.91	188.09	2,409.22	112.43	67.87	21.03
2030	--	--	0.00	0.00	0.00	0.00	4.00	0.00	0.00	1,212.86	277.91	241.71	2,442.91	112.77	74.27	21.03
2031	--	--	0.00	0.00	0.00	0.00	4.48	0.00	0.00	1,222.11	278.67	256.33	2,454.13	115.77	109.39	21.09
2032	--	--	0.00	0.00	0.00	0.00	4.53	0.00	0.00	1,231.35	277.91	241.49	2,472.11	96.51	87.26	21.03
2033	--	--	0.00	0.00	0.00	0.00	6.50	0.00	0.00	1,240.60	277.91	243.13	2,476.59	101.99	99.29	21.03
2034	--	--	0.00	0.00	0.00	0.00	3.68	0.00	0.00	1,249.85	277.91	188.09	2,487.82	112.43	67.87	21.03
2035	--	--	0.00	0.00	0.00	0.00	4.00	0.00	0.00	1,259.09	277.91	241.71	2,499.04	112.77	74.27	21.03
2036	--	--	0.00	0.00	0.00	0.00	4.48	0.00	0.00	1,270.45	278.67	256.33	2,505.89	115.77	109.39	21.09
2037	--	--	0.00	0.00	0.00	0.00	4.53	0.00	0.00	1,281.81	277.91	241.49	2,499.04	96.51	87.26	21.03
2038	--	--	0.00	0.00	0.00	0.00	6.50	0.00	0.00	1,293.16	277.91	243.13	2,499.04	101.99	99.29	21.03
2039	--	--	0.00	0.00	0.00	0.00	3.68	0.00	0.00	1,304.52	277.91	188.09	2,499.04	112.43	67.87	21.03
2040	--	--	0.00	0.00	0.00	0.00	4.00	0.00	0.00	1,315.88	277.91	241.71	2,505.89	112.77	74.27	21.03
2041	--	--	0.00	0.00	0.00	0.00	4.48	0.00	0.00	1,327.23	278.67	256.33	2,499.04	115.77	109.39	21.09
2042	--	--	0.00	0.00	0.00	0.00	4.53	0.00	0.00	1,338.59	277.91	241.49	2,499.04	96.51	87.26	21.03
2043	--	--	0.00	0.00	0.00	0.00	6.50	0.00	0.00	1,349.95	277.91	243.13	2,499.04	101.99	99.29	21.03
2044	--	--	0.00	0.00	0.00	0.00	3.68	0.00	0.00	1,361.30	277.91	188.09	2,505.89	112.43	67.87	21.03
2045	--	--	0.00	0.00	0.00	0.00	4.00	0.00	0.00	1,372.66	277.91	241.71	2,499.04	112.77	74.27	21.03
2046	--	--	0.00	0.00	0.00	0.00	4.48	0.00	0.00	1,372.66	278.67	256.33	2,499.04	115.77	109.39	21.09
2047	--	--	0.00	0.00	0.00	0.00	4.53	0.00	0.00	1,372.66	277.91	241.49	2,499.04	96.51	87.26	21.03
2048	--	--	0.00	0.00	0.00	0.00	6.50	0.00	0.00	1,372.66	277.91	243.13	2,505.89	101.99	99.29	21.03
2049	--	--	0.00	0.00	0.00	0.00	3.68	0.00	0.00	1,372.66	277.91	188.09	2,499.04	112.43	67.87	21.03
2050	--	--	0.00	0.00	0.00	0.00	4.00	0.00	0.00	1,372.66	277.91	241.71	2,499.04	112.77	74.27	21.03
2051	--	--	0.00	0.00	0.00	0.00	4.48	0.00	0.00	1,372.66	278.67	256.33	2,499.04	115.77	109.39	21.09
2052	--	--	0.00	0.00	0.00	0.00	4.53	0.00	0.00	1,372.66	277.91	241.49	2,505.89	96.51	87.26	21.03
2053	--	--	0.00	0.00	0.00	0.00	6.50	0.00	0.00	1,372.66	277.91	243.13	2,499.04	101.99	99.29	21.03
2054	--	--	0.00	0.00	0.00	0.00	3.68	0.00	0.00	1,372.66	277.91	188.09	2,499.04	112.43	67.87	21.03
2055	--	--	0.00	0.00	0.00	0.00	4.00	0.00	0.00	1,372.66	277.91	241.71	2,499.04	112.77	74.27	21.03
2056	--	--	0.00	0.00	0.00	0.00	4.48	0.00	0.00	1,372.66	278.67	256.33	2,505.89	115.77	109.39	21.09
2057	--	--	0.00	0.00	0.00	0.00	4.53	0.00	0.00	1,372.66	277.91	241.49	2,499.04	96.51	87.26	21.03
2058	--	--	0.00	0.00	0.00	0.00	6.50	0.00	0.00	1,372.66	277.91	243.13	2,499.04	101.99	99.29	21.03
2059	--	--	0.00	0.00	0.00	0.00	3.68	0.00	0.00	1,372.66	277.91	188.09	2,499.04	112.43	67.87	21.03
2060	--	--	0.00	0.00	0.00	0.00	4.00	0.00	0.00	1,372.66	277.91	241.71	2,505.89	112.77	74.27	21.03
2061	--	--	0.00	0.00	0.00	0.00	4.48	0.00	0.00	1,372.66	278.67	256.33	2,499.04	115.77	109.39	21.09
2062	--	--	0.00	0.00	0.00	0.00	4.53	0.00	0.00	1,372.66	277.91	241.49	2,499.04	96.51	87.26	21.03
2063	--	--	0.00	0.00	0.00	0.00	6.50	0.00	0.00	1,372.66	277.91	243.13	2,499.04	101.99	99.29	21.03
2064	--	--	0.00	0.00	0.00	0.00	3.68	0.00	0.00	1,372.66	277.91	188.09	2,505.89	112.43	67.87	21.03
2065	--	--	0.00	0.00	0.00	0.00	4.00	0.00	0.00	1,372.66	277.91	241.71	2,499.04	112.77	74.27	21.03
2066	--	--	0.00	0.00	0.00	0.00	4.48	0.00	0.00	1,372.66	278.67	256.33	2,499.04	115.77	109.39	21.09
2067	--	--	0.00	0.00	0.00	0.00	4.53	0.00	0.00	1,372.66	277.91	241.49	2,499.04	96.51	87.26	21.03
2068	--	--	0.00	0.00	0.00	0.00	6.50	0.00	0.00	1,372.66	277.91	243.13	2,505.89	101.99	99.29	21.03
2069	--	--	0.00	0.00	0.00	0.00	3.68	0.00	0.00	1,372.66	277.91	188.09	2,499.04	112.43	67.87	21.03

1. AFY = acre-feet per year, MCSB = Mission Creek Subbasin, WWTP = wastewater treatment plant, and "--" = not available.

Table B7

50-Year Forecast of Annual Return Flows

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Zone #	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	House & Landscape	**Desert Dunes Golf Course**	**Mission Creek GRF**	**Too Many Palms Nursery**	**Pipeline**	**Overhill Booster Station**	**House & Landscape**	**House & Landscape**	**House & Landscape**	**Desert Springs Aquaculture**	**Ephemeral streambed**	**Nurseries**	**Water Tank**	**San Marcos Date Farm**	**KK&R Nursery**	**Irrigated grass**
Date	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**
2020	0.00	201.65	1,768.00	0.00	0.00	0.00	0.00	0.00	0.00	20.85	0.00	0.00	0.00	0.00	0.00	0.00
2021	0.00	212.64	476.00	0.00	0.00	0.00	0.00	0.00	0.00	15.33	0.00	0.00	0.00	0.00	0.00	0.00
2022	0.00	178.34	4,066.74	0.00	0.00	0.00	0.00	0.00	0.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00
2023	0.00	193.87	4,081.58	0.00	0.00	0.00	0.00	0.00	0.00	10.14	0.00	0.00	0.00	0.00	0.00	0.00
2024	0.00	157.94	5,654.89	0.00	0.00	0.00	0.00	0.00	0.00	13.91	0.00	0.00	0.00	0.00	0.00	0.00
2025	0.00	201.65	9,196.07	0.00	0.00	0.00	0.00	0.00	0.00	20.85	0.00	0.00	0.00	0.00	0.00	0.00
2026	0.00	212.64	6,694.70	0.00	0.00	0.00	0.00	0.00	0.00	15.33	0.00	0.00	0.00	0.00	0.00	0.00
2027	0.00	178.34	578.92	0.00	0.00	0.00	0.00	0.00	0.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00
2028	0.00	193.87	7,417.11	0.00	0.00	0.00	0.00	0.00	0.00	10.14	0.00	0.00	0.00	0.00	0.00	0.00
2029	0.00	157.94	8,820.15	0.00	0.00	0.00	0.00	0.00	0.00	13.91	0.00	0.00	0.00	0.00	0.00	0.00
2030	0.00	201.65	6,014.96	0.00	0.00	0.00	0.00	0.00	0.00	20.85	0.00	0.00	0.00	0.00	0.00	0.00
2031	0.00	212.64	6,191.15	0.00	0.00	0.00	0.00	0.00	0.00	15.33	0.00	0.00	0.00	0.00	0.00	0.00
2032	0.00	178.34	6,976.92	0.00	0.00	0.00	0.00	0.00	0.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00
2033	0.00	193.87	8,418.35	0.00	0.00	0.00	0.00	0.00	0.00	10.14	0.00	0.00	0.00	0.00	0.00	0.00
2034	0.00	157.94	6,469.32	0.00	0.00	0.00	0.00	0.00	0.00	13.91	0.00	0.00	0.00	0.00	0.00	0.00
2035	0.00	201.65	10,303.12	0.00	0.00	0.00	0.00	0.00	0.00	20.85	0.00	0.00	0.00	0.00	0.00	0.00
2036	0.00	212.64	10,743.31	0.00	0.00	0.00	0.00	0.00	0.00	15.33	0.00	0.00	0.00	0.00	0.00	0.00
2037	0.00	178.34	6,588.96	0.00	0.00	0.00	0.00	0.00	0.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00
2038	0.00	193.87	1,710.26	0.00	0.00	0.00	0.00	0.00	0.00	10.14	0.00	0.00	0.00	0.00	0.00	0.00
2039	0.00	157.94	9,212.25	0.00	0.00	0.00	0.00	0.00	0.00	13.91	0.00	0.00	0.00	0.00	0.00	0.00
2040	0.00	201.65	3,731.58	0.00	0.00	0.00	0.00	0.00	0.00	20.85	0.00	0.00	0.00	0.00	0.00	0.00
2041	0.00	212.64	6,996.91	0.00	0.00	0.00	0.00	0.00	0.00	15.33	0.00	0.00	0.00	0.00	0.00	0.00
2042	0.00	178.34	4,547.91	0.00	0.00	0.00	0.00	0.00	0.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00
2043	0.00	193.87	17,413.50	0.00	0.00	0.00	0.00	0.00	0.00	10.14	0.00	0.00	0.00	0.00	0.00	0.00
2044	0.00	157.94	8,669.37	0.00	0.00	0.00	0.00	0.00	0.00	13.91	0.00	0.00	0.00	0.00	0.00	0.00
2045	0.00	201.65	8,882.28	0.00	0.00	0.00	0.00	0.00	0.00	20.85	0.00	0.00	0.00	0.00	0.00	0.00
2046	0.00	212.64	7,762.89	0.00	0.00	0.00	0.00	0.00	0.00	15.33	0.00	0.00	0.00	0.00	0.00	0.00
2047	0.00	178.34	7,853.12	0.00	0.00	0.00	0.00	0.00	0.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00
2048	0.00	193.87	9,188.13	0.00	0.00	0.00	0.00	0.00	0.00	10.14	0.00	0.00	0.00	0.00	0.00	0.00
2049	0.00	157.94	9,137.93	0.00	0.00	0.00	0.00	0.00	0.00	13.91	0.00	0.00	0.00	0.00	0.00	0.00
2050	0.00	201.65	10,407.35	0.00	0.00	0.00	0.00	0.00	0.00	20.85	0.00	0.00	0.00	0.00	0.00	0.00
2051	0.00	212.64	5,295.12	0.00	0.00	0.00	0.00	0.00	0.00	15.33	0.00	0.00	0.00	0.00	0.00	0.00
2052	0.00	178.34	6,019.26	0.00	0.00	0.00	0.00	0.00	0.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00
2053	0.00	193.87	11,688.76	0.00	0.00	0.00	0.00	0.00	0.00	10.14	0.00	0.00	0.00	0.00	0.00	0.00
2054	0.00	157.94	9,413.87	0.00	0.00	0.00	0.00	0.00	0.00	13.91	0.00	0.00	0.00	0.00	0.00	0.00
2055	0.00	201.65	11,859.05	0.00	0.00	0.00	0.00	0.00	0.00	20.85	0.00	0.00	0.00	0.00	0.00	0.00
2056	0.00	212.64	13,176.73	0.00	0.00	0.00	0.00	0.00	0.00	15.33	0.00	0.00	0.00	0.00	0.00	0.00
2057	0.00	178.34	7,906.04	0.00	0.00	0.00	0.00	0.00	0.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00
2058	0.00	193.87	4,611.85	0.00	0.00	0.00	0.00	0.00	0.00	10.14	0.00	0.00	0.00	0.00	0.00	0.00
2059	0.00	157.94	5,270.69	0.00	0.00	0.00	0.00	0.00	0.00	13.91	0.00	0.00	0.00	0.00	0.00	0.00
2060	0.00	201.65	9,111.57	0.00	0.00	0.00	0.00	0.00	0.00	20.85	0.00	0.00	0.00	0.00	0.00	0.00
2061	0.00	212.64	14,578.51	0.00	0.00	0.00	0.00	0.00	0.00	15.33	0.00	0.00	0.00	0.00	0.00	0.00
2062	0.00	178.34	11,845.04	0.00	0.00	0.00	0.00	0.00	0.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00
2063	0.00	193.87	6,378.10	0.00	0.00	0.00	0.00	0.00	0.00	10.14	0.00	0.00	0.00	0.00	0.00	0.00
2064	0.00	157.94	911.16	0.00	0.00	0.00	0.00	0.00	0.00	13.91	0.00	0.00	0.00	0.00	0.00	0.00
2065	0.00	201.65	3,114.50	0.00	0.00	0.00	0.00	0.00	0.00	20.85	0.00	0.00	0.00	0.00	0.00	0.00
2066	0.00	212.64	9,343.50	0.00	0.00	0.00	0.00	0.00	0.00	15.33	0.00	0.00	0.00	0.00	0.00	0.00
2067	0.00	178.34	13,236.62	0.00	0.00	0.00	0.00	0.00	0.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00
2068	0.00	193.87	5,450.37	0.00	0.00	0.00	0.00	0.00	0.00	10.14	0.00	0.00	0.00	0.00	0.00	0.00
2069	0.00	157.94	11,679.37	0.00	0.00	0.00	0.00	0.00	0.00	13.91	0.00	0.00	0.00	0.00	0.00	0.00

1. AFY = acre-feet per year, MCSB = Mission Creek Subbasin, WWTP = wastewater treatment plant, and "--" = not available.

Table B7
50-Year Forecast of Annual Return Flows
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Zone #	33	34	35	36	37	38	39	40	41	42	43	44	45
	Small Nursery	**Ranch Estate Glamping**	**Desert Crest WWTP**	**BlueBeyond (Fish farm)**	**MCSB Sewer Municipal Outdoor**	**DHS Septic Municipal Outdoor**	**DHS Septic Municipal Outdoor**	**Upper Sky Valley Septic**	**Lower Sky Valley Septic**	**Unknown Septic A**	**Unknown Septic B**	**Regional WWTP**	**Commercial area next to Regional WWTP (pending data)**
Date	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**	**(AFY)**
2020	32.01	0.00	43.07	47.47	214.03	968.56	410.07	388.48	646.48	77.10	25.66	0.00	0.00
2021	32.10	0.00	40.45	46.91	218.07	976.25	418.52	389.48	650.44	77.28	25.72	0.00	0.00
2022	32.01	0.00	48.34	51.43	252.95	983.95	426.98	390.48	654.41	77.18	25.68	0.00	0.00
2023	32.01	0.00	51.11	47.42	257.54	886.57	445.21	391.48	658.37	77.24	25.70	325.96	0.00
2024	32.01	0.00	49.13	52.52	262.14	894.08	453.86	392.48	662.33	77.29	25.72	635.55	0.00
2025	32.01	0.00	43.07	47.47	266.73	755.00	492.99	393.48	666.29	77.10	25.66	941.67	0.00
2026	32.10	0.00	40.45	46.91	271.33	761.93	502.21	394.48	670.25	77.28	25.72	1,064.81	0.00
2027	32.01	0.00	48.34	51.43	292.75	634.65	543.05	395.49	674.21	77.18	25.68	1,187.95	0.00
2028	32.01	0.00	51.11	47.42	297.62	641.01	552.84	396.49	678.17	77.24	25.70	1,314.68	0.00
2029	32.01	0.00	49.13	52.52	302.50	580.46	589.93	397.49	682.13	77.29	25.72	1,434.23	0.00
2030	32.01	0.00	43.07	47.47	307.37	586.35	600.19	398.49	686.09	77.10	25.66	1,557.37	0.00
2031	32.10	0.00	40.45	46.91	312.25	472.72	627.40	399.49	690.05	77.28	25.72	1,680.52	0.00
2032	32.01	0.00	48.34	51.43	317.12	478.33	637.95	400.49	694.01	77.18	25.68	1,808.60	0.00
2033	32.01	0.00	51.11	47.42	322.00	483.93	648.49	401.49	697.97	77.24	25.70	1,926.80	0.00
2034	32.01	0.00	49.13	52.52	326.88	489.54	659.03	402.49	701.94	77.29	25.72	2,049.94	0.00
2035	32.01	0.00	43.07	47.47	331.75	456.07	693.70	403.49	705.90	77.10	25.66	2,173.08	0.00
2036	32.10	0.00	40.45	46.91	337.74	461.03	704.07	403.49	708.40	77.28	25.72	2,287.99	0.00
2037	32.01	0.00	48.34	51.43	343.73	465.98	714.43	403.48	710.91	77.18	25.68	2,390.39	0.00
2038	32.01	0.00	51.11	47.42	349.72	470.94	724.79	403.47	713.42	77.24	25.70	2,499.04	0.00
2039	32.01	0.00	49.13	52.52	355.70	475.90	735.16	403.46	715.92	77.29	25.72	2,607.70	0.00
2040	32.01	0.00	43.07	47.47	361.69	480.85	745.52	403.45	718.43	77.10	25.66	2,723.79	0.00
2041	32.10	0.00	40.45	46.91	367.68	485.81	755.88	403.45	720.94	77.28	25.72	2,825.01	0.00
2042	32.01	0.00	48.34	51.43	373.67	490.77	766.25	403.44	723.44	77.18	25.68	2,933.66	0.00
2043	32.01	0.00	51.11	47.42	379.66	495.72	776.61	403.43	725.95	77.24	25.70	3,042.31	0.00
2044	32.01	0.00	49.13	52.52	385.64	500.68	786.97	403.42	728.46	77.29	25.72	3,159.60	0.00
2045	32.01	0.00	43.07	47.47	391.63	505.63	797.34	403.41	730.96	77.10	25.66	3,259.62	0.00
2046	32.10	0.00	40.45	46.91	391.63	505.63	797.34	403.41	730.96	77.28	25.72	3,259.62	0.00
2047	32.01	0.00	48.34	51.43	391.63	505.63	797.34	403.41	730.96	77.18	25.68	3,259.62	0.00
2048	32.01	0.00	51.11	47.42	391.63	505.63	797.34	403.41	730.96	77.24	25.70	3,268.55	0.00
2049	32.01	0.00	49.13	52.52	391.63	505.63	797.34	403.41	730.96	77.29	25.72	3,259.62	0.00
2050	32.01	0.00	43.07	47.47	391.63	505.63	797.34	403.41	730.96	77.10	25.66	3,259.62	0.00
2051	32.10	0.00	40.45	46.91	391.63	505.63	797.34	403.41	730.96	77.28	25.72	3,259.62	0.00
2052	32.01	0.00	48.34	51.43	391.63	505.63	797.34	403.41	730.96	77.18	25.68	3,268.55	0.00
2053	32.01	0.00	51.11	47.42	391.63	505.63	797.34	403.41	730.96	77.24	25.70	3,259.62	0.00
2054	32.01	0.00	49.13	52.52	391.63	505.63	797.34	403.41	730.96	77.29	25.72	3,259.62	0.00
2055	32.01	0.00	43.07	47.47	391.63	505.63	797.34	403.41	730.96	77.10	25.66	3,259.62	0.00
2056	32.10	0.00	40.45	46.91	391.63	505.63	797.34	403.41	730.96	77.28	25.72	3,268.55	0.00
2057	32.01	0.00	48.34	51.43	391.63	505.63	797.34	403.41	730.96	77.18	25.68	3,259.62	0.00
2058	32.01	0.00	51.11	47.42	391.63	505.63	797.34	403.41	730.96	77.24	25.70	3,259.62	0.00
2059	32.01	0.00	49.13	52.52	391.63	505.63	797.34	403.41	730.96	77.29	25.72	3,259.62	0.00
2060	32.01	0.00	43.07	47.47	391.63	505.63	797.34	403.41	730.96	77.10	25.66	3,268.55	0.00
2061	32.10	0.00	40.45	46.91	391.63	505.63	797.34	403.41	730.96	77.28	25.72	3,259.62	0.00
2062	32.01	0.00	48.34	51.43	391.63	505.63	797.34	403.41	730.96	77.18	25.68	3,259.62	0.00
2063	32.01	0.00	51.11	47.42	391.63	505.63	797.34	403.41	730.96	77.24	25.70	3,259.62	0.00
2064	32.01	0.00	49.13	52.52	391.63	505.63	797.34	403.41	730.96	77.29	25.72	3,268.55	0.00
2065	32.01	0.00	43.07	47.47	391.63	505.63	797.34	403.41	730.96	77.10	25.66	3,259.62	0.00
2066	32.10	0.00	40.45	46.91	391.63	505.63	797.34	403.41	730.96	77.28	25.72	3,259.62	0.00
2067	32.01	0.00	48.34	51.43	391.63	505.63	797.34	403.41	730.96	77.18	25.68	3,259.62	0.00
2068	32.01	0.00	51.11	47.42	391.63	505.63	797.34	403.41	730.96	77.24	25.70	3,268.55	0.00
2069	32.01	0.00	49.13	52.52	391.63	505.63	797.34	403.41	730.96	77.29	25.72	3,259.62	0.00

1. AFY = acre-feet per year, MCSB = Mission Creek Subbasin, WWTP = wastewater treatment plant, and "--" = not available.

Table B8

Annual Mountain Front Recharge with Climate Change by Watershed[1]

Misson Creek Subbasin Groundwater Model Update

Riverside County, California

SP	Forecast Year	Analog Year	Whitewater River[2] (AFY)	MCSB Total[3] (AFY)	Reach 51 MissionCreekGage (AFY)	Reach 52 ChinoCanyon (AFY)	Reach 53 GarnetWash (AFY)	Reach 54 BigMorongoCreek (AFY)	DHSSB Total[4] (AFY)	Reach 55 LittleMorongoCreek (AFY)	Reach 56 MorongoWash (AFY)	Reach 57 LongCanyon (AFY)	Reach 58 EastWideCanyon (AFY)	Reach 59 1kPalmCanyon (AFY)	Reach 60 FanCanyon (AFY)	Reach 61 PushawallaCanyon (AFY)	Reach 62 BerdooCanyon (AFY)	Total (AFY)	Cumulative (AFY)
1	2020	1970	11,014.45	19,525.95	19,518.87	2.45	2.45	2.18	8.68	0.61	2.45	2.46	2.45	1.84	1.84	1.84	1.84	30,549.08	30,549.08
2	2021	1971	3,582.13	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	3,606.77	34,155.85
3	2022	1972	3,480.74	7,530.03	6,733.86	3.27	3.27	789.64	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	11,022.34	45,178.19
4	2023	1973	1,442.07	13.06	3.27	3.26	3.26	3.26	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	1,466.70	46,644.89
5	2024	1974	705.79	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	730.43	47,375.32
6	2025	1975	1,650.71	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	1,675.35	49,050.67
7	2026	1976	2,011.86	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	2,036.50	51,087.17
8	2027	1977	2,754.26	13.06	3.27	3.26	3.26	3.26	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	2,778.89	53,866.07
9	2028	1978	5,188.36	5,047.66	5,037.86	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	10,247.60	64,113.66
10	2029	1979	7,363.68	9,561.17	6,925.61	120.94	250.19	2,264.43	4,882.09	767.28	576.92	919.08	593.82	432.69	518.86	420.02	373.92	21,806.94	85,920.60
11	2030	1980	1,887.84	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	1,912.49	87,833.09
12	2031	1981	5,506.00	2,340.33	2,330.53	3.26	3.26	3.26	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	7,857.90	95,690.99
13	2032	1982	4,185.14	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	4,209.78	99,900.77
14	2033	1983	4,730.92	1,779.61	1,769.81	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	6,522.10	106,422.87
15	2034	1984	15,571.15	31,753.20	25,381.39	185.92	344.60	5,841.29	10,210.08	1,203.09	676.00	3,039.65	3,324.77	556.59	658.86	2.45	279.83	57,534.43	163,957.31
16	2035	1985	7,479.32	2,614.03	2,604.24	3.26	3.26	3.26	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	10,104.92	174,062.22
17	2036	1986	1,212.44	1,153.99	1,144.19	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	2,378.00	176,440.22
18	2037	1987	617.55	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	642.19	177,082.42
19	2038	1988	5,137.32	730.48	720.67	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	5,879.37	182,961.78
20	2039	1989	3,789.93	768.07	758.28	3.26	3.26	3.26	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	4,569.58	187,531.36
21	2040	1990	5,593.35	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	5,617.99	193,149.35
22	2041	1991	17,091.15	21,509.33	17,891.44	66.91	133.23	3,417.74	3,225.69	326.03	3.27	1,184.28	1,457.00	370.64	391.71	2.45	2.45	41,826.17	234,975.52
23	2042	1992	10,380.21	3,433.74	3,423.94	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	13,825.53	248,801.04
24	2043	1993	14,770.94	4,934.93	4,925.13	3.26	3.26	3.26	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	19,717.43	268,518.47
25	2044	1994	16,814.49	29,866.62	24,844.61	3.27	94.80	4,923.94	5,149.09	939.66	237.16	849.57	614.02	2.45	2.45	2.45	2.45	51,830.19	320,348.67
26	2045	1995	16,768.55	29,866.62	24,844.61	3.27	94.80	4,923.94	5,149.09	939.66	237.16	849.57	614.02	2.45	2.45	2.45	2.45	51,784.25	372,132.92
27	2046	1996	14,749.15	4,934.93	4,925.13	3.26	3.26	3.26	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	19,695.65	391,828.57
28	2047	1997	10,075.21	3,433.74	3,423.94	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	13,520.52	405,349.09
29	2048	1998	17,137.98	21,509.33	17,891.44	66.91	133.23	3,417.74	3,225.69	326.03	3.27	1,184.28	1,457.00	370.64	391.71	2.45	2.45	41,872.99	447,222.08
30	2049	1999	5,578.06	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	5,602.71	452,824.79
31	2050	2000	3,789.93	768.07	758.28	3.26	3.26	3.26	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	4,569.58	457,394.37
32	2051	2001	5,137.32	730.48	720.67	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	5,879.37	463,273.73
33	2052	2002	619.24	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	643.89	463,917.62
34	2053	2003	1,209.13	1,153.99	1,144.19	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	2,374.69	466,292.30
35	2054	2004	7,479.32	2,614.03	2,604.24	3.26	3.26	3.26	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	10,104.92	476,397.22
36	2055	2005	15,571.15	31,753.20	25,381.39	185.92	344.60	5,841.29	10,210.08	1,203.09	676.00	3,039.65	3,324.77	556.59	658.86	2.45	279.83	57,534.43	533,931.65
37	2056	2006	4,743.88	1,779.61	1,769.81	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	6,535.07	540,466.72
38	2057	2007	4,173.70	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	4,198.35	544,665.07
39	2058	2008	5,506.00	2,340.33	2,330.53	3.26	3.26	3.26	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	7,857.90	552,522.97
40	2059	2009	1,887.84	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	1,912.49	554,435.45
41	2060	2010	7,383.86	9,561.17	6,925.61	120.94	250.19	2,264.43	4,882.09	767.28	576.92	919.08	593.82	432.69	518.86	420.02	373.92	21,827.11	576,262.57
42	2061	2011	5,174.19	5,047.66	5,037.86	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	10,233.42	586,495.99
43	2062	2012	2,754.26	13.06	3.27	3.26	3.26	3.26	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	2,778.89	589,274.88
44	2063	2013	2,011.86	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	2,036.50	591,311.38
45	2064	2014	1,655.23	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	1,679.88	592,991.26
46	2065	2015	703.86	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	728.50	593,719.76
47	2066	2016	1,442.07	13.06	3.27	3.26	3.26	3.26	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	1,466.70	595,186.46

Table B8

Annual Mountain Front Recharge with Climate Change by Watershed[1]

Misson Creek Subbasin Groundwater Model Update

Riverside County, California

SP	Forecast Year	Analog Year	Whitewater River[2] (AFY)	MCSB Total[3] (AFY)	Reach 51 MissionCreekGage (AFY)	Reach 52 ChinoCanyon (AFY)	Reach 53 GarnetWash (AFY)	Reach 54 BigMorongoCreek (AFY)	DHSSB Total[4] (AFY)	Reach 55 LittleMorongoCreek (AFY)	Reach 56 MorongoWash (AFY)	Reach 57 LongCanyon (AFY)	Reach 58 EastWideCanyon (AFY)	Reach 59 1kPalmCanyon (AFY)	Reach 60 FanCanyon (AFY)	Reach 61 PushawallaCanyon (AFY)	Reach 62 BerdooCanyon (AFY)	Total (AFY)	Cumulative (AFY)
48	2067	2017	3,020.72	7,530.03	6,733.86	3.27	3.27	789.64	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	10,562.32	605,748.78
49	2068	2018	2,577.80	13.07	3.27	3.27	3.27	3.27	11.57	0.82	3.27	3.28	3.27	2.45	2.45	2.45	2.45	2,602.44	608,351.22
50	2069	2019	9,110.76	19,525.95	19,518.87	2.45	2.45	2.18	8.68	0.61	2.45	2.46	2.45	1.84	1.84	1.84	1.84	28,645.38	636,996.60
Average 1936-2019			8,363.55	7,081.22	5,554.29	42.48	98.36	1,386.09	2,514.55	766.10	376.04	933.40	864.26	362.01	482.79	348.53	334.83	19,145.70	762,391.27
Average 1978-2019			6,609.07	6,148.22	5,281.28	20.58	41.81	804.55	1,126.77	154.75	73.74	287.99	287.85	66.84	76.82	22.32	33.33	13,884.06	380,159.61
Average 2020-2069			6,084.46	5,707.19	4,961.72	17.79	35.62	692.05	948.28	130.12	62.45	242.42	242.30	56.53	64.91	19.13	28.38	12,739.93	326,492.22

Notes

1. BCM = Basin Characterization Model, AFY = acre-feet per year, MCSB = Mission Creek Subbasin, and DHSSB = Desert Hot Springs Subbasin.
2. Whitewater River recharge extracted from Indio Subbasin Dry-Cycle Forecast model
3. MCSB Total = Sum of Reaches 51 through 54 in Mission Creek Subbasin.
4. DHSSB Total = Sum of Reached 55 through 62 in Desert Hot Springs Subbasin.

Table B9

Simulated MCSB Baseline Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	Natural Recharge	Underflow From Desert Hot Sprriongs Subbasin	Artificial Recharge	Wastewater Return	Return Flows[1]	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2009	13	1,291	4,090	1,409	3,100	9,903	-15,623	-884	-1,629	-588	-18,724	-8,821	0
2010	9,561	1,287	33,209	1,287	2,356	47,700	-14,818	-879	-1,670	-593	-17,959	29,742	29,742
2011	5,048	1,237	26,237	1,394	2,505	36,420	-14,824	-882	-1,763	-591	-18,060	18,360	48,102
2012	13	1,150	23,406	1,498	2,505	28,572	-14,904	-895	-1,806	-618	-18,224	10,348	58,450
2013	13	1,128	2,379	1,605	2,930	8,054	-15,293	-906	-1,780	-635	-18,614	-10,560	47,890
2014	13	1,133	4,323	1,715	2,799	9,984	-14,785	-916	-1,757	-631	-18,090	-8,106	39,784
2015	13	1,134	171	1,880	2,777	5,975	-13,530	-925	-1,768	-635	-16,858	-10,883	28,900
2016	13	1,147	0	1,866	2,862	5,888	-13,736	-937	-1,755	-654	-17,082	-11,194	17,707
2017	7,530	1,154	9,248	1,970	2,488	22,390	-14,049	-940	-1,714	-665	-17,367	5,024	22,731
2018	13	1,149	2,026	2,045	2,523	7,758	-14,391	-943	-1,703	-668	-17,705	-9,947	12,783
2019	19,526	1,147	5,390	2,132	2,210	30,406	-13,636	-949	-1,720	-666	-16,970	13,436	26,219
2020	199	1,153	1,768	2,280	2,300	7,700	-15,321	-950	-1,644	-655	-18,572	-10,872	15,347
2021	918	1,177	476	2,271	2,464	7,305	-15,646	-944	-1,601	-658	-18,848	-11,543	3,804
2022	13	1,175	4,067	2,279	2,458	9,991	-15,513	-938	-1,566	-659	-18,677	-8,686	-4,882
2023	5,088	1,165	4,082	1,957	2,924	15,215	-15,845	-933	-1,522	-655	-18,955	-3,740	-8,622
2024	3,378	1,182	5,655	2,181	2,755	15,152	-15,749	-929	-1,498	-645	-18,822	-3,670	-12,291
2025	13	1,172	9,196	2,389	2,711	15,481	-16,423	-920	-1,450	-628	-19,420	-3,939	-16,231
2026	4,808	1,237	6,695	2,421	2,834	17,995	-16,747	-913	-1,425	-624	-19,708	-1,714	-17,944
2027	1,831	1,238	579	2,464	2,718	8,830	-16,613	-907	-1,394	-623	-19,537	-10,707	-28,651
2028	42,473	1,517	7,417	2,508	2,722	56,637	-16,945	-903	-1,358	-620	-19,826	36,810	8,159
2029	21,547	1,615	8,820	2,534	2,656	37,172	-16,849	-895	-1,337	-608	-19,689	17,483	25,642
2030	53,526	1,837	6,015	2,563	2,696	66,637	-17,523	-889	-1,297	-594	-20,303	46,335	71,976
2031	1,558	1,611	6,191	2,572	2,747	14,680	-17,847	-882	-1,248	-592	-20,570	-5,890	66,087
2032	5,188	1,449	6,977	2,598	2,666	18,879	-17,715	-878	-1,203	-593	-20,389	-1,510	64,577
2033	35,903	1,454	8,418	2,606	2,707	51,088	-18,047	-868	-1,145	-587	-20,646	30,443	95,019
2034	13	1,401	6,469	2,615	2,658	13,158	-17,951	-861	-1,102	-577	-20,491	-7,333	87,686
2035	1,689	1,362	10,303	2,621	2,721	18,696	-18,625	-853	-1,038	-563	-21,079	-2,382	85,304
2036	4,897	1,345	10,743	2,625	2,777	22,387	-18,966	-846	-999	-563	-21,374	1,013	86,317
2037	13	1,325	6,589	2,626	2,723	13,276	-18,850	-837	-959	-562	-21,207	-7,930	78,387
2038	1,431	1,320	1,710	2,629	2,769	9,860	-19,200	-829	-900	-558	-21,487	-11,627	66,760
2039	13	1,315	9,212	2,627	2,732	15,899	-19,122	-820	-858	-549	-21,349	-5,450	61,310

Table B9

Simulated MCSB Baseline Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	Natural Recharge	Underflow From Desert Hot Spriongs Subbasin	Artificial Recharge	Wastewater Return	Return Flows[1]	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2040	13	1,322	3,732	2,628	2,800	10,495	-19,813	-811	-809	-536	-21,969	-11,474	49,836
2041	5,923	1,325	6,997	2,618	2,871	19,734	-19,908	-797	-781	-531	-22,017	-2,284	47,552
2042	6,304	1,327	4,548	2,626	2,809	17,614	-19,767	-786	-760	-529	-21,841	-4,227	43,325
2043	18,951	1,449	17,413	2,629	2,855	43,298	-20,111	-775	-738	-522	-22,147	21,151	64,476
2044	4,711	1,422	8,669	2,634	2,811	20,248	-19,974	-769	-746	-513	-22,002	-1,755	62,721
2045	29,867	1,442	8,882	2,621	2,894	45,705	-20,650	-758	-700	-499	-22,607	23,099	85,820
2046	4,935	1,413	7,763	2,618	2,955	19,684	-20,858	-748	-662	-497	-22,766	-3,082	82,738
2047	3,434	1,381	7,853	2,626	2,885	18,179	-20,480	-740	-636	-588	-22,444	-4,264	78,474
2048	21,510	1,392	9,188	2,636	2,915	37,641	-20,586	-734	-604	-593	-22,517	15,123	93,597
2049	13	1,368	9,138	2,627	2,875	16,021	-20,211	-726	-588	-591	-22,116	-6,095	87,502
2050	768	1,355	10,407	2,621	2,940	18,092	-20,649	-719	-554	-618	-22,540	-4,449	83,054
2051	731	1,353	5,295	2,618	2,993	12,990	-20,857	-712	-522	-635	-22,726	-9,736	73,317
2052	13	1,357	6,019	2,633	2,914	12,936	-20,479	-707	-503	-631	-22,320	-9,383	63,934
2053	1,154	1,348	11,689	2,629	2,956	19,776	-20,586	-699	-477	-635	-22,397	-2,621	61,313
2054	2,614	1,336	9,414	2,627	2,908	18,899	-20,210	-695	-484	-654	-22,043	-3,144	58,168
2055	31,753	1,413	11,859	2,621	2,972	50,618	-20,648	-690	-471	-665	-22,474	28,144	86,313
2056	1,780	1,387	13,177	2,625	3,017	21,986	-20,856	-688	-469	-668	-22,681	-695	85,618
2057	13	1,344	7,906	2,626	2,952	14,841	-20,477	-684	-470	-666	-22,297	-7,456	78,162
2058	2,340	1,335	4,612	2,629	2,986	13,903	-20,584	-683	-445	-655	-22,366	-8,463	69,698
2059	13	1,332	5,271	2,627	2,938	12,181	-20,210	-681	-432	-654	-21,978	-9,797	59,902
2060	9,561	1,392	9,112	2,628	2,992	25,685	-20,649	-679	-409	-653	-22,390	3,295	63,197
2061	5,048	1,371	14,579	2,618	3,047	26,662	-20,856	-673	-400	-647	-22,577	4,086	67,282
2062	13	1,337	11,845	2,626	2,970	18,791	-20,476	-671	-419	-637	-22,203	-3,411	63,871
2063	13	1,323	6,378	2,629	3,000	13,344	-20,584	-671	-410	-620	-22,285	-8,941	54,930
2064	13	1,324	911	2,634	2,941	7,823	-20,210	-672	-404	-617	-21,903	-14,080	40,850
2065	13	1,335	3,114	2,621	3,007	10,091	-20,649	-667	-361	-618	-22,295	-12,204	28,646
2066	13	1,343	9,343	2,618	3,054	16,372	-20,858	-662	-340	-616	-22,474	-6,103	22,543
2067	7,530	1,334	13,237	2,626	2,976	27,704	-20,477	-657	-355	-605	-22,095	5,609	28,152
2068	13	1,328	5,450	2,636	2,999	12,426	-20,584	-656	-359	-593	-22,192	-9,766	18,386

Table B9

Simulated MCSB Baseline Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	**Natural Recharge**	**Underflow From Desert Hot Sprions Subbasin**	**Artificial Recharge**	**Wastewater Return**	**Return Flows[1]**	**Total Inflow**	**Pumping**	**Evapo-transpiration**	**Underflow to Garnet Hill**	**Underflow to Indio Hills[2]**	**Total Outflow**	**Change in Storage (AFY)**	**Cumulative Change in Storage (AF)**
2069	19,526	1,314	11,679	2,627	2,952	38,099	-20,209	-653	-369	-592	-21,822	16,276	34,662
Average[3] 2020-2045	9,630	1,360	6,600	2,500	2,720	22,810	-17,910	-870	-1,160	-590	-20,520	2,290	
Min[3] 2020-2045	10	1,150	480	1,960	2,300	7,300	-20,650	-950	-1,640	-660	-22,610	-11,630	
Max[3] 2020-2045	53,530	1,840	17,410	2,630	2,920	66,640	-15,320	-760	-700	-500	-18,570	46,330	
Average[3] 2009-2069	6,640	1,320	7,990	2,410	2,800	21,160	-18,340	-810	-990	-610	-20,740	420	
Min[3] 2009-2069	10	1,130	0	1,290	2,210	5,890	-20,860	-950	-1,810	-670	-22,770	-14,080	
Max[3] 2009-2069	53,530	1,840	33,210	2,640	3,100	66,640	-13,530	-650	-340	-500	-16,860	46,330	

Notes
1. Septic Return and Applied Water Return.
2. Underflow to Indio Hills East and Indio Hills West.
3. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre feet
AFY = acre feet per year

Table B10

Simulated MCSB Baseline with Climate Change Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	Natural Recharge	Underflow From Desert Hot Spriongs Subbasin	Artificial Recharge	Wastewater Return	Other Return Flows[1]	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2009	13	1,291	4,090	1,409	3,100	9,903	-15,623	-884	-1,629	-588	-18,724	-8,821	0
2010	9,561	1,287	33,209	1,287	2,356	47,700	-14,818	-879	-1,670	-593	-17,959	29,742	29,742
2011	5,048	1,237	26,237	1,394	2,505	36,420	-14,824	-882	-1,763	-591	-18,060	18,360	48,102
2012	13	1,150	23,406	1,498	2,505	28,572	-14,904	-895	-1,806	-618	-18,224	10,348	58,450
2013	13	1,128	2,379	1,605	2,930	8,054	-15,293	-906	-1,780	-635	-18,614	-10,560	47,890
2014	13	1,133	4,323	1,715	2,799	9,984	-14,785	-916	-1,757	-631	-18,090	-8,106	39,784
2015	13	1,134	171	1,880	2,777	5,975	-13,530	-925	-1,768	-635	-16,858	-10,883	28,900
2016	13	1,147	0	1,866	2,862	5,888	-13,736	-937	-1,755	-654	-17,082	-11,194	17,707
2017	7,530	1,154	9,248	1,970	2,488	22,390	-14,049	-940	-1,714	-665	-17,367	5,024	22,731
2018	13	1,149	2,026	2,045	2,523	7,758	-14,391	-943	-1,703	-668	-17,705	-9,947	12,783
2019	19,526	1,147	5,390	2,132	2,210	30,406	-13,636	-949	-1,720	-666	-16,970	13,436	26,219
2020	19,526	1,158	1,768	2,280	2,202	26,933	-15,322	-950	-1,642	-655	-18,569	8,364	34,583
2021	13	1,163	476	2,271	2,262	6,186	-15,646	-943	-1,594	-658	-18,841	-12,656	21,928
2022	7,530	1,167	4,067	2,279	2,159	17,202	-15,514	-937	-1,558	-659	-18,668	-1,466	20,461
2023	13	1,165	4,082	1,957	2,212	9,429	-15,845	-929	-1,506	-655	-18,936	-9,507	10,954
2024	13	1,162	5,655	2,181	2,164	11,175	-15,750	-923	-1,484	-645	-18,803	-7,628	3,326
2025	13	1,157	9,165	2,389	2,231	14,955	-16,423	-912	-1,444	-628	-19,407	-4,452	-1,126
2026	13	1,152	6,672	2,421	2,290	12,548	-16,747	-903	-1,422	-624	-19,696	-7,148	-8,273
2027	13	1,148	577	2,464	2,205	6,407	-16,614	-894	-1,395	-623	-19,526	-13,119	-21,393
2028	5,048	1,148	7,392	2,508	2,247	18,342	-16,946	-888	-1,358	-620	-19,812	-1,469	-22,862
2029	9,561	1,182	8,790	2,534	2,204	24,272	-16,850	-876	-1,337	-608	-19,672	4,600	-18,262
2030	13	1,170	5,974	2,563	2,277	11,997	-17,524	-867	-1,301	-594	-20,287	-8,290	-26,552
2031	2,340	1,152	6,149	2,572	2,337	14,550	-17,848	-857	-1,270	-592	-20,566	-6,016	-32,568
2032	13	1,146	6,930	2,598	2,272	12,959	-17,715	-849	-1,251	-593	-20,408	-7,449	-40,017
2033	1,780	1,133	8,362	2,606	2,314	16,194	-18,047	-837	-1,213	-587	-20,683	-4,489	-44,506
2034	31,753	1,200	6,426	2,615	2,272	44,266	-17,951	-827	-1,194	-577	-20,550	23,717	-20,789
2035	2,614	1,180	10,199	2,621	2,346	18,960	-18,625	-817	-1,153	-563	-21,158	-2,198	-22,987
2036	1,154	1,148	10,647	2,625	2,409	17,983	-18,966	-808	-1,130	-563	-21,467	-3,484	-26,471
2037	13	1,131	6,530	2,626	2,347	12,647	-18,850	-796	-1,100	-562	-21,307	-8,660	-35,131
2038	731	1,129	1,695	2,629	2,393	8,577	-19,200	-785	-1,049	-558	-21,592	-13,016	-48,147
2039	768	1,126	9,130	2,627	2,355	16,005	-19,122	-774	-1,013	-549	-21,457	-5,452	-53,599
2040	13	1,135	3,687	2,628	2,432	9,895	-19,813	-763	-967	-536	-22,078	-12,183	-65,782

Table B10

Simulated MCSB Baseline with Climate Change Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	Natural Recharge	Underflow From Desert Hot Spriongs Subbasin	Artificial Recharge	Wastewater Return	Other Return Flows[1]	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2041	21,509	1,161	6,914	2,618	2,495	34,697	-19,908	-746	-939	-531	-22,124	12,573	-53,209
2042	3,434	1,159	4,494	2,626	2,433	14,145	-19,767	-731	-914	-529	-21,941	-7,795	-61,004
2043	4,935	1,143	17,206	2,629	2,479	28,392	-20,112	-717	-880	-522	-22,232	6,161	-54,844
2044	29,867	1,188	8,566	2,634	2,440	44,695	-19,975	-707	-881	-513	-22,076	22,619	-32,225
2045	29,867	1,231	8,750	2,621	2,518	44,986	-20,651	-693	-830	-499	-22,672	22,314	-9,911
2046	4,935	1,194	7,647	2,618	2,564	18,958	-20,858	-680	-787	-497	-22,823	-3,865	-13,776
2047	3,434	1,165	7,736	2,626	2,485	17,446	-20,480	-668	-756	-588	-22,492	-5,047	-18,823
2048	21,510	1,179	9,051	2,636	2,513	36,889	-20,587	-658	-720	-593	-22,558	14,331	-4,492
2049	13	1,159	9,002	2,627	2,458	15,258	-20,212	-646	-697	-591	-22,147	-6,889	-11,381
2050	768	1,150	10,252	2,621	2,518	17,309	-20,650	-636	-657	-618	-22,562	-5,253	-16,634
2051	731	1,150	5,216	2,618	2,564	12,279	-20,858	-625	-619	-635	-22,738	-10,459	-27,092
2052	13	1,156	5,930	2,633	2,485	12,216	-20,480	-616	-595	-631	-22,323	-10,106	-37,198
2053	1,154	1,149	11,515	2,629	2,514	18,961	-20,587	-605	-563	-635	-22,389	-3,429	-40,627
2054	2,614	1,138	9,274	2,627	2,458	18,111	-20,212	-596	-564	-654	-22,026	-3,915	-44,542
2055	31,753	1,214	11,682	2,621	2,518	49,788	-20,650	-588	-545	-665	-22,447	27,342	-17,201
2056	1,780	1,192	12,981	2,625	2,564	21,141	-20,857	-581	-537	-668	-22,643	-1,502	-18,703
2057	13	1,152	7,788	2,626	2,485	14,064	-20,478	-574	-531	-666	-22,249	-8,185	-26,888
2058	2,340	1,144	4,543	2,629	2,514	13,170	-20,586	-568	-500	-655	-22,309	-9,139	-36,027
2059	13	1,141	5,192	2,627	2,458	11,431	-20,211	-562	-483	-654	-21,910	-10,479	-46,506
2060	9,561	1,200	8,976	2,628	2,517	24,883	-20,650	-556	-453	-652	-22,311	2,571	-43,935
2061	5,048	1,183	14,361	2,618	2,564	25,774	-20,857	-547	-438	-645	-22,486	3,288	-40,647
2062	13	1,151	11,669	2,626	2,485	17,944	-20,477	-541	-449	-633	-22,100	-4,156	-44,803
2063	13	1,138	6,283	2,629	2,513	12,577	-20,585	-537	-434	-613	-22,169	-9,592	-54,395
2064	13	1,139	898	2,634	2,458	7,141	-20,211	-534	-423	-608	-21,775	-14,634	-69,028
2065	13	1,152	3,068	2,621	2,518	9,371	-20,650	-526	-374	-606	-22,156	-12,785	-81,813
2066	13	1,160	9,204	2,618	2,564	15,560	-20,858	-517	-346	-603	-22,324	-6,764	-88,577
2067	7,530	1,153	13,040	2,626	2,485	26,834	-20,478	-509	-355	-590	-21,932	4,902	-83,675
2068	13	1,148	5,369	2,636	2,513	11,680	-20,585	-504	-353	-575	-22,017	-10,337	-94,012

Table B10

Simulated MCSB Baseline with Climate Change Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	**Natural Recharge**	**Underflow From Desert Hot Spriongs Subbasin**	**Artificial Recharge**	**Wastewater Return**	**Other Return Flows[1]**	**Total Inflow**	**Pumping**	**Evapo-transpiration**	**Underflow to Garnet Hill**	**Underflow to Indio Hills[2]**	**Total Outflow**	**Change in Storage (AFY)**	**Cumulative Change in Storage (AF)**
2069	19,526	1,135	11,505	2,627	2,458	37,251	-20,210	-497	-356	-571	-21,634	15,617	-78,395
Average[3] 2020-2045	6,640	1,160	6,550	2,500	2,320	19,170	-17,910	-840	-1,220	-590	-20,560	-1,390	
Min[3] 2020-2045	10	1,130	480	1,960	2,160	6,190	-20,650	-950	-1,640	-660	-22,670	-13,120	
Max[3] 2020-2045	31,750	1,230	17,210	2,630	2,520	44,990	-15,320	-690	-830	-500	-18,570	23,720	
Average[3] 2009-2069	5,360	1,160	7,920	2,410	2,450	19,300	-18,340	-750	-1,040	-610	-20,730	-1,430	
Min[3] 2009-2069	10	1,130	0	1,290	2,160	5,890	-20,860	-950	-1,810	-670	-22,820	-14,630	
Max[3] 2009-2069	31,750	1,290	33,210	2,640	3,100	49,790	-13,530	-500	-350	-500	-16,860	29,740	

Notes
1. Septic Return and Applied Water Return.
2. Underflow to Indio Hills East and Indio Hills West.
3. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre feet
AFY = acre feet per year

Table B11

Simulated MCSB Near-Term Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	Natural Recharge	Underflow From Desert Hot Springs Subbasin	Artificial Recharge	Wastewater Return	Return Flows[1]	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2009	13	1,291	4,090	1,409	3,100	9,903	-15,623	-884	-1,629	-588	-18,724	-8,821	0
2010	9,561	1,287	33,209	1,287	2,356	47,700	-14,818	-879	-1,670	-593	-17,959	29,742	29,742
2011	5,048	1,237	26,237	1,394	2,505	36,420	-14,824	-882	-1,763	-591	-18,060	18,360	48,102
2012	13	1,150	23,406	1,498	2,505	28,572	-14,904	-895	-1,806	-618	-18,224	10,348	58,450
2013	13	1,128	2,379	1,605	2,930	8,054	-15,293	-906	-1,780	-635	-18,614	-10,560	47,890
2014	13	1,133	4,323	1,715	2,799	9,984	-14,785	-916	-1,757	-631	-18,090	-8,106	39,784
2015	13	1,134	171	1,880	2,777	5,975	-13,530	-925	-1,768	-635	-16,858	-10,883	28,900
2016	13	1,147	0	1,866	2,862	5,888	-13,736	-937	-1,755	-654	-17,082	-11,194	17,707
2017	7,530	1,154	9,248	1,970	2,488	22,390	-14,049	-940	-1,714	-665	-17,367	5,024	22,731
2018	13	1,149	2,026	2,045	2,523	7,758	-14,391	-943	-1,703	-668	-17,705	-9,947	12,783
2019	19,526	1,147	5,390	2,132	2,210	30,406	-13,636	-949	-1,720	-666	-16,970	13,436	26,219
2020	199	1,153	1,768	2,280	2,300	7,700	-15,321	-950	-1,644	-655	-18,572	-10,872	15,347
2021	918	1,177	476	2,271	2,464	7,305	-15,646	-944	-1,601	-658	-18,848	-11,543	3,804
2022	13	1,175	4,067	2,279	2,458	9,991	-15,513	-938	-1,566	-659	-18,677	-8,685	-4,881
2023	5,088	1,165	4,082	1,957	2,924	15,215	-15,845	-933	-1,522	-655	-18,955	-3,740	-8,622
2024	3,378	1,182	5,655	2,181	2,755	15,152	-15,749	-929	-1,498	-645	-18,822	-3,670	-12,291
2025	13	1,171	9,524	2,389	2,711	15,808	-16,423	-920	-1,450	-628	-19,421	-3,613	-15,904
2026	4,808	1,236	6,933	2,421	2,834	18,233	-16,747	-913	-1,426	-624	-19,710	-1,477	-17,381
2027	1,831	1,234	600	2,464	3,906	10,034	-16,610	-910	-1,443	-623	-19,586	-9,551	-26,933
2028	42,473	1,508	7,681	3,864	2,681	58,207	-16,943	-911	-1,429	-620	-19,903	38,304	11,372
2029	21,547	1,601	9,134	4,013	2,612	38,907	-16,846	-908	-1,428	-608	-19,791	19,117	30,488
2030	53,526	1,818	6,228	4,168	2,648	68,389	-17,520	-909	-1,408	-594	-20,430	47,959	78,447
2031	1,558	1,588	6,411	4,304	2,695	16,556	-17,845	-909	-1,380	-592	-20,725	-4,169	74,278
2032	5,188	1,420	7,224	4,463	2,610	20,906	-17,711	-911	-1,357	-593	-20,572	334	74,612
2033	35,903	1,419	8,717	4,592	2,648	53,279	-18,043	-909	-1,320	-587	-20,858	32,421	107,033
2034	13	1,361	6,699	4,729	2,595	15,397	-17,947	-909	-1,299	-577	-20,733	-5,336	101,697
2035	1,689	1,316	10,667	4,861	2,654	21,187	-18,621	-909	-1,259	-563	-21,353	-165	101,532
2036	4,897	1,292	11,092	4,984	2,706	24,971	-18,962	-912	-1,244	-563	-21,680	3,290	104,822
2037	13	1,266	6,803	5,090	2,649	15,822	-18,846	-910	-1,227	-562	-21,545	-5,723	99,099
2038	1,431	1,256	1,766	5,205	2,692	12,350	-19,197	-911	-1,192	-558	-21,859	-9,509	89,590
2039	13	1,244	9,511	5,315	2,652	18,735	-19,118	-911	-1,175	-549	-21,753	-3,018	86,572
2040	13	1,245	3,848	5,436	2,716	13,259	-19,810	-913	-1,154	-536	-22,413	-9,154	77,418

Table B11

Simulated MCSB Near-Term Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
	Natural Recharge	Underflow From Desert Hot Springs Subbasin	Artificial Recharge	Wastewater Return	Return Flows[1]	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2041	5,923	1,242	7,216	5,530	2,783	22,694	-19,906	-908	-1,153	-531	-22,498	197	77,614
2042	6,304	1,237	4,690	5,651	2,718	20,600	-19,765	-906	-1,158	-529	-22,357	-1,757	75,857
2043	18,951	1,352	17,958	5,765	2,761	46,787	-20,108	-905	-1,163	-522	-22,698	24,089	99,947
2044	4,711	1,317	8,941	5,891	2,714	23,574	-19,969	-909	-1,198	-513	-22,590	984	100,931
2045	29,867	1,330	9,160	5,981	2,793	49,131	-20,646	-908	-1,179	-499	-23,232	25,899	126,830
2046	4,935	1,295	8,006	5,978	2,854	23,068	-20,854	-909	-1,165	-497	-23,425	-357	126,473
2047	3,434	1,257	8,099	5,987	2,784	21,560	-20,475	-910	-1,161	-588	-23,134	-1,574	124,899
2048	21,510	1,261	9,475	6,006	2,814	41,065	-20,582	-915	-1,152	-593	-23,242	17,823	142,722
2049	13	1,230	9,424	5,987	2,774	19,429	-20,207	-915	-1,155	-591	-22,869	-3,440	139,282
2050	768	1,212	10,733	5,981	2,839	21,533	-20,645	-918	-1,142	-618	-23,324	-1,790	137,492
2051	731	1,205	5,461	5,978	2,892	16,266	-20,854	-920	-1,131	-635	-23,540	-7,274	130,218
2052	13	1,203	6,208	6,003	2,812	16,239	-20,475	-925	-1,133	-631	-23,164	-6,925	123,293
2053	1,154	1,189	12,054	5,989	2,855	23,242	-20,582	-925	-1,125	-635	-23,267	-25	123,268
2054	2,614	1,171	9,708	5,987	2,807	22,288	-20,207	-928	-1,151	-654	-22,940	-652	122,616
2055	31,753	1,242	12,230	5,981	2,872	54,078	-20,645	-932	-1,158	-665	-23,400	30,679	153,294
2056	1,780	1,211	13,589	5,995	2,916	25,491	-20,852	-939	-1,177	-668	-23,636	1,855	155,149
2057	13	1,164	8,153	5,987	2,851	18,168	-20,473	-942	-1,194	-666	-23,275	-5,106	150,043
2058	2,340	1,151	4,756	5,989	2,886	17,123	-20,581	-948	-1,187	-655	-23,371	-6,248	143,795
2059	13	1,144	5,436	5,987	2,837	15,418	-20,207	-953	-1,193	-654	-23,007	-7,589	136,205
2060	9,561	1,199	9,397	5,997	2,891	29,045	-20,646	-959	-1,190	-653	-23,447	5,598	141,803
2061	5,048	1,175	15,034	5,978	2,946	30,181	-20,853	-959	-1,196	-647	-23,656	6,526	148,329
2062	13	1,137	12,215	5,987	2,869	22,221	-20,473	-964	-1,231	-637	-23,305	-1,084	147,245
2063	13	1,119	6,578	5,989	2,900	16,599	-20,581	-970	-1,239	-620	-23,410	-6,811	140,434
2064	13	1,117	940	6,004	2,840	10,913	-20,207	-979	-1,251	-617	-23,054	-12,141	128,292
2065	13	1,125	3,212	5,981	2,906	13,238	-20,647	-979	-1,223	-619	-23,468	-10,230	118,063
2066	13	1,130	9,636	5,978	2,953	19,711	-20,855	-979	-1,217	-621	-23,673	-3,962	114,101
2067	7,530	1,118	13,651	5,987	2,875	31,161	-20,475	-981	-1,247	-615	-23,318	7,843	121,943
2068	13	1,108	5,621	6,006	2,897	15,646	-20,582	-987	-1,269	-609	-23,446	-7,800	114,143

Table B11

Simulated MCSB Near-Term Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	**Natural Recharge**	**Underflow From Desert Hot Springs Subbasin**	**Artificial Recharge**	**Wastewater Return**	**Return Flows[1]**	**Total Inflow**	**Pumping**	**Evapo-transpiration**	**Underflow to Garnet Hill**	**Underflow to Indio Hills[2]**	**Total Outflow**	**Change in Storage (AFY)**	**Cumulative Change in Storage (AF)**
2069	19,526	1,092	12,045	5,987	2,851	41,501	-20,207	-988	-1,289	-614	-23,098	18,403	132,546
Average[3] 2020-2045	9,630	1,320	6,800	4,160	2,720	24,620	-17,910	-920	-1,340	-590	-20,750	3,870	
Min[3] 2020-2045	10	1,150	480	1,960	2,300	7,300	-20,650	-950	-1,640	-660	-23,230	-11,540	
Max[3] 2020-2045	53,530	1,820	17,960	5,980	3,910	68,390	-15,320	-900	-1,150	-500	-18,570	47,960	
Average[3] 2009-2069	6,640	1,240	8,180	4,440	2,760	23,250	-18,330	-930	-1,350	-610	-21,220	2,030	
Min[3] 2009-2069	10	1,090	0	1,290	2,210	5,890	-20,850	-990	-1,810	-670	-23,670	-12,140	
Max[3] 2009-2069	53,530	1,820	33,210	6,010	3,910	68,390	-13,530	-880	-1,130	-500	-16,860	47,960	

Notes
1. Septic Return and Applied Water Return.
2. Underflow to Indio Hills East and Indio Hills West.
3. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre feet
AFY = acre feet per year

Table B12

Simulated MCSB Near-Term with Climate Change Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	Natural Recharge	Underflow From Desert Hot Sprions Subbasin	Artificial Recharge	Wastewater Return	Return Flows[1]	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2009	13	1,291	4,090	1,409	3,100	9,903	-15,623	-884	-1,629	-588	-18,724	-8,821	0
2010	9,561	1,287	33,209	1,287	2,356	47,700	-14,818	-879	-1,670	-593	-17,959	29,742	29,742
2011	5,048	1,237	26,237	1,394	2,505	36,420	-14,824	-882	-1,763	-591	-18,060	18,360	48,102
2012	13	1,150	23,406	1,498	2,505	28,572	-14,904	-895	-1,806	-618	-18,224	10,348	58,450
2013	13	1,128	2,379	1,605	2,930	8,054	-15,293	-906	-1,780	-635	-18,614	-10,560	47,890
2014	13	1,133	4,323	1,715	2,799	9,984	-14,785	-916	-1,757	-631	-18,090	-8,106	39,784
2015	13	1,134	171	1,880	2,777	5,975	-13,530	-925	-1,768	-635	-16,858	-10,883	28,900
2016	13	1,147	0	1,866	2,862	5,888	-13,736	-937	-1,755	-654	-17,082	-11,194	17,707
2017	7,530	1,154	9,248	1,970	2,488	22,390	-14,049	-940	-1,714	-665	-17,367	5,024	22,731
2018	13	1,149	2,026	2,045	2,523	7,758	-14,391	-943	-1,703	-668	-17,705	-9,947	12,783
2019	19,526	1,147	5,390	2,132	2,210	30,406	-13,636	-949	-1,720	-666	-16,970	13,436	26,219
2020	19,526	1,158	1,768	2,280	2,202	26,933	-15,322	-950	-1,642	-655	-18,569	8,364	34,583
2021	13	1,163	476	2,271	2,262	6,186	-15,646	-943	-1,594	-658	-18,841	-12,656	21,928
2022	7,530	1,167	4,067	2,279	2,159	17,202	-15,514	-937	-1,558	-659	-18,668	-1,466	20,461
2023	13	1,165	4,082	1,957	2,212	9,429	-15,845	-929	-1,506	-655	-18,936	-9,507	10,954
2024	13	1,162	5,655	2,181	2,164	11,175	-15,750	-923	-1,484	-645	-18,803	-7,628	3,326
2025	13	1,157	9,492	2,389	2,231	15,282	-16,423	-912	-1,445	-628	-19,408	-4,126	-799
2026	13	1,151	6,910	2,421	2,290	12,786	-16,747	-903	-1,425	-624	-19,699	-6,913	-7,712
2027	13	1,144	598	2,464	3,393	7,612	-16,611	-897	-1,446	-623	-19,577	-11,965	-19,677
2028	5,048	1,140	7,656	3,864	2,206	19,913	-16,944	-895	-1,431	-620	-19,891	22	-19,655
2029	9,561	1,169	9,104	4,013	2,160	26,008	-16,848	-890	-1,432	-608	-19,777	6,231	-13,424
2030	13	1,152	6,188	4,168	2,229	13,750	-17,522	-887	-1,417	-594	-20,419	-6,669	-20,093
2031	2,340	1,129	6,369	4,304	2,285	16,428	-17,846	-883	-1,407	-592	-20,727	-4,299	-24,393
2032	13	1,118	7,177	4,463	2,216	14,987	-17,712	-882	-1,411	-593	-20,598	-5,612	-30,004
2033	1,780	1,100	8,660	4,592	2,255	18,386	-18,044	-877	-1,396	-587	-20,904	-2,518	-32,522
2034	31,753	1,161	6,655	4,729	2,209	46,506	-17,948	-875	-1,400	-577	-20,801	25,705	-6,817
2035	2,614	1,135	10,563	4,861	2,279	21,451	-18,622	-873	-1,384	-563	-21,443	8	-6,809
2036	1,154	1,096	10,996	4,984	2,338	20,568	-18,963	-873	-1,389	-563	-21,788	-1,220	-8,028
2037	13	1,073	6,744	5,090	2,274	15,194	-18,847	-869	-1,386	-562	-21,664	-6,470	-14,498
2038	731	1,066	1,750	5,205	2,316	11,068	-19,198	-867	-1,362	-558	-21,985	-10,917	-25,415
2039	768	1,057	9,429	5,315	2,274	18,843	-19,120	-865	-1,350	-549	-21,883	-3,041	-28,456
2040	13	1,060	3,804	5,436	2,347	12,660	-19,811	-863	-1,333	-536	-22,543	-9,883	-38,338

Table B12

Simulated MCSB Near-Term with Climate Change Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	Natural Recharge	Underflow From Desert Hot Spriongs Subbasin	Artificial Recharge	Wastewater Return	Return Flows[1]	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2041	21,509	1,080	7,132	5,530	2,408	37,660	-19,907	-855	-1,331	-531	-22,624	15,036	-23,302
2042	3,434	1,071	4,636	5,651	2,343	17,134	-19,766	-850	-1,331	-529	-22,476	-5,342	-28,644
2043	4,935	1,049	17,751	5,765	2,385	31,885	-20,109	-846	-1,326	-522	-22,803	9,082	-19,562
2044	29,867	1,086	8,837	5,891	2,342	48,024	-19,971	-846	-1,354	-513	-22,684	25,339	5,777
2045	29,867	1,122	9,028	5,981	2,417	48,414	-20,648	-842	-1,331	-499	-23,320	25,094	30,872
2046	4,935	1,078	7,890	5,978	2,463	22,345	-20,856	-839	-1,313	-497	-23,505	-1,160	29,712
2047	3,434	1,044	7,982	5,987	2,384	20,830	-20,477	-837	-1,305	-588	-23,207	-2,377	27,334
2048	21,510	1,051	9,339	6,006	2,412	40,317	-20,584	-838	-1,293	-593	-23,307	17,010	44,344
2049	13	1,025	9,288	5,987	2,357	18,670	-20,209	-834	-1,290	-591	-22,924	-4,254	40,090
2050	768	1,011	10,578	5,981	2,417	20,755	-20,647	-833	-1,272	-618	-23,371	-2,616	37,474
2051	731	1,006	5,382	5,978	2,463	15,560	-20,856	-831	-1,256	-635	-23,578	-8,018	29,456
2052	13	1,006	6,118	6,003	2,383	15,523	-20,477	-832	-1,253	-631	-23,194	-7,670	21,786
2053	1,154	995	11,880	5,989	2,413	22,432	-20,584	-828	-1,240	-635	-23,287	-855	20,930
2054	2,614	979	9,568	5,987	2,357	21,505	-20,208	-828	-1,260	-654	-22,950	-1,445	19,485
2055	31,753	1,049	12,053	5,981	2,417	53,254	-20,646	-827	-1,262	-665	-23,400	29,854	49,339
2056	1,780	1,022	13,393	5,995	2,463	24,651	-20,854	-830	-1,276	-668	-23,627	1,025	50,364
2057	13	977	8,036	5,987	2,384	17,397	-20,475	-829	-1,287	-666	-23,257	-5,860	44,504
2058	2,340	966	4,687	5,989	2,413	16,396	-20,583	-831	-1,275	-655	-23,344	-6,948	37,556
2059	13	960	5,357	5,987	2,357	14,674	-20,209	-832	-1,275	-654	-22,970	-8,296	29,259
2060	9,561	1,014	9,261	5,997	2,416	28,250	-20,647	-834	-1,267	-652	-23,401	4,849	34,108
2061	5,048	993	14,817	5,978	2,463	29,300	-20,855	-831	-1,268	-645	-23,598	5,702	39,810
2062	13	957	12,039	5,987	2,384	21,380	-20,475	-832	-1,296	-633	-23,235	-1,855	37,954
2063	13	941	6,483	5,989	2,413	15,839	-20,582	-834	-1,299	-613	-23,329	-7,490	30,464
2064	13	938	926	6,004	2,356	10,238	-20,209	-838	-1,307	-608	-22,962	-12,724	17,740
2065	13	948	3,166	5,981	2,417	12,525	-20,648	-836	-1,274	-607	-23,365	-10,840	6,900
2066	13	954	9,497	5,978	2,463	18,906	-20,856	-832	-1,263	-608	-23,559	-4,653	2,247
2067	7,530	944	13,454	5,987	2,384	30,298	-20,476	-830	-1,287	-600	-23,193	7,105	9,352
2068	13	936	5,540	6,006	2,412	14,906	-20,583	-832	-1,302	-591	-23,309	-8,402	949

Table B12

Simulated MCSB Near-Term with Climate Change Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	Natural Recharge	Underflow From Desert Hot Spriongs Subbasin	Artificial Recharge	Wastewater Return	Return Flows[1]	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2069	19,526	920	11,871	5,987	2,357	40,661	-20,208	-830	-1,318	-593	-22,949	17,712	18,661
Average[3] 2020-2045	6,640	1,120	6,750	4,160	2,320	20,980	-17,910	-890	-1,420	-590	-20,800	180	
Min[3] 2020-2045	10	1,050	480	1,960	2,160	6,190	-20,650	-950	-1,640	-660	-23,320	-12,660	
Max[3] 2020-2045	31,750	1,170	17,750	5,980	3,390	48,410	-15,320	-840	-1,330	-500	-18,570	25,710	
Average[3] 2009-2069	5,360	1,080	8,110	4,440	2,410	21,400	-18,340	-870	-1,420	-610	-21,230	160	
Min[3] 2009-2069	10	920	0	1,290	2,160	5,890	-20,860	-950	-1,810	-670	-23,630	-12,720	
Max[3] 2009-2069	31,750	1,290	33,210	6,010	3,390	53,250	-13,530	-830	-1,240	-500	-16,860	29,850	

Notes
1. Septic Return and Applied Water Return.
2. Underflow to Indio Hills East and Indio Hills West.
3. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre feet
AFY = acre feet per year

Table B13

Simulated MCSB Future Projects Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	Natural Recharge	Underflow From Desert Hot Spriongs Subbasin	Artificial Recharge	Wastewater Return	Return Flows[1]	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2009	13	1,291	4,090	1,409	3,100	9,903	-15,623	-884	-1,629	-588	-18,724	-8,821	0
2010	9,561	1,287	33,209	1,287	2,356	47,700	-14,818	-879	-1,670	-593	-17,959	29,742	29,742
2011	5,048	1,237	26,237	1,394	2,505	36,420	-14,824	-882	-1,763	-591	-18,060	18,360	48,102
2012	13	1,150	23,406	1,498	2,505	28,572	-14,904	-895	-1,806	-618	-18,224	10,348	58,450
2013	13	1,128	2,379	1,605	2,930	8,054	-15,293	-906	-1,780	-635	-18,614	-10,560	47,890
2014	13	1,133	4,323	1,715	2,799	9,984	-14,785	-916	-1,757	-631	-18,090	-8,106	39,784
2015	13	1,134	171	1,880	2,777	5,975	-13,530	-925	-1,768	-635	-16,858	-10,883	28,900
2016	13	1,147	0	1,866	2,862	5,888	-13,736	-937	-1,755	-654	-17,082	-11,194	17,707
2017	7,530	1,154	9,248	1,970	2,488	22,390	-14,049	-940	-1,714	-665	-17,367	5,024	22,731
2018	13	1,149	2,026	2,045	2,523	7,758	-14,391	-943	-1,703	-668	-17,705	-9,947	12,783
2019	19,526	1,147	5,390	2,132	2,210	30,406	-13,636	-949	-1,720	-666	-16,970	13,436	26,219
2020	199	1,153	1,768	2,280	2,300	7,700	-15,321	-950	-1,644	-655	-18,572	-10,872	15,347
2021	918	1,177	476	2,271	2,464	7,305	-15,646	-944	-1,601	-658	-18,848	-11,543	3,804
2022	13	1,175	4,067	2,279	2,458	9,991	-15,513	-938	-1,566	-659	-18,677	-8,685	-4,881
2023	5,088	1,165	4,082	1,957	2,924	15,215	-15,845	-933	-1,522	-655	-18,955	-3,740	-8,622
2024	3,378	1,182	5,655	2,181	2,755	15,152	-15,749	-929	-1,498	-645	-18,822	-3,670	-12,291
2025	13	1,171	9,524	2,389	2,711	15,808	-16,423	-920	-1,450	-628	-19,421	-3,613	-15,904
2026	4,808	1,236	6,933	2,421	2,834	18,233	-16,747	-913	-1,426	-624	-19,710	-1,477	-17,381
2027	1,831	1,234	600	2,464	3,906	10,034	-16,610	-910	-1,443	-623	-19,586	-9,551	-26,933
2028	42,473	1,508	7,681	3,864	2,681	58,207	-16,943	-911	-1,429	-620	-19,903	38,304	11,372
2029	21,547	1,601	9,134	4,013	2,612	38,907	-16,846	-908	-1,428	-608	-19,791	19,117	30,488
2030	53,526	1,818	6,228	4,168	2,648	68,389	-17,520	-909	-1,408	-594	-20,430	47,959	78,447
2031	1,558	1,588	6,411	4,304	2,695	16,556	-17,845	-909	-1,380	-592	-20,725	-4,169	74,278
2032	5,188	1,420	7,224	4,463	2,610	20,906	-17,711	-911	-1,357	-593	-20,572	334	74,612
2033	35,903	1,419	8,717	4,592	2,648	53,279	-18,043	-909	-1,320	-587	-20,858	32,421	107,033
2034	13	1,361	6,699	4,729	2,595	15,397	-17,947	-909	-1,299	-577	-20,733	-5,336	101,697
2035	1,689	1,315	12,193	4,861	2,654	22,712	-18,621	-909	-1,261	-563	-21,355	1,358	103,055
2036	4,897	1,287	12,489	4,984	2,707	26,364	-18,961	-912	-1,251	-563	-21,687	4,676	107,731
2037	13	1,259	7,660	5,090	2,649	16,671	-18,845	-912	-1,238	-562	-21,557	-4,886	102,846
2038	1,431	1,246	1,988	5,205	2,692	12,563	-19,196	-913	-1,205	-558	-21,873	-9,310	93,535
2039	13	1,233	10,710	5,315	2,651	19,923	-19,118	-914	-1,190	-549	-21,771	-1,848	91,687
2040	13	1,233	4,338	5,436	2,716	13,736	-19,810	-917	-1,172	-536	-22,434	-8,698	82,989

Table B13

Simulated MCSB Future Projects Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	Natural Recharge	Underflow From Desert Hot Spriongs Subbasin	Artificial Recharge	Wastewater Return	Return Flows[1]	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2041	5,923	1,228	8,134	5,530	2,783	23,599	-19,905	-913	-1,173	-531	-22,522	1,076	84,066
2042	6,304	1,222	5,287	5,651	2,718	21,182	-19,764	-912	-1,181	-529	-22,385	-1,204	82,862
2043	18,951	1,333	20,244	5,765	2,761	49,054	-20,107	-912	-1,190	-522	-22,731	26,323	109,185
2044	4,711	1,295	10,078	5,891	2,713	24,689	-19,969	-918	-1,231	-513	-22,631	2,058	111,243
2045	29,867	1,302	13,001	5,981	2,793	52,944	-20,645	-919	-1,220	-499	-23,282	29,662	140,905
2046	4,935	1,260	11,362	5,978	2,854	26,389	-20,853	-922	-1,218	-497	-23,490	2,899	143,804
2047	3,434	1,213	11,494	5,987	2,784	24,913	-20,473	-927	-1,225	-588	-23,213	1,699	145,504
2048	21,510	1,209	13,448	6,006	2,814	44,987	-20,580	-935	-1,229	-593	-23,337	21,649	167,153
2049	13	1,170	13,375	5,987	2,774	23,320	-20,205	-940	-1,244	-591	-22,981	339	167,492
2050	768	1,143	15,233	5,981	2,839	25,964	-20,643	-948	-1,246	-618	-23,455	2,509	170,002
2051	731	1,128	7,750	5,978	2,892	18,479	-20,852	-955	-1,246	-635	-23,688	-5,209	164,793
2052	13	1,122	8,810	6,003	2,812	18,761	-20,473	-965	-1,256	-631	-23,325	-4,564	160,229
2053	1,154	1,102	17,109	5,989	2,855	28,209	-20,580	-970	-1,260	-635	-23,445	4,764	164,993
2054	2,614	1,076	13,779	5,987	2,807	26,263	-20,205	-979	-1,302	-654	-23,140	3,123	168,116
2055	31,753	1,136	17,358	5,981	2,872	59,100	-20,643	-989	-1,325	-665	-23,622	35,479	203,595
2056	1,780	1,092	19,287	5,995	2,916	31,070	-20,851	-1,003	-1,366	-668	-23,887	7,182	210,777
2057	13	1,038	11,572	5,987	2,851	21,460	-20,472	-1,013	-1,398	-666	-23,549	-2,089	208,689
2058	2,340	1,024	6,750	5,989	2,886	18,989	-20,580	-1,026	-1,397	-655	-23,657	-4,667	204,021
2059	13	1,017	7,715	5,987	2,837	17,570	-20,205	-1,037	-1,407	-654	-23,304	-5,734	198,287
2060	9,561	1,069	13,336	5,997	2,890	32,855	-20,643	-1,048	-1,414	-653	-23,759	9,096	207,384
2061	5,048	1,036	21,338	5,978	2,946	36,347	-20,851	-1,052	-1,439	-647	-23,989	12,357	219,741
2062	13	986	17,337	5,987	2,869	27,192	-20,472	-1,060	-1,496	-637	-23,666	3,526	223,267
2063	13	964	9,335	5,989	2,899	19,201	-20,579	-1,068	-1,514	-620	-23,782	-4,581	218,686
2064	13	965	1,334	6,004	2,840	11,155	-20,206	-1,078	-1,526	-617	-23,428	-12,273	206,413
2065	13	979	4,559	5,981	2,907	14,439	-20,646	-1,079	-1,496	-619	-23,839	-9,401	197,013
2066	13	985	13,676	5,978	2,953	23,606	-20,853	-1,081	-1,496	-621	-24,051	-445	196,568
2067	7,530	967	19,374	5,987	2,876	36,734	-20,473	-1,084	-1,541	-615	-23,714	13,020	209,588
2068	13	952	7,978	6,006	2,898	17,846	-20,580	-1,091	-1,576	-609	-23,856	-6,010	203,578

Table B13

Simulated MCSB Future Projects Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
	Natural Recharge	Underflow From Desert Hot Spriongs Subbasin	Artificial Recharge	Wastewater Return	Return Flows[1]	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2069	19,526	932	17,095	5,987	2,851	46,392	-20,205	-1,092	-1,604	-614	-23,516	22,876	226,454
Average[3] 2020-2045	9,630	1,310	7,360	4,160	2,720	25,170	-17,910	-920	-1,350	-590	-20,760	4,410	
Min[3] 2020-2045	10	1,150	480	1,960	2,300	7,300	-20,650	-950	-1,640	-660	-23,280	-11,540	
Max[3] 2020-2045	53,530	1,820	20,240	5,980	3,910	68,390	-15,320	-910	-1,170	-500	-18,570	47,960	
Average[3] 2009-2069	6,640	1,190	9,870	4,440	2,760	24,900	-18,330	-950	-1,430	-610	-21,330	3,570	
Min[3] 2009-2069	10	930	0	1,290	2,210	5,890	-20,850	-1,090	-1,810	-670	-24,050	-12,270	
Max[3] 2009-2069	53,530	1,820	33,210	6,010	3,910	68,390	-13,530	-880	-1,170	-500	-16,860	47,960	

Notes
1. Septic Return and Applied Water Return
2. Underflow to Indio Hills East and Indio Hills West.
3. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre feet
AFY = acre feet per year

Table B14

Simulated MCSB Future Projects with Climate Change Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	Natural Recharge	Underflow From Desert Hot Spriongs Subbasin	Artificial Recharge	Wastewater Return	Return Flows[1]	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2009	13	1,291	4,090	1,409	3,100	9,903	-15,623	-884	-1,629	-588	-18,724	-8,821	0
2010	9,561	1,287	33,209	1,287	2,356	47,700	-14,818	-879	-1,670	-593	-17,959	29,742	29,742
2011	5,048	1,237	26,237	1,394	2,505	36,420	-14,824	-882	-1,763	-591	-18,060	18,360	48,102
2012	13	1,150	23,406	1,498	2,505	28,572	-14,904	-895	-1,806	-618	-18,224	10,348	58,450
2013	13	1,128	2,379	1,605	2,930	8,054	-15,293	-906	-1,780	-635	-18,614	-10,560	47,890
2014	13	1,133	4,323	1,715	2,799	9,984	-14,785	-916	-1,757	-631	-18,090	-8,106	39,784
2015	13	1,134	171	1,880	2,777	5,975	-13,530	-925	-1,768	-635	-16,858	-10,883	28,900
2016	13	1,147	0	1,866	2,862	5,888	-13,736	-937	-1,755	-654	-17,082	-11,194	17,707
2017	7,530	1,154	9,248	1,970	2,488	22,390	-14,049	-940	-1,714	-665	-17,367	5,024	22,731
2018	13	1,149	2,026	2,045	2,523	7,758	-14,391	-943	-1,703	-668	-17,705	-9,947	12,783
2019	19,526	1,147	5,390	2,132	2,210	30,406	-13,636	-949	-1,720	-666	-16,970	13,436	26,219
2020	19,526	1,158	1,768	2,280	2,202	26,933	-15,322	-950	-1,642	-655	-18,569	8,364	34,583
2021	13	1,163	476	2,271	2,262	6,186	-15,646	-943	-1,594	-658	-18,841	-12,656	21,928
2022	7,530	1,167	4,067	2,279	2,159	17,202	-15,514	-937	-1,558	-659	-18,668	-1,466	20,461
2023	13	1,165	4,082	1,957	2,212	9,429	-15,845	-929	-1,506	-655	-18,936	-9,507	10,954
2024	13	1,162	5,655	2,181	2,164	11,175	-15,750	-923	-1,484	-645	-18,803	-7,628	3,326
2025	13	1,157	9,492	2,389	2,231	15,282	-16,423	-912	-1,445	-628	-19,408	-4,126	-799
2026	13	1,151	6,910	2,421	2,290	12,786	-16,747	-903	-1,425	-624	-19,699	-6,913	-7,712
2027	13	1,144	598	2,464	3,393	7,612	-16,611	-897	-1,446	-623	-19,577	-11,965	-19,677
2028	5,048	1,140	7,656	3,864	2,206	19,913	-16,944	-895	-1,431	-620	-19,891	22	-19,655
2029	9,561	1,169	9,104	4,013	2,160	26,008	-16,848	-890	-1,432	-608	-19,777	6,231	-13,424
2030	13	1,152	6,188	4,168	2,229	13,750	-17,522	-887	-1,417	-594	-20,419	-6,669	-20,093
2031	2,340	1,129	6,369	4,304	2,285	16,428	-17,846	-883	-1,407	-592	-20,727	-4,299	-24,393
2032	13	1,118	7,177	4,463	2,216	14,987	-17,712	-882	-1,411	-593	-20,598	-5,612	-30,004
2033	1,780	1,100	8,660	4,592	2,255	18,386	-18,044	-877	-1,396	-587	-20,904	-2,518	-32,522
2034	31,753	1,161	6,655	4,729	2,209	46,506	-17,948	-875	-1,400	-577	-20,801	25,705	-6,817
2035	2,614	1,133	12,089	4,861	2,279	22,976	-18,622	-873	-1,386	-563	-21,445	1,531	-5,286
2036	1,154	1,092	12,393	4,984	2,338	21,961	-18,963	-873	-1,396	-563	-21,795	166	-5,119
2037	13	1,066	7,601	5,090	2,273	16,044	-18,847	-870	-1,397	-562	-21,676	-5,632	-10,751
2038	731	1,057	1,973	5,205	2,316	11,281	-19,197	-870	-1,374	-558	-22,000	-10,718	-21,469
2039	768	1,046	10,627	5,315	2,274	20,031	-19,119	-868	-1,365	-549	-21,901	-1,870	-23,339
2040	13	1,047	4,294	5,436	2,347	13,137	-19,811	-867	-1,350	-536	-22,564	-9,427	-32,766

Table B14

Simulated MCSB Future Projects with Climate Change Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	Natural Recharge	Underflow From Desert Hot Spriongs Subbasin	Artificial Recharge	Wastewater Return	Return Flows[1]	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2041	21,509	1,066	8,051	5,530	2,408	38,564	-19,907	-860	-1,350	-531	-22,648	15,916	-16,850
2042	3,434	1,056	5,233	5,651	2,343	17,716	-19,765	-857	-1,354	-529	-22,504	-4,788	-21,639
2043	4,935	1,031	20,036	5,765	2,385	34,153	-20,109	-854	-1,352	-522	-22,837	11,316	-10,322
2044	29,867	1,064	9,975	5,891	2,343	49,140	-19,970	-855	-1,387	-513	-22,726	26,414	16,092
2045	29,867	1,095	12,828	5,981	2,417	52,188	-20,647	-853	-1,372	-499	-23,370	28,818	44,909
2046	4,935	1,043	11,212	5,978	2,463	25,632	-20,854	-853	-1,365	-497	-23,569	2,062	46,972
2047	3,434	1,001	11,342	5,987	2,384	24,148	-20,475	-854	-1,368	-588	-23,285	863	47,834
2048	21,510	1,000	13,270	6,006	2,412	44,198	-20,582	-858	-1,368	-593	-23,401	20,797	68,631
2049	13	966	13,198	5,987	2,357	22,521	-20,207	-859	-1,378	-591	-23,036	-514	68,117
2050	768	942	15,031	5,981	2,417	25,140	-20,645	-863	-1,375	-618	-23,501	1,639	69,756
2051	731	931	7,648	5,978	2,463	17,750	-20,853	-866	-1,370	-635	-23,724	-5,974	63,782
2052	13	927	8,693	6,003	2,384	18,020	-20,475	-872	-1,375	-631	-23,353	-5,333	58,449
2053	1,154	910	16,882	5,989	2,413	27,348	-20,581	-873	-1,373	-635	-23,463	3,885	62,334
2054	2,614	885	13,596	5,987	2,357	25,440	-20,206	-878	-1,409	-654	-23,147	2,293	64,627
2055	31,753	946	17,128	5,981	2,417	58,225	-20,644	-884	-1,426	-665	-23,619	34,606	99,233
2056	1,780	906	19,031	5,995	2,462	30,173	-20,851	-893	-1,461	-668	-23,873	6,300	105,533
2057	13	854	11,418	5,987	2,384	20,656	-20,472	-900	-1,487	-666	-23,525	-2,869	102,664
2058	2,340	841	6,661	5,989	2,413	18,244	-20,581	-908	-1,481	-655	-23,625	-5,381	97,283
2059	13	835	7,612	5,987	2,357	16,805	-20,207	-915	-1,487	-654	-23,263	-6,458	90,825
2060	9,561	886	13,160	5,997	2,416	32,021	-20,645	-923	-1,489	-652	-23,709	8,312	99,137
2061	5,048	857	21,055	5,978	2,463	35,402	-20,852	-925	-1,507	-645	-23,929	11,473	110,610
2062	13	810	17,107	5,987	2,384	26,301	-20,472	-933	-1,558	-633	-23,596	2,705	113,315
2063	13	789	9,212	5,989	2,413	18,416	-20,580	-943	-1,573	-613	-23,709	-5,293	108,022
2064	13	788	1,316	6,004	2,356	10,477	-20,207	-954	-1,582	-608	-23,351	-12,874	95,148
2065	13	804	4,498	5,981	2,417	13,713	-20,647	-956	-1,549	-607	-23,759	-10,046	85,102
2066	13	810	13,495	5,978	2,463	22,759	-20,855	-957	-1,545	-608	-23,964	-1,205	83,897
2067	7,530	794	19,117	5,987	2,384	35,812	-20,474	-960	-1,585	-600	-23,619	12,193	96,090
2068	13	779	7,872	6,006	2,412	17,082	-20,581	-967	-1,616	-591	-23,756	-6,674	89,416

Table B14

Simulated MCSB Future Projects with Climate Change Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)						Simulated Outflows (AFY)						
Year	Natural Recharge	Underflow From Desert Hot Spriongs Subbasin	Artificial Recharge	Wastewater Return	Return Flows[1]	Total Inflow	Pumping	Evapo-transpiration	Underflow to Garnet Hill	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2069	19,526	760	16,868	5,987	2,357	45,498	-20,206	-971	-1,641	-593	-23,411	22,087	111,503
Average[3] 2020-2045	6,640	1,110	7,310	4,160	2,320	21,530	-17,910	-890	-1,430	-590	-20,810	720	
Min[3] 2020-2045	10	1,030	480	1,960	2,160	6,190	-20,650	-950	-1,640	-660	-23,370	-12,660	
Max[3] 2020-2045	31,750	1,170	20,040	5,980	3,390	52,190	-15,320	-850	-1,350	-500	-18,570	28,820	
Average[3] 2009-2069	5,360	1,030	9,780	4,440	2,410	23,030	-18,330	-900	-1,500	-610	-21,340	1,680	
Min[3] 2009-2069	10	760	0	1,290	2,160	5,890	-20,850	-970	-1,810	-670	-23,960	-12,870	
Max[3] 2009-2069	31,750	1,290	33,210	6,010	3,390	58,220	-13,530	-850	-1,350	-500	-16,860	34,610	

Notes
1. Septic Return and Applied Water Return.
2. Underflow to Indio Hills East and Indio Hills West.
3. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre feet
AFY = acre feet per year

Table B15

Simulated GHSA Baseline Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF[1]	Return Flow	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2009	3,008	0	114	1,629	4,751	-327	-9,163	-9,490	-4,740	0
2010	10,097	0	106	1,670	11,873	-1,022	-9,081	-10,104	1,770	1,770
2011	8,311	0	104	1,763	10,179	-1,562	-8,139	-9,701	478	2,248
2012	6,286	0	103	1,806	8,196	-1,129	-6,832	-7,962	234	2,481
2013	5,175	0	102	1,780	7,056	-604	-6,061	-6,665	391	2,873
2014	5,036	0	104	1,757	6,897	-192	-6,830	-7,023	-125	2,747
2015	4,071	0	102	1,768	5,941	-74	-7,791	-7,865	-1,923	824
2016	4,840	0	106	1,755	6,701	-112	-8,689	-8,801	-2,100	-1,276
2017	6,507	0	100	1,714	8,320	-1,119	-8,164	-9,283	-963	-2,239
2018	5,955	0	89	1,703	7,747	-931	-6,652	-7,582	165	-2,074
2019	12,139	0	84	1,720	13,943	-1,720	-5,944	-7,664	6,279	4,204
2020	23,114	0	85	1,644	24,844	-480	-6,193	-6,673	18,171	22,376
2021	14,874	0	86	1,601	16,561	-442	-6,170	-6,613	9,948	32,323
2022	9,778	0	86	1,566	11,430	-626	-5,805	-6,432	4,998	37,321
2023	11,731	336	77	1,522	13,666	-318	-6,134	-6,452	7,214	44,536
2024	8,506	655	68	1,498	10,727	-427	-6,130	-6,557	4,170	48,706
2025	4,706	971	59	1,450	7,185	-480	-5,655	-6,134	1,051	49,757
2026	3,367	1,098	56	1,425	5,945	-442	-5,319	-5,761	184	49,941
2027	4,147	1,225	52	1,394	6,817	-626	-5,570	-6,196	621	50,562
2028	51,034	1,355	49	1,358	53,797	-318	-11,283	-11,601	42,196	92,758
2029	24,600	1,479	46	1,337	27,462	-427	-10,809	-11,236	16,226	108,983

Table B15

Simulated GHSA Baseline Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Year	Simulated Inflows (AFY) Natural Recharge	RWRF[1]	Return Flow	Underflow From Mission Creek	Total Inflow	Simulated Outflows (AFY) Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2030	42,111	1,606	43	1,297	45,056	-480	-12,398	-12,878	32,178	141,162
2031	18,269	1,732	40	1,248	21,290	-442	-10,823	-11,266	10,024	151,185
2032	22,611	1,865	36	1,203	25,715	-626	-10,843	-11,469	14,246	165,432
2033	45,540	1,986	33	1,145	48,704	-318	-13,728	-14,045	34,658	200,090
2034	18,834	2,113	30	1,102	22,079	-427	-11,987	-12,415	9,664	209,754
2035	11,053	2,240	27	1,038	14,357	-480	-10,276	-10,756	3,601	213,355
2036	13,366	2,359	24	999	16,747	-442	-9,913	-10,356	6,392	219,746
2037	6,308	2,464	21	959	9,752	-626	-9,015	-9,641	111	219,857
2038	2,857	2,576	18	900	6,352	-318	-8,491	-8,809	-2,457	217,400
2039	1,507	2,688	16	858	5,070	-427	-8,263	-8,691	-3,621	213,779
2040	1,187	2,808	13	809	4,817	-480	-8,187	-8,666	-3,850	209,930
2041	8,466	2,912	10	781	12,170	-442	-8,920	-9,363	2,807	212,736
2042	10,182	3,024	7	760	13,974	-626	-9,519	-10,145	3,829	216,565
2043	30,017	3,136	5	738	33,896	-318	-11,607	-11,925	21,972	238,537
2044	16,630	3,257	2	746	20,635	-427	-10,810	-11,238	9,397	247,934
2045	16,769	3,360	0	700	20,829	-480	-10,289	-10,769	10,060	257,994
2046	14,749	3,360	0	662	18,772	-442	-10,087	-10,530	8,242	266,236
2047	10,075	3,360	0	636	14,072	-626	-9,633	-10,259	3,813	270,049
2048	17,138	3,370	0	604	21,112	-318	-10,301	-10,619	10,493	280,542
2049	5,578	3,360	1	588	9,527	-427	-9,370	-9,798	-270	280,272
2050	3,790	3,360	1	554	7,706	-480	-8,673	-9,153	-1,447	278,825

Table B15

Simulated GHSA Baseline Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF[1]	Return Flow	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2051	5,137	3,360	2	522	9,021	-442	-8,660	-9,102	-81	278,744
2052	619	3,370	2	503	4,493	-626	-8,381	-9,007	-4,514	274,230
2053	1,209	3,360	3	477	5,049	-318	-8,211	-8,529	-3,480	270,750
2054	7,479	3,360	3	484	11,327	-427	-8,697	-9,124	2,202	272,952
2055	15,571	3,360	3	471	19,406	-480	-9,666	-10,146	9,260	282,213
2056	4,744	3,370	3	469	8,586	-442	-8,717	-9,160	-573	281,639
2057	4,174	3,360	4	470	8,008	-626	-8,067	-8,693	-685	280,954
2058	5,506	3,360	4	445	9,315	-318	-8,232	-8,550	766	281,720
2059	1,888	3,360	5	432	5,685	-427	-8,187	-8,615	-2,929	278,790
2060	7,384	3,370	5	409	11,167	-480	-8,821	-9,301	1,866	280,656
2061	5,174	3,360	5	400	8,940	-442	-8,682	-9,124	-184	280,472
2062	2,754	3,360	5	419	6,538	-626	-8,058	-8,684	-2,146	278,326
2063	2,012	3,360	5	410	5,788	-318	-7,726	-8,044	-2,256	276,069
2064	1,655	3,370	5	404	5,434	-427	-7,903	-8,330	-2,896	273,173
2065	704	3,360	5	361	4,431	-480	-8,202	-8,681	-4,250	268,923
2066	1,442	3,360	5	340	5,148	-442	-8,490	-8,933	-3,785	265,137
2067	3,021	3,360	5	355	6,742	-626	-8,574	-9,200	-2,458	262,679
2068	2,578	3,370	5	359	6,312	-318	-8,493	-8,811	-2,499	260,180

Table B15

Simulated GHSA Baseline Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF[1]	Return Flow	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2069	9,111	3,360	5	369	12,845	-427	-9,060	-9,487	3,358	263,539
Average[3] 2020-2045	16,210	1,820	40	1,160	19,230	-460	-9,010	-9,460	9,760	
Min[3] 2020-2045	1,190	0	0	700	4,820	-630	-13,730	-14,050	-3,850	
Max[3] 2020-2045	51,030	3,360	90	1,640	53,800	-320	-5,320	-5,760	42,200	
Average[3] 2009-2069	10,270	2,100	40	990	13,390	-520	-8,630	-9,150	4,240	
Min[3] 2009-2069	620	0	0	340	4,430	-1,720	-13,730	-14,050	-4,740	
Max[3] 2009-2069	51,030	3,370	110	1,810	53,800	-70	-5,320	-5,760	42,200	

Notes
1. Regional Wastewater Reclamation Facility
2. Indio Hills west and Indio Subbasin
3. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre feet
AFY = acre feet per year

Table B16

Simulated GHSA Baseline Scenario with Climate Change Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF	Other Return Flow[1]	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2009	3,008	0	114	1,629	4,751	-327	-9,163	-9,490	-4,740	0
2010	10,097	0	106	1,670	11,873	-1,022	-9,081	-10,104	1,770	1,770
2011	8,311	0	104	1,763	10,179	-1,562	-8,139	-9,701	478	2,248
2012	6,286	0	103	1,806	8,196	-1,129	-6,832	-7,962	234	2,481
2013	5,175	0	102	1,780	7,056	-604	-6,061	-6,665	391	2,873
2014	5,036	0	104	1,757	6,897	-192	-6,830	-7,023	-125	2,747
2015	4,071	0	102	1,768	5,941	-74	-7,791	-7,865	-1,923	824
2016	4,840	0	106	1,755	6,701	-112	-8,689	-8,801	-2,100	-1,276
2017	6,507	0	100	1,714	8,320	-1,119	-8,164	-9,283	-963	-2,239
2018	5,955	0	89	1,703	7,747	-931	-6,652	-7,582	165	-2,074
2019	12,139	0	84	1,720	13,943	-1,720	-5,944	-7,664	6,279	4,204
2020	11,014	0	82	1,642	12,738	-480	-4,783	-5,262	7,476	11,680
2021	3,582	0	83	1,594	5,259	-442	-4,195	-4,637	622	12,302
2022	3,481	0	83	1,558	5,122	-626	-4,160	-4,786	336	12,638
2023	1,442	336	74	1,506	3,358	-318	-4,126	-4,444	-1,086	11,552
2024	706	655	65	1,484	2,909	-427	-4,079	-4,506	-1,597	9,955
2025	1,651	971	56	1,444	4,121	-480	-4,083	-4,563	-441	9,514
2026	2,012	1,098	52	1,422	4,584	-442	-4,124	-4,566	18	9,532
2027	2,754	1,225	49	1,395	5,423	-626	-4,496	-5,122	301	9,833
2028	5,188	1,355	46	1,358	7,947	-318	-5,166	-5,484	2,463	12,296
2029	7,364	1,479	42	1,337	10,222	-427	-5,665	-6,093	4,129	16,425
2030	1,888	1,606	39	1,301	4,834	-480	-5,343	-5,823	-989	15,436

Table B16

Simulated GHSA Baseline Scenario with Climate Change Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				Cumulative
Year	Natural Recharge	RWRF	Other Return Flow[1]	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Change in Storage (AF)
2031	5,506	1,732	36	1,270	8,544	-442	-5,700	-6,142	2,402	17,838
2032	4,185	1,865	32	1,251	7,333	-626	-5,938	-6,564	769	18,607
2033	4,731	1,986	29	1,213	7,960	-318	-6,082	-6,400	1,560	20,167
2034	15,571	2,113	26	1,194	18,904	-427	-7,377	-7,804	11,100	31,267
2035	7,479	2,240	22	1,153	10,895	-480	-7,115	-7,594	3,300	34,568
2036	1,212	2,359	20	1,130	4,721	-442	-6,128	-6,571	-1,850	32,717
2037	618	2,464	17	1,100	4,199	-626	-5,694	-6,320	-2,121	30,596
2038	5,137	2,576	14	1,049	8,777	-318	-6,349	-6,667	2,110	32,706
2039	3,790	2,688	12	1,013	7,502	-427	-6,731	-7,159	344	33,050
2040	5,593	2,808	9	967	9,377	-480	-7,182	-7,661	1,715	34,765
2041	17,091	2,912	6	939	20,949	-442	-8,761	-9,204	11,745	46,510
2042	10,380	3,024	3	914	14,322	-626	-8,899	-9,525	4,797	51,307
2043	14,771	3,136	1	880	18,788	-318	-9,189	-9,507	9,281	60,588
2044	16,814	3,257	0	881	20,953	-427	-9,406	-9,834	11,119	71,707
2045	16,769	3,360	0	830	20,959	-480	-9,443	-9,923	11,036	82,743
2046	14,749	3,360	0	787	18,897	-442	-9,343	-9,786	9,111	91,854
2047	10,075	3,360	0	756	14,192	-626	-8,915	-9,541	4,651	96,505
2048	17,138	3,370	0	720	21,227	-318	-9,629	-9,947	11,281	107,786
2049	5,578	3,360	0	697	9,636	-427	-8,731	-9,159	477	108,263
2050	3,790	3,360	0	657	7,808	-480	-8,059	-8,539	-731	107,532
2051	5,137	3,360	0	619	9,117	-442	-8,079	-8,522	595	108,127
2052	619	3,370	0	595	4,584	-626	-7,817	-8,443	-3,859	104,268

Table B16

Simulated GHSA Baseline Scenario with Climate Change Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				Cumulative
Year	Natural Recharge	RWRF	Other Return Flow[1]	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Change in Storage (AF)
2053	1,209	3,360	0	563	5,133	-318	-7,680	-7,998	-2,865	101,403
2054	7,479	3,360	0	564	11,404	-427	-8,220	-8,648	2,756	104,159
2055	15,571	3,360	0	545	19,477	-480	-9,255	-9,735	9,742	113,901
2056	4,744	3,370	0	537	8,651	-442	-8,332	-8,774	-123	113,778
2057	4,174	3,360	0	531	8,066	-626	-7,678	-8,304	-238	113,540
2058	5,506	3,360	0	500	9,367	-318	-7,832	-8,150	1,217	114,756
2059	1,888	3,360	0	483	5,731	-427	-7,769	-8,196	-2,465	112,291
2060	7,384	3,370	0	453	11,206	-480	-8,409	-8,889	2,318	114,609
2061	5,174	3,360	0	438	8,972	-442	-8,302	-8,744	228	114,837
2062	2,754	3,360	0	449	6,564	-626	-7,700	-8,327	-1,763	113,074
2063	2,012	3,360	0	434	5,806	-318	-7,368	-7,686	-1,880	111,194
2064	1,655	3,370	0	423	5,447	-427	-7,521	-7,948	-2,501	108,693
2065	704	3,360	0	374	4,438	-480	-7,794	-8,274	-3,836	104,857
2066	1,442	3,360	0	346	5,149	-442	-8,083	-8,525	-3,377	101,481
2067	3,021	3,360	0	355	6,736	-626	-8,195	-8,822	-2,085	99,395
2068	2,578	3,370	0	353	6,300	-318	-8,131	-8,449	-2,149	97,246

Table B16

Simulated GHSA Baseline Scenario with Climate Change Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				Cumulative
Year	**Natural Recharge**	**RWRF**	**Other Return Flow[1]**	**Underflow From Mission Creek**	**Total Inflow**	**Pumping**	**Underflow to Indio Hills[2]**	**Total Outflow**	**Change in Storage (AFY)**	**Change in Storage (AF)**
2069	9,111	3,360	0	356	12,827	-427	-8,723	-9,151	3,676	100,922
Average[3] 2020-2045	6,570	1,820	30	1,220	9,640	-460	-6,160	-6,620	3,020	
Min[3] 2020-2045	620	0	0	830	2,910	-630	-9,440	-9,920	-2,120	
Max[3] 2020-2045	17,090	3,360	80	1,640	20,960	-320	-4,080	-4,440	11,740	
Average[3] 2009-2069	6,160	2,100	30	1,040	9,330	-520	-7,230	-7,750	1,580	
Min[3] 2009-2069	620	0	0	350	2,910	-1,720	-9,630	-10,100	-4,740	
Max[3] 2009-2069	17,140	3,370	110	1,810	21,230	-70	-4,080	-4,440	11,740	

Notes

1. Septic Return and Applied Water Return
2. Indio Hills west and Indio Subbasin
3. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations

AF = acre feet

AFY = acre feet per year

RWRF = Regional Water Reclamation Facility

Table B17

Simulated GHSA Near-Term Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF	Return Flow[1]	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2009	3,008	0	114	1,629	4,751	-327	-9,163	-9,490	-4,740	0
2010	10,097	0	106	1,670	11,873	-1,022	-9,081	-10,104	1,770	1,770
2011	8,311	0	104	1,763	10,179	-1,562	-8,139	-9,701	478	2,248
2012	6,286	0	103	1,806	8,196	-1,129	-6,832	-7,962	234	2,481
2013	5,175	0	102	1,780	7,056	-604	-6,061	-6,665	391	2,873
2014	5,036	0	104	1,757	6,897	-192	-6,830	-7,023	-125	2,747
2015	4,071	0	102	1,768	5,941	-74	-7,791	-7,865	-1,923	824
2016	4,840	0	106	1,755	6,701	-112	-8,689	-8,801	-2,100	-1,276
2017	6,507	0	100	1,714	8,320	-1,119	-8,164	-9,283	-963	-2,239
2018	5,955	0	89	1,703	7,747	-931	-6,652	-7,582	165	-2,074
2019	12,139	0	84	1,720	13,943	-1,720	-5,944	-7,664	6,279	4,204
2020	23,114	0	85	1,644	24,844	-480	-6,193	-6,673	18,171	22,376
2021	14,874	0	86	1,601	16,561	-442	-6,170	-6,613	9,948	32,323
2022	9,778	0	86	1,566	11,430	-626	-5,805	-6,432	4,998	37,321
2023	11,731	336	77	1,522	13,666	-318	-6,140	-6,458	7,208	44,530
2024	8,506	655	68	1,498	10,728	-427	-6,161	-6,589	4,139	48,668
2025	4,706	971	59	1,450	7,186	-480	-5,745	-6,225	961	49,629
2026	3,367	1,098	56	1,426	5,947	-442	-5,475	-5,918	29	49,658
2027	4,147	1,225	0	1,443	6,814	-626	-5,741	-6,367	447	50,105
2028	51,034	0	90	1,429	52,553	-318	-11,419	-11,737	40,816	90,921
2029	24,600	0	90	1,428	26,119	-427	-10,898	-11,325	14,793	105,715

Table B17

Simulated GHSA Near-Term Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF	Return Flow[1]	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2030	42,111	0	91	1,408	43,610	-480	-12,426	-12,905	30,705	136,419
2031	18,269	0	92	1,380	19,740	-442	-10,787	-11,230	8,511	144,930
2032	22,611	0	92	1,357	24,060	-626	-10,742	-11,368	12,692	157,622
2033	45,540	0	93	1,320	46,952	-318	-13,564	-13,882	33,070	190,692
2034	18,834	0	93	1,299	20,227	-427	-11,765	-12,192	8,034	198,726
2035	11,053	0	94	1,259	12,405	-480	-9,996	-10,475	1,930	200,656
2036	13,366	0	94	1,244	14,705	-442	-9,576	-10,018	4,687	205,343
2037	6,308	0	95	1,227	7,630	-626	-8,625	-9,251	-1,621	203,721
2038	2,857	0	96	1,192	4,145	-318	-8,053	-8,371	-4,226	199,496
2039	1,507	0	96	1,175	2,779	-427	-7,779	-8,206	-5,428	194,068
2040	1,187	0	97	1,154	2,438	-480	-7,658	-8,138	-5,700	188,368
2041	8,466	0	98	1,153	9,717	-442	-8,353	-8,796	922	189,290
2042	10,182	0	98	1,158	11,439	-626	-8,914	-9,540	1,899	191,189
2043	30,017	0	99	1,163	31,279	-318	-10,963	-11,281	19,998	211,186
2044	16,630	0	99	1,198	17,928	-427	-10,128	-10,555	7,373	218,559
2045	16,769	0	100	1,179	18,048	-480	-9,574	-10,054	7,994	226,553
2046	14,749	0	100	1,165	16,015	-442	-9,341	-9,783	6,232	232,785
2047	10,075	0	101	1,161	11,337	-626	-8,857	-9,483	1,854	234,639
2048	17,138	0	101	1,152	18,392	-318	-9,497	-9,815	8,577	243,216
2049	5,578	0	102	1,155	6,835	-427	-8,543	-8,970	-2,135	241,081
2050	3,790	0	102	1,142	5,035	-480	-7,822	-8,302	-3,267	237,814

Table B17

Simulated GHSA Near-Term Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF	Return Flow[1]	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2051	5,137	0	103	1,131	6,371	-442	-7,791	-8,233	-1,862	235,951
2052	619	0	103	1,133	1,855	-626	-7,494	-8,121	-6,265	229,686
2053	1,209	0	103	1,125	2,438	-318	-7,313	-7,631	-5,193	224,493
2054	7,479	0	104	1,151	8,734	-427	-7,788	-8,215	519	225,012
2055	15,571	0	104	1,158	16,834	-480	-8,745	-9,224	7,609	232,621
2056	4,744	0	105	1,177	6,026	-442	-7,777	-8,219	-2,193	230,428
2057	4,174	0	105	1,194	5,472	-626	-7,119	-7,745	-2,273	228,155
2058	5,506	0	105	1,187	6,798	-318	-7,281	-7,599	-800	227,355
2059	1,888	0	105	1,193	3,186	-427	-7,235	-7,662	-4,476	222,878
2060	7,384	0	106	1,190	8,679	-480	-7,865	-8,345	334	223,213
2061	5,174	0	106	1,196	6,476	-442	-7,719	-8,161	-1,685	221,528
2062	2,754	0	106	1,231	4,091	-626	-7,085	-7,711	-3,621	217,907
2063	2,012	0	106	1,239	3,357	-318	-6,750	-7,068	-3,711	214,196
2064	1,655	0	106	1,251	3,012	-427	-6,930	-7,358	-4,346	209,851
2065	704	0	106	1,223	2,033	-480	-7,241	-7,721	-5,688	204,163
2066	1,442	0	106	1,217	2,766	-442	-7,534	-7,977	-5,211	198,952
2067	3,021	0	106	1,247	4,374	-626	-7,614	-8,240	-3,866	195,086
2068	2,578	0	106	1,269	3,953	-318	-7,528	-7,846	-3,893	191,194

Table B17

Simulated GHSA Near-Term Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF	Return Flow[1]	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2069	9,111	0	106	1,289	10,506	-427	-8,098	-8,525	1,981	193,174
Average[3] 2020-2045	16,210	160	90	1,340	17,810	-460	-8,790	-9,250	8,550	
Min[3] 2020-2045	1,190	0	0	1,150	2,440	-630	-13,560	-13,880	-5,700	
Max[3] 2020-2045	51,030	1,220	100	1,640	52,550	-320	-5,480	-5,920	40,820	
Average[3] 2009-2069	10,270	70	100	1,350	11,790	-520	-8,180	-8,700	3,090	
Min[3] 2009-2069	620	0	0	1,130	1,860	-1,720	-13,560	-13,880	-6,270	
Max[3] 2009-2069	51,030	1,220	110	1,810	52,550	-70	-5,480	-5,920	40,820	

Notes
1. Septic Return and Applied Water Return.
2. Indio Hills west and Indio Subbasin
3. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre feet
AFY = acre feet per year
RWRF = Regional Water Reclamation Facility

Table B18

Simulated GHSA Near-Term with Climate Change Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF	Return Flow[1]	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2009	3,008	0	114	1,629	4,751	-327	-9,163	-9,490	-4,740	0
2010	10,097	0	106	1,670	11,873	-1,022	-9,081	-10,104	1,770	1,770
2011	8,311	0	104	1,763	10,179	-1,562	-8,139	-9,701	478	2,248
2012	6,286	0	103	1,806	8,196	-1,129	-6,832	-7,962	234	2,481
2013	5,175	0	102	1,780	7,056	-604	-6,061	-6,665	391	2,873
2014	5,036	0	104	1,757	6,897	-192	-6,830	-7,023	-125	2,747
2015	4,071	0	102	1,768	5,941	-74	-7,791	-7,865	-1,923	824
2016	4,840	0	106	1,755	6,701	-112	-8,689	-8,801	-2,100	-1,276
2017	6,507	0	100	1,714	8,320	-1,119	-8,164	-9,283	-963	-2,239
2018	5,955	0	89	1,703	7,747	-931	-6,652	-7,582	165	-2,074
2019	12,139	0	84	1,720	13,943	-1,720	-5,944	-7,664	6,279	4,204
2020	11,014	0	82	1,642	12,738	-480	-4,783	-5,262	7,476	11,680
2021	3,582	0	83	1,594	5,259	-442	-4,195	-4,637	622	12,302
2022	3,481	0	83	1,558	5,122	-626	-4,160	-4,786	336	12,638
2023	1,442	336	74	1,506	3,358	-318	-4,173	-4,491	-1,134	11,505
2024	706	655	65	1,484	2,910	-427	-4,245	-4,672	-1,763	9,742
2025	1,651	971	56	1,445	4,122	-480	-4,416	-4,896	-774	8,968
2026	2,012	1,098	52	1,425	4,587	-442	-4,622	-5,064	-477	8,491
2027	2,754	1,225	0	1,446	5,425	-626	-5,077	-5,703	-278	8,213
2028	5,188	0	86	1,431	6,706	-318	-5,772	-6,090	616	8,829
2029	7,364	0	87	1,432	8,882	-427	-6,272	-6,699	2,182	11,011

Table B18

Simulated GHSA Near-Term with Climate Change Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF	Return Flow[1]	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2030	1,888	0	87	1,417	3,392	-480	-5,937	-6,416	-3,025	7,986
2031	5,506	0	88	1,407	7,001	-442	-6,252	-6,694	307	8,293
2032	4,185	0	88	1,411	5,684	-626	-6,450	-7,076	-1,392	6,901
2033	4,731	0	89	1,396	6,215	-318	-6,550	-6,868	-653	6,248
2034	15,571	0	89	1,400	17,061	-427	-7,791	-8,218	8,843	15,091
2035	7,479	0	90	1,384	8,953	-480	-7,501	-7,981	972	16,064
2036	1,212	0	90	1,389	2,692	-442	-6,486	-6,929	-4,236	11,827
2037	618	0	91	1,386	2,095	-626	-5,999	-6,625	-4,530	7,297
2038	5,137	0	92	1,362	6,590	-318	-6,575	-6,893	-303	6,995
2039	3,790	0	92	1,350	5,233	-427	-6,901	-7,329	-2,096	4,898
2040	5,593	0	93	1,333	7,019	-480	-7,294	-7,773	-755	4,144
2041	17,091	0	93	1,331	18,515	-442	-8,812	-9,254	9,261	13,404
2042	10,380	0	94	1,331	11,806	-626	-8,914	-9,540	2,266	15,670
2043	14,771	0	95	1,326	16,191	-318	-9,183	-9,501	6,690	22,360
2044	16,814	0	95	1,354	18,264	-427	-9,379	-9,807	8,457	30,818
2045	16,769	0	96	1,331	18,196	-480	-9,382	-9,862	8,334	39,151
2046	14,749	0	96	1,313	16,158	-442	-9,245	-9,688	6,471	45,622
2047	10,075	0	96	1,305	11,476	-626	-8,786	-9,413	2,063	47,685
2048	17,138	0	96	1,293	18,526	-318	-9,472	-9,789	8,737	56,422
2049	5,578	0	96	1,290	6,964	-427	-8,572	-9,000	-2,036	54,386
2050	3,790	0	96	1,272	5,158	-480	-7,893	-8,372	-3,214	51,172

Table B18

Simulated GHSA Near-Term with Climate Change Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF	Return Flow[1]	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2051	5,137	0	96	1,256	6,489	-442	-7,894	-8,337	-1,848	49,324
2052	619	0	96	1,253	1,969	-626	-7,621	-8,247	-6,278	43,046
2053	1,209	0	96	1,240	2,545	-318	-7,483	-7,800	-5,255	37,791
2054	7,479	0	96	1,260	8,835	-427	-8,021	-8,448	387	38,178
2055	15,571	0	96	1,262	16,929	-480	-9,067	-9,547	7,382	45,560
2056	4,744	0	96	1,276	6,116	-442	-8,180	-8,622	-2,507	43,053
2057	4,174	0	96	1,287	5,556	-626	-7,531	-8,157	-2,601	40,452
2058	5,506	0	96	1,275	6,877	-318	-7,671	-7,989	-1,112	39,340
2059	1,888	0	96	1,275	3,259	-427	-7,599	-8,026	-4,767	34,573
2060	7,384	0	96	1,267	8,747	-480	-8,230	-8,710	37	34,610
2061	5,174	0	96	1,268	6,538	-442	-8,150	-8,592	-2,054	32,556
2062	2,754	0	96	1,296	4,146	-626	-7,575	-8,202	-4,055	28,501
2063	2,012	0	96	1,299	3,407	-318	-7,249	-7,567	-4,159	24,342
2064	1,655	0	96	1,307	3,058	-427	-7,384	-7,811	-4,753	19,588
2065	704	0	96	1,274	2,073	-480	-7,640	-8,119	-6,046	13,542
2066	1,442	0	96	1,263	2,801	-442	-7,928	-8,370	-5,569	7,973
2067	3,021	0	96	1,287	4,403	-626	-8,062	-8,688	-4,284	3,688
2068	2,578	0	96	1,302	3,976	-318	-8,014	-8,332	-4,355	-667

Table B18

Simulated GHSA Near-Term with Climate Change Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF	Return Flow[1]	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2069	9,111	0	96	1,318	10,524	-427	-8,614	-9,042	1,482	815
Average[3] 2020-2045	6,570	160	80	1,420	8,230	-460	-6,430	-6,890	1,340	
Min[3] 2020-2045	620	0	0	1,330	2,090	-630	-9,380	-9,860	-4,530	
Max[3] 2020-2045	17,090	1,220	100	1,640	18,520	-320	-4,160	-4,490	9,260	
Average[3] 2009-2069	6,160	70	90	1,420	7,740	-520	-7,280	-7,800	-60	
Min[3] 2009-2069	620	0	0	1,240	1,970	-1,720	-9,470	-10,100	-6,280	
Max[3] 2009-2069	17,140	1,220	110	1,810	18,530	-70	-4,160	-4,490	9,260	

Notes
1. Septic Return and Applied Water Return.
2. Indio Hills west and Indio Subbasin.
3. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre feet
AFY = acre feet per year
RWRF = Regional Water Reclamation Facility

Table B19

Simulated GHSA Future Projects Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF	Return Flow[1]	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2009	3,008	0	114	1,629	4,751	-327	-9,163	-9,490	-4,740	0
2010	10,097	0	106	1,670	11,873	-1,022	-9,081	-10,104	1,770	1,770
2011	8,311	0	104	1,763	10,179	-1,562	-8,139	-9,701	478	2,248
2012	6,286	0	103	1,806	8,196	-1,129	-6,832	-7,962	234	2,481
2013	5,175	0	102	1,780	7,056	-604	-6,061	-6,665	391	2,873
2014	5,036	0	104	1,757	6,897	-192	-6,830	-7,023	-125	2,747
2015	4,071	0	102	1,768	5,941	-74	-7,791	-7,865	-1,923	824
2016	4,840	0	106	1,755	6,701	-112	-8,689	-8,801	-2,100	-1,276
2017	6,507	0	100	1,714	8,320	-1,119	-8,164	-9,283	-963	-2,239
2018	5,955	0	89	1,703	7,747	-931	-6,652	-7,582	165	-2,074
2019	12,139	0	84	1,720	13,943	-1,720	-5,944	-7,664	6,279	4,204
2020	23,114	0	85	1,644	24,844	-480	-6,193	-6,673	18,171	22,376
2021	14,874	0	86	1,601	16,561	-442	-6,170	-6,613	9,948	32,323
2022	9,778	0	86	1,566	11,430	-626	-5,805	-6,432	4,998	37,321
2023	11,731	336	77	1,522	13,666	-318	-6,140	-6,458	7,208	44,530
2024	8,506	655	68	1,498	10,728	-427	-6,161	-6,589	4,139	48,668
2025	4,706	971	59	1,450	7,186	-480	-5,745	-6,225	961	49,629
2026	3,367	1,098	56	1,426	5,947	-442	-5,475	-5,918	29	49,658
2027	4,147	1,225	0	1,443	6,814	-626	-5,741	-6,367	447	50,105
2028	51,034	0	90	1,429	52,553	-318	-11,419	-11,737	40,816	90,921
2029	24,600	0	90	1,428	26,119	-427	-10,898	-11,325	14,793	105,715

Table B19

Simulated GHSA Future Projects Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF	Return Flow[1]	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2030	42,111	0	91	1,408	43,610	-480	-12,426	-12,905	30,705	136,419
2031	18,269	0	92	1,380	19,740	-442	-10,787	-11,230	8,511	144,930
2032	22,611	0	92	1,357	24,060	-626	-10,742	-11,368	12,692	157,622
2033	45,540	0	93	1,320	46,952	-318	-13,564	-13,882	33,070	190,692
2034	18,834	0	93	1,299	20,227	-427	-11,765	-12,192	8,034	198,726
2035	11,053	0	94	1,261	12,407	-480	-9,996	-10,475	1,932	200,658
2036	13,366	0	94	1,251	14,712	-442	-9,576	-10,018	4,694	205,351
2037	6,308	0	95	1,238	7,641	-626	-8,625	-9,251	-1,610	203,741
2038	2,857	0	96	1,205	4,158	-318	-8,053	-8,371	-4,213	199,529
2039	1,507	0	96	1,190	2,793	-427	-7,779	-8,206	-5,413	194,116
2040	1,187	0	97	1,172	2,456	-480	-7,658	-8,138	-5,682	188,433
2041	8,466	0	98	1,173	9,737	-442	-8,353	-8,795	942	189,375
2042	10,182	0	98	1,181	11,461	-626	-8,914	-9,540	1,921	191,296
2043	30,017	0	99	1,190	31,306	-318	-10,963	-11,281	20,025	211,321
2044	16,630	0	99	1,231	17,961	-427	-10,127	-10,555	7,406	218,727
2045	16,769	0	100	1,220	18,088	-480	-9,573	-10,053	8,035	226,763
2046	14,749	0	100	1,218	16,068	-442	-9,340	-9,782	6,285	233,048
2047	10,075	0	101	1,225	11,401	-626	-8,856	-9,483	1,918	234,966
2048	17,138	0	101	1,229	18,468	-318	-9,496	-9,814	8,654	243,621
2049	5,578	0	102	1,244	6,924	-427	-8,541	-8,969	-2,045	241,576
2050	3,790	0	102	1,246	5,138	-480	-7,821	-8,300	-3,162	238,414

Table B19

Simulated GHSA Future Projects Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF	Return Flow[1]	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2051	5,137	0	103	1,246	6,486	-442	-7,789	-8,231	-1,745	236,669
2052	619	0	103	1,256	1,978	-626	-7,492	-8,118	-6,140	230,529
2053	1,209	0	103	1,260	2,572	-318	-7,310	-7,628	-5,056	225,473
2054	7,479	0	104	1,302	8,885	-427	-7,785	-8,212	672	226,145
2055	15,571	0	104	1,325	17,001	-480	-8,741	-9,221	7,780	233,925
2056	4,744	0	105	1,366	6,215	-442	-7,773	-8,215	-2,001	231,924
2057	4,174	0	105	1,398	5,676	-626	-7,115	-7,741	-2,065	229,860
2058	5,506	0	105	1,397	7,008	-318	-7,276	-7,594	-586	229,273
2059	1,888	0	105	1,407	3,401	-427	-7,229	-7,657	-4,256	225,017
2060	7,384	0	106	1,414	8,904	-480	-7,860	-8,339	564	225,581
2061	5,174	0	106	1,439	6,719	-442	-7,713	-8,155	-1,436	224,145
2062	2,754	0	106	1,496	4,356	-626	-7,079	-7,705	-3,349	220,796
2063	2,012	0	106	1,514	3,632	-318	-6,743	-7,061	-3,429	217,367
2064	1,655	0	106	1,526	3,287	-427	-6,924	-7,351	-4,064	213,303
2065	704	0	106	1,496	2,306	-480	-7,234	-7,714	-5,408	207,895
2066	1,442	0	106	1,496	3,044	-442	-7,527	-7,970	-4,926	202,970
2067	3,021	0	106	1,541	4,668	-626	-7,607	-8,234	-3,565	199,404
2068	2,578	0	106	1,576	4,260	-318	-7,521	-7,839	-3,579	195,825

Table B19

Simulated GHSA Future Projects Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	**Natural Recharge**	**RWRF**	**Return Flow[1]**	**Underflow From Mission Creek**	**Total Inflow**	**Pumping**	**Underflow to Indio Hills[2]**	**Total Outflow**	**Change in Storage (AFY)**	**Cumulative Change in Storage (AF)**
2069	9,111	0	106	1,604	10,821	-427	-8,091	-8,519	2,302	198,128
Average[3] 2020-2045	16,210	160	90	1,350	17,810	-460	-8,790	-9,250	8,560	
Min[3] 2020-2045	1,190	0	0	1,170	2,460	-630	-13,560	-13,880	-5,680	
Max[3] 2020-2045	51,030	1,220	100	1,640	52,550	-320	-5,480	-5,920	40,820	
Average[3] 2009-2069	10,270	70	100	1,430	11,870	-520	-8,180	-8,700	3,170	
Min[3] 2009-2069	620	0	0	1,170	1,980	-1,720	-13,560	-13,880	-6,140	
Max[3] 2009-2069	51,030	1,220	110	1,810	52,550	-70	-5,480	-5,920	40,820	

Notes

1. Regional Wastewater Reclamation Facility
2. Indio Hills west and Indio Subbasin
3. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations

AF = acre feet

AFY = acre feet per year

Table B20

Simulated GHSA Future Projects with Climate Change Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF[1]	Return Flow	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2009	3,008	0	114	1,629	4,751	-327	-9,163	-9,490	-4,740	0
2010	10,097	0	106	1,670	11,873	-1,022	-9,081	-10,104	1,770	1,770
2011	8,311	0	104	1,763	10,179	-1,562	-8,139	-9,701	478	2,248
2012	6,286	0	103	1,806	8,196	-1,129	-6,832	-7,962	234	2,481
2013	5,175	0	102	1,780	7,056	-604	-6,061	-6,665	391	2,873
2014	5,036	0	104	1,757	6,897	-192	-6,830	-7,023	-125	2,747
2015	4,071	0	102	1,768	5,941	-74	-7,791	-7,865	-1,923	824
2016	4,840	0	106	1,755	6,701	-112	-8,689	-8,801	-2,100	-1,276
2017	6,507	0	100	1,714	8,320	-1,119	-8,164	-9,283	-963	-2,239
2018	5,955	0	89	1,703	7,747	-931	-6,652	-7,582	165	-2,074
2019	12,139	0	84	1,720	13,943	-1,720	-5,944	-7,664	6,279	4,204
2020	11,014	0	82	1,642	12,738	-480	-4,783	-5,262	7,476	11,680
2021	3,582	0	83	1,594	5,259	-442	-4,195	-4,637	622	12,302
2022	3,481	0	83	1,558	5,122	-626	-4,160	-4,786	336	12,638
2023	1,442	336	74	1,506	3,358	-318	-4,173	-4,491	-1,134	11,505
2024	706	655	65	1,484	2,910	-427	-4,245	-4,672	-1,763	9,742
2025	1,651	971	56	1,445	4,122	-480	-4,416	-4,896	-774	8,968
2026	2,012	1,098	52	1,425	4,587	-442	-4,622	-5,064	-477	8,491
2027	2,754	1,225	0	1,446	5,425	-626	-5,077	-5,703	-278	8,213
2028	5,188	0	86	1,431	6,706	-318	-5,772	-6,090	616	8,829
2029	7,364	0	87	1,432	8,882	-427	-6,272	-6,699	2,182	11,011

Table B20

Simulated GHSA Future Projects with Climate Change Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF[1]	Return Flow	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2030	1,888	0	87	1,417	3,392	-480	-5,937	-6,416	-3,025	7,986
2031	5,506	0	88	1,407	7,001	-442	-6,252	-6,694	307	8,293
2032	4,185	0	88	1,411	5,684	-626	-6,450	-7,076	-1,392	6,901
2033	4,731	0	89	1,396	6,215	-318	-6,550	-6,868	-653	6,248
2034	15,571	0	89	1,400	17,061	-427	-7,791	-8,218	8,843	15,091
2035	7,479	0	90	1,386	8,955	-480	-7,501	-7,981	974	16,066
2036	1,212	0	90	1,396	2,699	-442	-6,486	-6,929	-4,229	11,836
2037	618	0	91	1,397	2,106	-626	-5,999	-6,625	-4,519	7,317
2038	5,137	0	92	1,374	6,603	-318	-6,575	-6,893	-290	7,027
2039	3,790	0	92	1,365	5,247	-427	-6,901	-7,329	-2,082	4,946
2040	5,593	0	93	1,350	7,036	-480	-7,294	-7,773	-737	4,209
2041	17,091	0	93	1,350	18,535	-442	-8,812	-9,254	9,281	13,489
2042	10,380	0	94	1,354	11,828	-626	-8,913	-9,539	2,288	15,778
2043	14,771	0	95	1,352	16,218	-318	-9,183	-9,501	6,717	22,495
2044	16,814	0	95	1,387	18,297	-427	-9,379	-9,806	8,491	30,986
2045	16,769	0	96	1,372	18,236	-480	-9,382	-9,861	8,375	39,361
2046	14,749	0	96	1,365	16,211	-442	-9,245	-9,687	6,524	45,884
2047	10,075	0	96	1,368	11,540	-626	-8,785	-9,412	2,128	48,012
2048	17,138	0	96	1,368	18,602	-318	-9,470	-9,788	8,814	56,826
2049	5,578	0	96	1,378	7,052	-427	-8,571	-8,998	-1,946	54,880
2050	3,790	0	96	1,375	5,261	-480	-7,891	-8,371	-3,110	51,770

Table B20

Simulated GHSA Future Projects with Climate Change Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	Natural Recharge	RWRF[1]	Return Flow	Underflow From Mission Creek	Total Inflow	Pumping	Underflow to Indio Hills[2]	Total Outflow	Change in Storage (AFY)	Cumulative Change in Storage (AF)
2051	5,137	0	96	1,370	6,603	-442	-7,892	-8,335	-1,732	50,038
2052	619	0	96	1,375	2,090	-626	-7,619	-8,245	-6,155	43,883
2053	1,209	0	96	1,373	2,678	-318	-7,480	-7,798	-5,120	38,763
2054	7,479	0	96	1,409	8,984	-427	-8,018	-8,445	539	39,302
2055	15,571	0	96	1,426	17,093	-480	-9,064	-9,543	7,550	46,852
2056	4,744	0	96	1,461	6,301	-442	-8,176	-8,619	-2,317	44,534
2057	4,174	0	96	1,487	5,757	-626	-7,527	-8,153	-2,397	42,137
2058	5,506	0	96	1,481	7,083	-318	-7,667	-7,984	-901	41,236
2059	1,888	0	96	1,487	3,471	-427	-7,594	-8,021	-4,551	36,686
2060	7,384	0	96	1,489	8,968	-480	-8,225	-8,704	264	36,950
2061	5,174	0	96	1,507	6,777	-442	-8,144	-8,586	-1,809	35,141
2062	2,754	0	96	1,558	4,408	-626	-7,569	-8,195	-3,787	31,354
2063	2,012	0	96	1,573	3,680	-318	-7,242	-7,560	-3,879	27,474
2064	1,655	0	96	1,582	3,334	-427	-7,377	-7,804	-4,471	23,004
2065	704	0	96	1,549	2,349	-480	-7,632	-8,112	-5,764	17,240
2066	1,442	0	96	1,545	3,083	-442	-7,920	-8,362	-5,280	11,960
2067	3,021	0	96	1,585	4,702	-626	-8,054	-8,680	-3,978	7,982
2068	2,578	0	96	1,616	4,290	-318	-8,006	-8,323	-4,033	3,949

Table B20

Simulated GHSA Future Projects with Climate Change Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

	Simulated Inflows (AFY)					Simulated Outflows (AFY)				
Year	**Natural Recharge**	**RWRF[1]**	**Return Flow**	**Underflow From Mission Creek**	**Total Inflow**	**Pumping**	**Underflow to Indio Hills[2]**	**Total Outflow**	**Change in Storage (AFY)**	**Cumulative Change in Storage (AF)**
2069	9,111	0	96	1,641	10,848	-427	-8,606	-9,033	1,814	5,763
Average[3] 2020-2045	6,570	160	80	1,430	8,240	-460	-6,430	-6,890	1,350	
Min[3] 2020-2045	620	0	0	1,350	2,110	-630	-9,380	-9,860	-4,520	
Max[3] 2020-2045	17,090	1,220	100	1,640	18,530	-320	-4,160	-4,490	9,280	
Average[3] 2009-2069	6,160	70	90	1,500	7,820	-520	-7,280	-7,800	20	
Min[3] 2009-2069	620	0	0	1,350	2,090	-1,720	-9,470	-10,100	-6,150	
Max[3] 2009-2069	17,140	1,220	110	1,810	18,600	-70	-4,160	-4,490	9,280	

Notes
1. Regional Wastewater Reclamation Facility
2. Indio Hills west and Indio Subbasin
3. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre-feet
AFY = acre-feet per year

Table B21

Simulated DHSSB Baseline Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2009	20	2,760	2,781	-1,691	-1,291	-686	-3,669	-888	0
2010	4,603	2,485	7,088	-1,691	-1,287	-682	-3,660	3,428	3,428
2011	20	2,360	2,380	-1,691	-1,237	-678	-3,606	-1,226	2,202
2012	20	2,419	2,439	-1,691	-1,150	-675	-3,516	-1,077	1,126
2013	20	2,404	2,425	-1,691	-1,128	-669	-3,487	-1,062	63
2014	20	2,372	2,393	-1,691	-1,133	-664	-3,488	-1,095	-1,032
2015	20	2,124	2,145	-1,691	-1,134	-660	-3,485	-1,340	-2,372
2016	20	2,188	2,209	-1,691	-1,147	-657	-3,495	-1,287	-3,659
2017	20	2,410	2,430	-1,691	-1,154	-650	-3,496	-1,066	-4,724
2018	20	2,356	2,377	-1,691	-1,149	-646	-3,486	-1,110	-5,834
2019	15	2,151	2,166	-1,691	-1,147	-642	-3,479	-1,313	-7,147
2020	20	1,730	1,751	-1,697	-1,153	-632	-3,482	-1,731	-8,879
2021	2,098	1,772	3,870	-1,697	-1,177	-627	-3,501	369	-8,509
2022	20	1,794	1,814	-1,697	-1,175	-624	-3,496	-1,682	-10,191
2023	20	1,836	1,856	-1,697	-1,165	-621	-3,483	-1,627	-11,818
2024	2,446	1,831	4,277	-1,697	-1,182	-620	-3,499	778	-11,040
2025	20	1,926	1,946	-1,697	-1,172	-616	-3,484	-1,538	-12,578
2026	9,981	1,968	11,949	-1,697	-1,237	-613	-3,548	8,401	-4,177
2027	1,581	2,017	3,598	-1,697	-1,238	-611	-3,546	52	-4,125
2028	35,044	2,050	37,095	-1,697	-1,517	-610	-3,824	33,271	29,146
2029	8,625	2,069	10,694	-1,697	-1,615	-606	-3,918	6,776	35,922

Table B21

Simulated DHSSB Baseline Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2030	31,951	2,137	34,088	-1,697	-1,837	-604	-4,138	29,950	65,872
2031	20	2,197	2,217	-1,697	-1,611	-602	-3,910	-1,693	64,179
2032	20	2,219	2,240	-1,697	-1,449	-602	-3,747	-1,508	62,671
2033	1,766	2,252	4,018	-1,697	-1,454	-598	-3,749	269	62,940
2034	20	2,248	2,268	-1,697	-1,401	-597	-3,695	-1,427	61,513
2035	20	2,330	2,350	-1,697	-1,362	-595	-3,654	-1,304	60,209
2036	20	2,363	2,383	-1,697	-1,345	-595	-3,637	-1,253	58,956
2037	20	2,376	2,397	-1,697	-1,325	-592	-3,614	-1,217	57,738
2038	20	2,401	2,421	-1,697	-1,320	-591	-3,608	-1,187	56,552
2039	20	2,388	2,408	-1,697	-1,315	-590	-3,602	-1,194	55,358
2040	20	2,447	2,467	-1,697	-1,322	-591	-3,610	-1,143	54,216
2041	20	2,480	2,500	-1,697	-1,325	-588	-3,610	-1,110	53,106
2042	20	2,493	2,514	-1,697	-1,327	-587	-3,611	-1,097	52,008
2043	36,406	2,518	38,924	-1,697	-1,449	-587	-3,733	35,191	87,200
2044	20	2,505	2,525	-1,697	-1,422	-588	-3,707	-1,182	86,018
2045	2,650	2,564	5,214	-1,697	-1,442	-586	-3,725	1,489	87,507
2046	20	2,594	2,614	-1,697	-1,413	-585	-3,696	-1,081	86,426
2047	20	2,584	2,605	-1,697	-1,381	-585	-3,663	-1,059	85,367
2048	3,738	2,585	6,323	-1,697	-1,392	-587	-3,676	2,647	88,014
2049	20	2,548	2,569	-1,697	-1,368	-585	-3,650	-1,081	86,934
2050	20	2,584	2,605	-1,697	-1,355	-585	-3,637	-1,033	85,901

Table B21

Simulated DHSSB Baseline Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2051	20	2,594	2,615	-1,697	-1,353	-585	-3,635	-1,021	84,880
2052	20	2,584	2,605	-1,697	-1,357	-587	-3,641	-1,036	83,844
2053	20	2,585	2,606	-1,697	-1,348	-585	-3,630	-1,025	82,819
2054	20	2,548	2,569	-1,697	-1,336	-585	-3,618	-1,049	81,770
2055	9,741	2,584	12,325	-1,697	-1,413	-585	-3,695	8,630	90,400
2056	20	2,594	2,614	-1,697	-1,387	-587	-3,672	-1,057	89,343
2057	20	2,584	2,605	-1,697	-1,344	-586	-3,627	-1,023	88,320
2058	20	2,585	2,606	-1,697	-1,335	-586	-3,619	-1,013	87,307
2059	20	2,548	2,569	-1,697	-1,332	-587	-3,616	-1,047	86,260
2060	4,603	2,584	7,187	-1,697	-1,392	-589	-3,678	3,509	89,769
2061	20	2,594	2,615	-1,697	-1,371	-588	-3,656	-1,041	88,728
2062	20	2,584	2,605	-1,697	-1,337	-588	-3,623	-1,018	87,710
2063	20	2,585	2,606	-1,697	-1,323	-589	-3,609	-1,003	86,706
2064	20	2,548	2,569	-1,697	-1,324	-591	-3,612	-1,043	85,663
2065	20	2,584	2,605	-1,697	-1,335	-590	-3,622	-1,017	84,646
2066	20	2,594	2,614	-1,697	-1,343	-590	-3,630	-1,016	83,630
2067	20	2,584	2,605	-1,697	-1,334	-591	-3,622	-1,018	82,613
2068	20	2,585	2,606	-1,697	-1,328	-593	-3,618	-1,013	81,600

Table B21

Simulated DHSSB Baseline Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2069	15	2,548	2,564	-1,697	-1,314	-592	-3,603	-1,040	80,560
Average[4] 2020-2045	5,110	2,190	7,300	-1,700	-1,360	-600	-3,660	3,640	
Min[4] 2020-2045	20	1,730	1,750	-1,700	-1,840	-630	-4,140	-1,730	
Max[4] 2020-2045	36,410	2,560	38,920	-1,700	-1,150	-590	-3,480	35,190	
Average[4] 2009-2069	2,560	2,370	4,930	-1,700	-1,320	-610	-3,630	1,310	
Min[4] 2009-2069	20	1,730	1,750	-1,700	-1,840	-690	-4,140	-1,730	
Max[4] 2009-2069	36,410	2,760	38,920	-1,690	-1,130	-580	-3,480	35,190	

Notes
1. Applied Water and Septic Return.
2. Pumping from Mayer et al., 2007.
3. Discharge at General Head Boundary located along bottom edge of model where Desert Hot Springs Subbasin flows into the Indio Subbasin.
4. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre-feet
AFY = acre feet per year

Table B22

Simulated DHSSB Baseline with Climate Change Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2009	20	2,760	2,781	-1,691	-1,291	-686	-3,669	-888	0
2010	4,603	2,485	7,088	-1,691	-1,287	-682	-3,660	3,428	3,428
2011	20	2,360	2,380	-1,691	-1,237	-678	-3,606	-1,226	2,202
2012	20	2,419	2,439	-1,691	-1,150	-675	-3,516	-1,077	1,126
2013	20	2,404	2,425	-1,691	-1,128	-669	-3,487	-1,062	63
2014	20	2,372	2,393	-1,691	-1,133	-664	-3,488	-1,095	-1,032
2015	20	2,124	2,145	-1,691	-1,134	-660	-3,485	-1,340	-2,372
2016	20	2,188	2,209	-1,691	-1,147	-657	-3,495	-1,287	-3,659
2017	20	2,410	2,430	-1,691	-1,154	-650	-3,496	-1,066	-4,724
2018	20	2,356	2,377	-1,691	-1,149	-646	-3,486	-1,110	-5,834
2019	15	2,151	2,166	-1,691	-1,147	-642	-3,479	-1,313	-7,147
2020	15	2,617	2,632	-1,697	-1,158	-632	-3,486	-854	-8,002
2021	20	2,650	2,670	-1,697	-1,163	-627	-3,487	-817	-8,819
2022	20	2,658	2,678	-1,697	-1,167	-624	-3,488	-810	-9,628
2023	20	2,584	2,605	-1,697	-1,165	-621	-3,484	-879	-10,507
2024	20	2,558	2,578	-1,697	-1,162	-620	-3,480	-901	-11,409
2025	20	2,508	2,529	-1,697	-1,157	-616	-3,470	-942	-12,350
2026	20	2,541	2,562	-1,697	-1,152	-614	-3,463	-901	-13,251
2027	20	2,447	2,467	-1,697	-1,148	-612	-3,457	-990	-14,241
2028	20	2,469	2,489	-1,697	-1,148	-612	-3,456	-967	-15,208
2029	4,603	2,402	7,005	-1,697	-1,182	-608	-3,487	3,518	-11,691

Table B22

Simulated DHSSB Baseline with Climate Change Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2030	20	2,469	2,489	-1,697	-1,170	-606	-3,473	-984	-12,674
2031	20	2,397	2,417	-1,697	-1,152	-605	-3,454	-1,036	-13,710
2032	20	2,405	2,425	-1,697	-1,146	-605	-3,448	-1,022	-14,733
2033	20	2,427	2,447	-1,697	-1,133	-602	-3,432	-985	-15,717
2034	9,741	2,400	12,141	-1,697	-1,200	-601	-3,497	8,644	-7,073
2035	20	2,454	2,474	-1,697	-1,180	-600	-3,476	-1,002	-8,075
2036	20	2,484	2,504	-1,697	-1,148	-600	-3,445	-941	-9,016
2037	20	2,489	2,509	-1,697	-1,131	-598	-3,425	-916	-9,932
2038	20	2,507	2,528	-1,697	-1,129	-597	-3,423	-895	-10,827
2039	20	2,477	2,498	-1,697	-1,126	-596	-3,419	-921	-11,749
2040	20	2,541	2,561	-1,697	-1,135	-598	-3,430	-869	-12,617
2041	3,738	2,571	6,308	-1,697	-1,161	-596	-3,454	2,854	-9,763
2042	20	2,575	2,596	-1,697	-1,159	-596	-3,451	-856	-10,619
2043	20	2,594	2,614	-1,697	-1,143	-596	-3,436	-822	-11,440
2044	2,650	2,564	5,214	-1,697	-1,188	-597	-3,482	1,732	-9,709
2045	2,650	2,627	5,277	-1,697	-1,231	-596	-3,524	1,754	-7,955
2046	20	2,640	2,660	-1,697	-1,194	-596	-3,487	-827	-8,782
2047	20	2,627	2,648	-1,697	-1,165	-597	-3,459	-811	-9,593
2048	3,738	2,628	6,366	-1,697	-1,179	-599	-3,474	2,892	-6,701
2049	20	2,581	2,602	-1,697	-1,159	-598	-3,453	-852	-7,552
2050	20	2,627	2,648	-1,697	-1,150	-598	-3,445	-797	-8,350

Table B22

Simulated DHSSB Baseline with Climate Change Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2051	20	2,640	2,660	-1,697	-1,150	-599	-3,447	-786	-9,136
2052	20	2,627	2,648	-1,697	-1,156	-601	-3,454	-807	-9,943
2053	20	2,628	2,649	-1,697	-1,149	-600	-3,447	-798	-10,741
2054	20	2,581	2,602	-1,697	-1,138	-601	-3,436	-835	-11,576
2055	9,741	2,627	12,368	-1,697	-1,214	-602	-3,514	8,855	-2,721
2056	20	2,640	2,660	-1,697	-1,192	-605	-3,494	-834	-3,554
2057	20	2,627	2,648	-1,697	-1,152	-604	-3,453	-805	-4,360
2058	20	2,628	2,649	-1,697	-1,144	-605	-3,446	-797	-5,157
2059	20	2,581	2,602	-1,697	-1,141	-606	-3,444	-842	-5,999
2060	4,603	2,627	7,230	-1,697	-1,200	-608	-3,506	3,724	-2,275
2061	20	2,640	2,660	-1,697	-1,183	-608	-3,488	-828	-3,103
2062	20	2,627	2,648	-1,697	-1,151	-609	-3,457	-809	-3,912
2063	20	2,628	2,649	-1,697	-1,138	-610	-3,445	-796	-4,708
2064	20	2,581	2,602	-1,697	-1,139	-612	-3,449	-847	-5,555
2065	20	2,627	2,648	-1,697	-1,152	-612	-3,460	-813	-6,367
2066	20	2,640	2,660	-1,697	-1,160	-613	-3,470	-810	-7,177
2067	20	2,627	2,648	-1,697	-1,153	-614	-3,464	-817	-7,994
2068	20	2,628	2,649	-1,697	-1,148	-617	-3,462	-813	-8,806

Table B22

Simulated DHSSB Baseline with Climate Change Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2069	15	2,581	2,597	-1,697	-1,135	-616	-3,448	-851	-9,658
Average[4] 2020-2045	920	2,520	3,430	-1,700	-1,160	-610	-3,460	-30	
Min[4] 2020-2045	20	2,400	2,420	-1,700	-1,230	-630	-3,520	-1,040	
Max[4] 2020-2045	9,740	2,660	12,140	-1,700	-1,130	-600	-3,420	8,640	
Average[4] 2009-2069	770	2,530	3,300	-1,700	-1,160	-620	-3,480	-170	
Min[4] 2009-2069	20	2,120	2,140	-1,700	-1,290	-690	-3,670	-1,340	
Max[4] 2009-2069	9,740	2,760	12,370	-1,690	-1,130	-600	-3,420	8,850	

Notes
1. Applied Water and Septic Return
2. Pumping from Mayer et al., 2007.
3. Discharge at General Head Boundary located along bottom edge of model where Desert Hot Springs Subbasin flows into the Indio Subbasin
4. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre feet
AFY = acre feet per year

Table B23

Simulated DHSSB Near-Term Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2009	20	2,760	2,781	-1,691	-1,291	-686	-3,669	-888	0
2010	4,603	2,485	7,088	-1,691	-1,287	-682	-3,660	3,428	3,428
2011	20	2,360	2,380	-1,691	-1,237	-678	-3,606	-1,226	2,202
2012	20	2,419	2,439	-1,691	-1,150	-675	-3,516	-1,077	1,126
2013	20	2,404	2,425	-1,691	-1,128	-669	-3,487	-1,062	63
2014	20	2,372	2,393	-1,691	-1,133	-664	-3,488	-1,095	-1,032
2015	20	2,124	2,145	-1,691	-1,134	-660	-3,485	-1,340	-2,372
2016	20	2,188	2,209	-1,691	-1,147	-657	-3,495	-1,287	-3,659
2017	20	2,410	2,430	-1,691	-1,154	-650	-3,496	-1,066	-4,724
2018	20	2,356	2,377	-1,691	-1,149	-646	-3,486	-1,110	-5,834
2019	15	2,151	2,166	-1,691	-1,147	-642	-3,479	-1,313	-7,147
2020	20	1,730	1,751	-1,697	-1,153	-632	-3,482	-1,731	-8,879
2021	2,098	1,772	3,870	-1,697	-1,177	-627	-3,501	369	-8,509
2022	20	1,794	1,814	-1,697	-1,175	-624	-3,496	-1,682	-10,191
2023	20	1,836	1,856	-1,697	-1,165	-621	-3,483	-1,627	-11,818
2024	2,446	1,831	4,277	-1,697	-1,182	-620	-3,499	778	-11,040
2025	20	1,926	1,946	-1,697	-1,171	-616	-3,484	-1,538	-12,578
2026	9,981	1,968	11,949	-1,697	-1,236	-613	-3,547	8,402	-4,176
2027	1,581	2,017	3,598	-1,697	-1,234	-611	-3,542	56	-4,120
2028	35,044	2,050	37,095	-1,697	-1,508	-610	-3,815	33,280	29,160
2029	8,625	2,069	10,694	-1,697	-1,601	-606	-3,904	6,790	35,949

Table B23

Simulated DHSSB Near-Term Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2030	31,951	2,137	34,088	-1,697	-1,818	-604	-4,119	29,969	65,919
2031	20	2,197	2,217	-1,697	-1,588	-602	-3,886	-1,669	64,250
2032	20	2,219	2,240	-1,697	-1,420	-601	-3,718	-1,478	62,772
2033	1,766	2,252	4,018	-1,697	-1,419	-597	-3,714	304	63,076
2034	20	2,248	2,268	-1,697	-1,361	-595	-3,654	-1,385	61,691
2035	20	2,330	2,350	-1,697	-1,316	-593	-3,607	-1,256	60,435
2036	20	2,363	2,383	-1,697	-1,292	-593	-3,582	-1,199	59,236
2037	20	2,376	2,397	-1,697	-1,266	-590	-3,553	-1,156	58,080
2038	20	2,401	2,421	-1,697	-1,256	-588	-3,540	-1,119	56,961
2039	20	2,388	2,408	-1,697	-1,244	-586	-3,527	-1,119	55,842
2040	20	2,447	2,467	-1,697	-1,245	-586	-3,528	-1,061	54,781
2041	20	2,480	2,500	-1,697	-1,242	-583	-3,522	-1,021	53,760
2042	20	2,493	2,514	-1,697	-1,237	-581	-3,516	-1,002	52,758
2043	36,406	2,518	38,924	-1,697	-1,352	-580	-3,628	35,296	88,053
2044	20	2,505	2,525	-1,697	-1,317	-580	-3,594	-1,069	86,984
2045	2,650	2,564	5,214	-1,697	-1,330	-577	-3,604	1,610	88,594
2046	20	2,594	2,614	-1,697	-1,295	-576	-3,568	-953	87,641
2047	20	2,584	2,605	-1,697	-1,257	-575	-3,528	-924	86,717
2048	3,738	2,585	6,323	-1,697	-1,261	-575	-3,533	2,790	89,508
2049	20	2,548	2,569	-1,697	-1,230	-572	-3,500	-931	88,577
2050	20	2,584	2,605	-1,697	-1,212	-571	-3,481	-876	87,701

Table B23

Simulated DHSSB Near-Term Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2051	20	2,594	2,615	-1,697	-1,205	-570	-3,472	-857	86,844
2052	20	2,584	2,605	-1,697	-1,203	-571	-3,471	-866	85,977
2053	20	2,585	2,606	-1,697	-1,189	-568	-3,454	-849	85,128
2054	20	2,548	2,569	-1,697	-1,171	-567	-3,436	-867	84,262
2055	9,741	2,584	12,325	-1,697	-1,242	-567	-3,506	8,820	93,081
2056	20	2,594	2,614	-1,697	-1,211	-567	-3,476	-861	92,220
2057	20	2,584	2,605	-1,697	-1,164	-565	-3,426	-822	91,398
2058	20	2,585	2,606	-1,697	-1,151	-564	-3,413	-807	90,591
2059	20	2,548	2,569	-1,697	-1,144	-564	-3,405	-836	89,755
2060	4,603	2,584	7,187	-1,697	-1,199	-564	-3,461	3,726	93,481
2061	20	2,594	2,615	-1,697	-1,175	-562	-3,434	-820	92,662
2062	20	2,584	2,605	-1,697	-1,137	-562	-3,396	-791	91,870
2063	20	2,585	2,606	-1,697	-1,119	-561	-3,377	-772	91,099
2064	20	2,548	2,569	-1,697	-1,117	-562	-3,376	-807	90,292
2065	20	2,584	2,605	-1,697	-1,125	-560	-3,382	-778	89,514
2066	20	2,594	2,614	-1,697	-1,130	-560	-3,387	-772	88,742
2067	20	2,584	2,605	-1,697	-1,118	-559	-3,374	-770	87,972
2068	20	2,585	2,606	-1,697	-1,108	-560	-3,366	-760	87,212

Table B23

Simulated DHSSB Near-Term Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2069	15	2,548	2,564	-1,697	-1,092	-559	-3,347	-784	86,428
Average[4] 2020-2045	5,110	2,190	7,300	-1,700	-1,320	-600	-3,620	3,680	
Min[4] 2020-2045	20	1,730	1,750	-1,700	-1,820	-630	-4,120	-1,730	
Max[4] 2020-2045	36,410	2,560	38,920	-1,700	-1,150	-580	-3,480	35,300	
Average[4] 2009-2069	2,560	2,370	4,930	-1,700	-1,240	-600	-3,530	1,400	
Min[4] 2009-2069	20	1,730	1,750	-1,700	-1,820	-690	-4,120	-1,730	
Max[4] 2009-2069	36,410	2,760	38,920	-1,690	-1,090	-560	-3,350	35,300	

Notes
1. Applied Water and Septic Return
2. Pumping from Mayer et al., 2007.
3. Discharge at General Head Boundary located along bottom edge of model where Desert Hot Springs Subbasin flows into the Indio Subbasin
4. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre feet
AFY = acre feet per year

Table B24

Simulated DHSSB Near-Term with Climate Change Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2009	20	2,760	2,781	-1,691	-1,291	-686	-3,669	-888	0
2010	4,603	2,485	7,088	-1,691	-1,287	-682	-3,660	3,428	3,428
2011	20	2,360	2,380	-1,691	-1,237	-678	-3,606	-1,226	2,202
2012	20	2,419	2,439	-1,691	-1,150	-675	-3,516	-1,077	1,126
2013	20	2,404	2,425	-1,691	-1,128	-669	-3,487	-1,062	63
2014	20	2,372	2,393	-1,691	-1,133	-664	-3,488	-1,095	-1,032
2015	20	2,124	2,145	-1,691	-1,134	-660	-3,485	-1,340	-2,372
2016	20	2,188	2,209	-1,691	-1,147	-657	-3,495	-1,287	-3,659
2017	20	2,410	2,430	-1,691	-1,154	-650	-3,496	-1,066	-4,724
2018	20	2,356	2,377	-1,691	-1,149	-646	-3,486	-1,110	-5,834
2019	15	2,151	2,166	-1,691	-1,147	-642	-3,479	-1,313	-7,147
2020	15	2,617	2,632	-1,697	-1,158	-632	-3,486	-854	-8,002
2021	20	2,650	2,670	-1,697	-1,163	-627	-3,487	-817	-8,819
2022	20	2,658	2,678	-1,697	-1,167	-624	-3,488	-810	-9,628
2023	20	2,584	2,605	-1,697	-1,165	-621	-3,484	-879	-10,507
2024	20	2,558	2,578	-1,697	-1,162	-620	-3,480	-901	-11,409
2025	20	2,508	2,529	-1,697	-1,157	-616	-3,470	-941	-12,350
2026	20	2,541	2,562	-1,697	-1,151	-614	-3,462	-900	-13,250
2027	20	2,447	2,467	-1,697	-1,144	-612	-3,453	-986	-14,236
2028	20	2,469	2,489	-1,697	-1,140	-611	-3,448	-959	-15,195
2029	4,603	2,402	7,005	-1,697	-1,169	-608	-3,474	3,531	-11,664

Table B24

Simulated DHSSB Near-Term with Climate Change Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2030	20	2,469	2,489	-1,697	-1,152	-606	-3,455	-966	-12,630
2031	20	2,397	2,417	-1,697	-1,129	-604	-3,430	-1,013	-13,643
2032	20	2,405	2,425	-1,697	-1,118	-604	-3,419	-994	-14,637
2033	20	2,427	2,447	-1,697	-1,100	-601	-3,398	-950	-15,587
2034	9,741	2,400	12,141	-1,697	-1,161	-599	-3,457	8,684	-6,903
2035	20	2,454	2,474	-1,697	-1,135	-598	-3,429	-955	-7,858
2036	20	2,484	2,504	-1,697	-1,096	-598	-3,392	-887	-8,745
2037	20	2,489	2,509	-1,697	-1,073	-595	-3,366	-857	-9,601
2038	20	2,507	2,528	-1,697	-1,066	-594	-3,357	-829	-10,431
2039	20	2,477	2,498	-1,697	-1,057	-593	-3,347	-849	-11,279
2040	20	2,541	2,561	-1,697	-1,060	-593	-3,350	-789	-12,069
2041	3,738	2,571	6,308	-1,697	-1,080	-591	-3,368	2,940	-9,128
2042	20	2,575	2,596	-1,697	-1,071	-590	-3,358	-763	-9,891
2043	20	2,594	2,614	-1,697	-1,049	-589	-3,336	-722	-10,612
2044	2,650	2,564	5,214	-1,697	-1,086	-590	-3,374	1,840	-8,772
2045	2,650	2,627	5,277	-1,697	-1,122	-588	-3,407	1,870	-6,902
2046	20	2,640	2,660	-1,697	-1,078	-588	-3,363	-703	-7,604
2047	20	2,627	2,648	-1,697	-1,044	-587	-3,328	-681	-8,285
2048	3,738	2,628	6,366	-1,697	-1,051	-589	-3,337	3,030	-5,255
2049	20	2,581	2,602	-1,697	-1,025	-587	-3,309	-707	-5,963
2050	20	2,627	2,648	-1,697	-1,011	-586	-3,294	-647	-6,609

Table B24

Simulated DHSSB Near-Term with Climate Change Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2051	20	2,640	2,660	-1,697	-1,006	-586	-3,289	-629	-7,238
2052	20	2,627	2,648	-1,697	-1,006	-588	-3,291	-643	-7,882
2053	20	2,628	2,649	-1,697	-995	-586	-3,278	-629	-8,511
2054	20	2,581	2,602	-1,697	-979	-586	-3,262	-660	-9,170
2055	9,741	2,627	12,368	-1,697	-1,049	-586	-3,332	9,037	-134
2056	20	2,640	2,660	-1,697	-1,022	-587	-3,306	-646	-779
2057	20	2,627	2,648	-1,697	-977	-586	-3,260	-612	-1,392
2058	20	2,628	2,649	-1,697	-966	-586	-3,248	-599	-1,991
2059	20	2,581	2,602	-1,697	-960	-586	-3,242	-640	-2,632
2060	4,603	2,627	7,230	-1,697	-1,014	-587	-3,298	3,932	1,301
2061	20	2,640	2,660	-1,697	-993	-586	-3,275	-615	685
2062	20	2,627	2,648	-1,697	-957	-586	-3,240	-592	93
2063	20	2,628	2,649	-1,697	-941	-586	-3,224	-575	-482
2064	20	2,581	2,602	-1,697	-938	-587	-3,223	-621	-1,103
2065	20	2,627	2,648	-1,697	-948	-586	-3,231	-584	-1,686
2066	20	2,640	2,660	-1,697	-954	-586	-3,238	-577	-2,264
2067	20	2,627	2,648	-1,697	-944	-586	-3,228	-580	-2,844
2068	20	2,628	2,649	-1,697	-936	-588	-3,221	-572	-3,416

Table B24

Simulated DHSSB Near-Term with Climate Change Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2069	15	2,581	2,597	-1,697	-920	-587	-3,204	-607	-4,023
Average[4] 2020-2045	920	2,520	3,430	-1,700	-1,120	-600	-3,420	10	
Min[4] 2020-2045	20	2,400	2,420	-1,700	-1,170	-630	-3,490	-1,010	
Max[4] 2020-2045	9,740	2,660	12,140	-1,700	-1,050	-590	-3,340	8,680	
Average[4] 2009-2069	770	2,530	3,300	-1,700	-1,080	-610	-3,380	-80	
Min[4] 2009-2069	20	2,120	2,140	-1,700	-1,290	-690	-3,670	-1,340	
Max[4] 2009-2069	9,740	2,760	12,370	-1,690	-920	-590	-3,200	9,040	

Notes
1. Applied Water and Septic Return.
2. Pumping from Mayer et al., 2007.
3. Discharge at General Head Boundary located along bottom edge of model where Desert Hot Springs Subbasin flows into the Indio Subbasin
4. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre feet
AFY = acre feet per year

Table B25

Simulated DHSSB Future Projects Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2009	20	2,760	2,781	-1,691	-1,291	-686	-3,669	-888	0
2010	4,603	2,485	7,088	-1,691	-1,287	-682	-3,660	3,428	3,428
2011	20	2,360	2,380	-1,691	-1,237	-678	-3,606	-1,226	2,202
2012	20	2,419	2,439	-1,691	-1,150	-675	-3,516	-1,077	1,126
2013	20	2,404	2,425	-1,691	-1,128	-669	-3,487	-1,062	63
2014	20	2,372	2,393	-1,691	-1,133	-664	-3,488	-1,095	-1,032
2015	20	2,124	2,145	-1,691	-1,134	-660	-3,485	-1,340	-2,372
2016	20	2,188	2,209	-1,691	-1,147	-657	-3,495	-1,287	-3,659
2017	20	2,410	2,430	-1,691	-1,154	-650	-3,496	-1,066	-4,724
2018	20	2,356	2,377	-1,691	-1,149	-646	-3,486	-1,110	-5,834
2019	15	2,151	2,166	-1,691	-1,147	-642	-3,479	-1,313	-7,147
2020	20	1,730	1,751	-1,697	-1,153	-632	-3,482	-1,731	-8,879
2021	2,098	1,772	3,870	-1,697	-1,177	-627	-3,501	369	-8,509
2022	20	1,794	1,814	-1,697	-1,175	-624	-3,496	-1,682	-10,191
2023	20	1,836	1,856	-1,697	-1,165	-621	-3,483	-1,627	-11,818
2024	2,446	1,831	4,277	-1,697	-1,182	-620	-3,499	778	-11,040
2025	20	1,926	1,946	-1,697	-1,171	-616	-3,484	-1,538	-12,578
2026	9,981	1,968	11,949	-1,697	-1,236	-613	-3,547	8,402	-4,176
2027	1,581	2,017	3,598	-1,697	-1,234	-611	-3,542	56	-4,120
2028	35,044	2,050	37,095	-1,697	-1,508	-610	-3,815	33,280	29,160
2029	8,625	2,069	10,694	-1,697	-1,601	-606	-3,904	6,790	35,949

Table B25

Simulated DHSSB Future Projects Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2030	31,951	2,137	34,088	-1,697	-1,818	-604	-4,119	29,969	65,919
2031	20	2,197	2,217	-1,697	-1,588	-602	-3,886	-1,669	64,250
2032	20	2,219	2,240	-1,697	-1,420	-601	-3,718	-1,478	62,772
2033	1,766	2,252	4,018	-1,697	-1,419	-597	-3,714	304	63,076
2034	20	2,248	2,268	-1,697	-1,361	-595	-3,654	-1,385	61,691
2035	20	2,330	2,350	-1,697	-1,315	-593	-3,605	-1,255	60,436
2036	20	2,363	2,383	-1,697	-1,287	-593	-3,577	-1,194	59,242
2037	20	2,376	2,397	-1,697	-1,259	-590	-3,545	-1,148	58,094
2038	20	2,401	2,421	-1,697	-1,246	-588	-3,531	-1,110	56,984
2039	20	2,388	2,408	-1,697	-1,233	-586	-3,516	-1,108	55,876
2040	20	2,447	2,467	-1,697	-1,233	-586	-3,515	-1,048	54,828
2041	20	2,480	2,500	-1,697	-1,228	-583	-3,508	-1,007	53,821
2042	20	2,493	2,514	-1,697	-1,222	-581	-3,500	-986	52,834
2043	36,406	2,518	38,924	-1,697	-1,333	-579	-3,610	35,314	88,149
2044	20	2,505	2,525	-1,697	-1,295	-580	-3,572	-1,046	87,102
2045	2,650	2,564	5,214	-1,697	-1,302	-577	-3,576	1,638	88,740
2046	20	2,594	2,614	-1,697	-1,260	-575	-3,532	-917	87,823
2047	20	2,584	2,605	-1,697	-1,213	-574	-3,485	-880	86,943
2048	3,738	2,585	6,323	-1,697	-1,209	-574	-3,480	2,843	89,785
2049	20	2,548	2,569	-1,697	-1,170	-571	-3,439	-870	88,915
2050	20	2,584	2,605	-1,697	-1,143	-570	-3,410	-805	88,110

Table B25

Simulated DHSSB Future Projects Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2051	20	2,594	2,615	-1,697	-1,128	-569	-3,394	-780	87,330
2052	20	2,584	2,605	-1,697	-1,122	-569	-3,389	-784	86,546
2053	20	2,585	2,606	-1,697	-1,102	-567	-3,366	-760	85,786
2054	20	2,548	2,569	-1,697	-1,076	-565	-3,338	-769	85,017
2055	9,741	2,584	12,325	-1,697	-1,136	-564	-3,397	8,928	93,945
2056	20	2,594	2,614	-1,697	-1,092	-565	-3,354	-740	93,205
2057	20	2,584	2,605	-1,697	-1,038	-562	-3,297	-692	92,513
2058	20	2,585	2,606	-1,697	-1,024	-561	-3,281	-676	91,837
2059	20	2,548	2,569	-1,697	-1,017	-559	-3,274	-705	91,132
2060	4,603	2,584	7,187	-1,697	-1,069	-560	-3,326	3,861	94,993
2061	20	2,594	2,615	-1,697	-1,036	-557	-3,291	-676	94,317
2062	20	2,584	2,605	-1,697	-986	-556	-3,239	-635	93,682
2063	20	2,585	2,606	-1,697	-964	-555	-3,216	-610	93,072
2064	20	2,548	2,569	-1,697	-965	-555	-3,217	-648	92,424
2065	20	2,584	2,605	-1,697	-979	-553	-3,229	-625	91,799
2066	20	2,594	2,614	-1,697	-985	-552	-3,234	-620	91,179
2067	20	2,584	2,605	-1,697	-967	-551	-3,215	-611	90,569
2068	20	2,585	2,606	-1,697	-952	-552	-3,201	-595	89,973

Table B25

Simulated DHSSB Future Projects Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2069	15	2,548	2,564	-1,697	-932	-550	-3,179	-615	89,358
Average[4] 2020-2045	5,110	2,190	7,300	-1,700	-1,310	-600	-3,610	3,690	
Min[4] 2020-2045	20	1,730	1,750	-1,700	-1,820	-630	-4,120	-1,730	
Max[4] 2020-2045	36,410	2,560	38,920	-1,700	-1,150	-580	-3,480	35,310	
Average[4] 2009-2069	2,560	2,370	4,930	-1,700	-1,190	-600	-3,480	1,450	
Min[4] 2009-2069	20	1,730	1,750	-1,700	-1,820	-690	-4,120	-1,730	
Max[4] 2009-2069	36,410	2,760	38,920	-1,690	-930	-550	-3,180	35,310	

Notes
1. Applied Water and Septic Return.
2. Pumping from Mayer et al., 2007.
3. Discharge at General Head Boundary located along bottom edge of model where Desert Hot Springs Subbasin flows into the Indio Subbasin
4. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre feet
AFY = acre feet per year

Table B26

Simulated DHSSB Future Projects with Climate Change Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2009	20	2,760	2,781	-1,691	-1,291	-686	-3,669	-888	0
2010	4,603	2,485	7,088	-1,691	-1,287	-682	-3,660	3,428	3,428
2011	20	2,360	2,380	-1,691	-1,237	-678	-3,606	-1,226	2,202
2012	20	2,419	2,439	-1,691	-1,150	-675	-3,516	-1,077	1,126
2013	20	2,404	2,425	-1,691	-1,128	-669	-3,487	-1,062	63
2014	20	2,372	2,393	-1,691	-1,133	-664	-3,488	-1,095	-1,032
2015	20	2,124	2,145	-1,691	-1,134	-660	-3,485	-1,340	-2,372
2016	20	2,188	2,209	-1,691	-1,147	-657	-3,495	-1,287	-3,659
2017	20	2,410	2,430	-1,691	-1,154	-650	-3,496	-1,066	-4,724
2018	20	2,356	2,377	-1,691	-1,149	-646	-3,486	-1,110	-5,834
2019	15	2,151	2,166	-1,691	-1,147	-642	-3,479	-1,313	-7,147
2020	15	2,617	2,632	-1,697	-1,158	-632	-3,486	-854	-8,002
2021	20	2,650	2,670	-1,697	-1,163	-627	-3,487	-817	-8,819
2022	20	2,658	2,678	-1,697	-1,167	-624	-3,488	-810	-9,628
2023	20	2,584	2,605	-1,697	-1,165	-621	-3,484	-879	-10,507
2024	20	2,558	2,578	-1,697	-1,162	-620	-3,480	-901	-11,409
2025	20	2,508	2,529	-1,697	-1,157	-616	-3,470	-941	-12,350
2026	20	2,541	2,562	-1,697	-1,151	-614	-3,462	-900	-13,250
2027	20	2,447	2,467	-1,697	-1,144	-612	-3,453	-986	-14,236
2028	20	2,469	2,489	-1,697	-1,140	-611	-3,448	-959	-15,195
2029	4,603	2,402	7,005	-1,697	-1,169	-608	-3,474	3,531	-11,664
2030	20	2,469	2,489	-1,697	-1,152	-606	-3,455	-966	-12,630

Table B26

Simulated DHSSB Future Projects with Climate Change Scenario Water Balance 2009 - 2069

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2031	20	2,397	2,417	-1,697	-1,129	-604	-3,430	-1,013	-13,643
2032	20	2,405	2,425	-1,697	-1,118	-604	-3,419	-994	-14,637
2033	20	2,427	2,447	-1,697	-1,100	-601	-3,398	-950	-15,587
2034	9,741	2,400	12,141	-1,697	-1,161	-599	-3,457	8,684	-6,903
2035	20	2,454	2,474	-1,697	-1,133	-598	-3,428	-954	-7,856
2036	20	2,484	2,504	-1,697	-1,092	-598	-3,387	-882	-8,739
2037	20	2,489	2,509	-1,697	-1,066	-595	-3,358	-849	-9,588
2038	20	2,507	2,528	-1,697	-1,057	-594	-3,348	-820	-10,407
2039	20	2,477	2,498	-1,697	-1,046	-593	-3,336	-838	-11,245
2040	20	2,541	2,561	-1,697	-1,047	-593	-3,338	-777	-12,022
2041	3,738	2,571	6,308	-1,697	-1,066	-591	-3,354	2,955	-9,067
2042	20	2,575	2,596	-1,697	-1,056	-590	-3,343	-747	-9,815
2043	20	2,594	2,614	-1,697	-1,031	-589	-3,317	-703	-10,518
2044	2,650	2,564	5,214	-1,697	-1,064	-590	-3,351	1,863	-8,655
2045	2,650	2,627	5,277	-1,697	-1,095	-588	-3,379	1,898	-6,757
2046	20	2,640	2,660	-1,697	-1,043	-587	-3,328	-667	-7,425
2047	20	2,627	2,648	-1,697	-1,001	-587	-3,285	-638	-8,062
2048	3,738	2,628	6,366	-1,697	-1,000	-588	-3,285	3,081	-4,981
2049	20	2,581	2,602	-1,697	-966	-586	-3,249	-647	-5,628
2050	20	2,627	2,648	-1,697	-942	-585	-3,225	-577	-6,205
2051	20	2,640	2,660	-1,697	-931	-585	-3,213	-553	-6,758
2052	20	2,627	2,648	-1,697	-927	-586	-3,210	-563	-7,321

Table B26

Simulated DHSSB Future Projects with Climate Change Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2053	20	2,628	2,649	-1,697	-910	-584	-3,191	-542	-7,862
2054	20	2,581	2,602	-1,697	-885	-584	-3,166	-564	-8,427
2055	9,741	2,627	12,368	-1,697	-946	-583	-3,226	9,143	716
2056	20	2,640	2,660	-1,697	-906	-584	-3,187	-527	189
2057	20	2,627	2,648	-1,697	-854	-582	-3,133	-486	-297
2058	20	2,628	2,649	-1,697	-841	-582	-3,120	-471	-768
2059	20	2,581	2,602	-1,697	-835	-581	-3,113	-512	-1,279
2060	4,603	2,627	7,230	-1,697	-886	-583	-3,166	4,064	2,785
2061	20	2,640	2,660	-1,697	-857	-581	-3,135	-475	2,310
2062	20	2,627	2,648	-1,697	-810	-580	-3,087	-440	1,870
2063	20	2,628	2,649	-1,697	-789	-580	-3,065	-417	1,454
2064	20	2,581	2,602	-1,697	-788	-581	-3,066	-464	989
2065	20	2,627	2,648	-1,697	-804	-579	-3,079	-432	558
2066	20	2,640	2,660	-1,697	-810	-579	-3,086	-425	132
2067	20	2,627	2,648	-1,697	-794	-578	-3,069	-421	-289
2068	20	2,628	2,649	-1,697	-779	-579	-3,055	-406	-696

Table B26

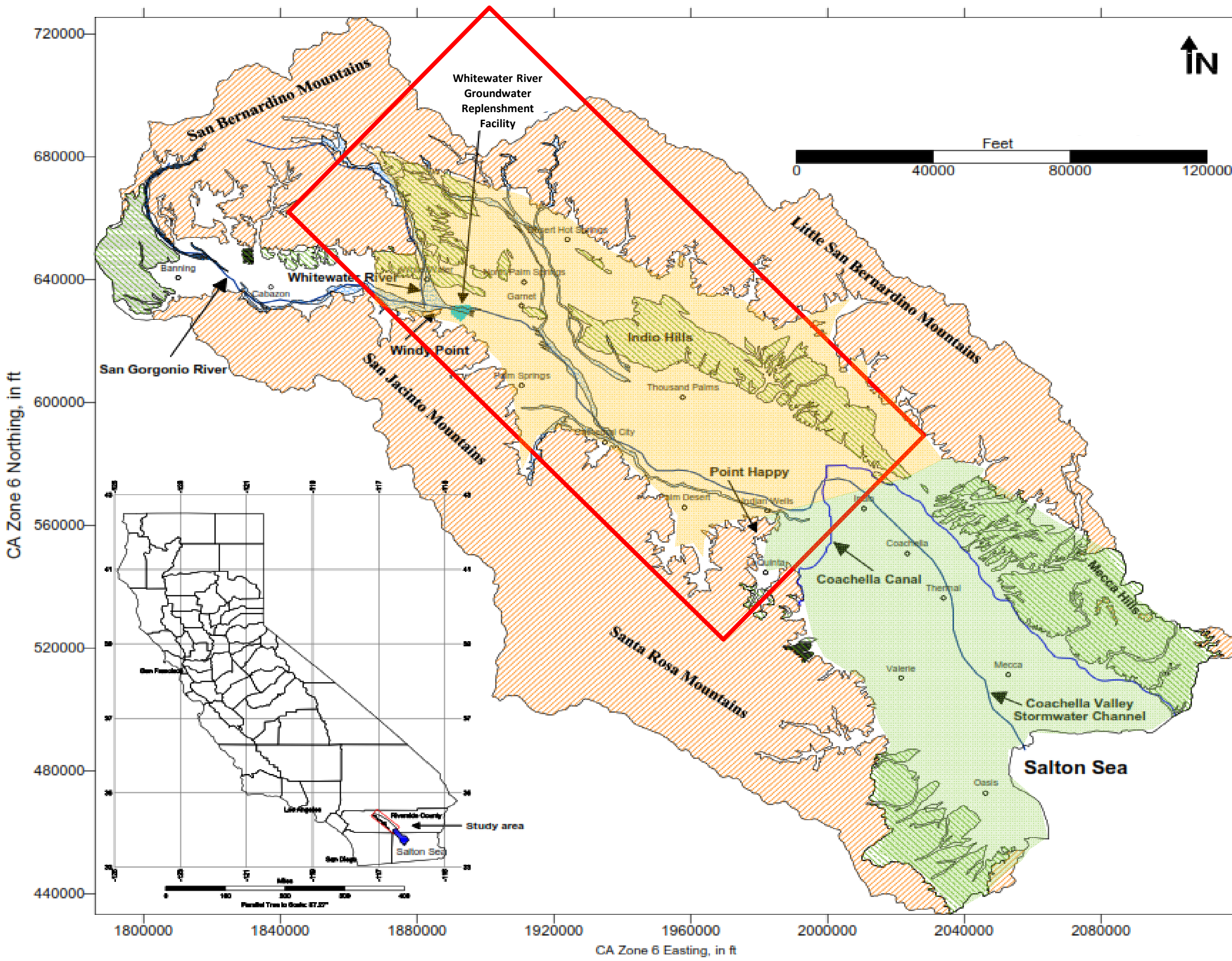
Simulated DHSSB Future Projects with Climate Change Scenario Water Balance 2009 - 2069
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

Year	Simulated Inflows (AFY)			Simulated Outflows (AFY)				Change in Storage (AFY)	Cumulative Change in Storage (AF)
	Natural Recharge	Return Flow[1]	Total Inflow	Pumping[2]	Underflow to Mission Creek	Underflow to Indio Hills East[3]	Total Outflow		
2069	15	2,581	2,597	-1,697	-760	-578	-3,034	-437	-1,133
Average[4] 2020-2045	920	2,520	3,430	-1,700	-1,110	-600	-3,420	20	
Min[4] 2020-2045	20	2,400	2,420	-1,700	-1,170	-630	-3,490	-1,010	
Max[4] 2020-2045	9,740	2,660	12,140	-1,700	-1,030	-590	-3,320	8,680	
Average[4] 2009-2069	770	2,530	3,300	-1,700	-1,030	-610	-3,340	-30	
Min[4] 2009-2069	20	2,120	2,140	-1,700	-1,290	-690	-3,670	-1,340	
Max[4] 2009-2069	9,740	2,760	12,370	-1,690	-760	-580	-3,030	9,140	

Notes
1. Applied Water and Septic Return
2. Pumping from Mayer et al., 2007.
3. Discharge at General Head Boundary located along bottom edge of model where Desert Hot Springs Subbasin flows into the Indio Subbasin
4. Average, minimum (min), maximum (max) values rounded to the nearest 10 units.

Abbreviations
AF = acre feet
AFY = acre feet per year

Figures



Explaination

Study Area

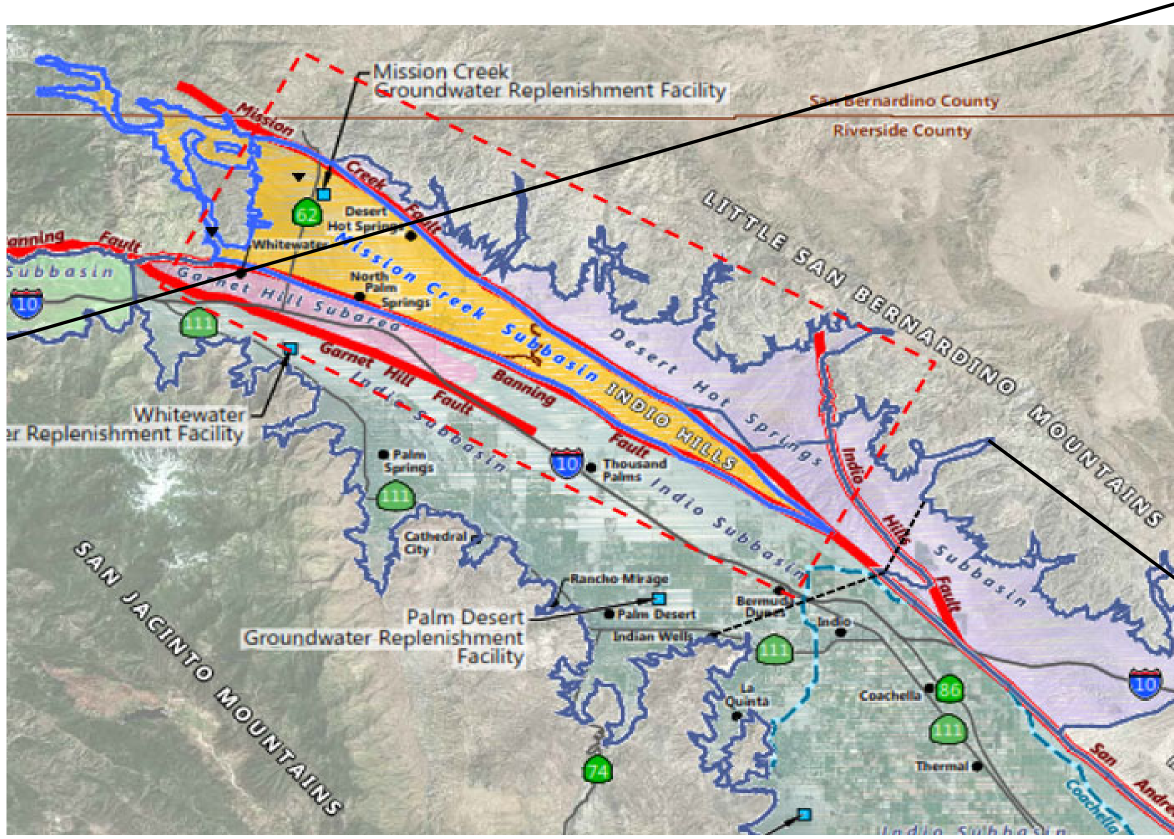
Upper Coachella Valley

Lower Coachella Valley

Note: Modified from Groundwater Flow Model of Coachella Valley, California: An Overview (Fogg, 2000)

Location Map
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 05/27/2021	Project No.: CM19167351
wood.		Figure **B1**

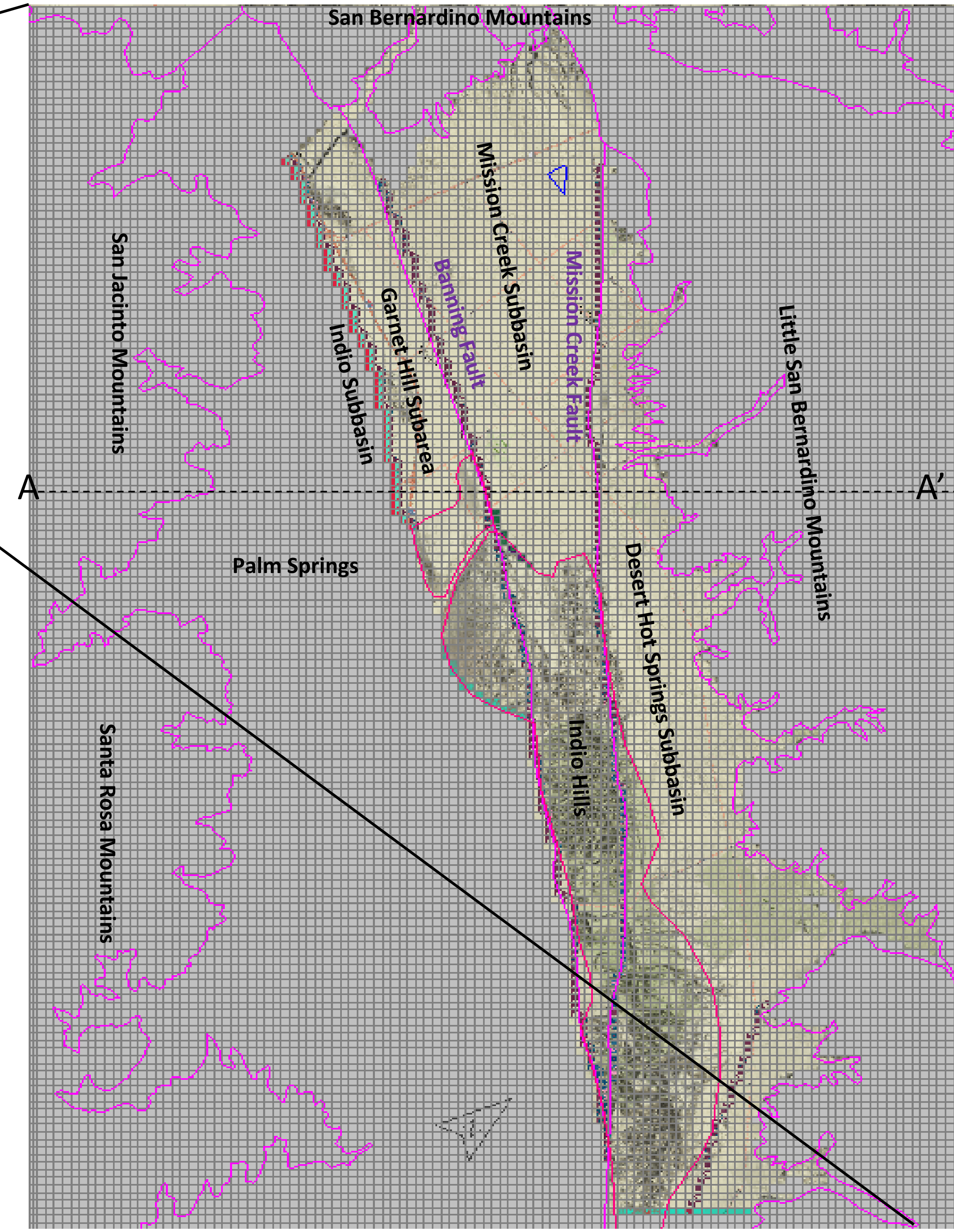


Basemap modified from an undated drawing by Krieger & Stewart Engineering, subbasin boundaries from "Mission Creek and Garnet Hill Subbasins Water Management Plan Final Report", January 2013, and an aerial photo from Esri World Imagery- Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, dated 10-15-2017.

Modified from Fogg, 2000

Explanation

- Coachella Valley Groundwater Basin boundary
- Mission Creek Subbasin
- Desert Hot Springs Subbasin
- San Gorgonio Pass Subbasin
- Indio Subbasin
- Garnet Hill Subarea of Indio Subbasin
- Fault
- Indio Hills boundary
- Coachella Canal



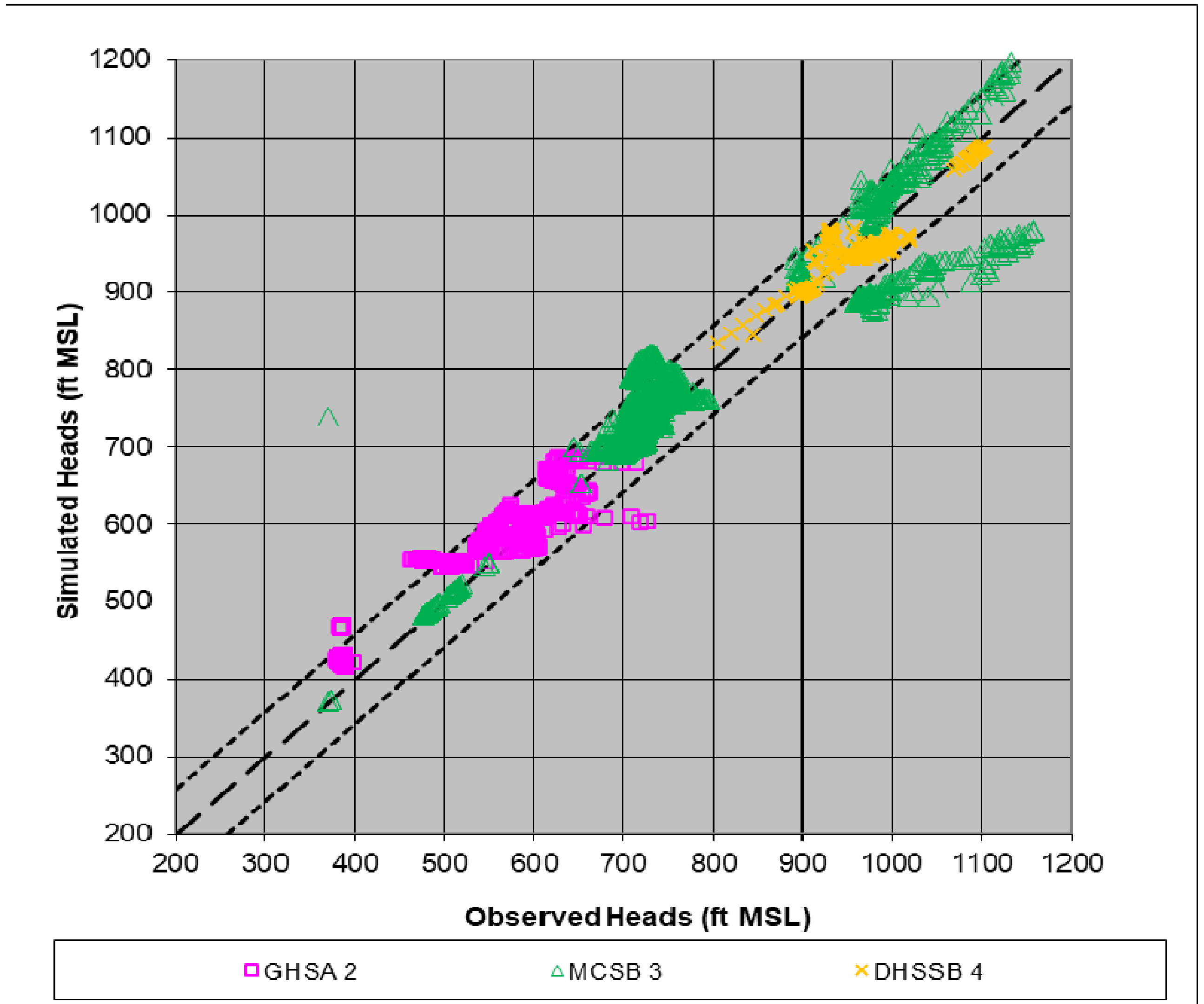
Legend

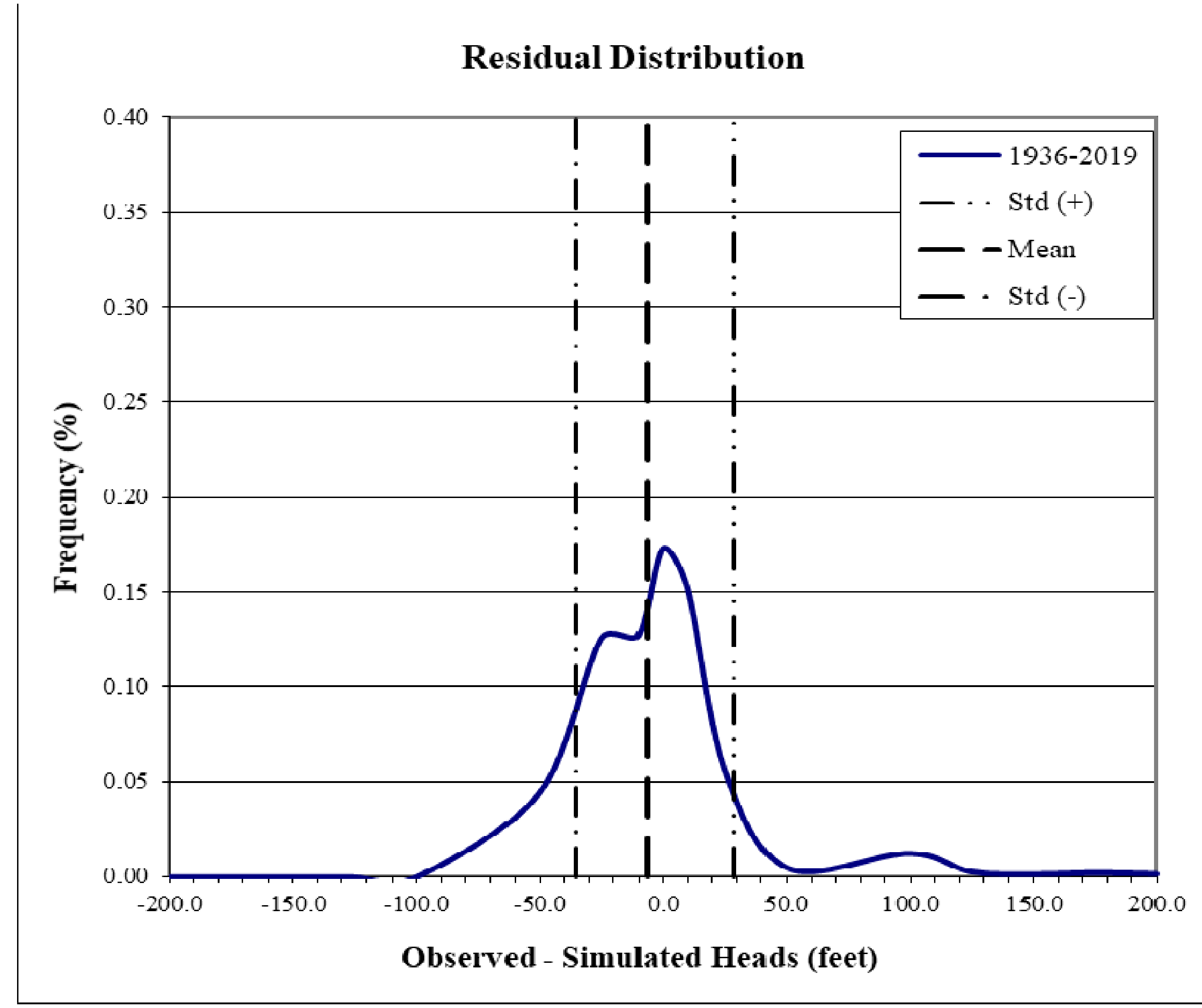
- Specified Flux
- Drain
- General Head
- Horizontal Flow Barrier
- Inactive

Upper Coachella Valley

Model Domain and Grid
Mission Creek Groundwater Subbasin Model Update
Riverside County, California

By: dmb	Date: 05/27/2021	Project No.: CM19167351
wood.		Figure B2





Calibration Statistic	Units	All Areas	GHSA	MCSB	DHSSB
Residual Mean	ft	-6.59	-29.29	-5.50	8.03
Absolute Residual Mean	ft	18.58	20.83	15.13	18.22
Residual Std. Deviation	ft	28.68	27.83	27.60	21.94
Sum of Squares	ft^2	6172072	1452649	4109618	572060
RMS Error	ft	29.43	27.83	27.60	21.94
Min. Residual	ft	-368.17	-90.85	-368.17	-52.23
Max. Residual	ft	186.24	122.70	186.24	52.73
Number of Observations		7128	890	5190	1048
Range in Observations	ft	806.10	728.20	1178.00	398.10
Scaled Residual Std. Deviation		0.036	3.8%	2.3%	5.5%
Scaled Absolute Residual Mean		0.023	2.9%	1.3%	4.6%
Scaled RMS Error		**3.7%**	**3.8%**	**2.3%**	**5.5%**
Scaled Residual Mean		-0.008	-4.0%	-0.5%	2.0%
Correlation Coefficient		97.8%	97.0%	95.9%	98.1%

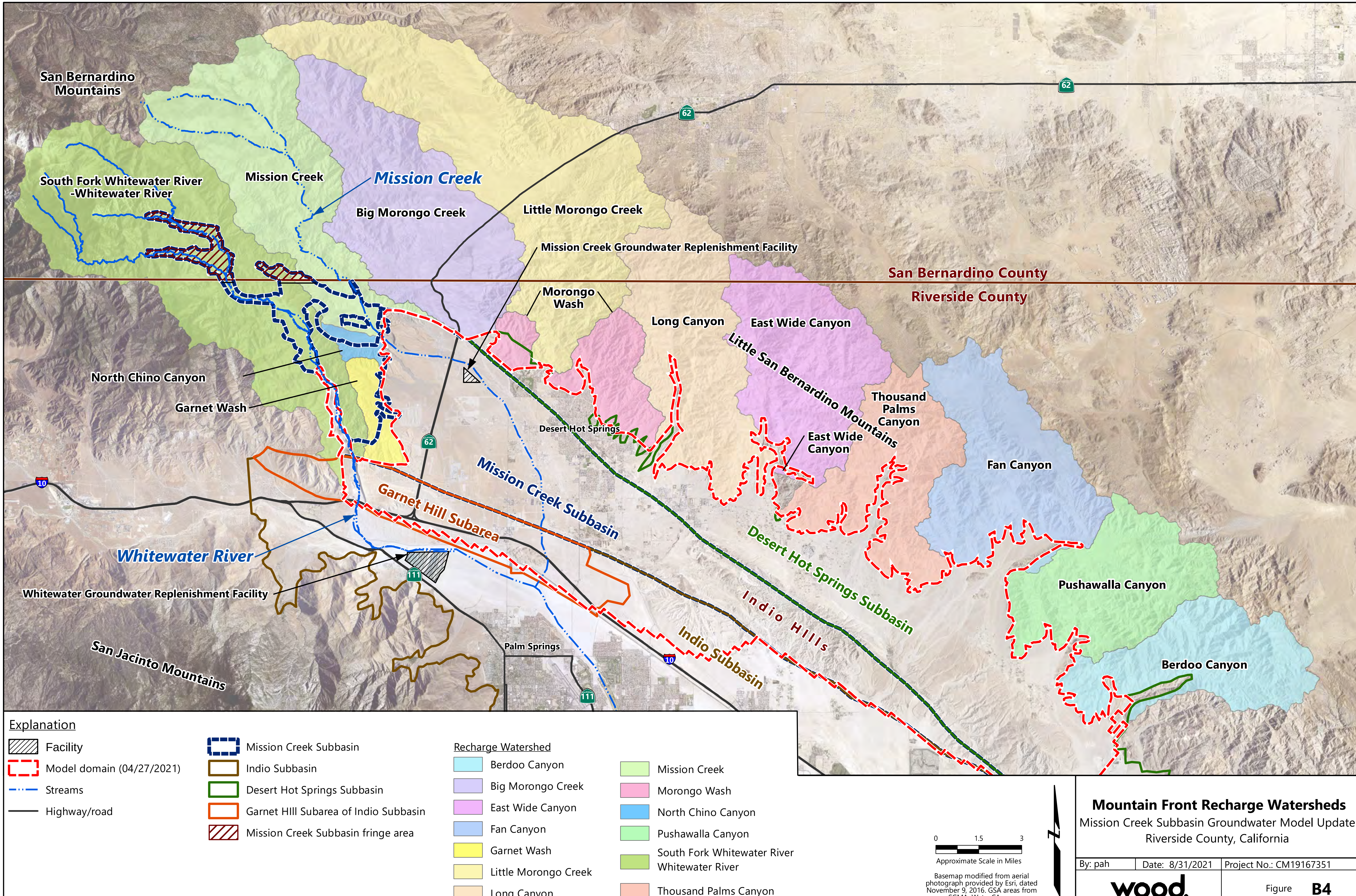
Transient Calibration Statistics and Scatter Plot

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb | Date: 05/27/2021 | Project No.: CM19167351

wood.

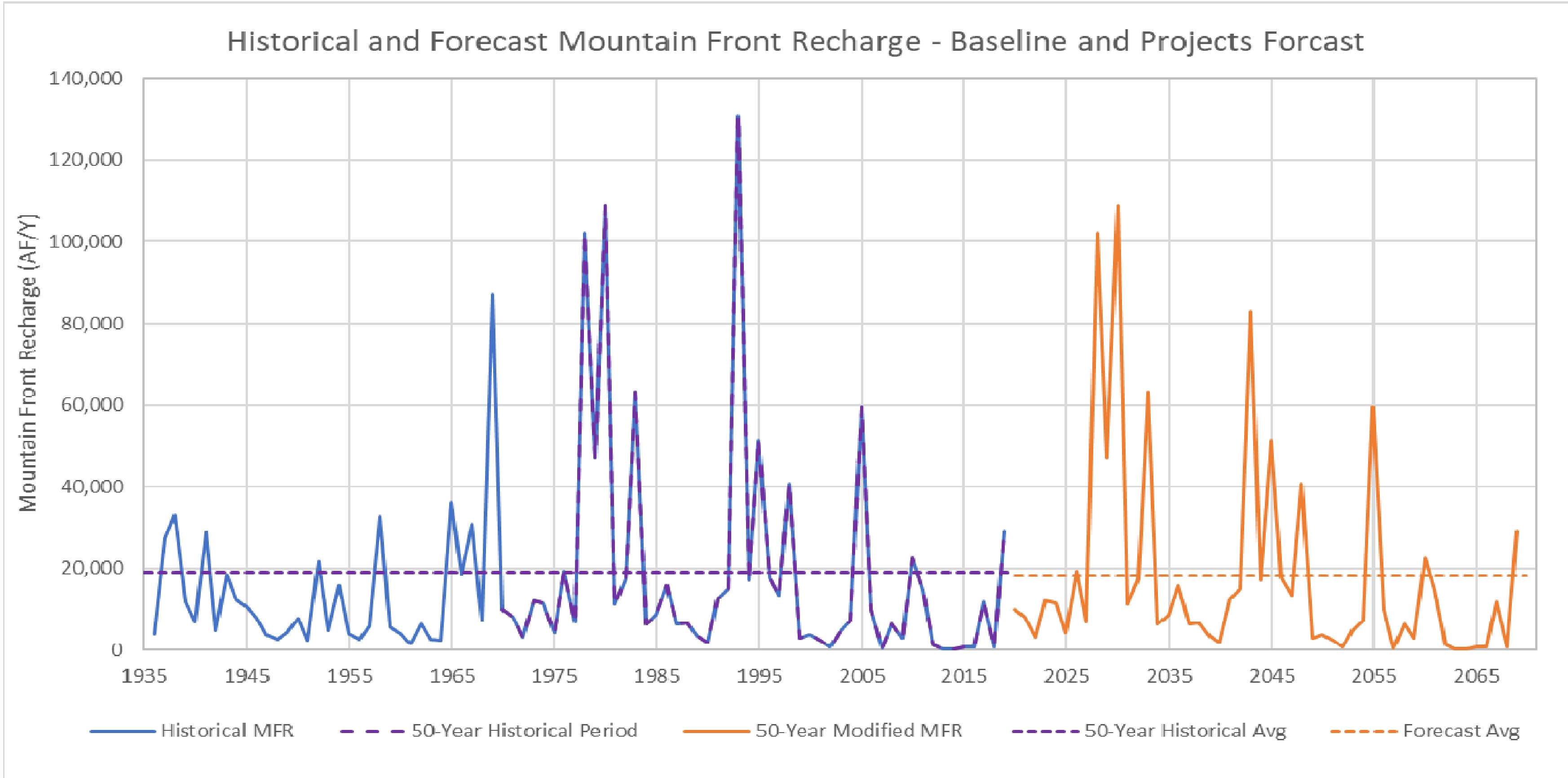
Figure **B3**

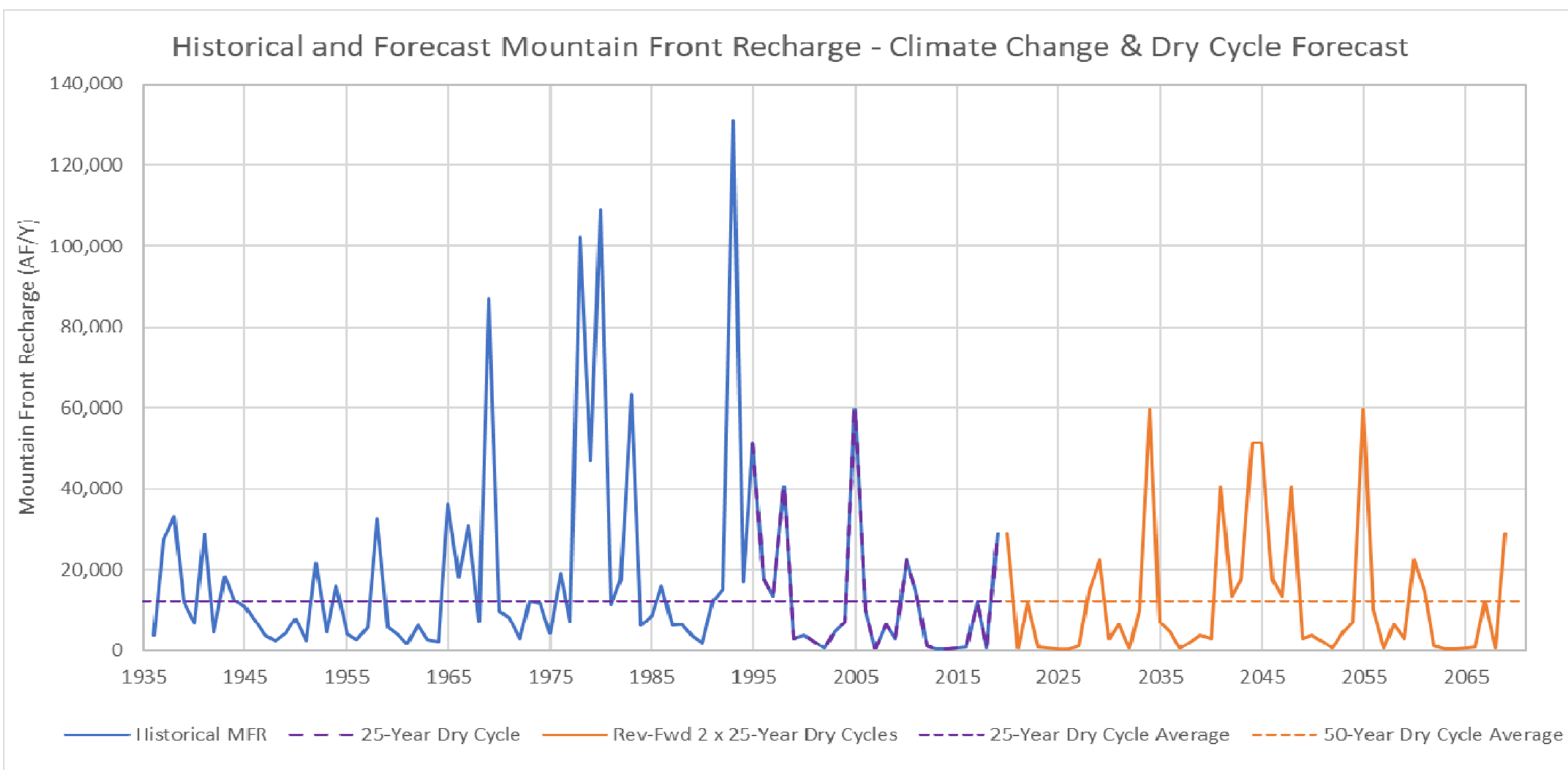


Mountain Front Recharge Watersheds
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: pah	Date: 8/31/2021	Project No.: CM19167351
wood.		Figure B4

Date: 8/31/2021 Printed by: pat.herring
Path: Y:\CM19167351 (Mission Creek Alternate)\Esri\Alternative Update_tb_Recharge_Watershed.mxd





Mountain Front Recharge Forecasts

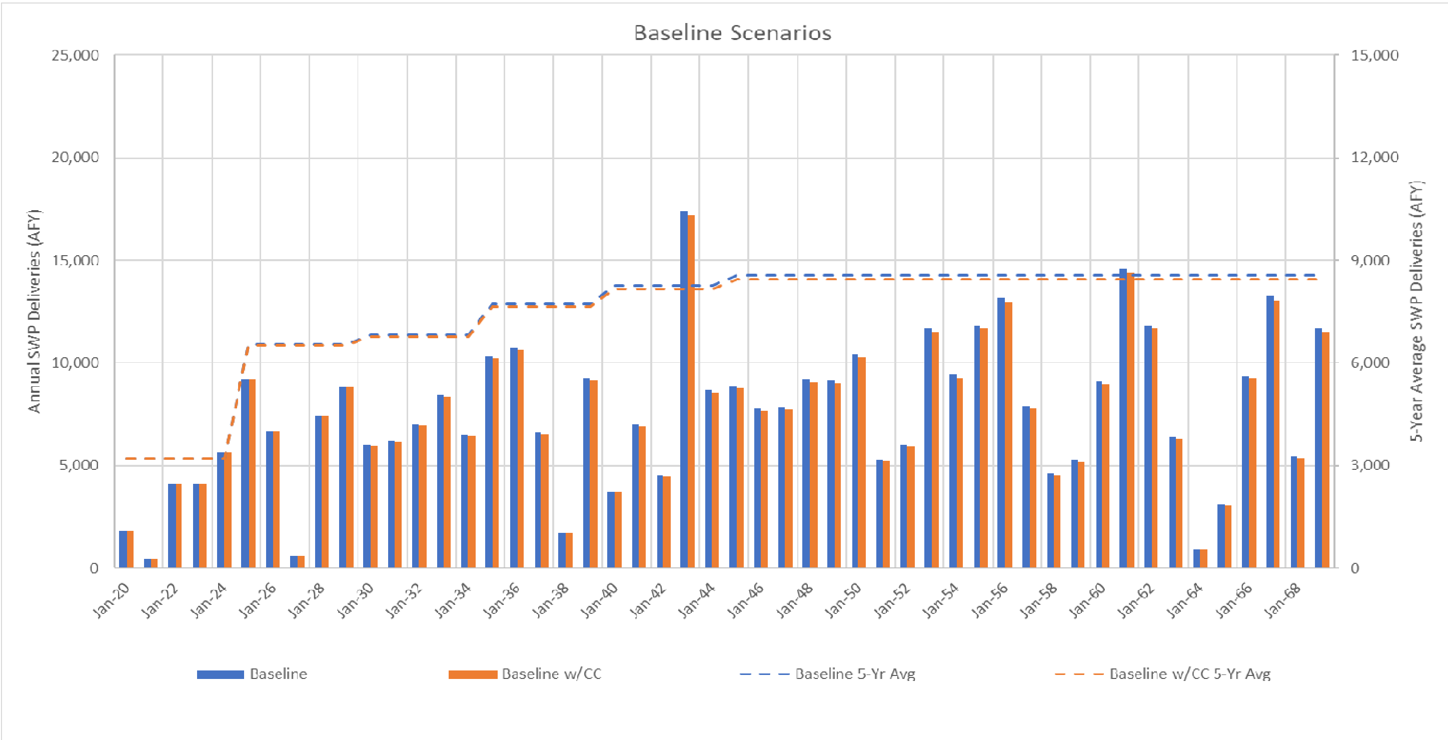
Mission Creek Subbasin Groundwater Model Update

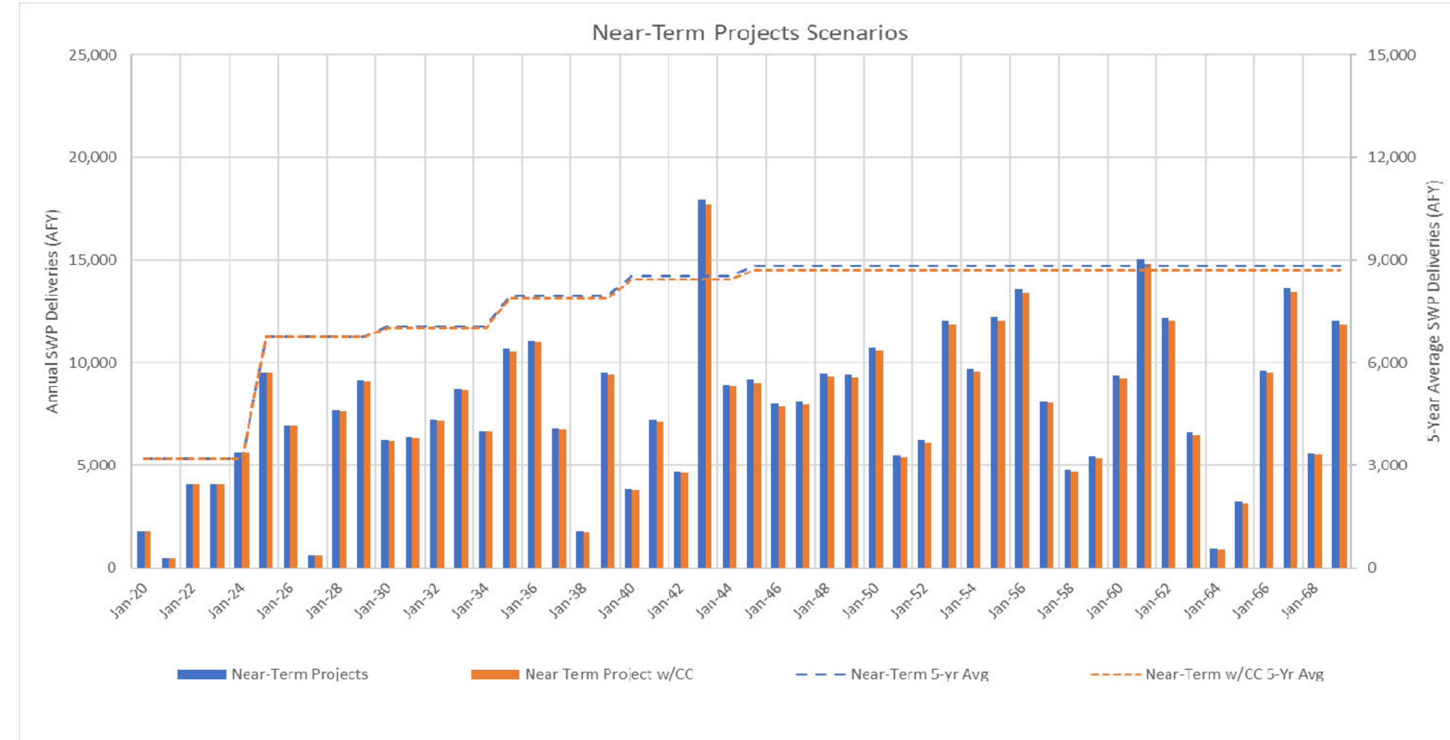
Riverside County, California

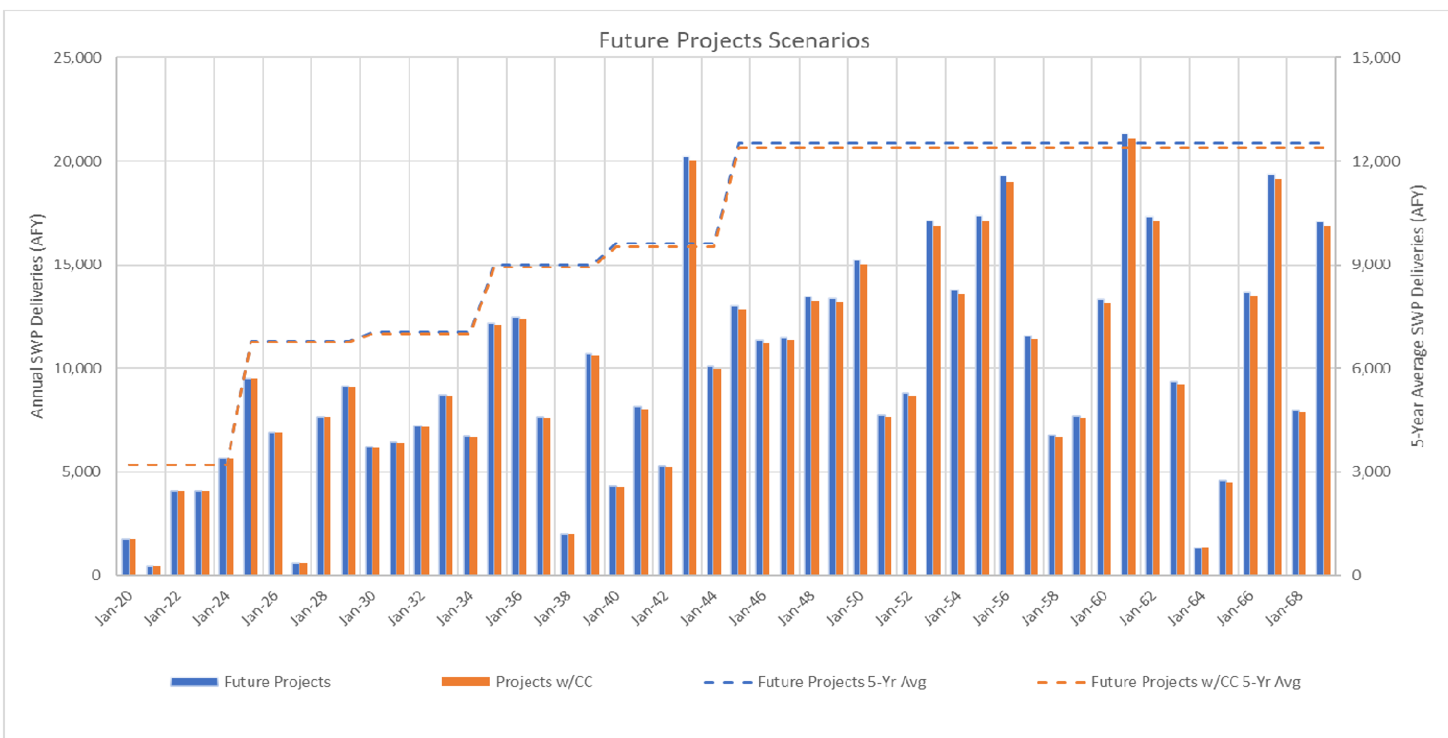
By: dmb	Date: 05/27/2021	Project No.: CM19167351

wood.

Figure **B5**







Notes:
CC = Climate Change

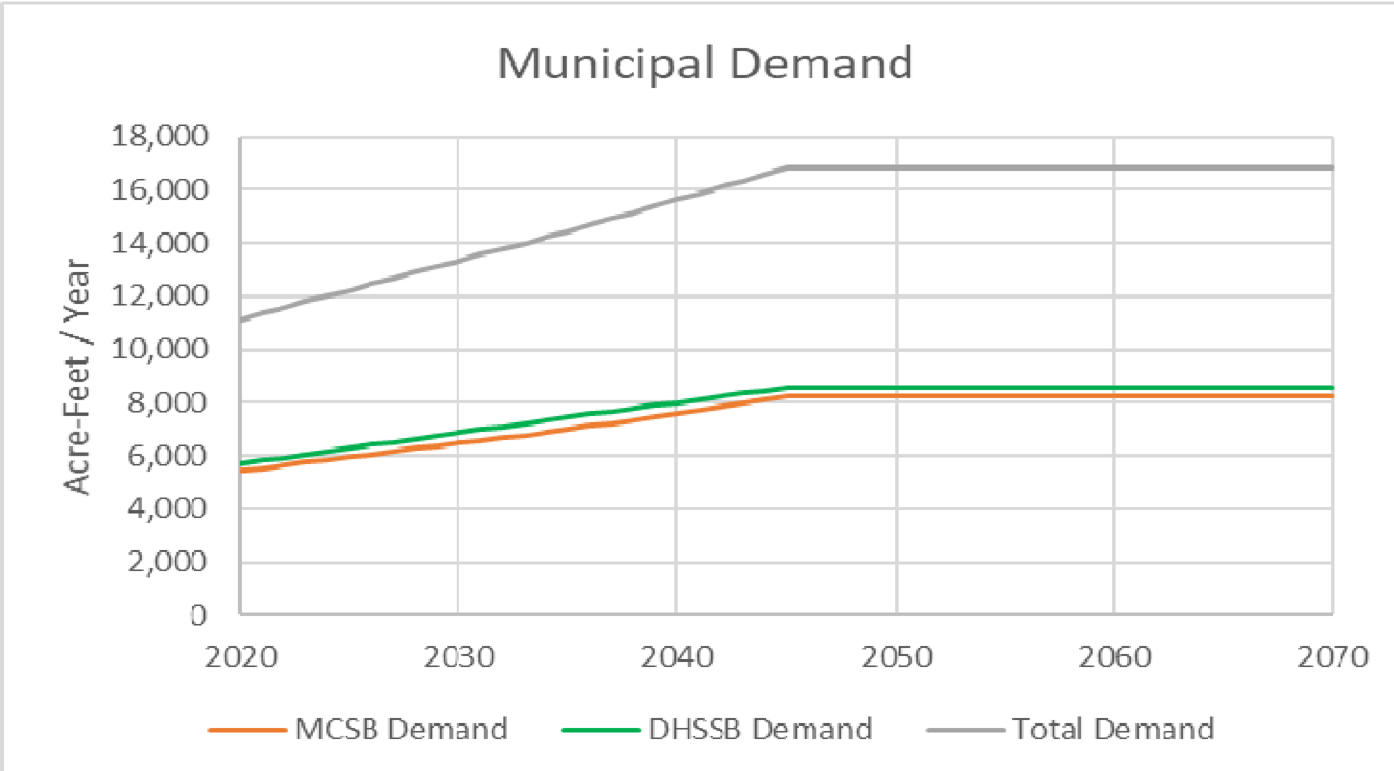
Forecast State Water Project Deliveries for Groundwater Replenishment

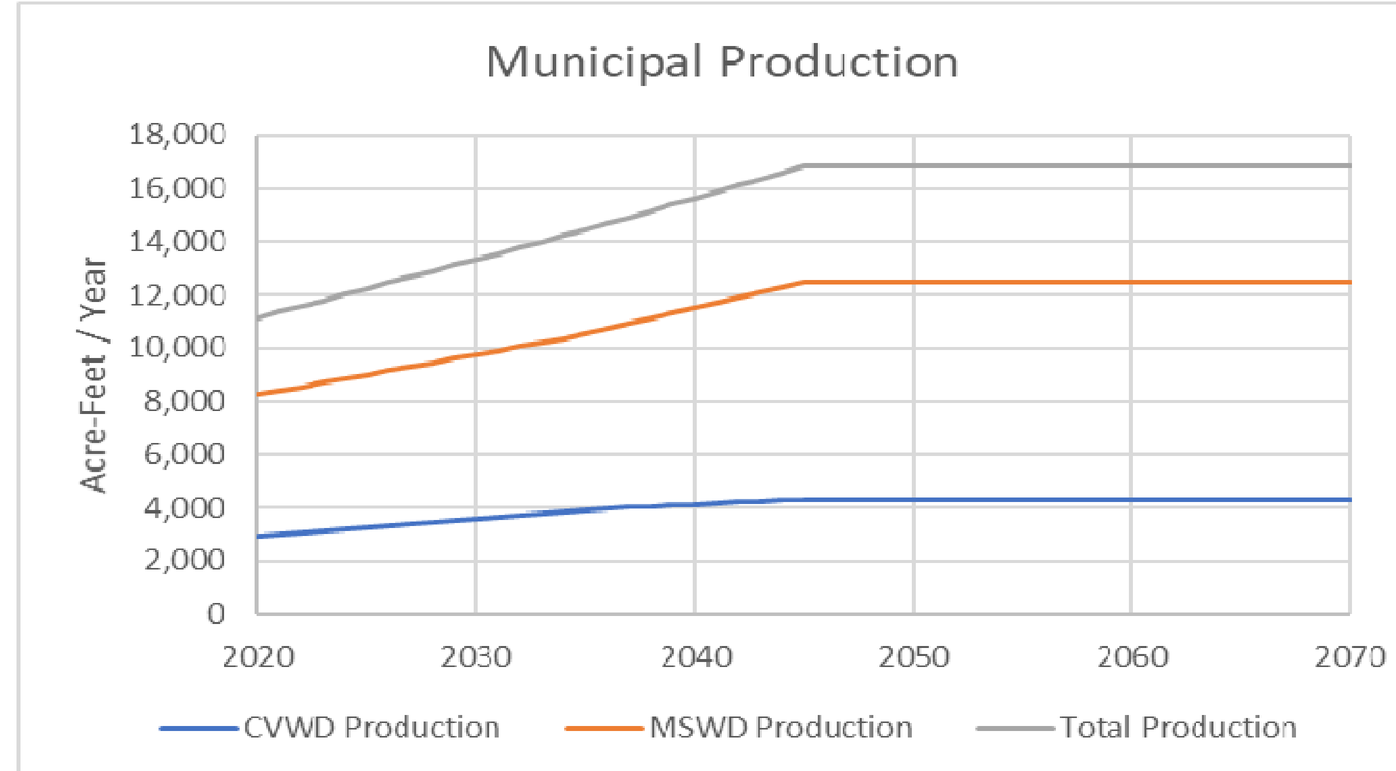
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

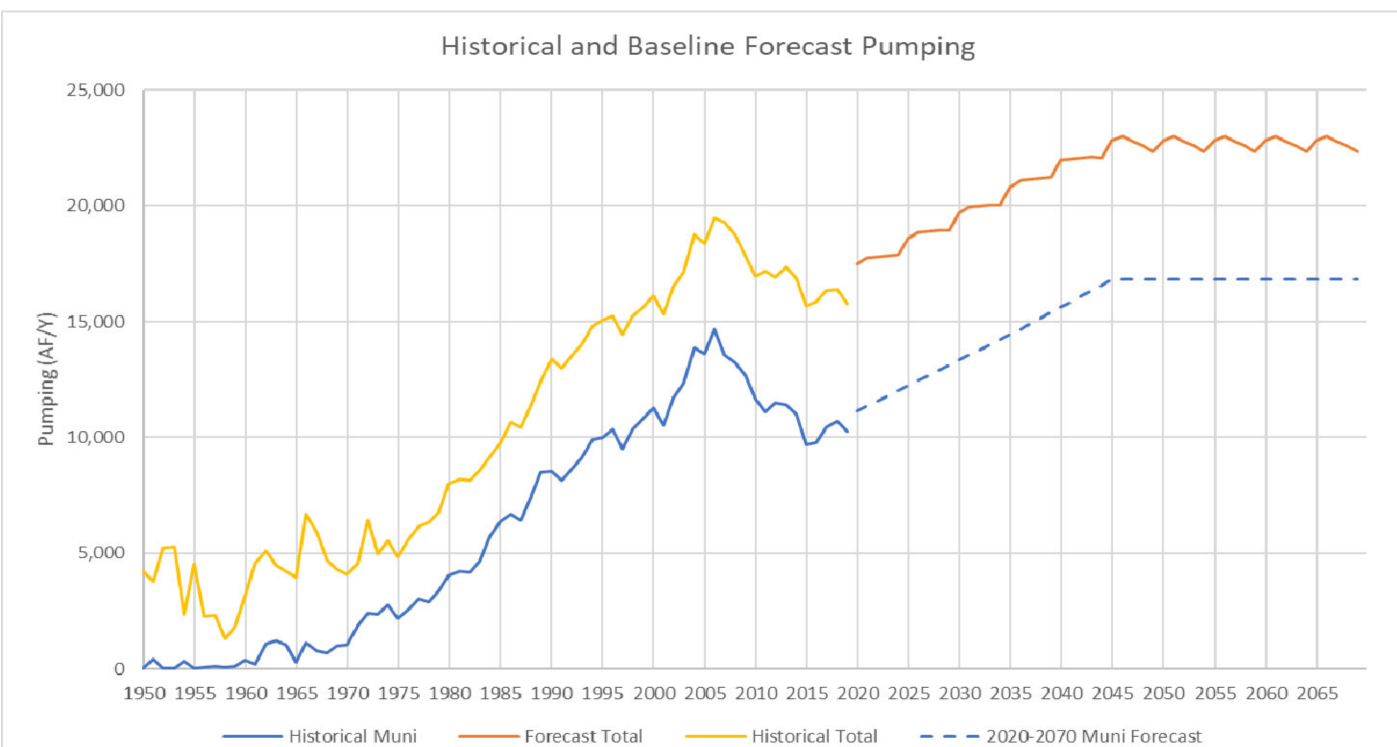
By: dmb | Date: 09/30/2021 | Project No.: CM19167351

wood.

Figure **B6**



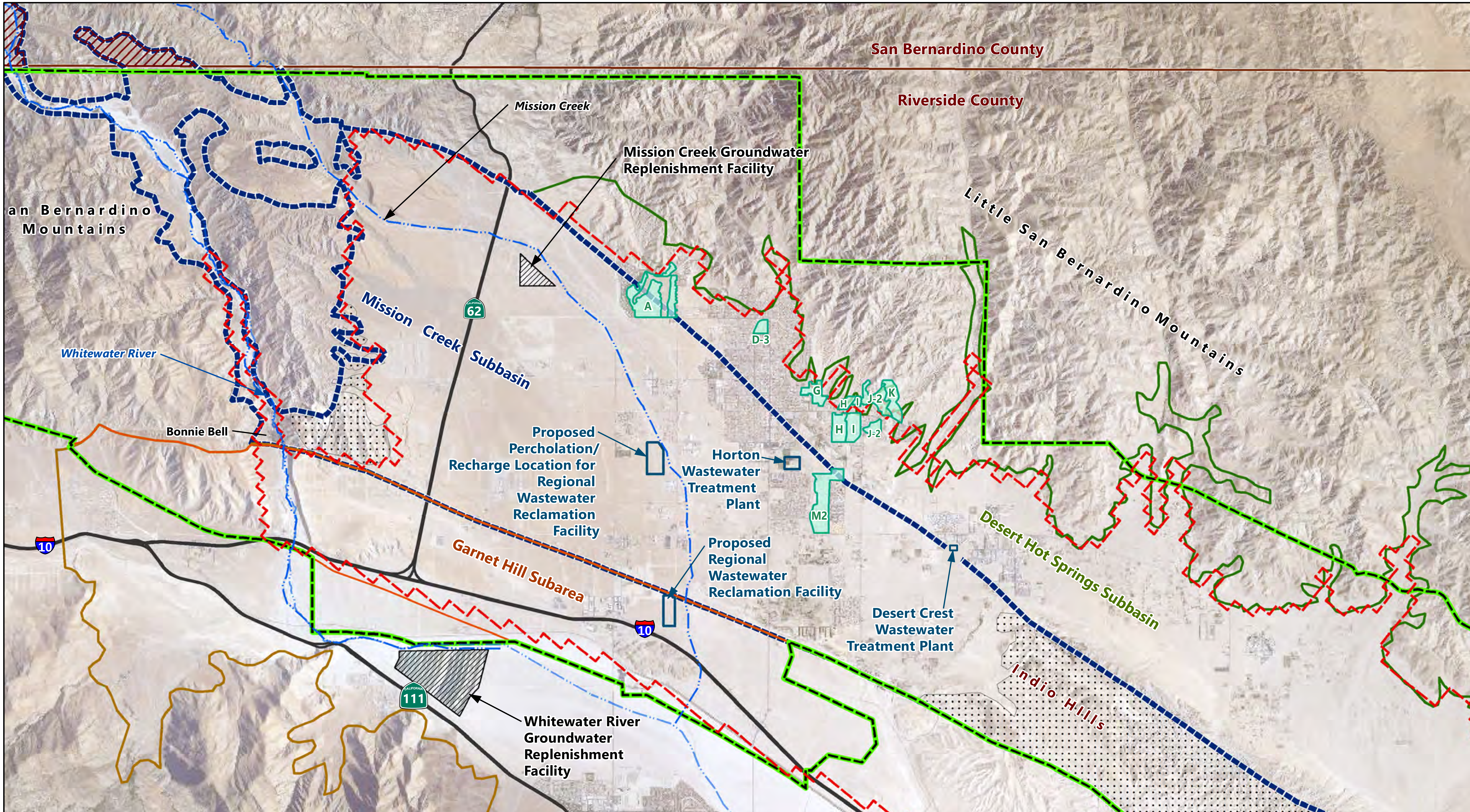




Note: Pumping records compiled from various sources including Fogg, 2000, PSOMAS, 2010, and Agency records
Muni = municipal pumping

Groundwater Demand
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 05/27/2021	Project No.: CM19167351
wood.		Figure B7



Explanation

- Wastewater Treatment and Reclamation facility
- A Septic to sewer conversion area
- Groundwater Replenishment Facility
- Planning Area
- Approximate Active Model Boundary
- Streams
- Highway/road
- Mission Creek Subbasin fringe area
- Garnet Hill Subarea of Indio Subbasin
- Low permeability/non-water bearing sediments/bedrock
- Desert Hot Springs Subbasin
- Indio Subbasin
- Mission Creek Subbasin

0 4,000 8,000
Feet

Basemap modified from aerial photograph provided by Esri, dated November 9, 2016. GSA areas from SGMA. Water.CA.gov.

Wastewater Treatment and Reclamation Facilities and Septic to Sewer Conversion Areas
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: jrw/pah | Date: 9/22/2021 | Project No.: CM19167351

wood.

Figure B8

Date: 9/22/2021 Printed by: joanna.worker
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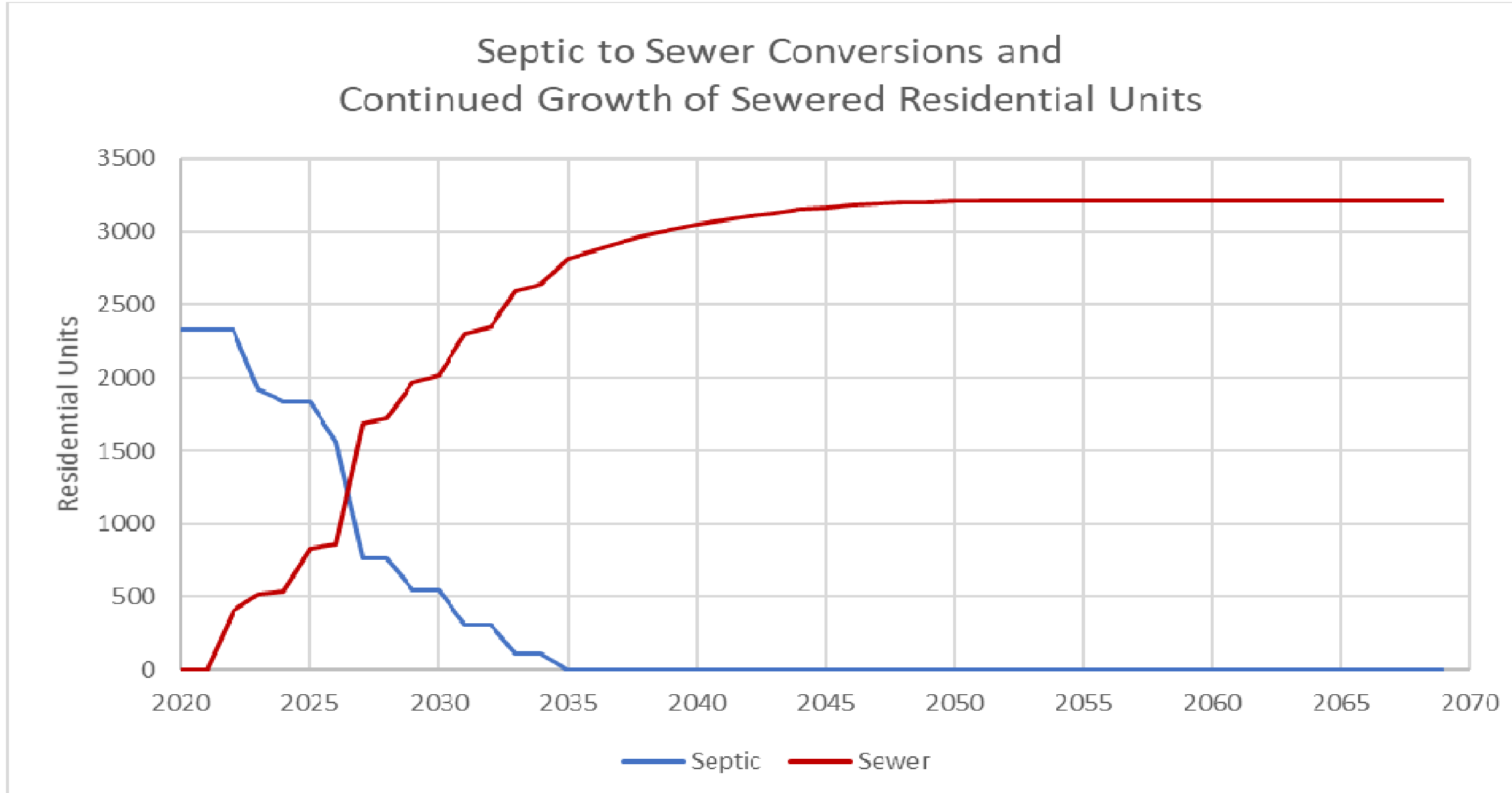
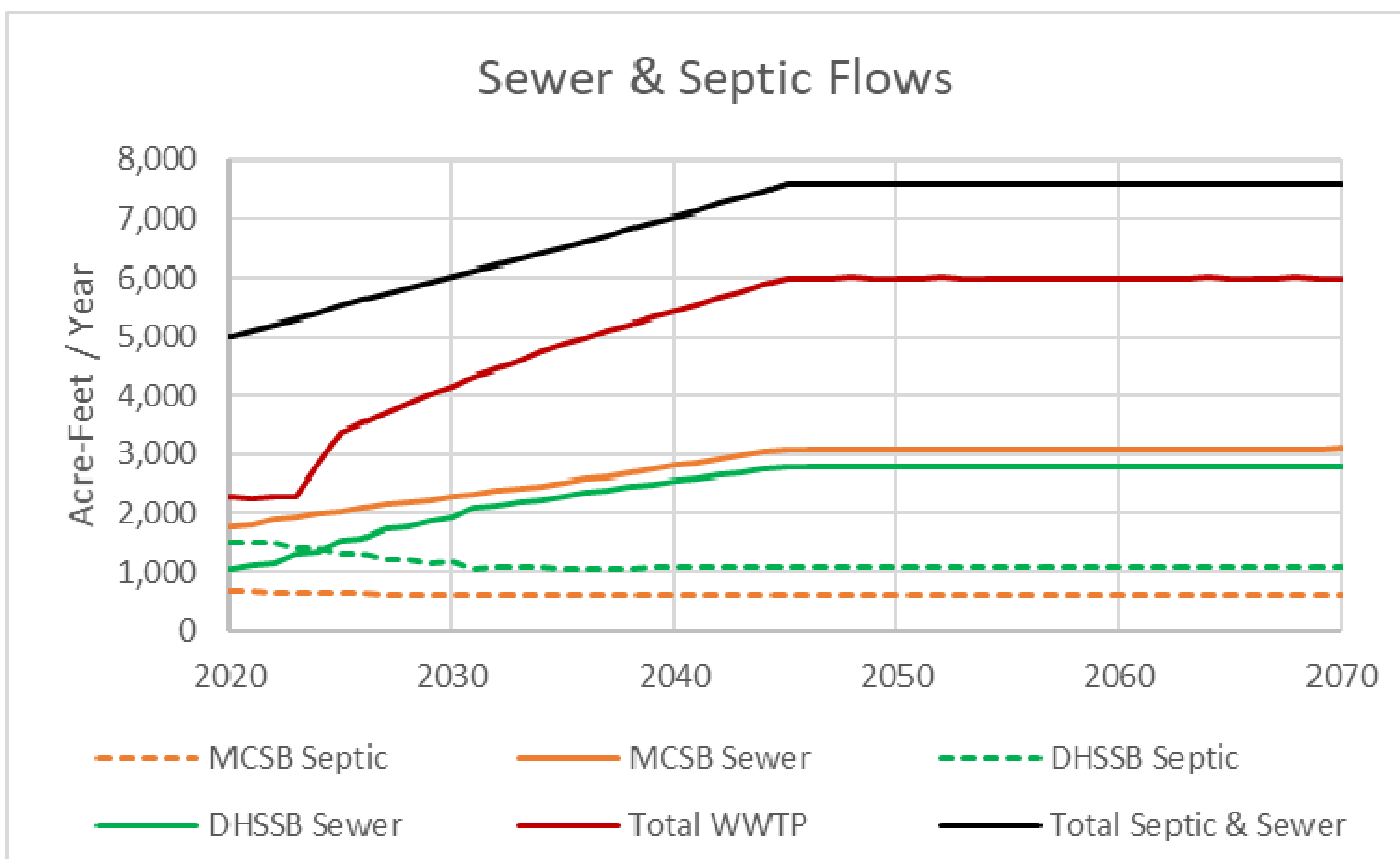


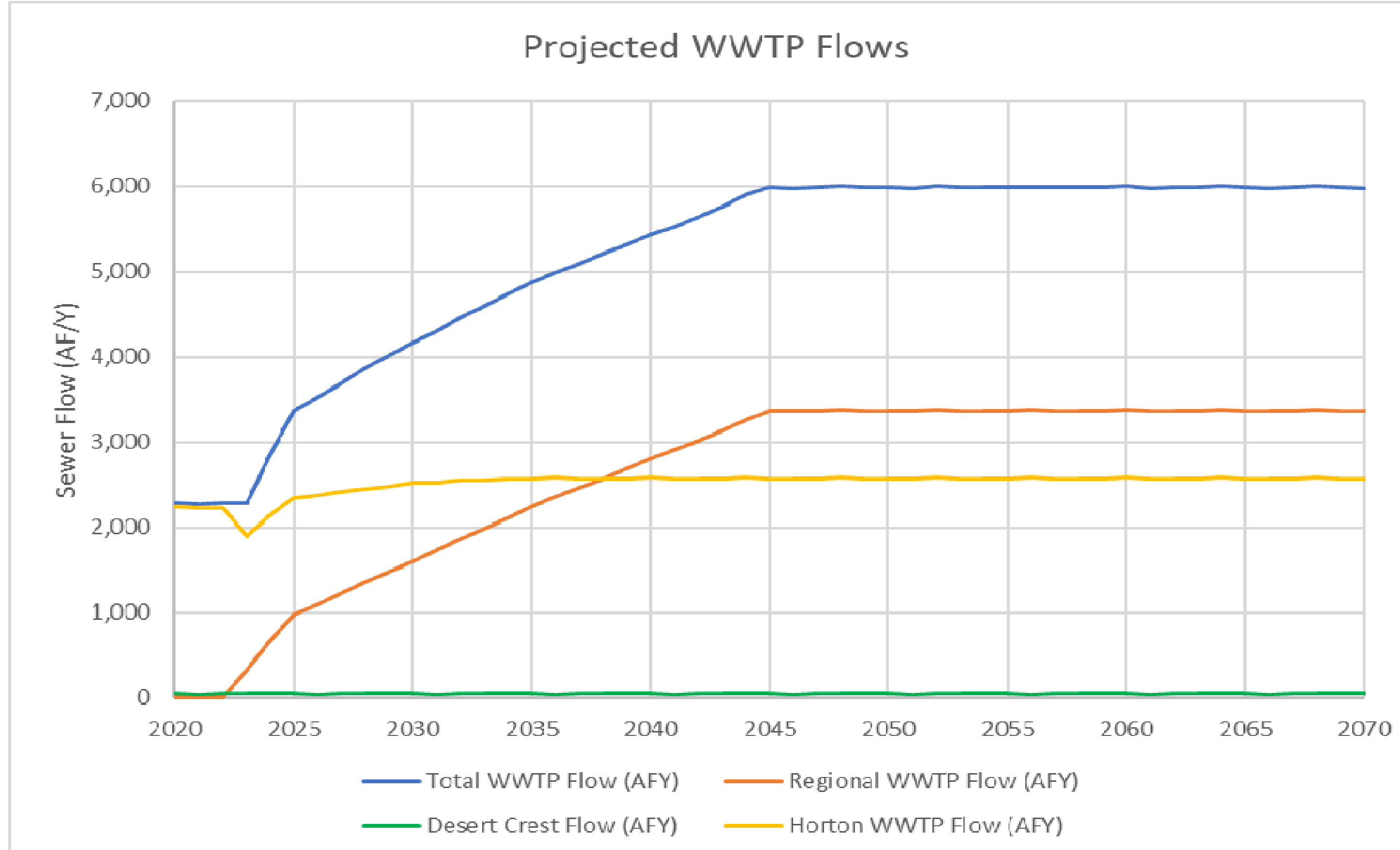


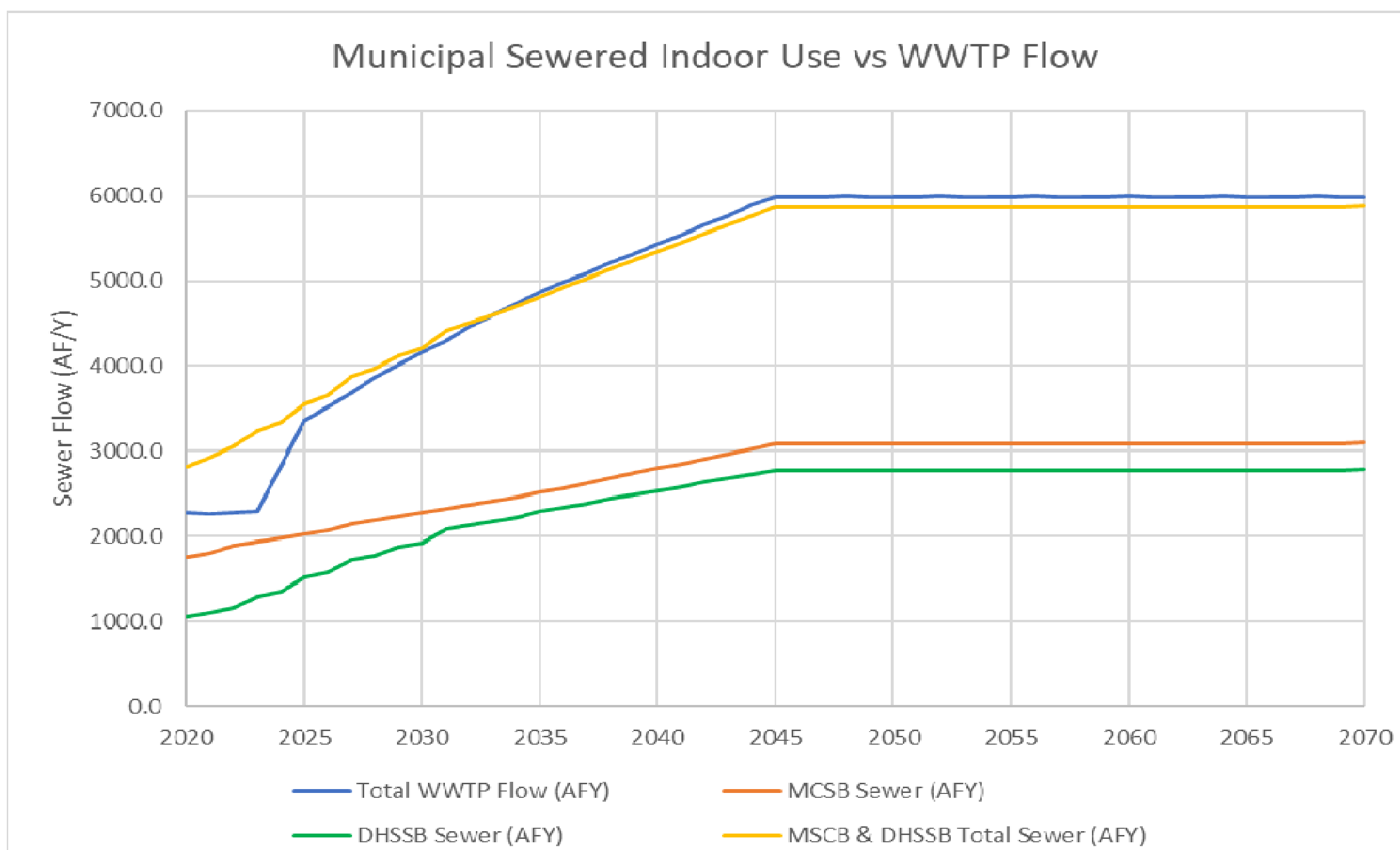
Projected Septic to Sewer Conversions and Sewer and Septic Flows

Mission Creek Groundwater Model Update

Riverside County, California

By: dmb	Date: 05/27/2021	Project No.: CM19167351
wood.	Figure	B9



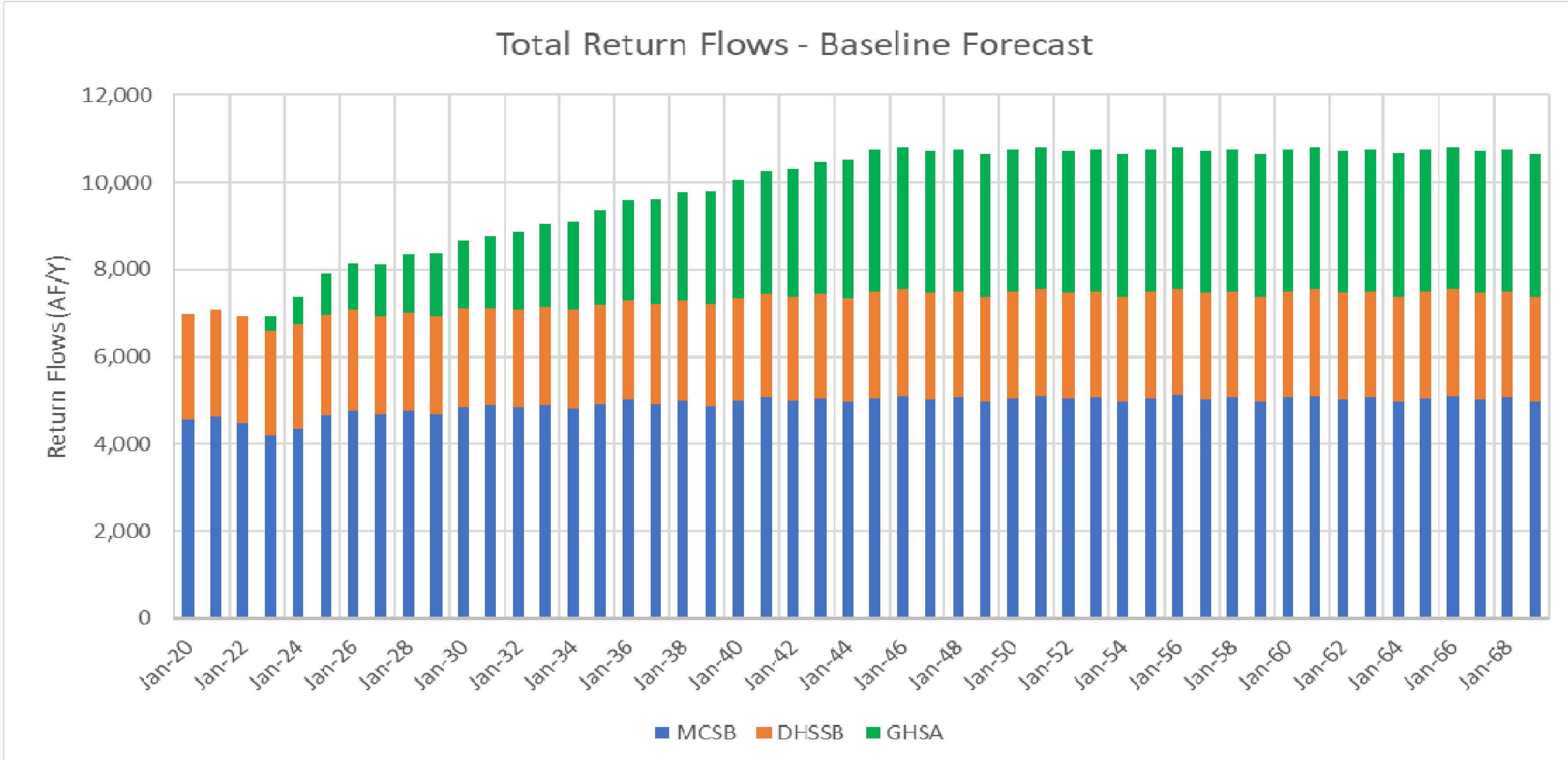


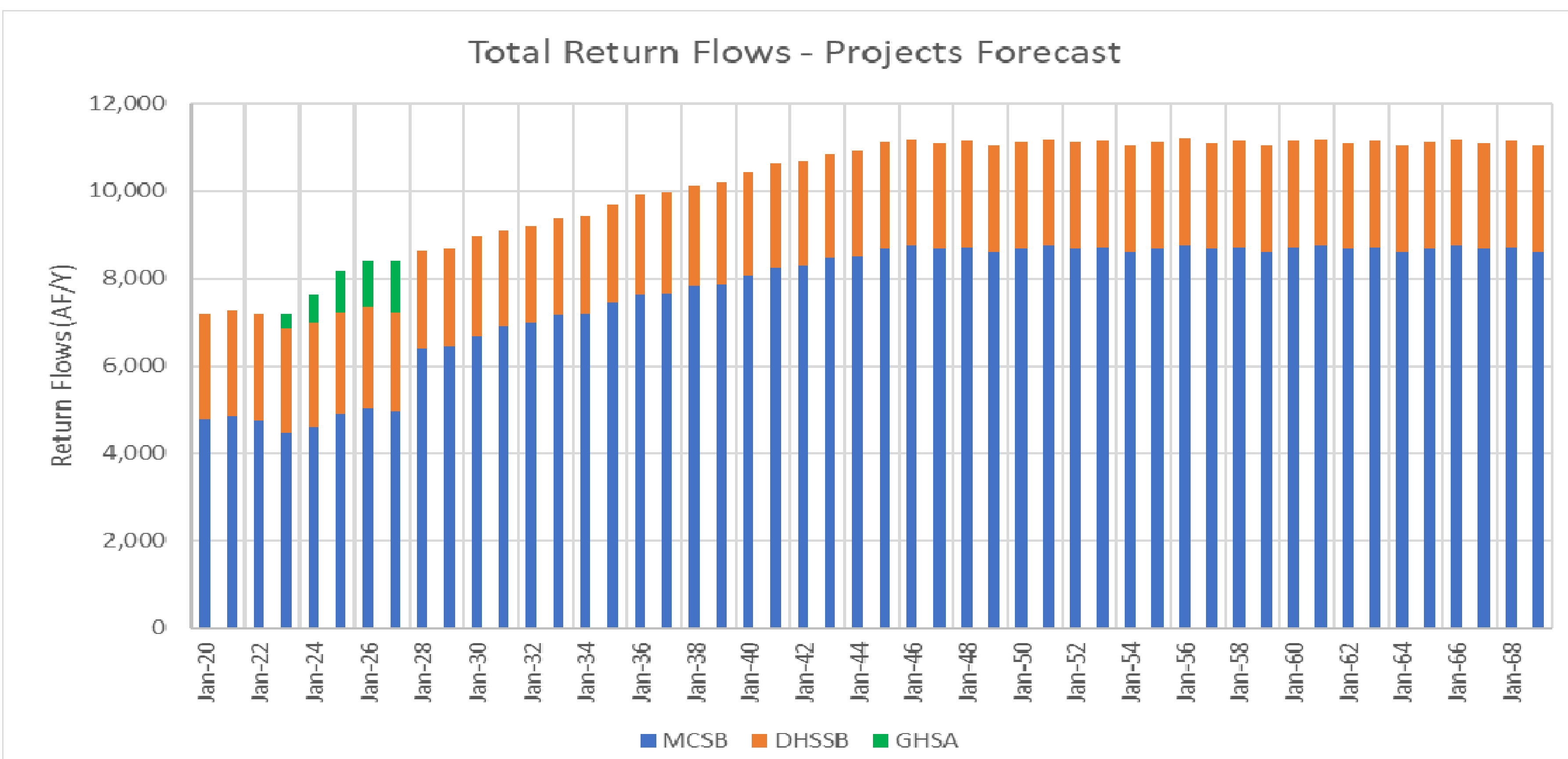
Wastewater Treatment Plant Forecast Flows

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

By: dmb	Date: 05/27/2021	Project No.: CM19167351
wood.	Figure	B10



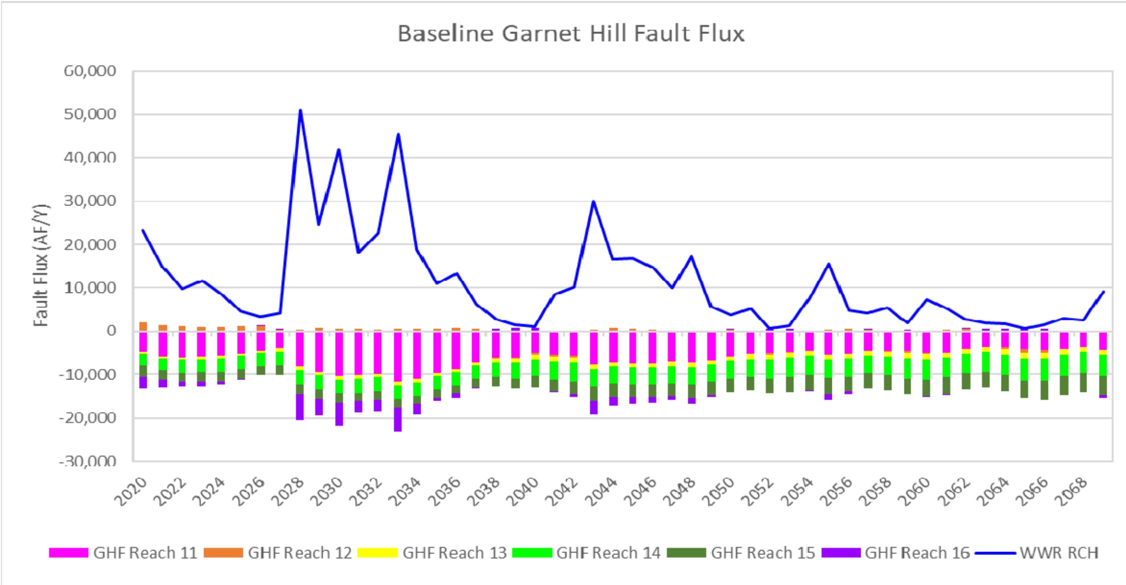


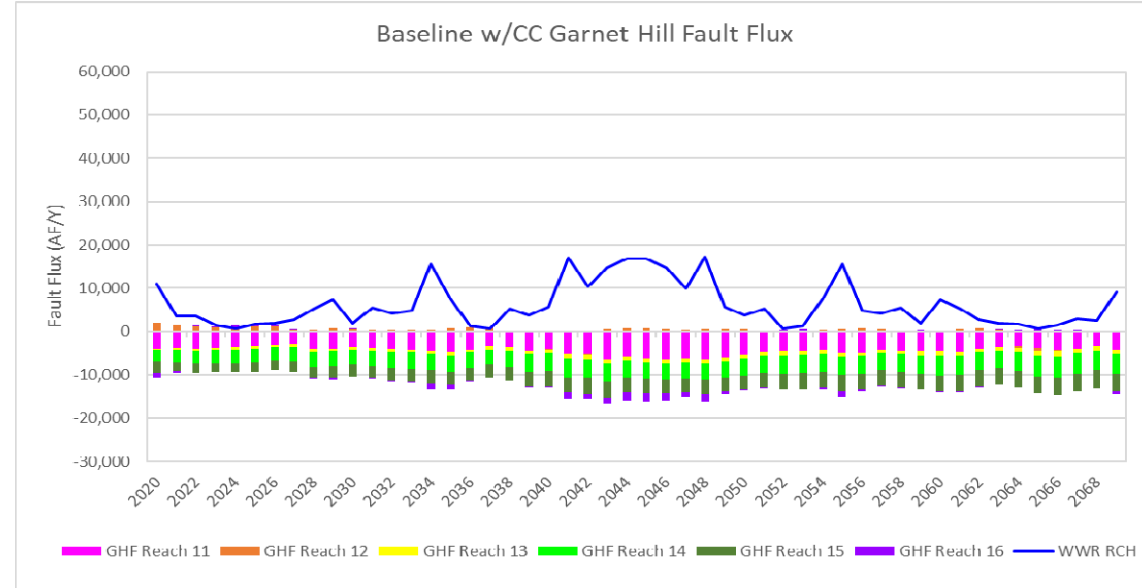
Forecast Return Flows by Subbasin/Subarea

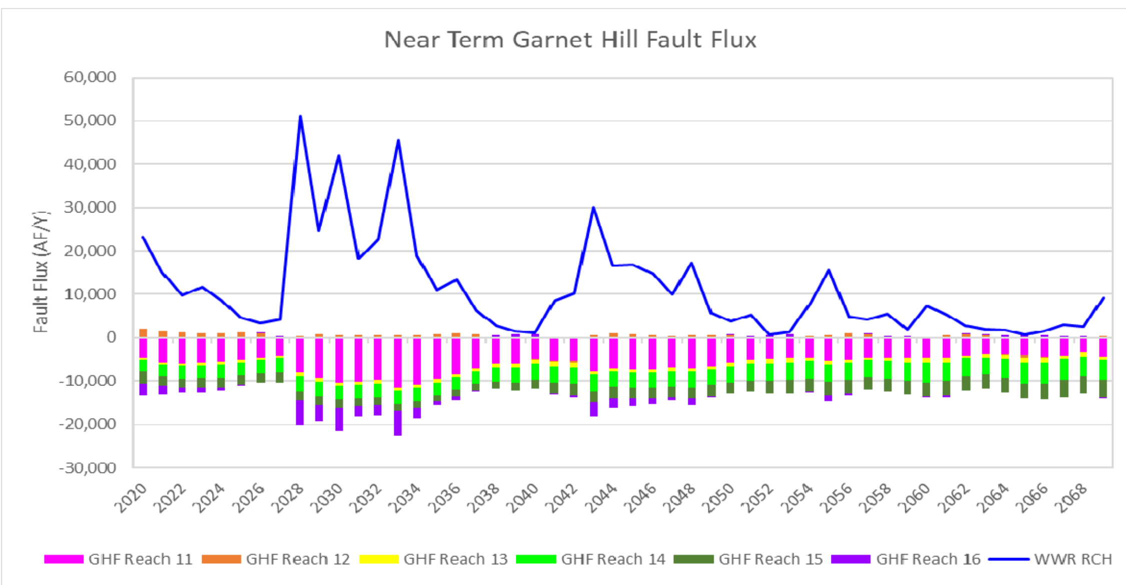
Mission Creek Subbasin Groundwater Model Update

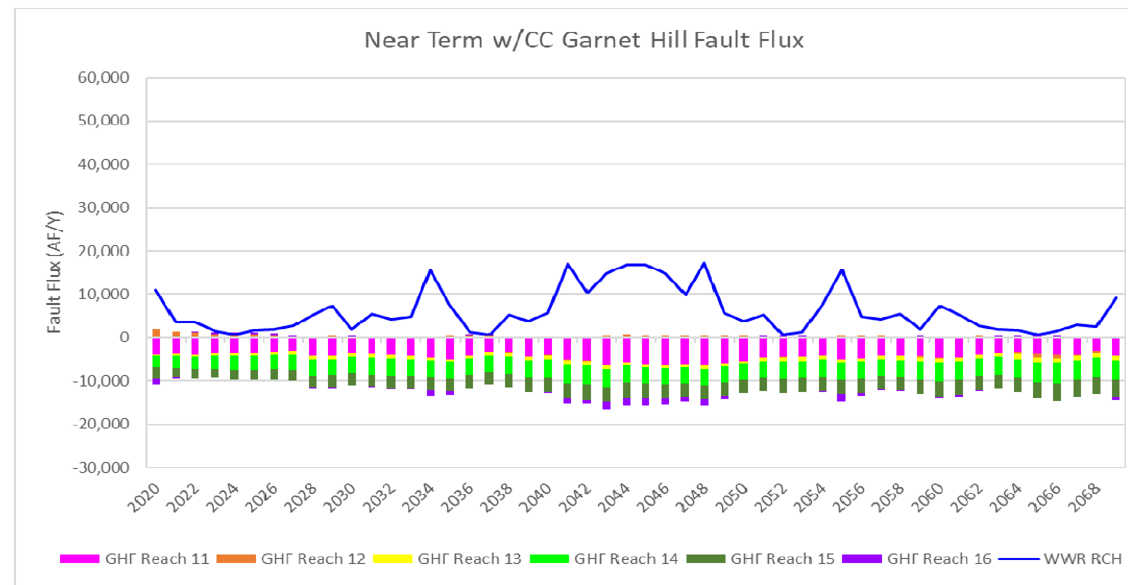
Riverside County, California

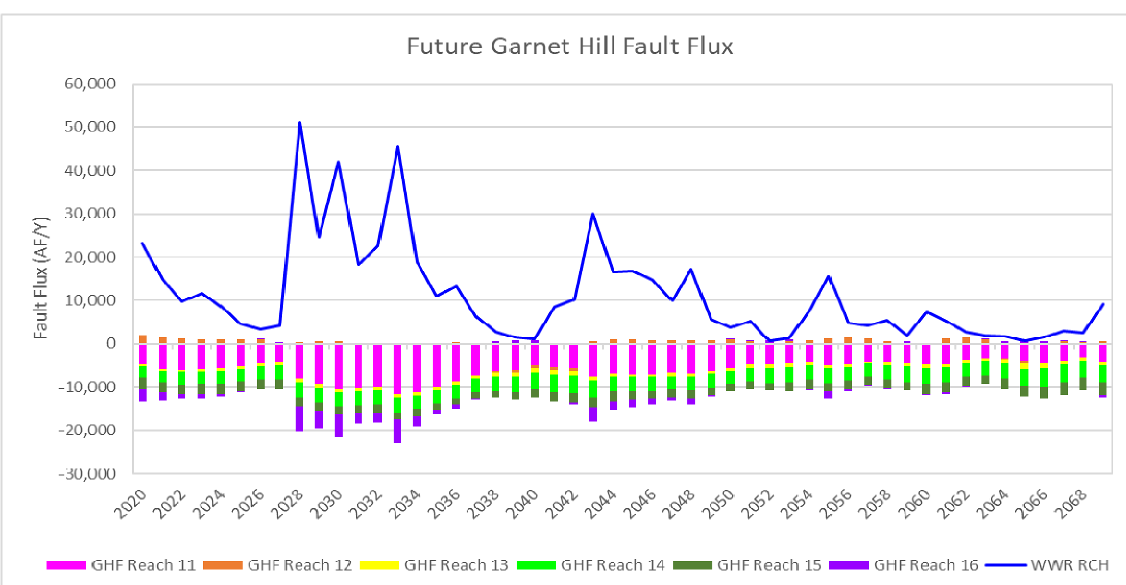
By: dmb	Date: 05/27/2021	Project No.: CM19167351
wood.	Figure	B11

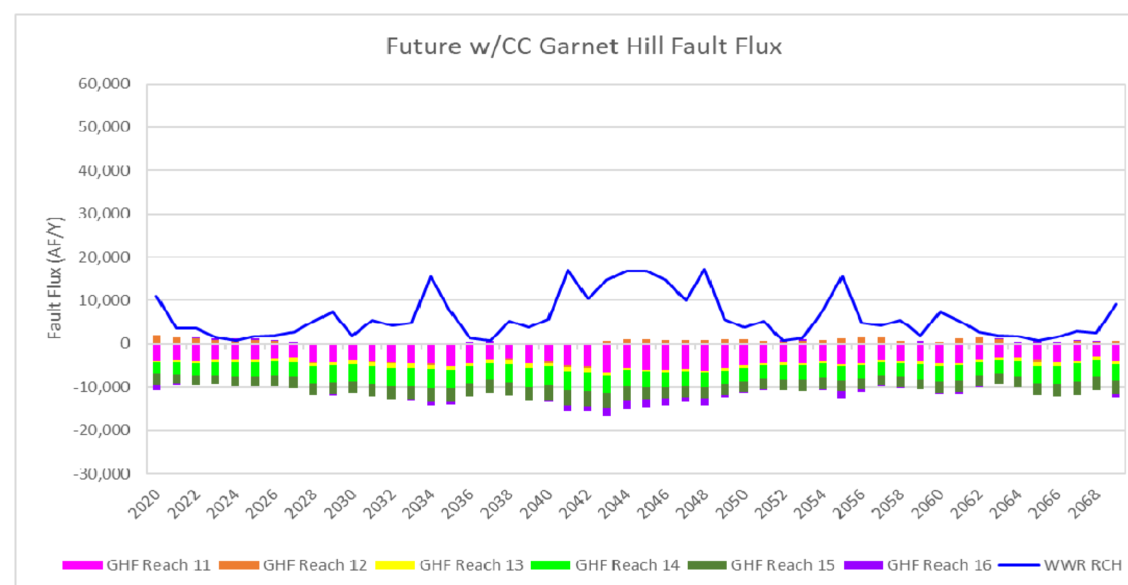










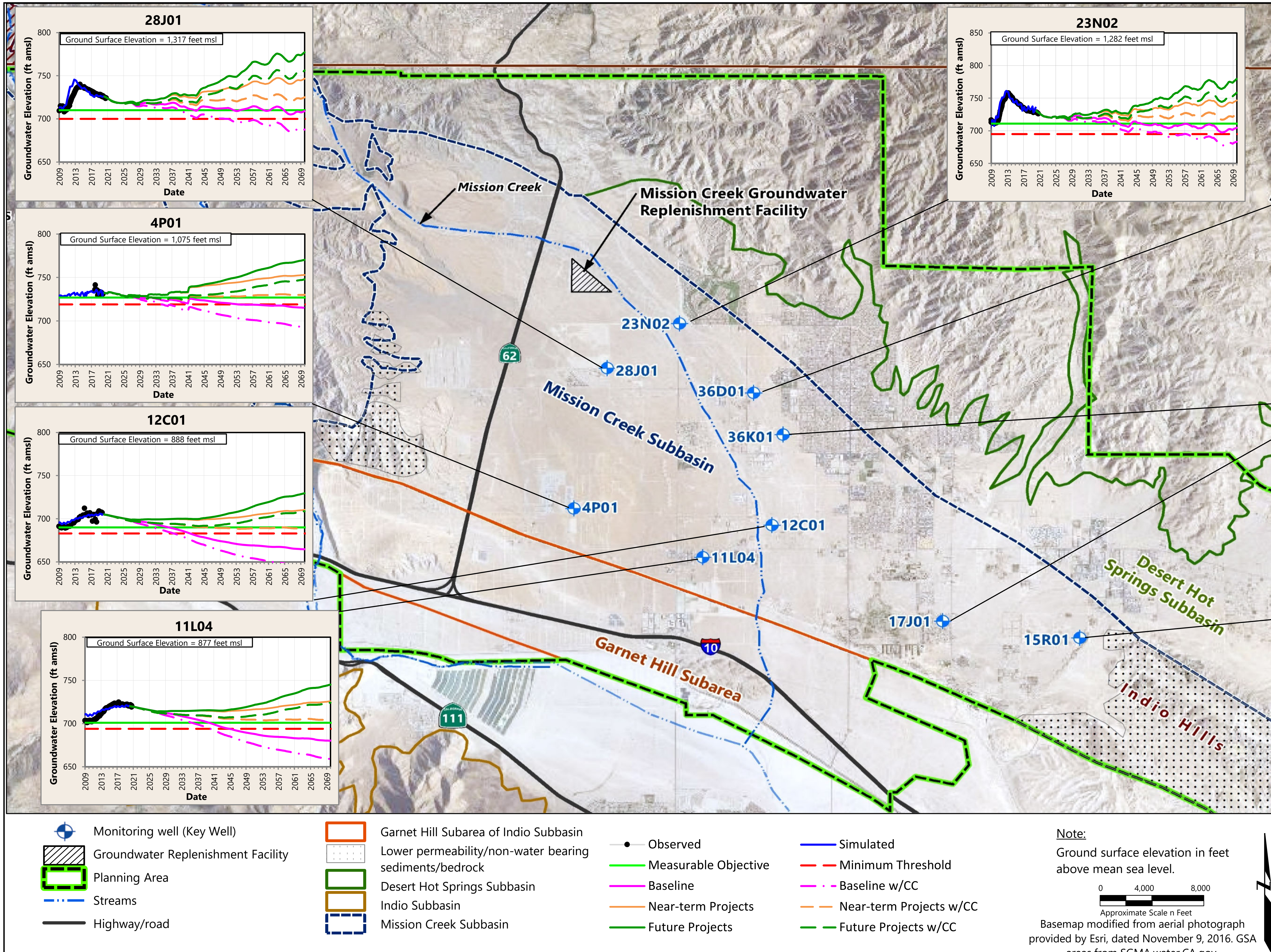


Indio Model Simulated Garnet Hill Fault Flux and Whitewater River Recharge

Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 05/27/2021	Project No.: CM19167351
wood.	Figure	**B12**

K:\CM19167351 (CVWD Alt update)\Final Report Figure\00 Appendix B\Appendix_B_Forecast_Figures_v30_02-11-22 Figure ES7, ES8, 7-6, 7-11, B13, and B32 v2

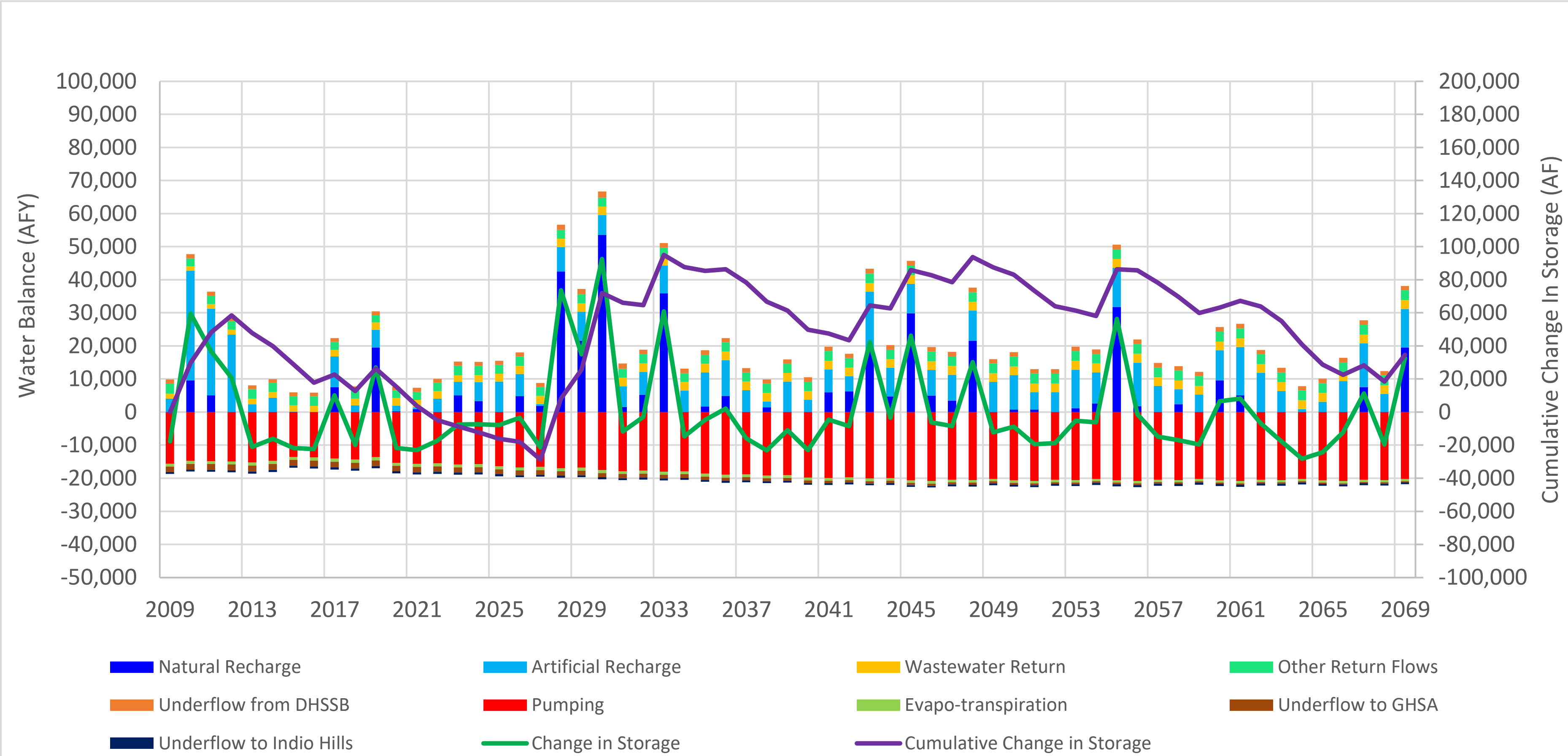


Forecast Simulation Results For Key Wells With Measurable Objectives and Minimum Thresholds
Mission Creek Subbasin Alternative Update
Riverside County, California

By: grr/pah | Date: 03/09/2022 | Project No.: CM19167351

wood.

Figure B13



Abbreviations:

AF= Acre feet; AFY = Acre feet per year

DHSSB = Desert Hot Springs Subbasin

GHSA = Garnet Hill Subarea

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated

Water Balance for Mission Creek Subbasin

Baseline Scenario

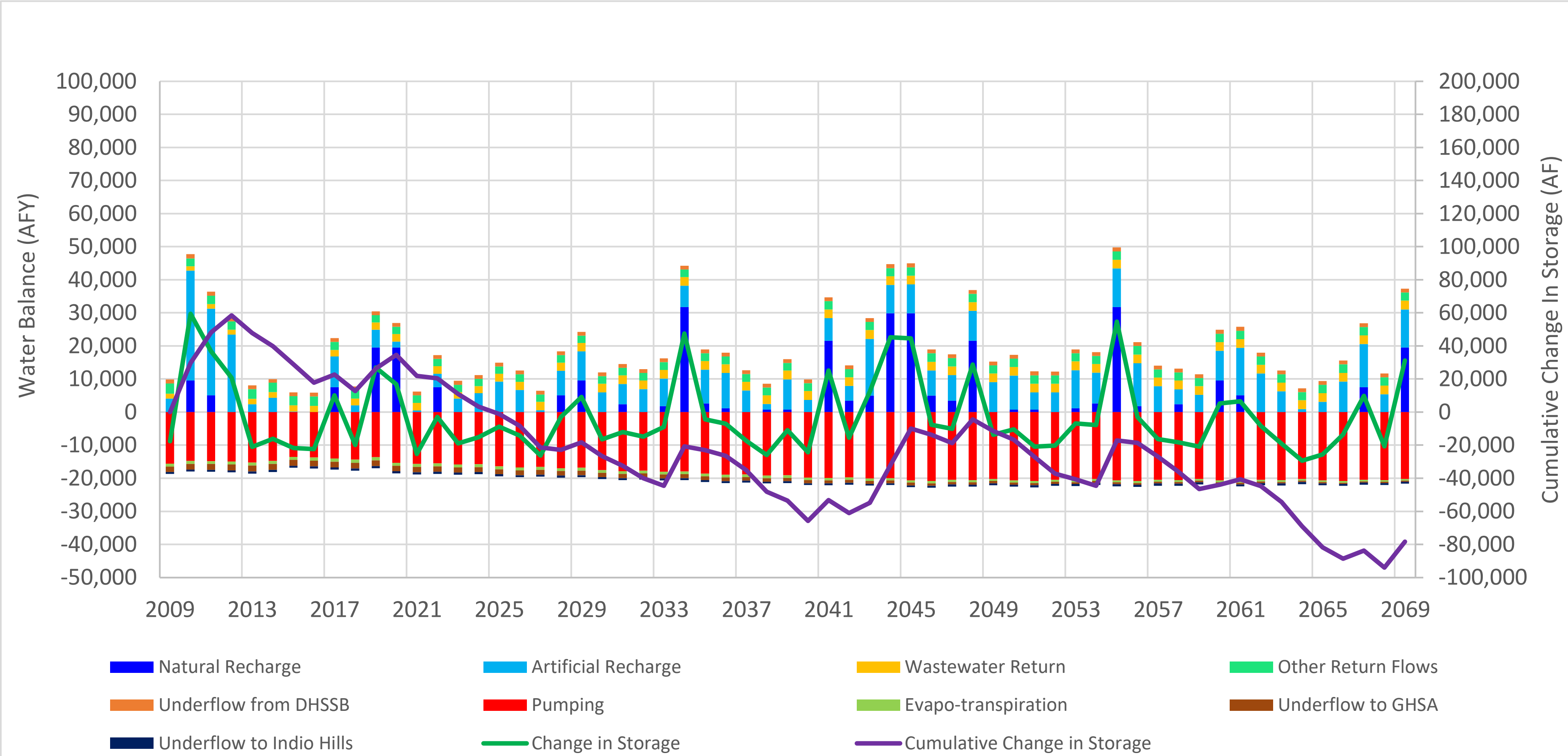
Mission Creek Subbasin Groundwater Model Update

Riverside County, California

By: dmb	Date: 02/14/2022	Project No.: CM19167351

wood.

Figure **B14**

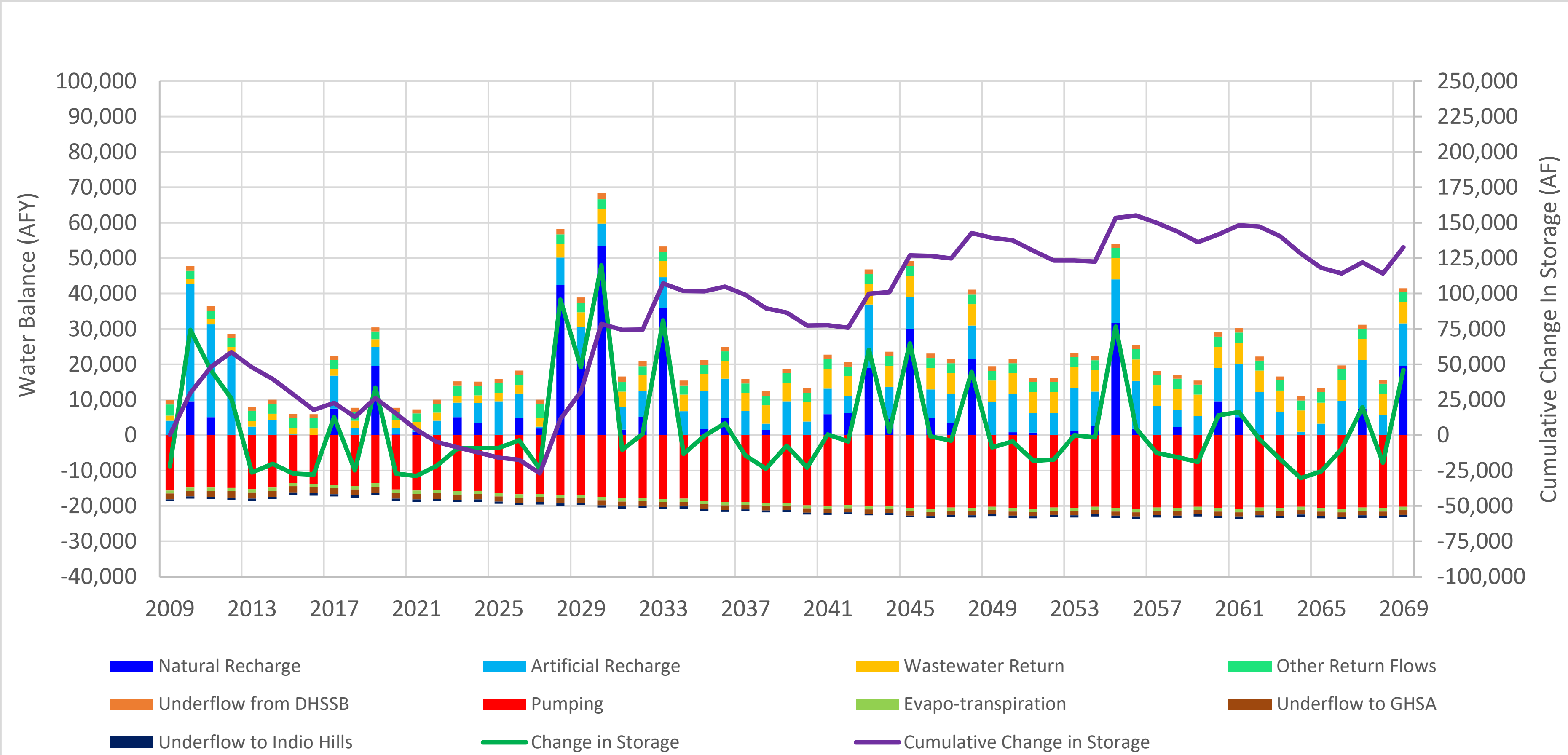


Abbreviations:
AF= Acre feet; AFY = Acre feet per year
DHSSB = Desert Hot Springs Subbasin
GHSA = Garnet Hill Subarea

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated
Water Balance for Mission Creek Subbasin
Baseline w/CC Scenario
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 03/09/2022	Project No.: CM19167351
wood.	Figure	B15

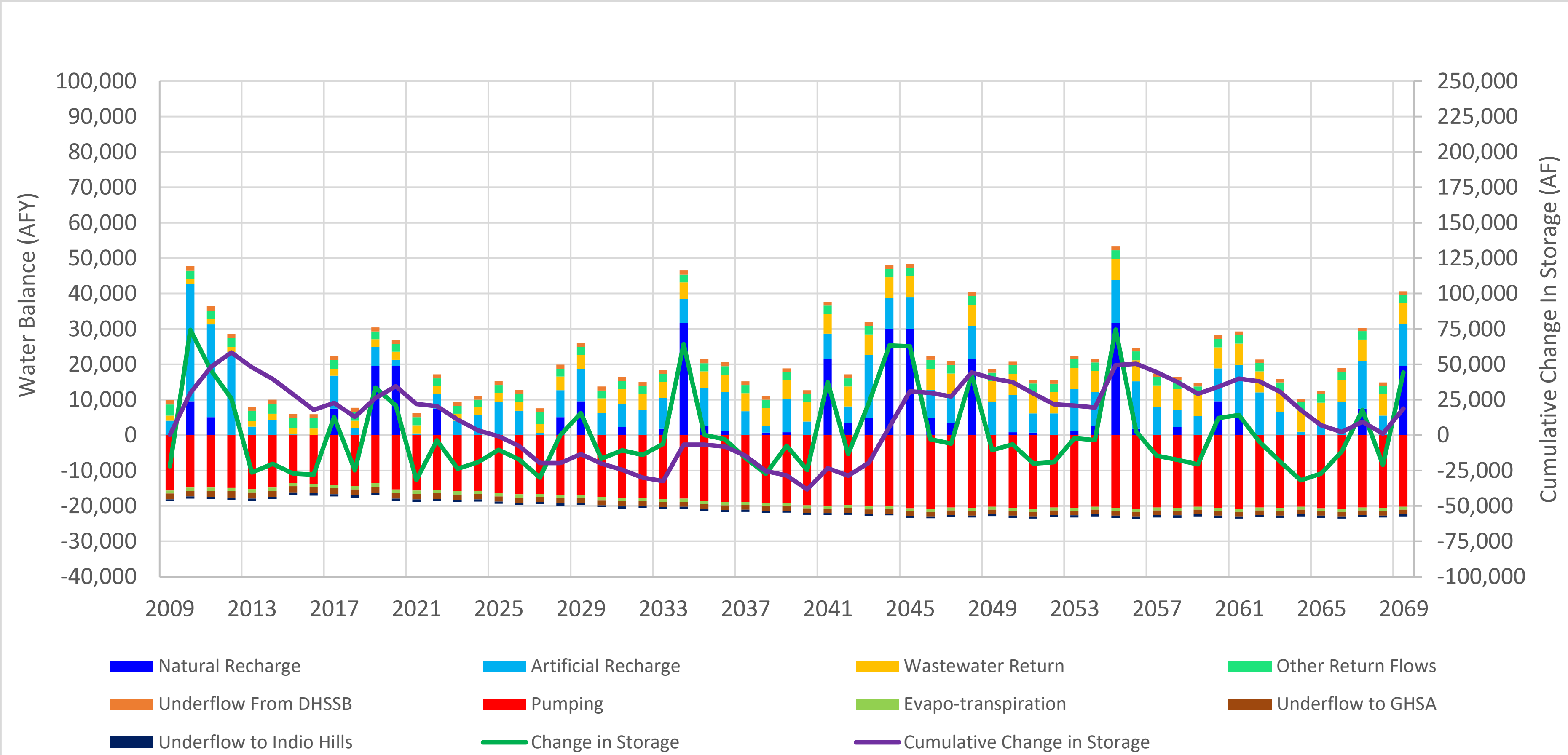


Abbreviations:
AF= Acre feet; AFY = Acre feet per year
DHSSB = Desert Hot Springs Subbasin
GHSA = Garnet Hill Subarea

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated
Water Balance for Mission Creek Subbasin
Near-Term Scenario
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 02/14/2022	Project No.: CM19167351
wood.	Figure **B16**	

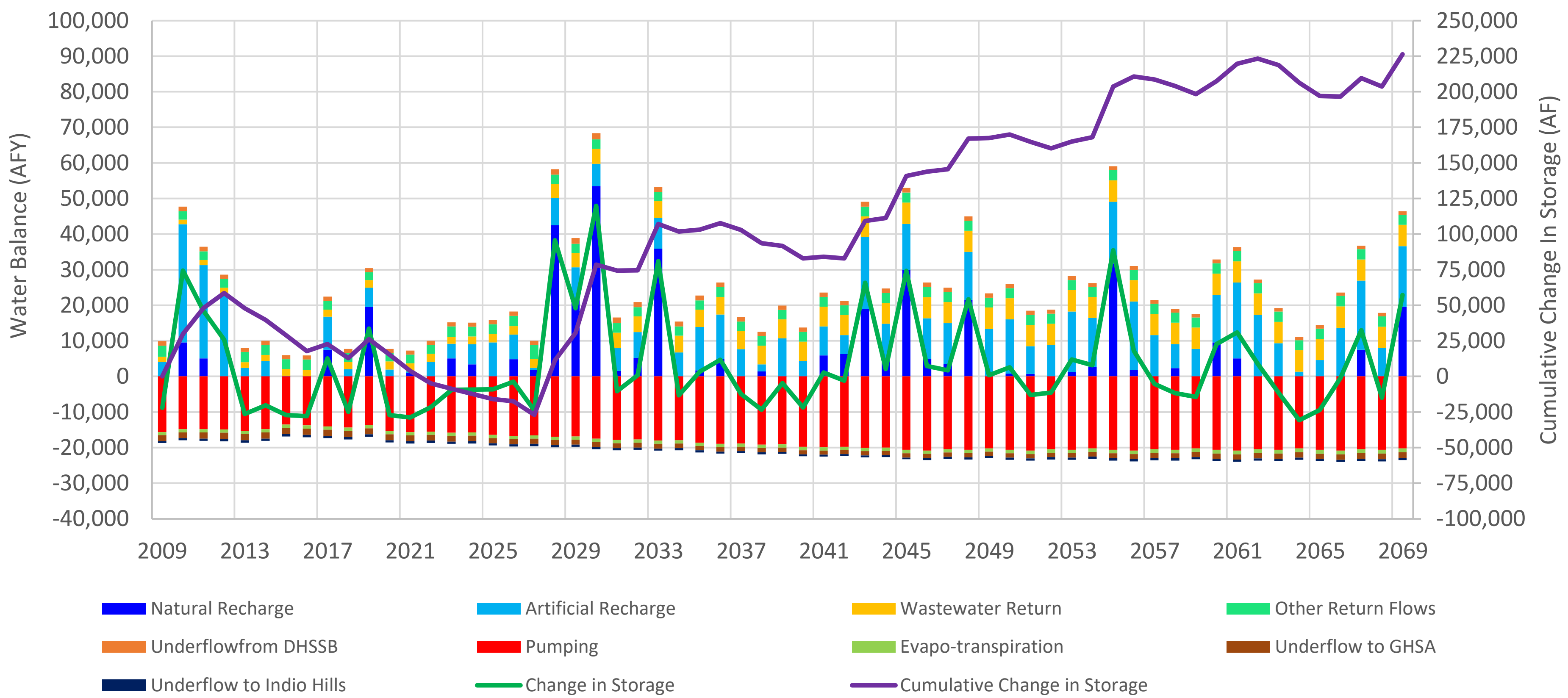


Abbreviations:
AF= Acre feet; AFY = Acre feet per year
DHSSB = Desert Hot Springs Subbasin
GHSA = Garnet Hill Subarea

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated
Water Balance for Mission Creek Subbasin
Near-Term w/CC Scenario
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 02/14/2022	Project No.: CM19167351
wood.	Figure	**B17**



Abbreviations:
AF= Acre feet; AFY = Acre feet per year
DHSSB = Desert Hot Springs Subbasin
GHSA = Garnet Hill Subarea

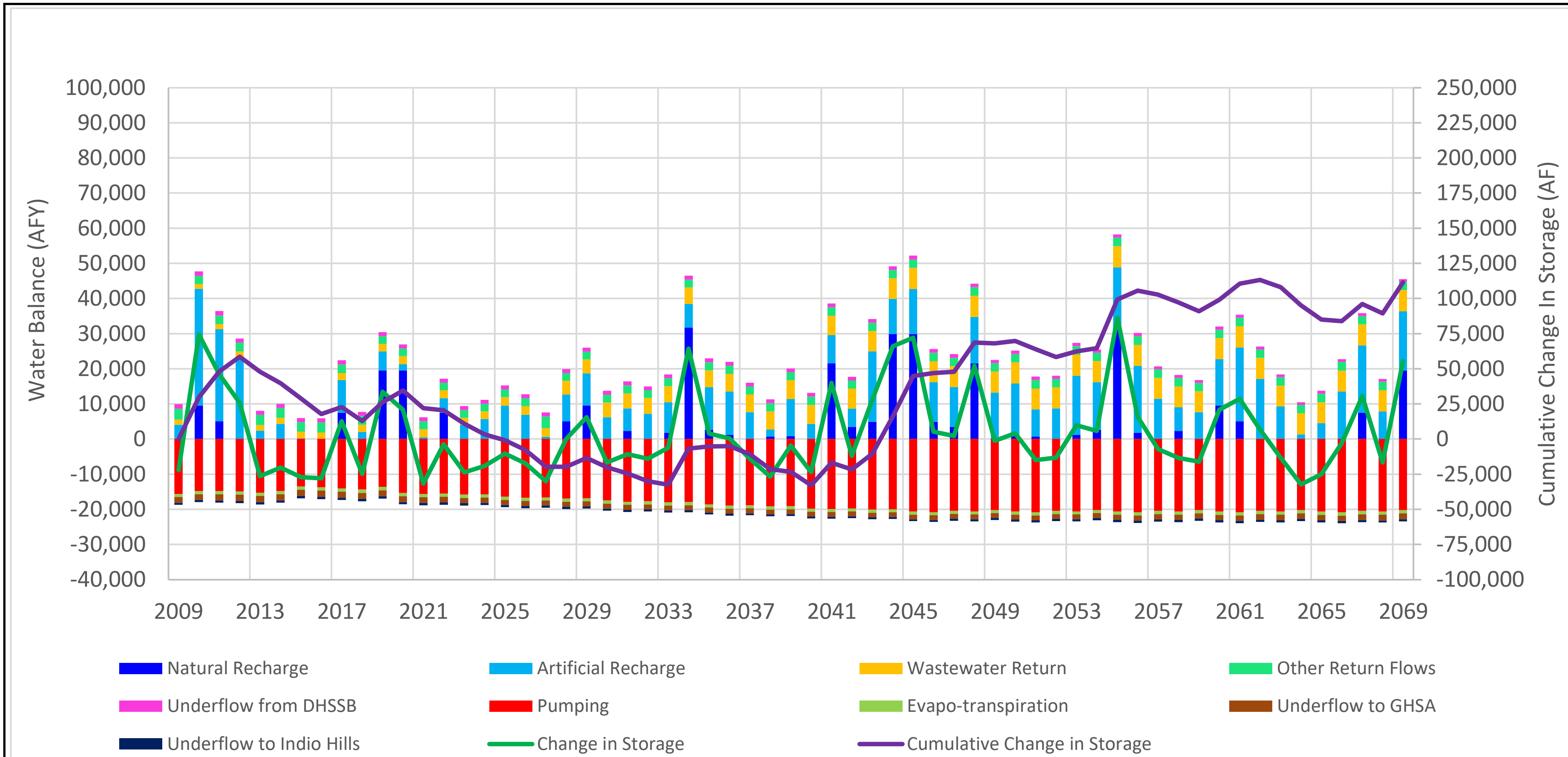
Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated
Water Balance for Mission Creek Subbasin
Future Projects Scenario
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 02/14/2022	Project No.: CM19167351

wood.

Figure **B18**

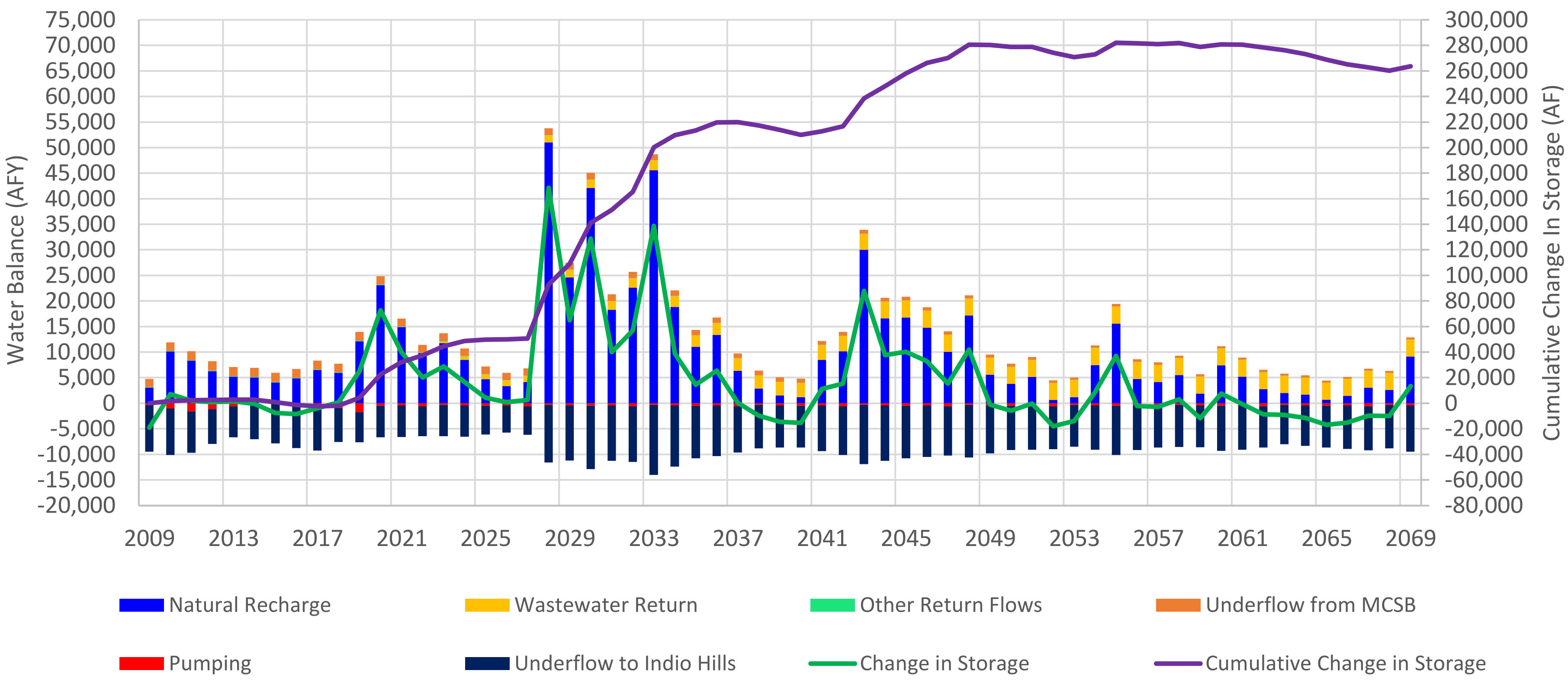


Abbreviations:
AF= Acre feet; AFY = Acre feet per year
DHSSB = Desert Hot Springs Subbasin
GHSA = Garnet Hill Subarea

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated
Water Balance for Mission Creek Subbasin
Future Projects w/CC Scenario
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 02/14/2022	Project No.: CM19167351
wood.	Figure	B19



Abbreviations:

AF= Acre feet; AFY = Acre feet per year

RWRF = Regional Water Reclamation Facility

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated

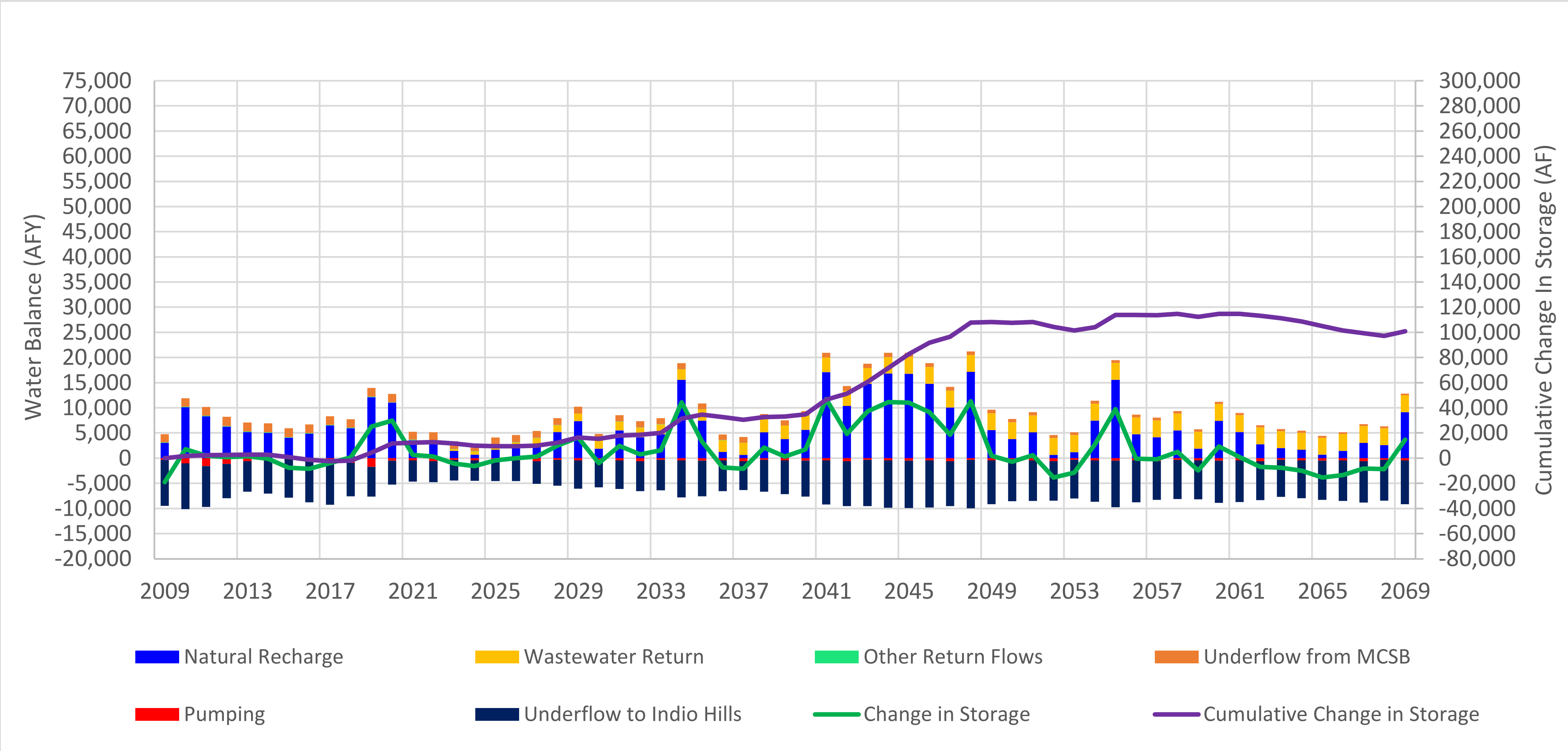
Water Balance for Garnet Hill Subarea

Baseline Scanerio

Mission Creek Subbasin Groundwater Model Update

Riverside County, California

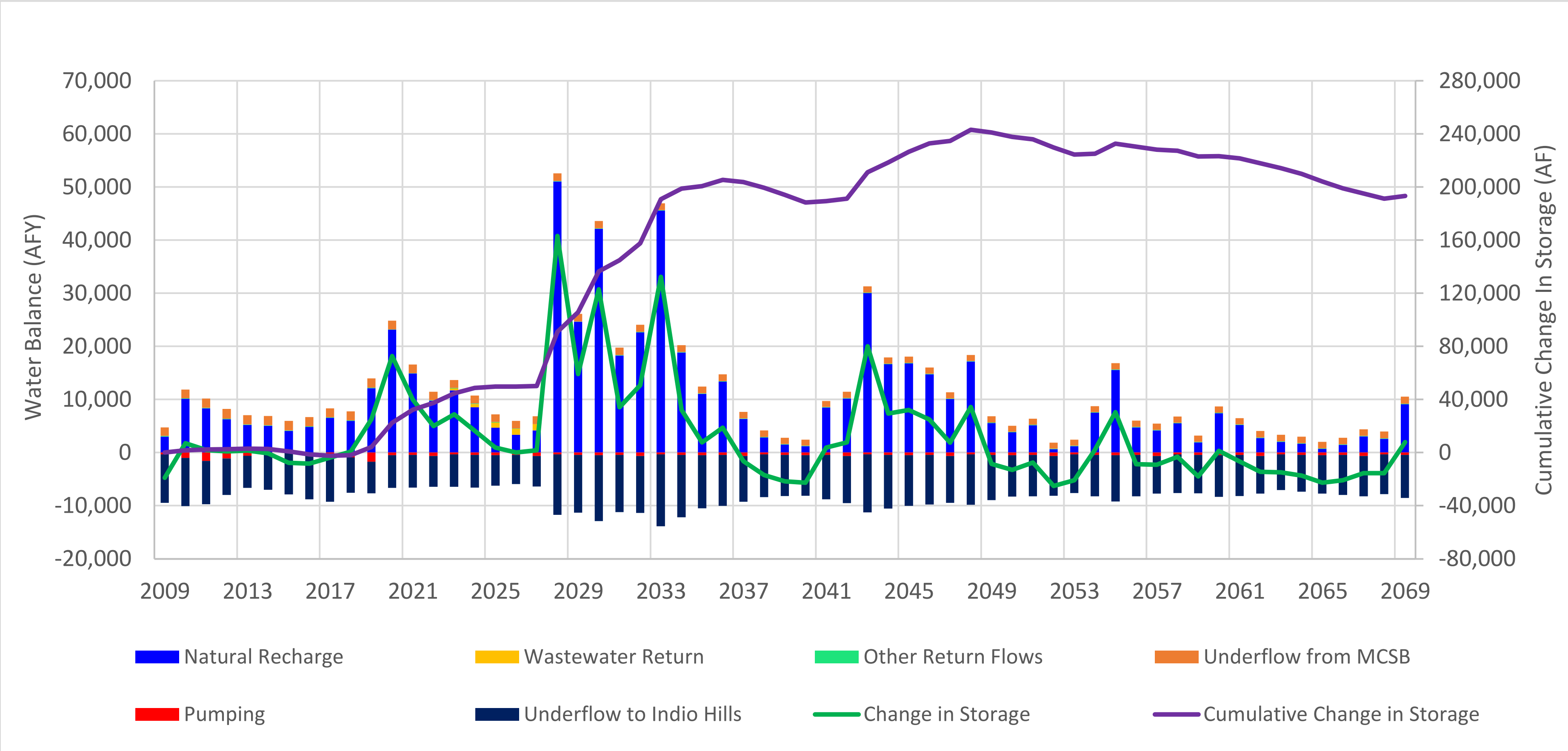
By: dmb	Date: 03/08/2022	Project No.: CM19167351
wood.		Figure **B20**



Abbreviations:
AF= Acre feet; AFY = Acre feet per year
Wastewater Return = Regional Water Reclamation Facility

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated Water Balance for Garnet Hill Subarea Baseline w/CC Scenario Mission Creek Subbasin Groundwater Model Update Riverside County, California		
By: dmb	Date: 03/08/2022	Project No.: CM19167351
wood.		Figure B21

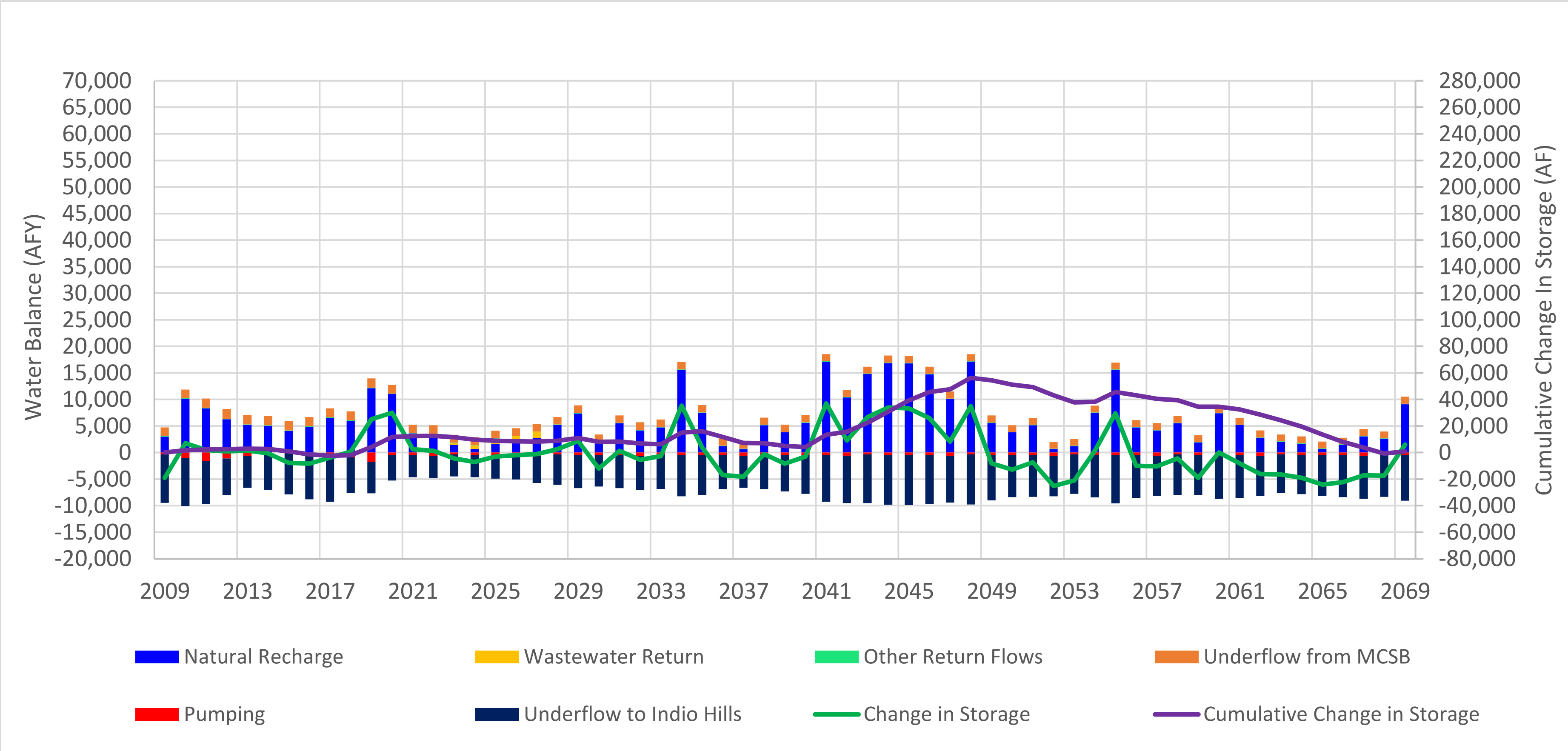


Abbreviations:
AF= Acre feet; AFY = Acre feet per year
RWRF = Regional Water Reclamation Facility

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated
Water Balance for Garnet Hill Subarea
Near-Term Scenerio
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 03/09/2022	Project No.: CM19167351
wood.		Figure B22

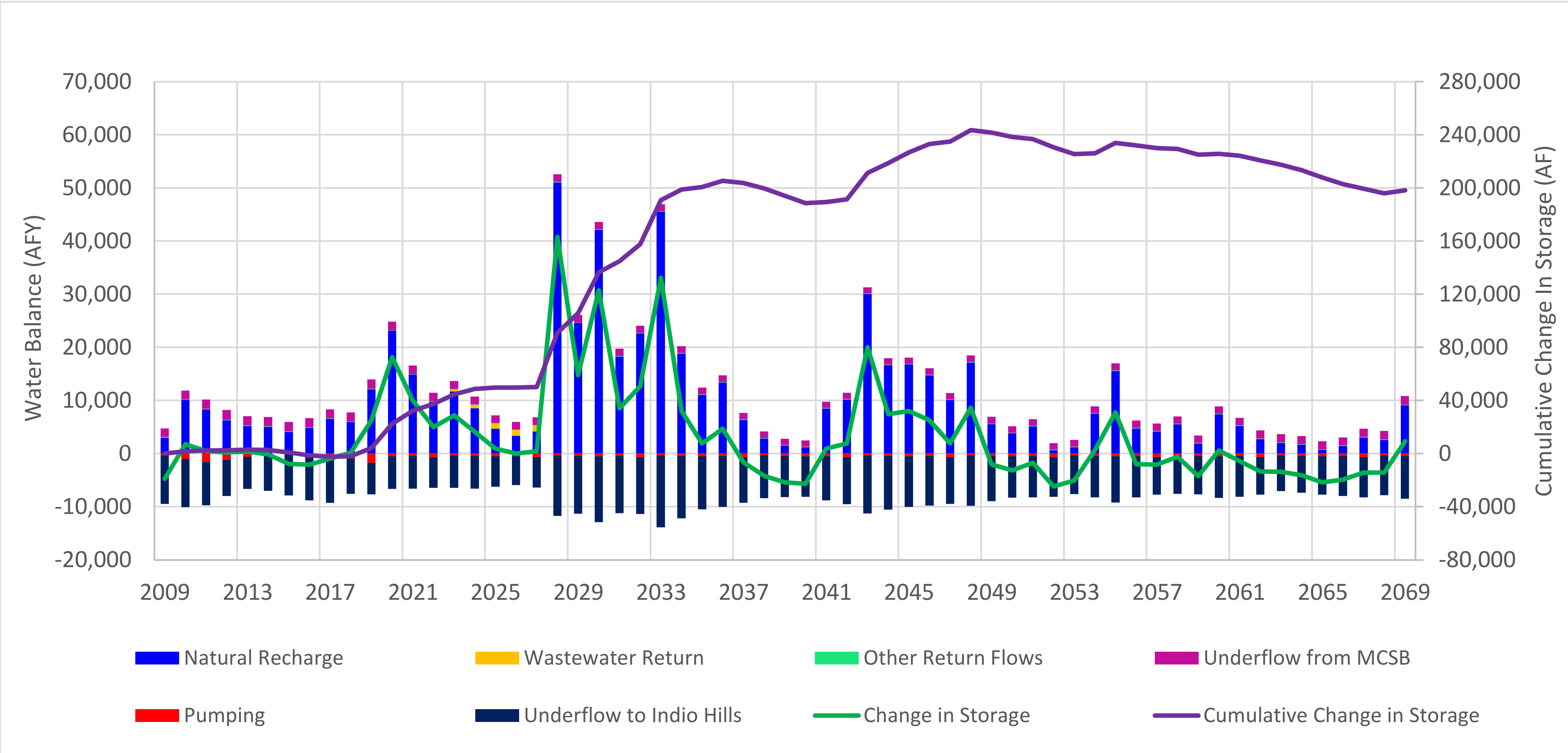


Abbreviations:
AF= Acre feet; AFY = Acre feet per year
RWRF = Regional Water Reclamation Facility

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated
Water Balance for Garnet Hill Subarea
Near-Term w/CC Scanerio
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 03/08/2022	Project No.: CM19167351
wood.		Figure **B23**



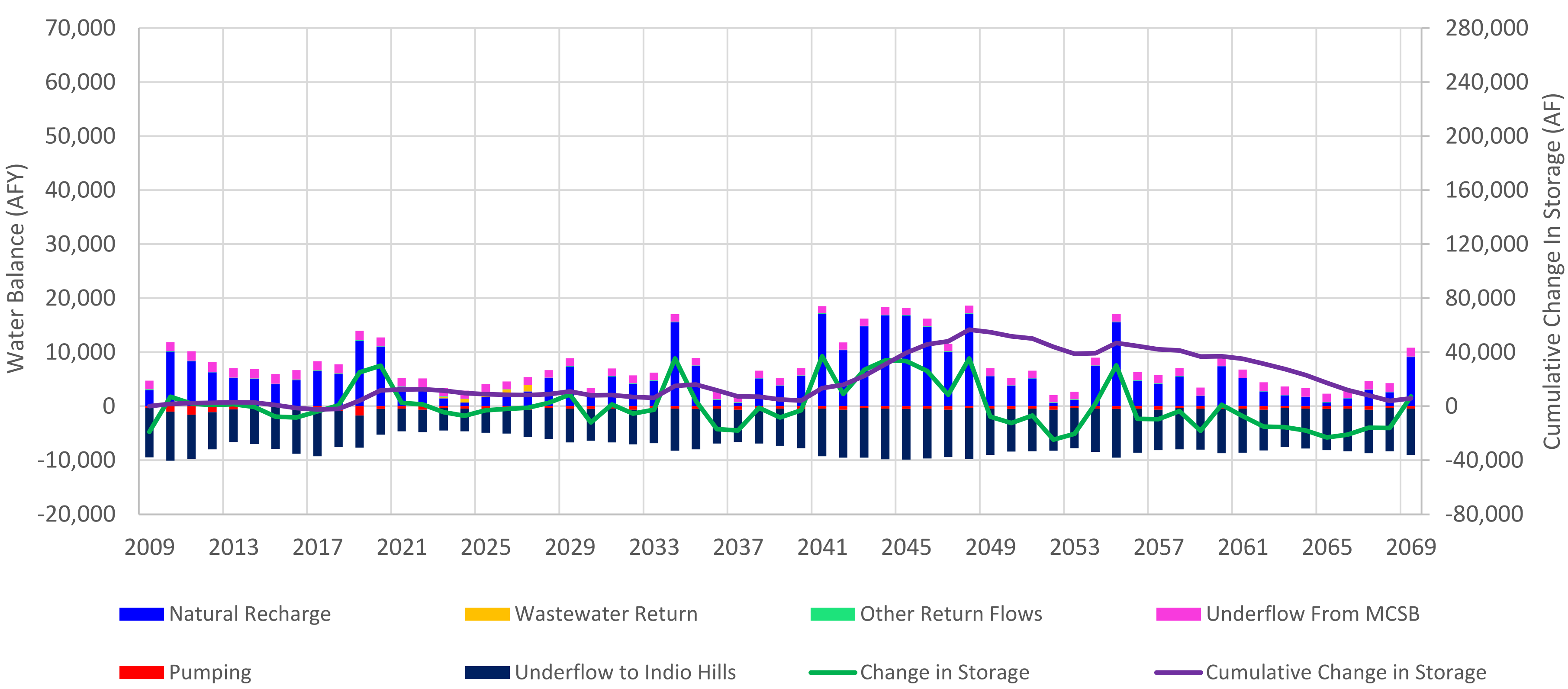
Abbreviations:

AF= Acre feet; AFY = Acre feet per year

RWRF = Regional Water Reclamation Facility

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated Water Balance for Garnet Hill Subarea Future Projects Scanerio Mission Creek Subbasin Groundwater Model Update Riverside County, California		
By: dmb	Date: 03/08/2022	Project No.: CM19167351
wood.		Figure B24

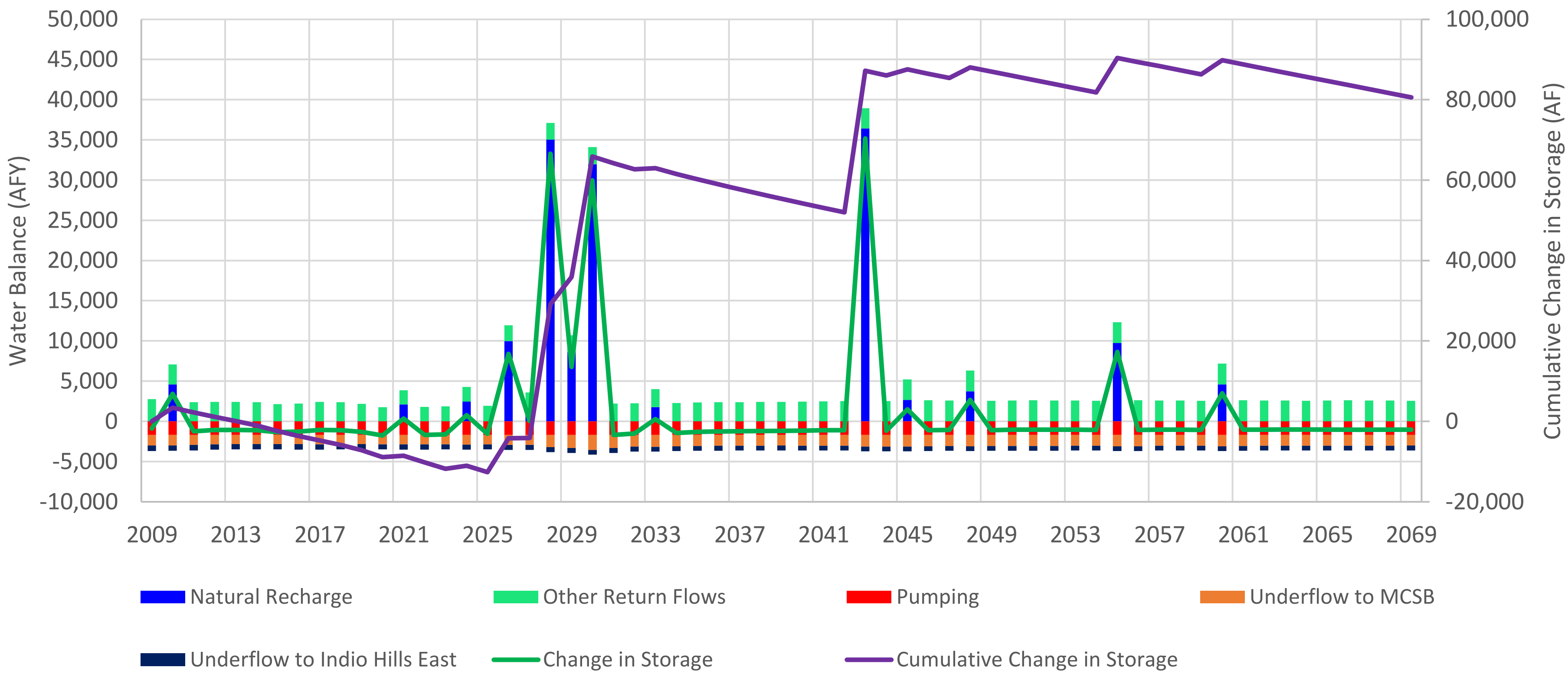


Abbreviations:
AF= Acre feet; AFY = Acre feet per year
RWRF = Regional Water Reclamation Facility

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated
Water Balance for Garnet Hill Subarea
Future Projects w/CC Scenerio
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 03/08/2022	Project No.: CM19167351
wood.		Figure B25

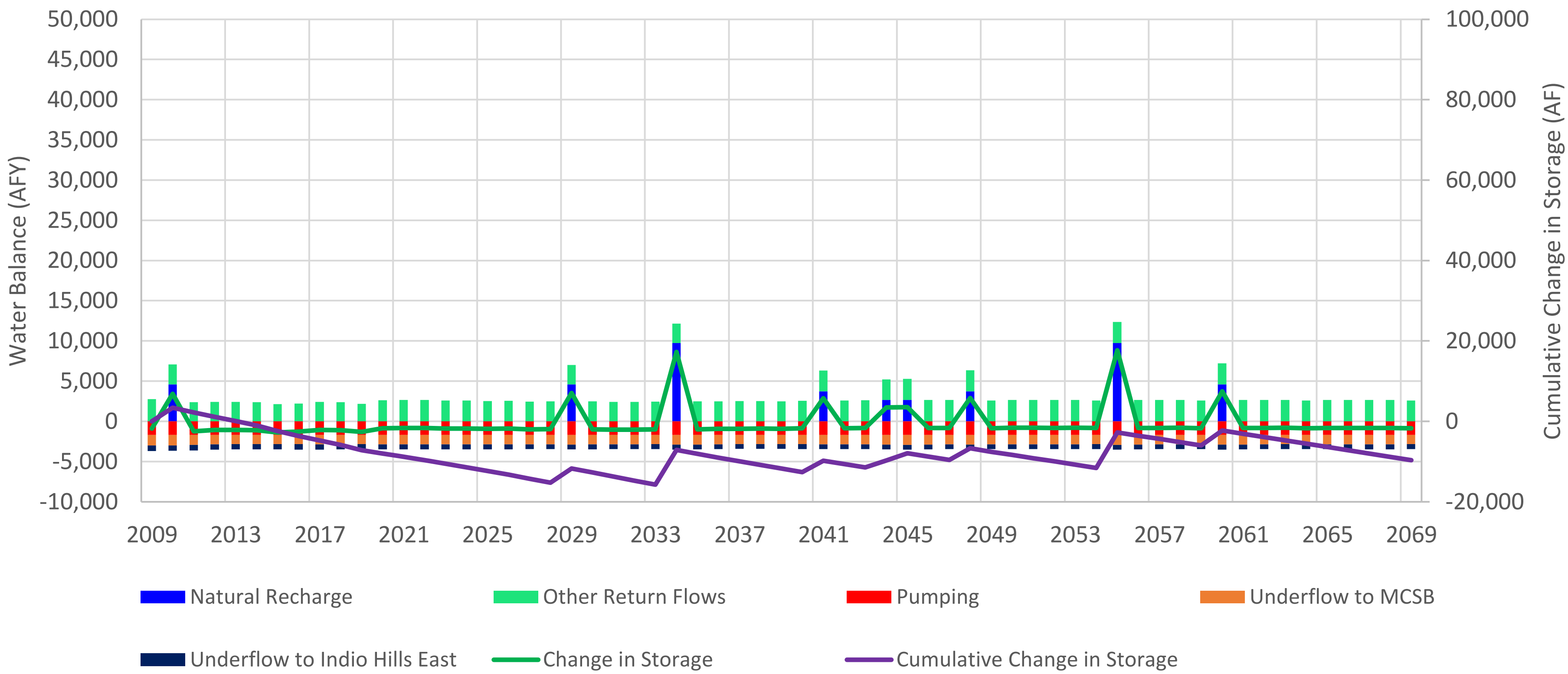


Abbreviations:
AF= Acre feet; AFY = Acre feet per year
MCSB = Mission Creek Subbasin

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated
Water Balance for Desert Hot Springs Subbasin
Baseline Scenario
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 03/08/2022	Project No.: CM19167351
wood.		Figure B26

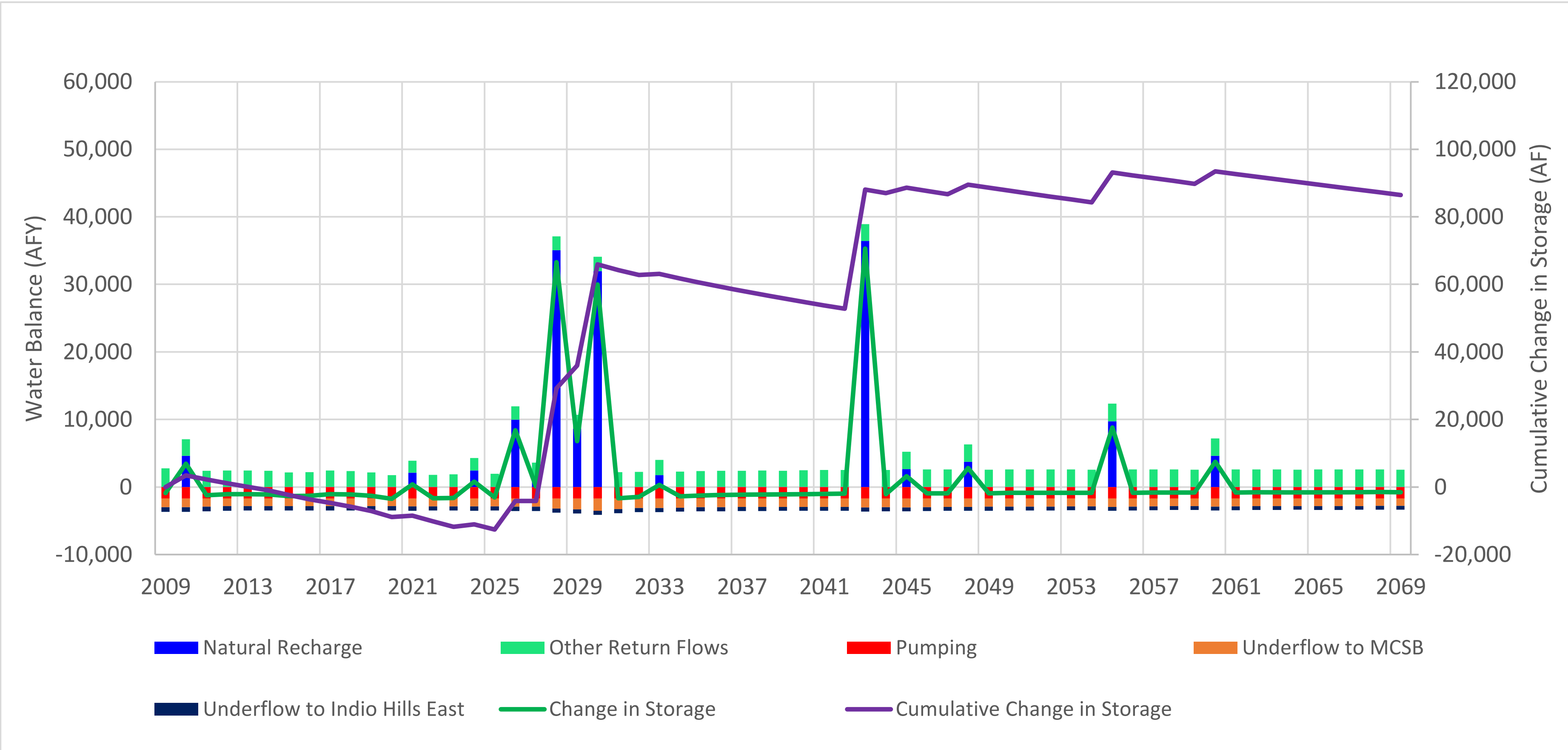


Abbreviations:
AF= Acre feet; AFY = Acre feet per year
MCSB = Mission Creek Subbasin

Note: Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated
Water Balance for Desert Hot Springs Subbasin
Baseline w/CC Scenario
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 03/08/2022	Project No.: CM19167351
wood.	Figure	B27

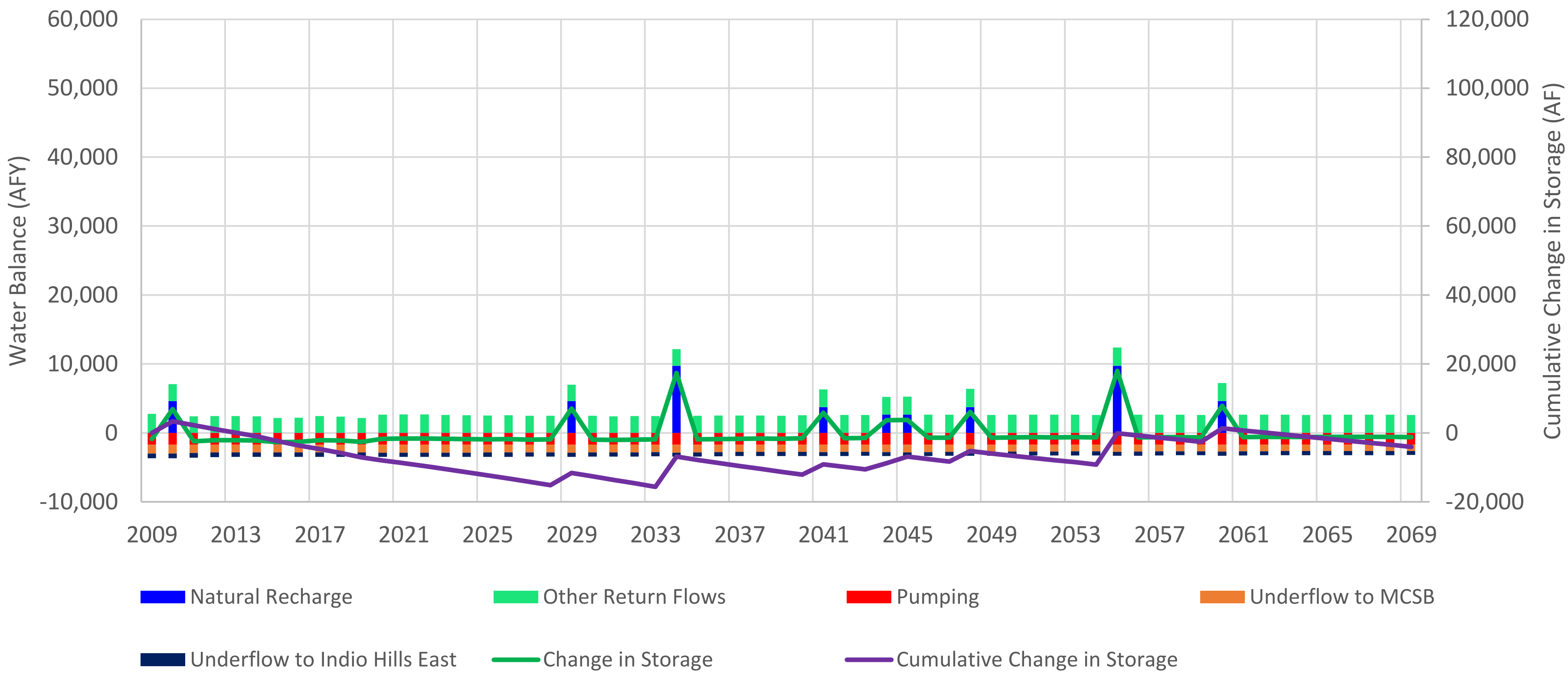


Abbreviations:
AF= Acre feet; AFY = Acre feet per year
MCSB = Mission Creek Subbasin

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated
Water Balance for Desert Hot Springs Subbasin
Near-Term Scenario
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 03/08/2022	Project No.: CM19167351
wood.		Figure B28

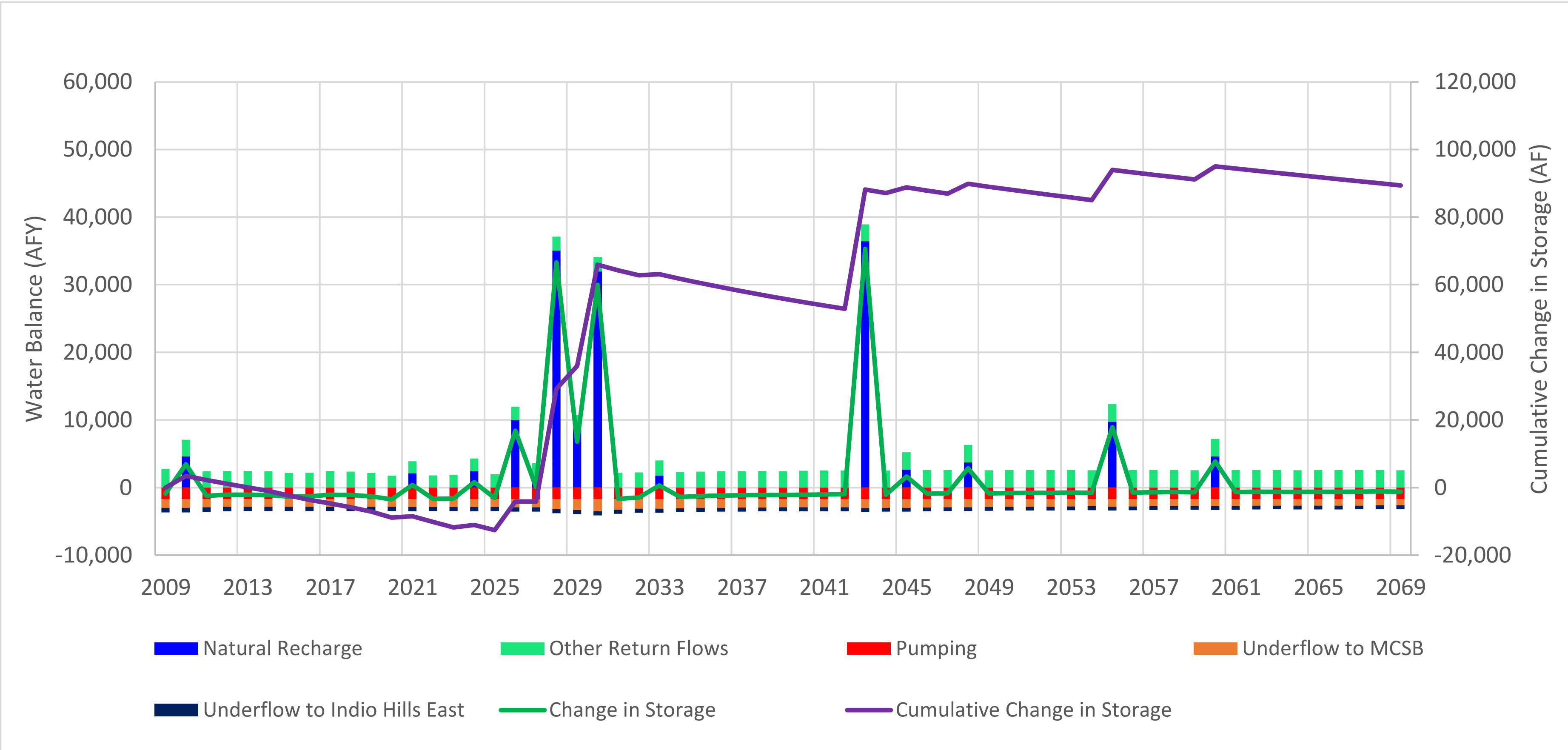


Abbreviations:
AF= Acre feet; AFY = Acre feet per year
MCSB = Mission Creek Subbasin

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated
Water Balance for Desert Hot Springs Subbasin
Near-Term w/CC Scenario
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 03/08/2022	Project No.: CM19167351
wood.		Figure B29

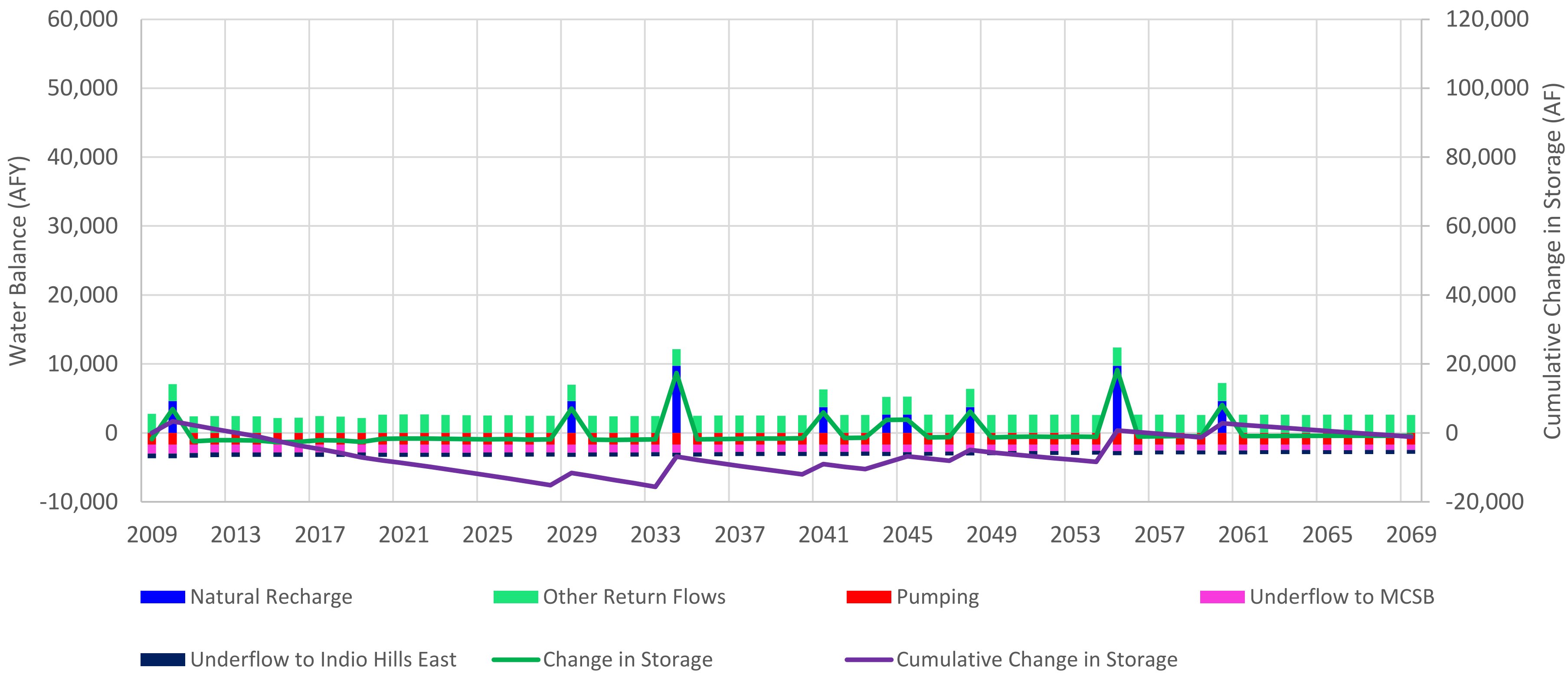


Abbreviations:
AF= Acre feet; AFY = Acre feet per year
MCSB = Mission Creek Subbasin

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated
Water Balance for Desert Hot Springs Subbasin
Future Projects Scenario
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 03/09/2022	Project No.: CM19167351
wood.		Figure B30

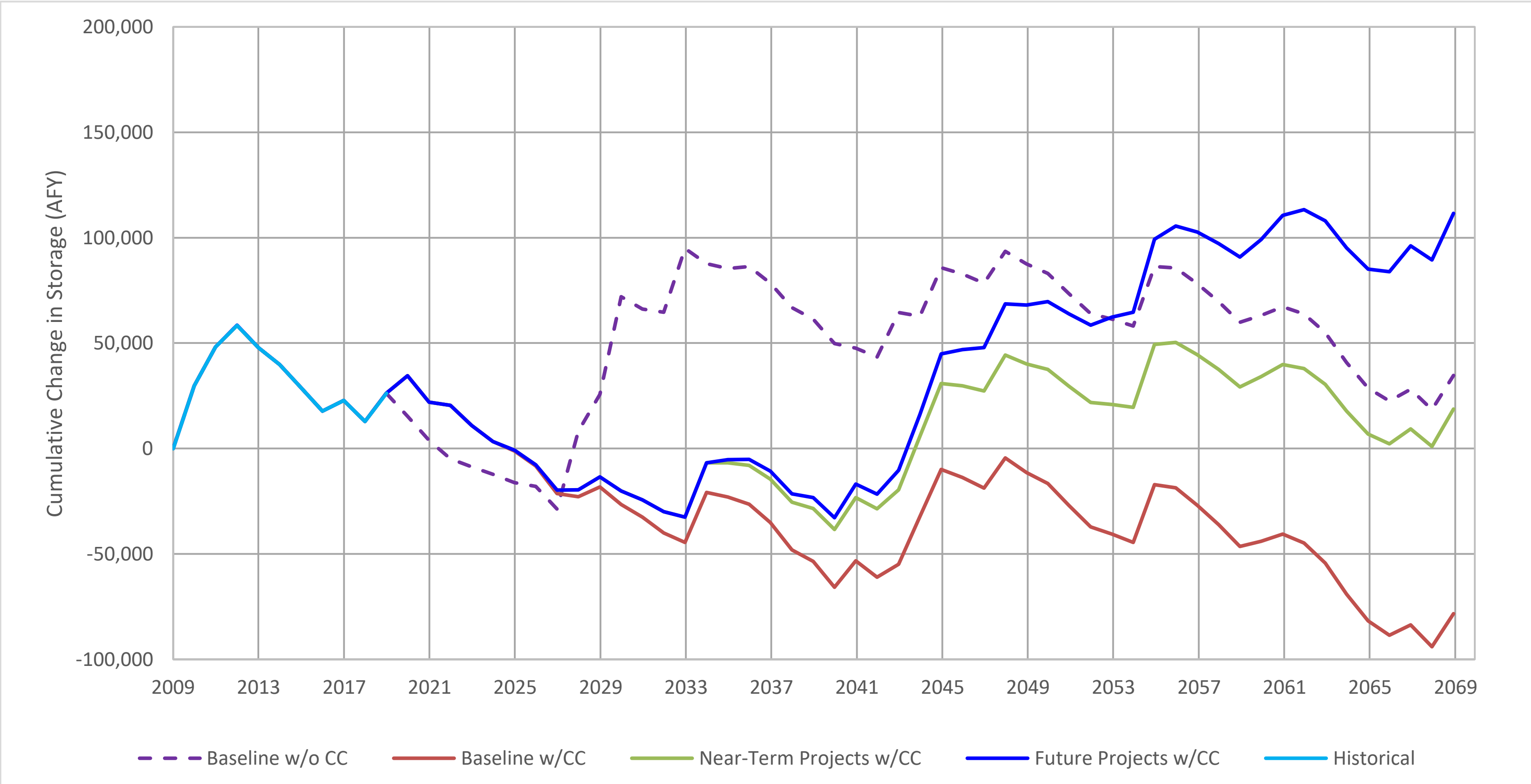


Abbreviations:
AF= Acre feet; AFY = Acre feet per year
MCSB = Mission Creek Subbasin

Note: 2009-2019 Water balance inflows and outflows derived from calibrated model.

2009 - 2069 Simulated
Water Balance for Desert Hot Springs Subbasin
Future Projects w/CC Scenario
Mission Creek Subbasin Groundwater Model Update
Riverside County, California

By: dmb	Date: 03/09/2022	Project No.: CM19167351
wood.		Figure B31



Abbreviations:
AFY = Acre feet per year
MCSB = Mission Creek Subbasin
w/o CC = with out Climate Change
w/CC = with Climate Change

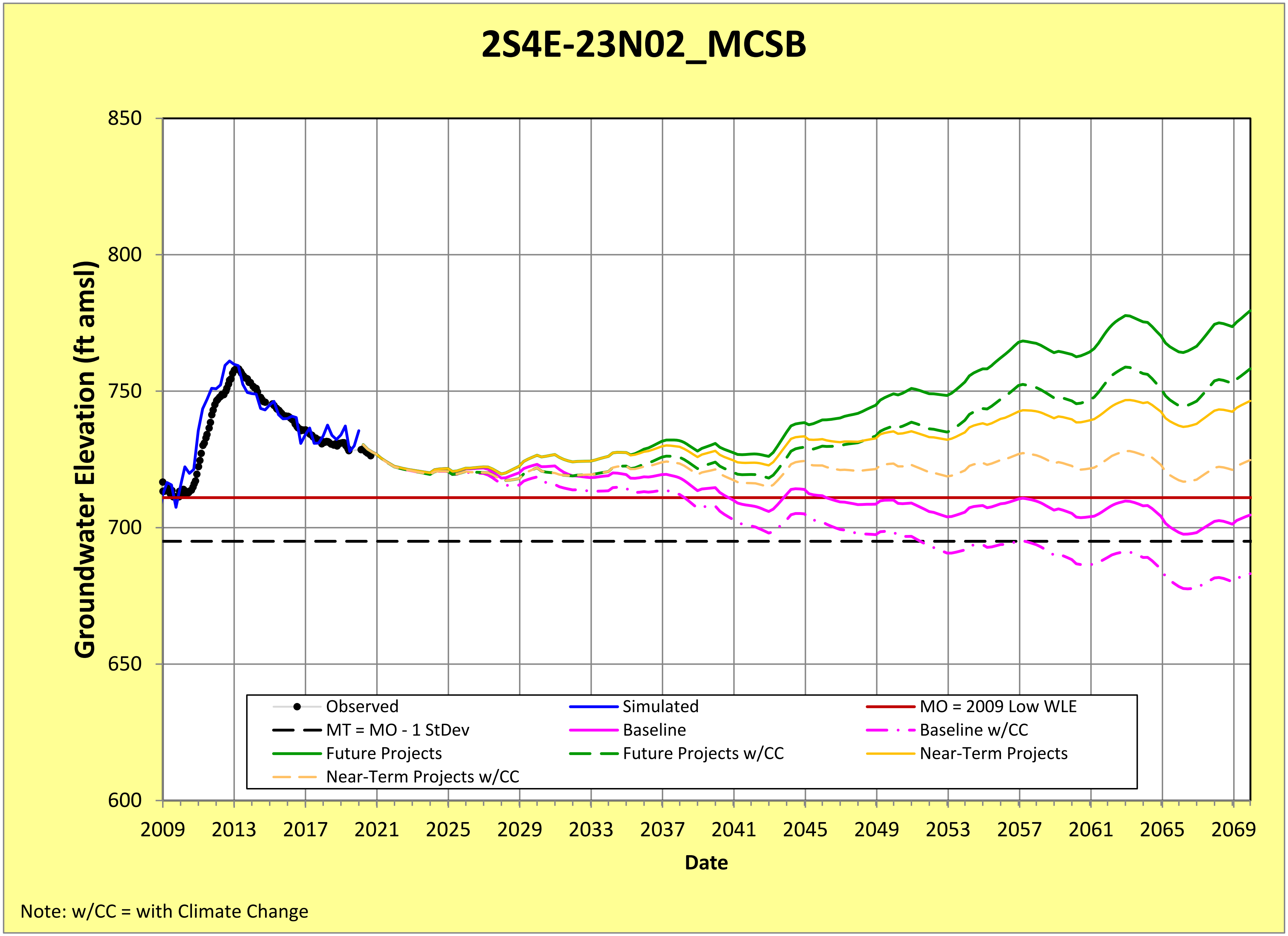
Note: 2009-2019 Cumulative Change in Storage derived from calibrated model.

Comparison of Simulated MCSB Cumulative Change in Storage for Baseline and Climate Change Scenarios
Mission Creek Subbasin Alternative Update
Riverside County, California

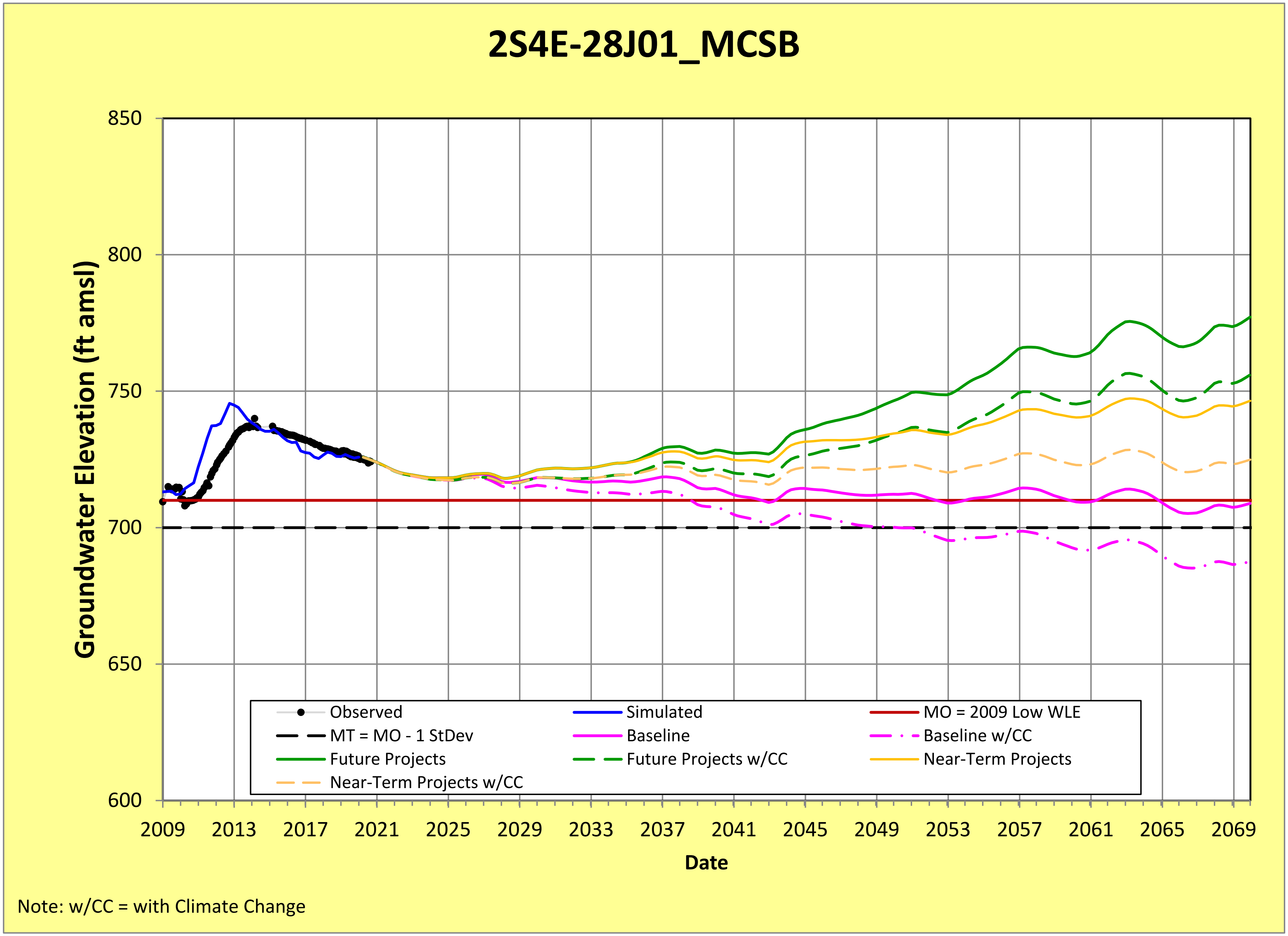
By: dmb	Date: 02/14/2022	Project No.: CM19167351
wood.		Figure B32

Attachment B1

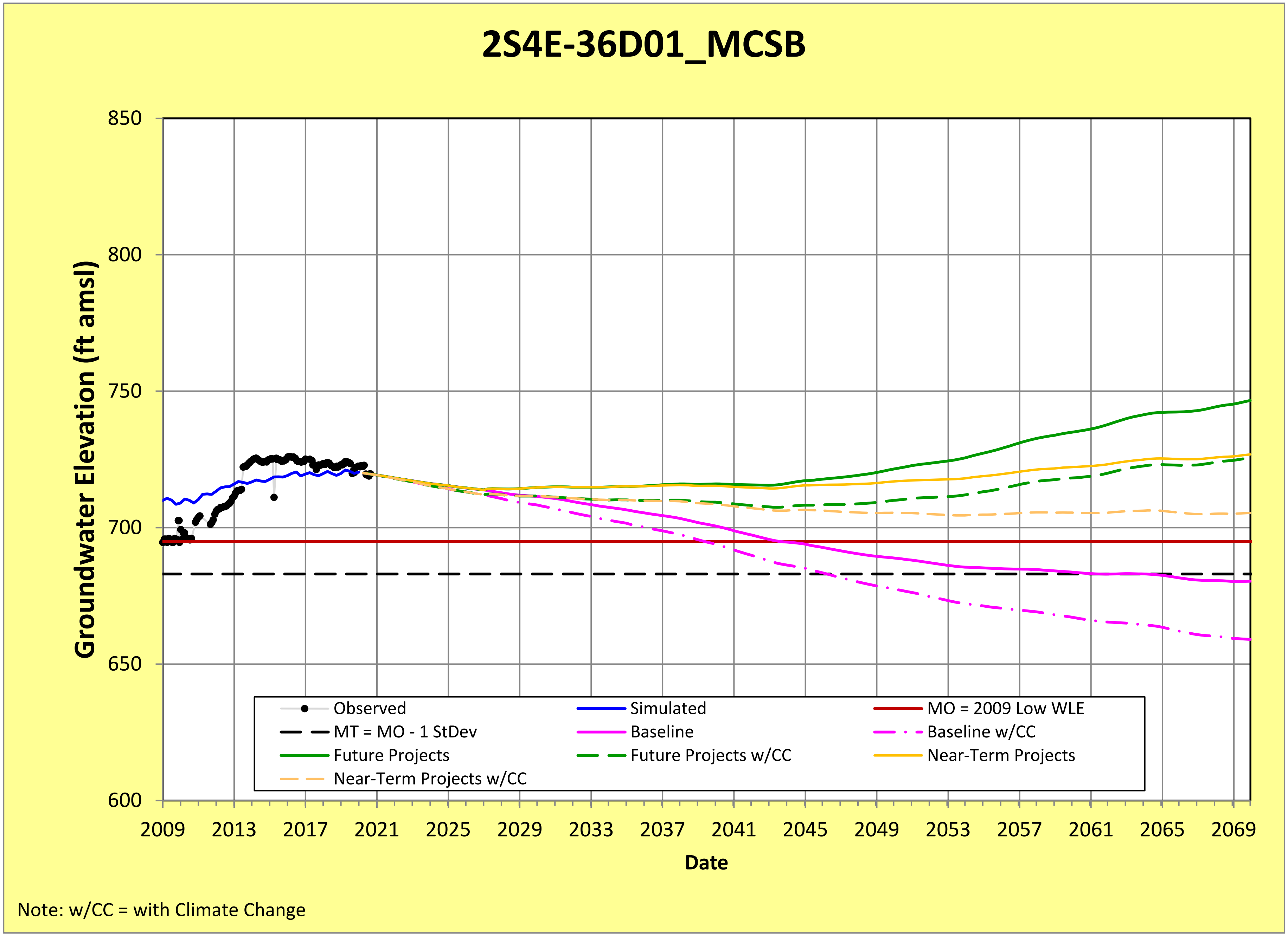
Observed and Simulated Hydrographs for Key Wells in MCSB



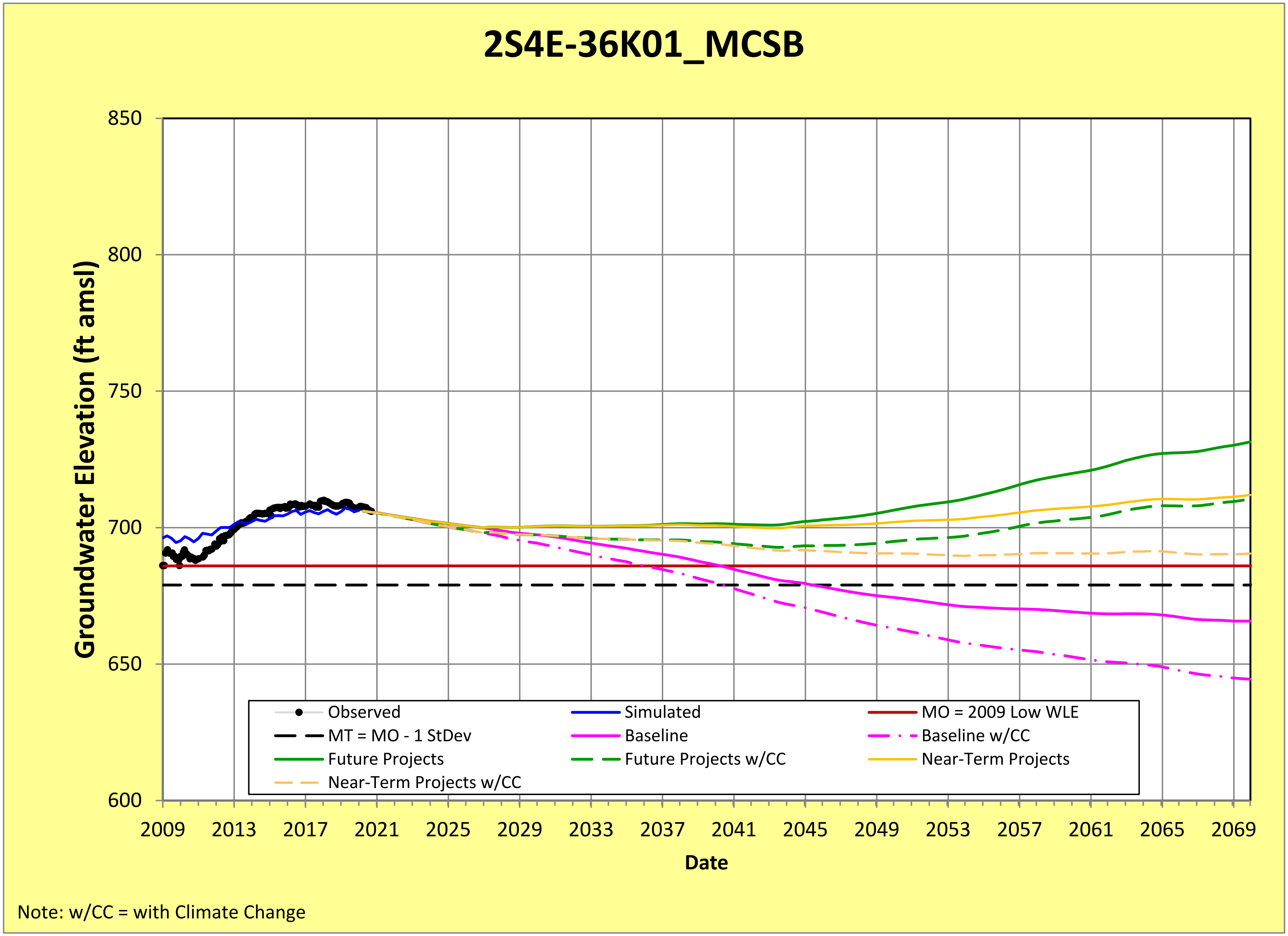
2S4E-23N02_MCSB
Groundwater Elevation (ft amsl)
850
800
750
700
650
600
2009
2013
2017
2021
2025
2029
2033
2037
2041
2045
2049
2053
2057
2061
2065
2069
Date
Observed
Simulated
MO = 2009 Low WLE
MT = MO - 1 StDev
Baseline
Baseline w/CC
Future Projects
Future Projects w/CC
Near-Term Projects
Near-Term Projects w/CC
Note: w/CC = with Climate Change



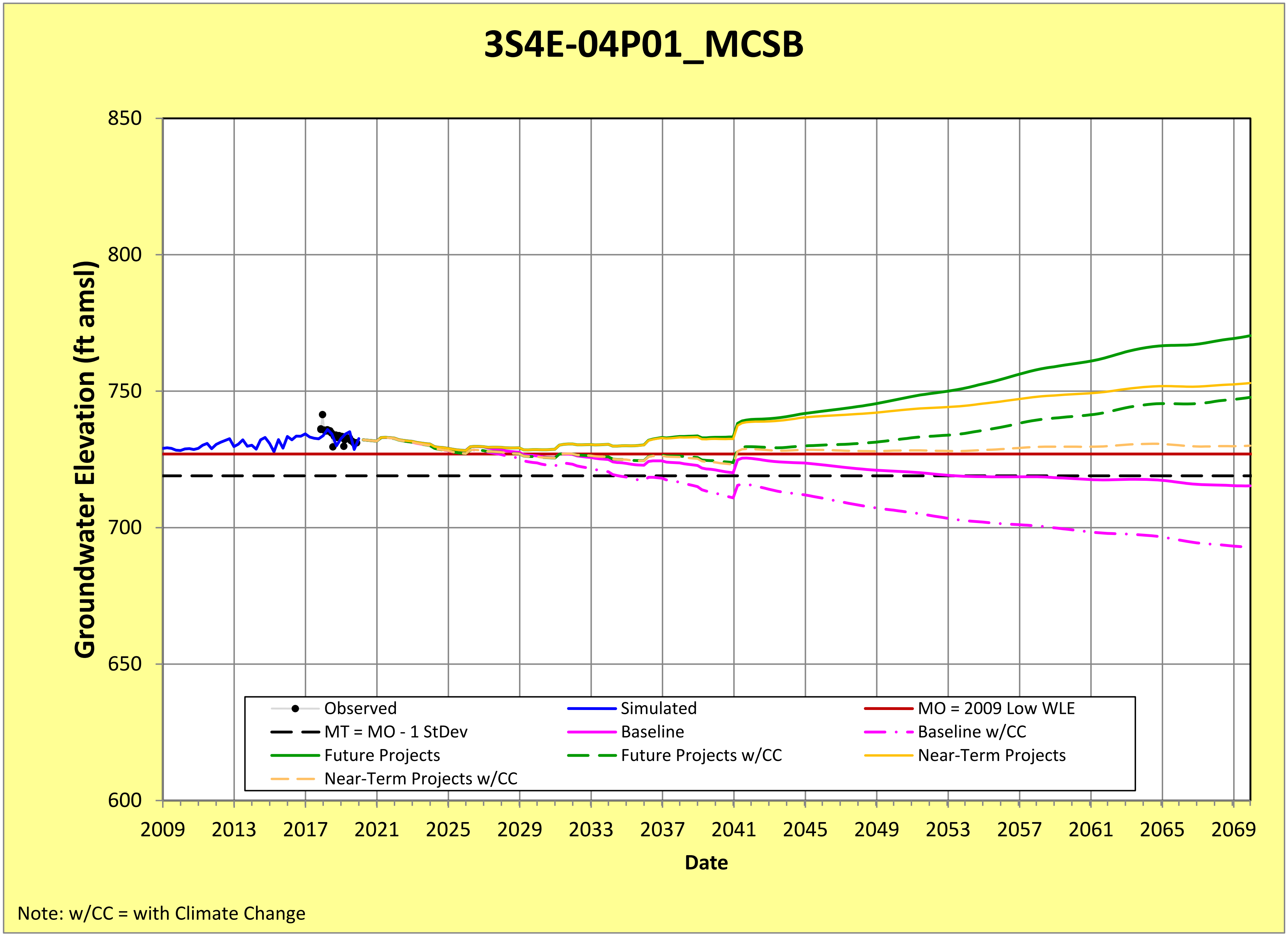
2S4E-28J01_MCSB
Groundwater Elevation (ft amsl)
850
800
750
700
650
600
2009
2013
2017
2021
2025
2029
2033
2037
2041
2045
2049
2053
2057
2061
2065
2069
Date
Observed
Simulated
MO = 2009 Low WLE
MT = MO - 1 StDev
Baseline
Baseline w/CC
Future Projects
Future Projects w/CC
Near-Term Projects
Near-Term Projects w/CC
Note: w/CC = with Climate Change

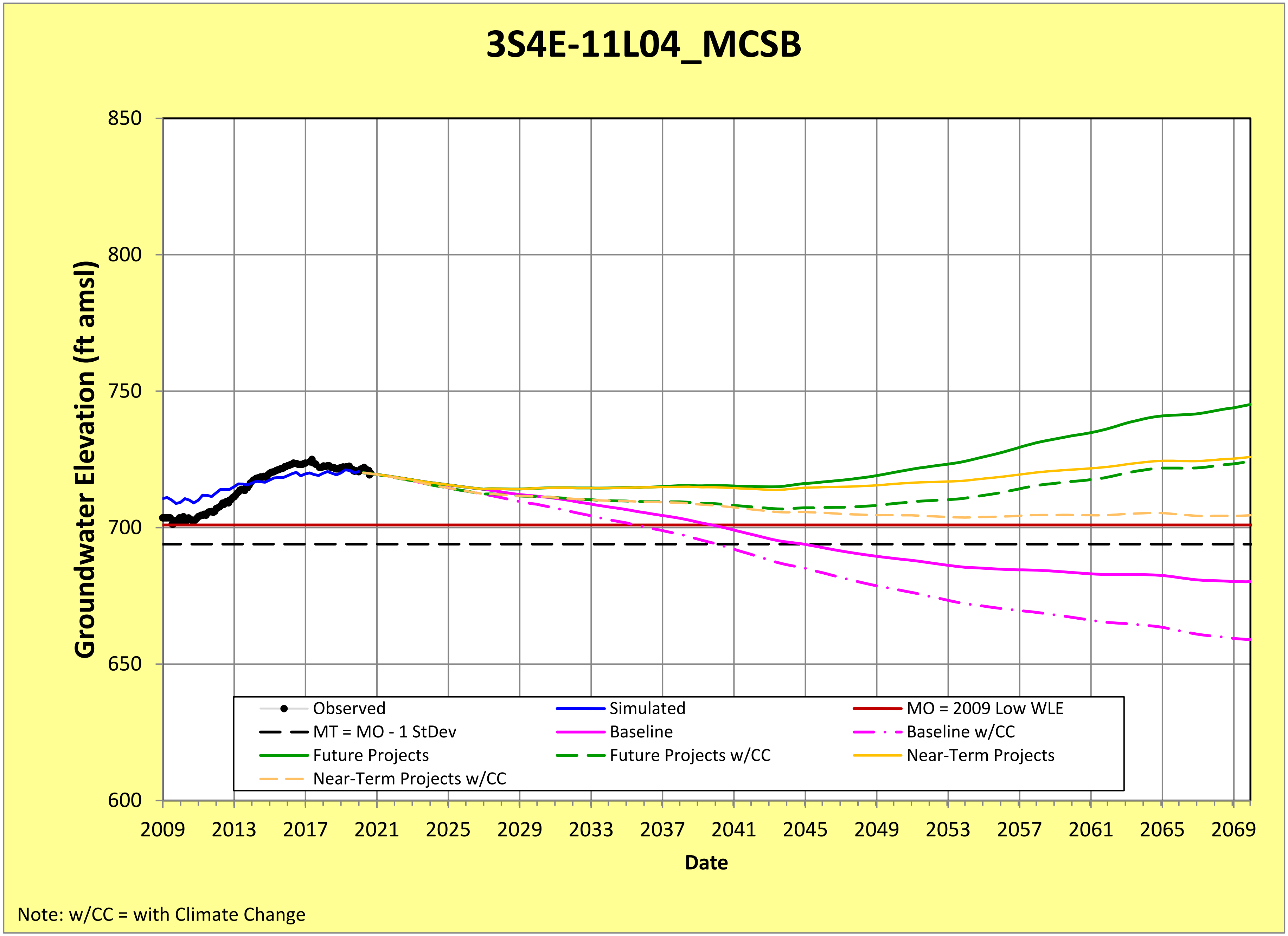


2S4E-36D01_MCSB
Groundwater Elevation (ft amsl)
850
800
750
700
650
600
2009
2013
2017
2021
2025
2029
2033
2037
2041
2045
2049
2053
2057
2061
2065
2069
Date
Observed
Simulated
MO = 2009 Low WLE
MT = MO - 1 StDev
Baseline
Baseline w/CC
Future Projects
Future Projects w/CC
Near-Term Projects
Near-Term Projects w/CC
Note: w/CC = with Climate Change

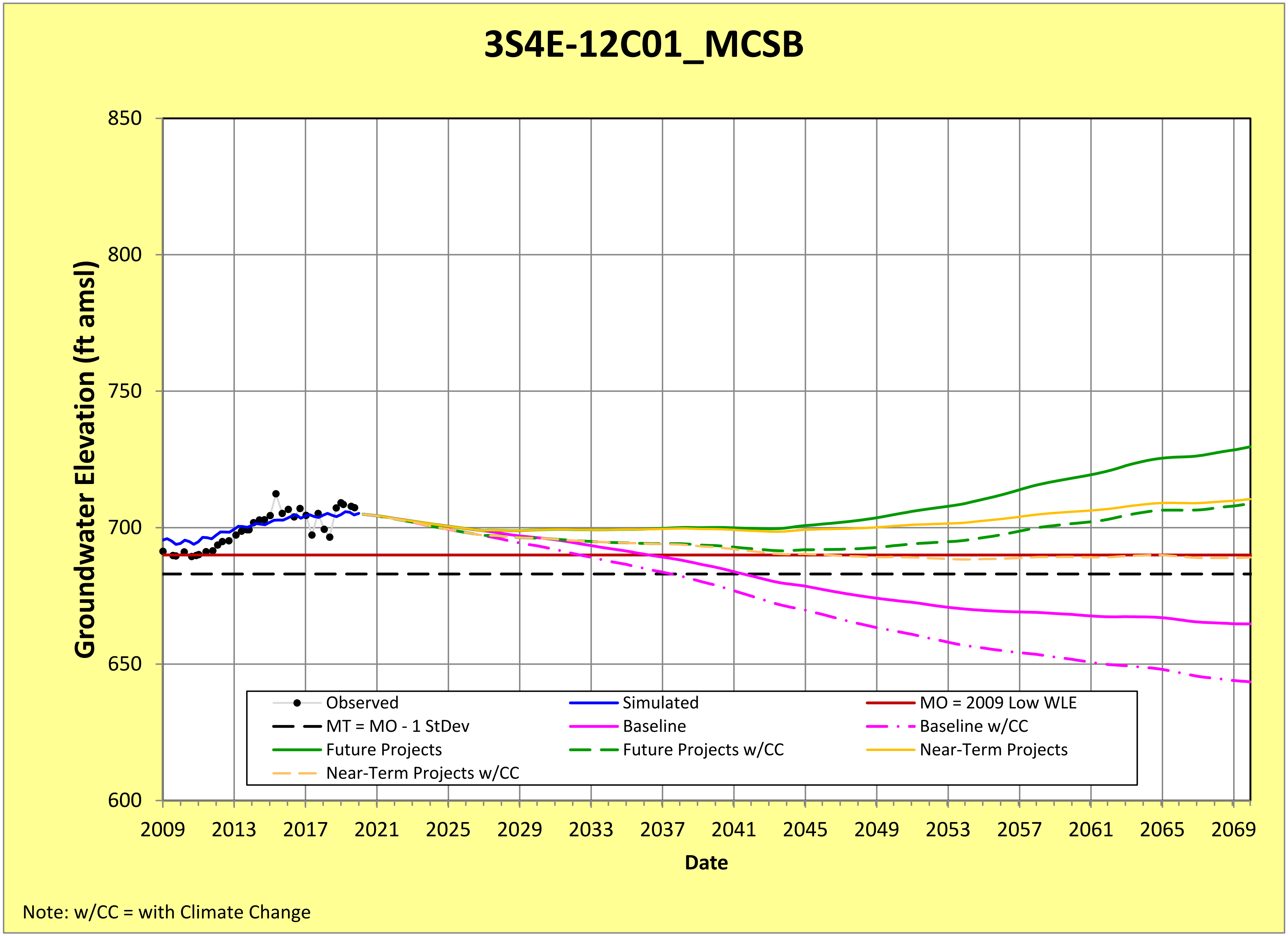


2S4E-36K01_MCSB
Groundwater Elevation (ft amsl)
850
800
750
700
650
600
2009
2013
2017
2021
2025
2029
2033
2037
2041
2045
2049
2053
2057
2061
2065
2069
Date
Observed
Simulated
MO = 2009 Low WLE
MT = MO - 1 StDev
Baseline
Baseline w/CC
Future Projects
Future Projects w/CC
Near-Term Projects
Near-Term Projects w/CC
Note: w/CC = with Climate Change

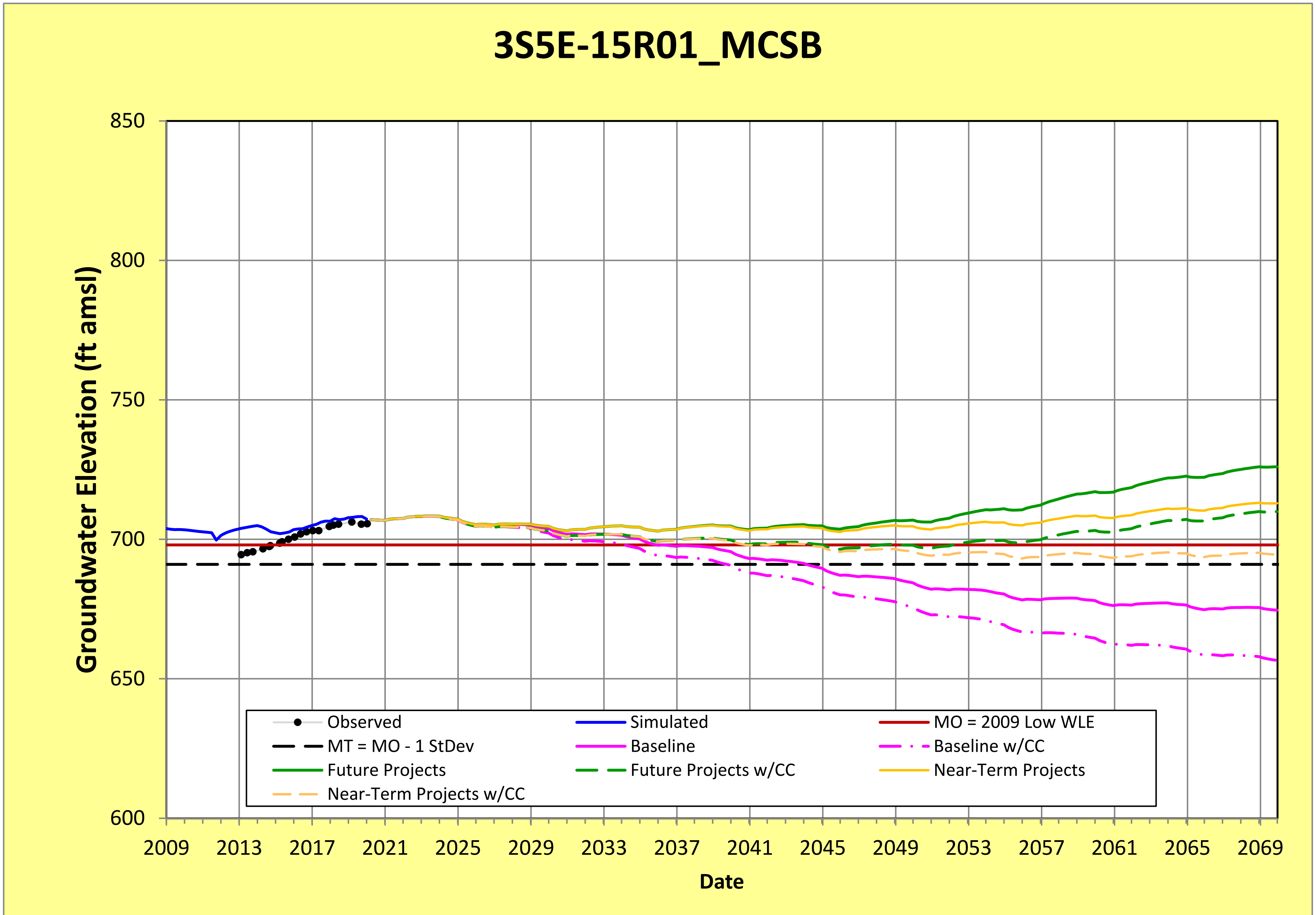

3S4E-04P01_MCSB
Groundwater Elevation (ft amsl)
850
800
750
700
650
600
2009
2013
2017
2021
2025
2029
2033
2037
2041
2045
2049
2053
2057
2061
2065
2069
Date
Observed
Simulated
MO = 2009 Low WLE
MT = MO - 1 StDev
Baseline
Baseline w/CC
Future Projects
Future Projects w/CC
Near-Term Projects
Near-Term Projects w/CC
Note: w/CC = with Climate Change



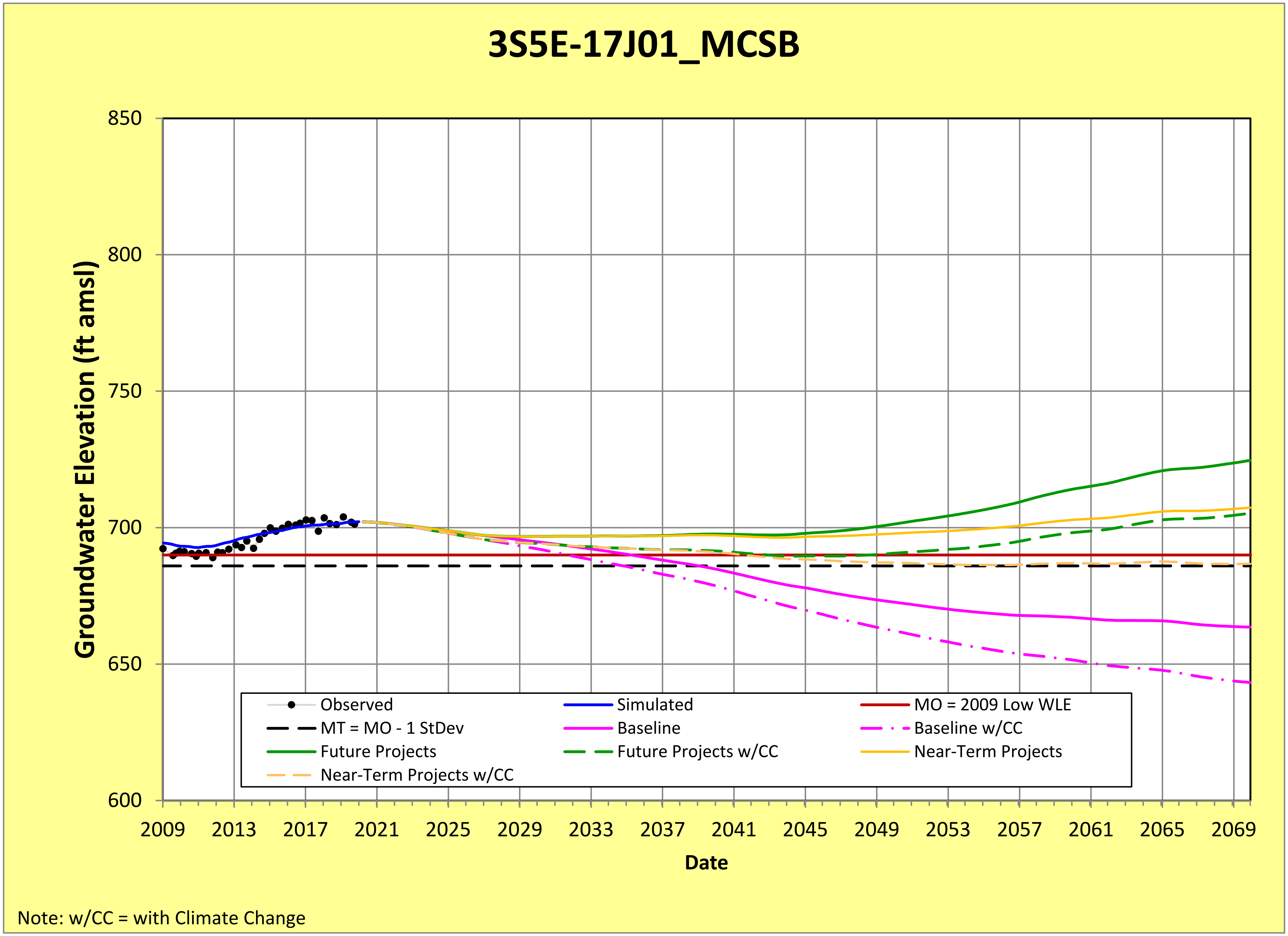
3S4E-11L04_MCSB
Groundwater Elevation (ft amsl)
850
800
750
700
650
600
2009
2013
2017
2021
2025
2029
2033
2037
2041
2045
2049
2053
2057
2061
2065
2069
Date
Observed
Simulated
MO = 2009 Low WLE
MT = MO - 1 StDev
Baseline
Baseline w/CC
Future Projects
Future Projects w/CC
Near-Term Projects
Near-Term Projects w/CC
Note: w/CC = with Climate Change



3S4E-12C01_MCSB
Groundwater Elevation (ft amsl)
850
800
750
700
650
600
2009
2013
2017
2021
2025
2029
2033
2037
2041
2045
2049
2053
2057
2061
2065
2069
Date
Observed
Simulated
MO = 2009 Low WLE
MT = MO - 1 StDev
Baseline
Baseline w/CC
Future Projects
Future Projects w/CC
Near-Term Projects
Near-Term Projects w/CC
Note: w/CC = with Climate Change



Note: w/CC = with Climate Change



3S5E-17J01_MCSB
Groundwater Elevation (ft amsl)
850
800
750
700
650
600
2009
2013
2017
2021
2025
2029
2033
2037
2041
2045
2049
2053
2057
2061
2065
2069
Date
Observed
Simulated
MO = 2009 Low WLE
MT = MO - 1 StDev
Baseline
Baseline w/CC
Future Projects
Future Projects w/CC
Near-Term Projects
Near-Term Projects w/CC
Note: w/CC = with Climate Change

Appendix C
Water Demand Supporting Information

Table of Contents

List of Tables

List of Figures

Acronyms and Abbreviations

Acronym	Definition
AFY	Acre-Feet per Year
AFY/Ac	Acre-Feet per Year per Acre
APN	Assessor's parcel number
cf	cubic foot
City of DHS	City of Desert Hot Springs
CVWD	Coachella Valley Water District
DHSSB	Desert Hot Springs Subbasin
DOF	California Department of Finance
DWA	Desert Water Agency
FEIR	Final Environmental Impact Report
GHSA	Garnet Hill Subarea
GIS	Geographic Information System
GPCD	gallons per capita per day
gpf	gallons per flush
gpm	gallons per minute
IWF	integrated water factor
Kennedy Jenks	Kennedy/Jenks Consultants, Inc.
MC-GH WMP	Mission Creek-Garnet Hill Water Management Plan
MCSB	Mission Creek Subbasin
MSHCP	Multi-Species Habitat Conservation Plan
MSWD	Mission Springs Water District
RAC	Replenishment Assessment Charge
SCAG	Southern California Association of Governments
TAZ	Transportation Analysis Zone
WSA	Water Supply Assessment

C.1 Introduction

Reliable estimates of future water needs are required for regional water planning. Routine revision and refinement of water demand projections in the region are necessary due to the wide range of variables influencing future water demand. These include changes to economic trends, population, employment, seasonality, environmental needs, water conservation efforts, regulations, and land use. These factors can rapidly change the demographics of a region and corresponding water demands.

Previous water demand projections in the 2013 Mission Creek/Garnet Hill Water Management Plan (2013 MC/GH WMP) were based, in part, on projected population growth in the Planning Area. The Planning Area has experienced significantly reduced population growth from 2013 MC/GH WMP predictions (detailed in Section 1.0 of the Alternative Plan Update), with corresponding lower water demand compared to these earlier projections. The analysis presented in the report and this Appendix uses more-current population projections, as the basis for projected future water demands as described below.

Using available information from published reports and historical water use data for the Planning Area, this Appendix details the development of updated water demand projections for the 25-year planning horizon (2020-2045) established for the Mission Creek Subbasin Alternative Plan Update. The projections in this Appendix update future water demands to align with the updated (reduced) population projections forecasted for the Planning Area by 2045. Projections are presented in 5-year increments from 2020 through 2045 and include consideration of conservation savings.

The water demand estimates are broken into two major categories of: 1) municipal demand, and 2) private pumping. Municipal demands in the Planning Area are met by Coachella Valley Water District (CVWD) and Mission Springs Water District (MSWD) within their respective retail service areas. Historical demands from each retail service area were used to develop demand projections for two regions of the Planning Area, as described in Section C.3. Private pumping in the Planning Area consists of: 1) small private wells for individual residences that are unmetered, and 2) larger private wells for agricultural, golf course, and industrial demands that are metered and report their groundwater production to CVWD or Desert Water Agency (DWA) as described in Section C.4. Demand projections for the two categories, municipal and private pumping, were developed separately and combined into total demand projections for the Planning Area.

C.2 Factors Affecting Water Demand Projections

In addition to the general variables that may affect future water demand, specific factors, including recent land use planning updates and future California regulations regarding water conservation, described below, may affect water demand projections in the Planning Area.

Revised Growth Forecast – The Southern California Association of Governments (SCAG) released new socioeconomic growth forecasts in early 2020 that significantly reduced previously projected increases in population, housing, and employment in the region. SCAG forecasts are developed in coordination with City and County municipalities and are based on the land use designations in their adopted General Plans. During the development of this Alternative Plan, an updated City of Desert Hot Springs (City of DHS) General Plan was adopted in May 2020 but has not yet been captured in SCAG's growth forecast.

The Final Environmental Impact Report (FEIR) for the 2020 City of DHS General Plan Update (City of Desert Hot Springs, 2020) plans for higher-than-projected growth with associated increases in water demand. While full growth is unlikely to occur within the 25-year planning horizon, the General Plan Update includes several water supply policies/mitigation measures such as consultation with local water agencies to plan for adequate supplies. In addition, the General Plan Update includes the need to recognize any immediate water supply constraints and consider long-term availability of water in the approval of development projects and a coordinated review process with local water resources management agencies. The water supply policies/mitigation measures link the City's project approval and building permitting to the water resources agencies' ability to manage resources consistent with approved water management plans, SGMA groundwater sustainability plans, and Urban Water Management Plans.

An additional mitigation measure identified in the FEIR is for the City of DHS to prepare an annual report of building permits issued and land use approvals for submittal to MSWD and CVWD to allow the agencies to estimate related water use increases and identify concerns and issues regarding the adequacy of water supply for permits/approvals. These mitigation measures can lessen some of the uncertainty associated with water needs from the City of DHS planning area. In addition, the revised growth forecasts can be incorporated into future updates of the Alternative Plan, as appropriate.

Long-Term Conservation Regulations – Water conservation has long been a part of water management in California and in the Planning Area. Following the 2012-2016 drought, California passed two major pieces of conservation legislation, Assembly Bill 1668 (Friedman) and Senate Bill 606 (Hertzberg) that further emphasize water conservation. As outlined in *Making Conservation A California Way of Life* (CDWR and SWRCB, 2018), the legislation requires establishment, implementation, reporting, and enforcement of urban water use objectives, along with agricultural water use efficiency. These objectives and standards are currently under development and future impacts are uncertain in the near-term. Current expected conservation impacts based on existing standards, such as improved efficiency water fixtures, as discussed in Section C.3.6**,** are included in this analysis. Future conservation, if required, can be incorporated into subsequent updates of the Alternative Plan as the effects of these standards become apparent.

C.3 Municipal Demand

This section describes the process used to develop municipal water demand projections for the Planning Area. The Planning Area includes the retail service areas of two water agencies – CVWD and MSWD – and overlies all or portions of four groundwater subbasins/subareas – Mission Creek Subbasin (MCSB), Desert Hot Springs Subbasin (DHSSB), Garnet Hill Subarea (GHSA) of the Indio Subbasin, and a small portion of the main Indio Subbasin – as shown earlier on **Figure 1-3** of the Alternative Plan Update.

For the purposes of analysis, the Planning Area was divided into two regions as shown on **Figure C-1**.

1) **CVWD Planning Area** is the portion of the CVWD area that is within the Planning Area. The CVWD Planning Area is delineated by a blue boundary on **Figure C-1**. Water consumption meter data from CVWD's Improvement District No. 8 (ID-8), shown in red, was used to develop water demand projections for the CVWD Planning Area.
2) **MSWD/DWA Planning Area** encompasses DWA's area, shown in brown, and MSWD's area, shown in hatch pattern, within the Planning Area. The MSWD/DWA Planning Area is delineated by a purple boundary on **Figure C-1**. Water consumption meter data from MSWD's retail service area was used to develop water demand projections for the MSWD/DWA Planning Area.

A description of the Planning Area, including jurisdictional boundaries for each agency, is summarized in Section 1. and detailed in Section 2.1 of the Alternative Plan Update.

C.3.1 Municipal Demand Projection Methodology

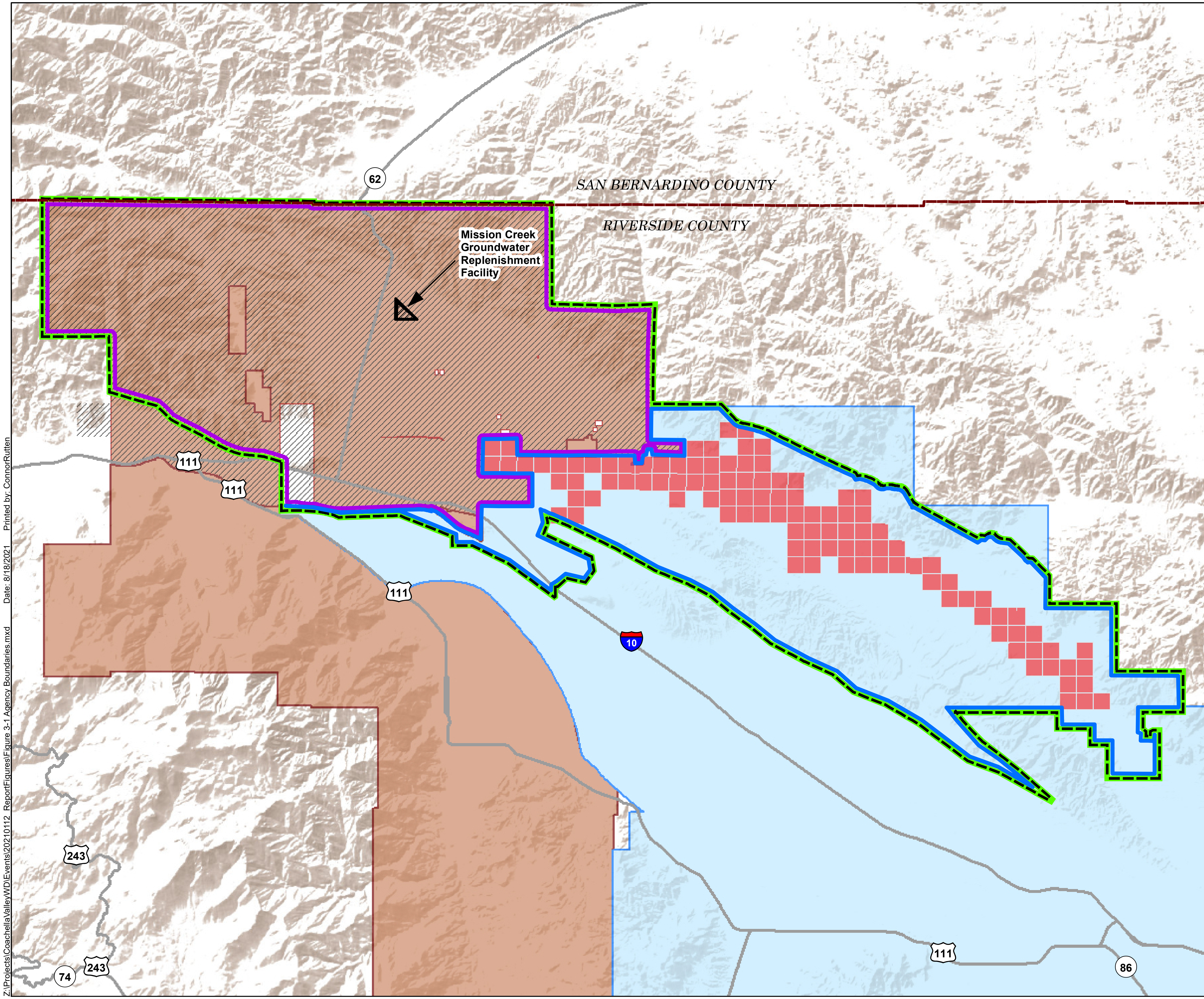
This section summarizes the process used to develop municipal demand projections for the Planning Area. The municipal demand projections rely upon data that, in raw form, may not be readily conditioned for the analysis. A high-level overview of the sources and analysis of available data, a detailed account of the process for converting available data into per-capita consumption units used to develop demand projections, and the associated demand project methodology is presented below.

C.3.1.1 Data Sources

Available data sources were identified and prepared for use in demand projections as described below and detailed in sections that follow:

1. **<u>Historical Meter Data</u>**: Historical meter data are available for CVWD's ID-8 and MSWD's retail service areas. CVWD meter data from 2010 to 2019 were used to analyze recent historical municipal use trends within the ID-8 Service Area. MSWD meter data from 2014 to 2019 were used to analyze recent historical municipal use trends within their retail service area. Average consumption based on meter data was calculated for integration into demand projections as the basis for future consumption.
2. **<u>Riverside County Land Use Data</u>**: Land use data provide information about existing parcels and future development. Geographic Information System (GIS) mapping was used to assist in identifying the general distribution, general location, and extent of land uses, such as housing type (Single Family Residential, Multi-Family Residential, etc.), business, industry, open space, agriculture, natural resources, recreation, and public/quasi-public uses that may influence future development and water demand. Land use data were used to identify the land use associated with an existing meter and to align future growth projections with allowable land uses within the Planning Area.

Sources: Esri, USGS, NOAA



AGENCY BOUNDARIES AND PLANNING AREAS
Mission Creek Subbasin Alternative Update
Coachella Valley, California

By: CJR | Date: 8/18/2021 | Project No.: 1944537*00

Kennedy Jenks

Figure C-1

3. **SCAG Regional Growth Forecast**: Socioeconomic forecasts are provided by SCAG for population and households for 2016, 2020, 2035, and 2045 (SCAG, 2019) within the Planning Area. SCAG develops the forecasts throughout southern California using enhanced forecasting methods and interactive public outreach. SCAG forecasts used in this analysis project less growth when compared to previous forecasts included in the 2013 MC/GH WMP.

C.3.1.2 Methodology

Following the identification and preparation of available data, the analysis developed municipal unit consumption factors and adjustments, and accounted for water losses as summarized below:

1. **Municipal Unit Consumption per Person:** Municipal unit consumption factors by land use type (Acre-Feet per Year per Acre or AFY/Ac) were developed based on historical meter data and existing developed parcels data. SCAG persons per household information and parcel data were used to convert the municipal unit consumption factors to municipal unit consumption per person (AFY/person) for each land use type. The product of calculated municipal unit consumption per person and SCAG future population estimates was used to project residential consumption at a rate consistent with population growth projections.
2. **Adjustment to Unit Consumption for Commercial/Industrial Usage**: Since residential growth is generally accompanied by commercial/industrial growth, existing parcel data were used to establish the relationship between residential and commercial/industrial use within the Planning Area. The analysis assumes that this ratio of residential to commercial/industrial use will remain consistent over the planning horizon.
3. **Passive Conservation Adjustment**: Projected consumption was adjusted to account for future indoor water use savings from the inevitable replacement of water fixtures and appliances with higher efficiency models.
4. **Water Loss**: Annual water loss as a percentage was calculated based on the difference between annual metered groundwater production and annual metered consumption for 10 and 6 years of recent data within the ID-8 and MSWD retail service areas, respectively. The average percent water loss was used to calculate the annual water loss based on future projected consumption. The water loss was then used to adjust projected consumption to calculate total water demand as described below. In this report, water loss includes all non-revenue water such as leaks, metering errors, or record keeping issues.
5. **Projected Water Demand.** Projected municipal water demand was calculated using projected municipal consumption and the water loss adjustment:

$$Projected\ Demand = Projected\ Consumption + Water\ Loss$$

More detail regarding data sources, processing of data, and demand methodology is provided in the sections below.

C.3.2 Metered Consumption

Consumption is defined as water consumed by end users as measured by customer meters. Metered retail water delivery is provided by the municipal service providers (MSWD and CVWD). The municipal consumption in the Planning Area is primarily residential with small amounts of commercial and industrial uses.

Consumption for the CVWD Planning Area was obtained from the meter data available from the ID--8 service area. Consumption for the MSWD/DWA Planning Area was obtained from MSWD meter data. Together, the CVWD Planning Area consumption and MSWD/DWA Planning Area consumption provide historical consumption for the entire Planning Area. Meter datasets provided associated assessor's parcel numbers (APNs) or addresses that were matched to Riverside County land use, described in Section C.3.3. This information allowed an assignment of consumption by usage type that is uniform across the entire Planning Area. The metered usage types in this analysis were grouped according to the following Riverside County land use categories: Single-Family Residential, Multi-Family Residential, Mobile Home/Manufactured Home Residential, commercial, and industrial.

The initial steps of analyzing the historical consumption and land use data are summarized below:

STEP 1: The following datasets were assembled and organized for use to perform the historical consumption analysis:

1. 2019 Riverside County Parcel Data (most recent available dataset at project start).
2. Riverside County Land Use data.
3. 2014 – 2019 monthly water meter billing data for consumption in MSWD's Service Area with APNs provided for the meters that were not for temporary irrigation or construction.
4. 2014 – 2019 monthly MSWD municipal well production data within the Planning Area.
5. 2010 – 2019 monthly water meter billing data for consumption in Improvement ID-8 Service Area within CVWD with APNs for all meters except those identified as for temporary construction.
6. 2010 – 2019 annual CVWD municipal well production data within the Planning Area.

STEP 2: Meter data were geolocated to identify land use type based on the following priorities:

1. Assessor's parcel number.
2. Latitude/longitude data.
3. Address information.
4. Review of aerial photography and manual categorizing of land use type.

The geolocated meter data for the CVWD Planning Area and the MSWD/DWA Planning Area were used in the metered consumption analysis described in the next section. The metered consumption analysis and the sections that follow present additional detail regarding the approach and results for estimating demands and production for the Planning Area.

C.3.2.1 Metered Consumption Analysis

While CVWD and MSWD serve municipal retail customers of similar usage types, their typical consumption per person and parcel size/densities vary. Each agency's meter dataset was processed and analyzed independently to examine regional usage patterns and to capture the geographical variability of historical water consumption within the Planning Area. Historical consumption for each agency is summarized in graphs **on Figure C-3 and Figure C-4** showing annual consumption based on land use type.

Evaluation of historical consumption is necessary to provide an informed estimate of how much future consumption can be expected. By developing relationships between historical consumption, land use, and population, future consumption can be estimated based on anticipated population growth and land use trends. The population/consumption relationship helps predict how consumption in the Planning Area will increase over the planning horizon, while the land use/consumption relationship helps to inform what the "ceiling" of potential consumption in the Planning Area may be, given how much remaining land there is with potential for development.

CVWD Planning Area

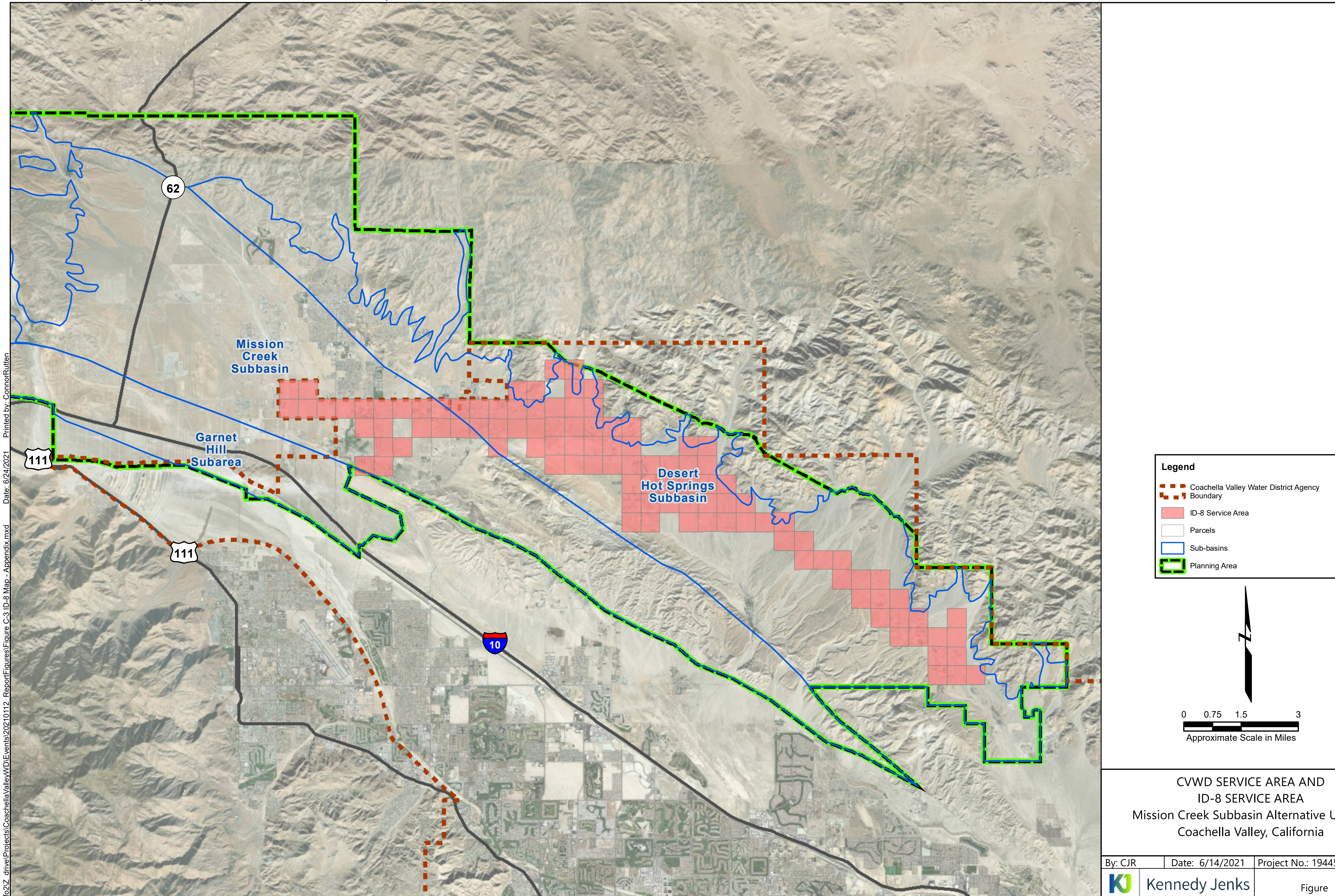
(A) <u>Municipal Water System Overview</u>

The CVWD boundary encompasses public water systems that serve municipal retail customers in the larger Coachella Valley; The ID-8 Service Area, shown in pink on **Figure C-2,** is the public water system that is located within the CVWD Planning Area. ID-8 customers are currently served water from four municipal water supply wells. In the future, the ID-8 Service Area could be extended within the CVWD Planning Area provided that the necessary demand and infrastructure were established.

The ID-8 Service Area includes meters located in both the MCSB and DHSSB (**Figure C-2)**. The ID-8 Service area does not extend into the GHSA so there are no meters located in the GHSA.

The ID-8 meter dataset contained 3,410 meter records that were geolocated within the ID-8 Service Area and associated with 1,483 parcels. Some parcels had multiple meter records that are likely associated with meter replacements or other changes to meter numbers that occurred from 2010-2019. The dataset contained additional meter records used for "construction" purposes. Construction meters are temporary meters that use municipal water and are moved as needed for construction projects. According to CVWD's estimate, approximately 84% of construction consumption occurred in the DHSSB, with the remaining 16% occurring within the MCSB. Total metered consumption associated with construction constitutes about 0.5% of the total consumption in the CVWD Planning Area.

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



\\sfo2\Z_drive\Projects\CoachellaValleyWD\Events\20210112_ReportFigures\Figure C-3 ID-8 Map - Appendix.mxd Date: 6/24/2021 Printed by: ConnorRutten

CVWD SERVICE AREA AND
ID-8 SERVICE AREA
Mission Creek Subbasin Alternative Update
Coachella Valley, California

By: CJR	Date: 6/14/2021	Project No.: 1944537*00
Kennedy Jenks		Figure C-2

(B) Annual Consumption Based on Land Use Type

Figure C-3 illustrates the annual consumption in the CVWD Planning Area based on geolocated meters, other historical water consumption, and land use data.

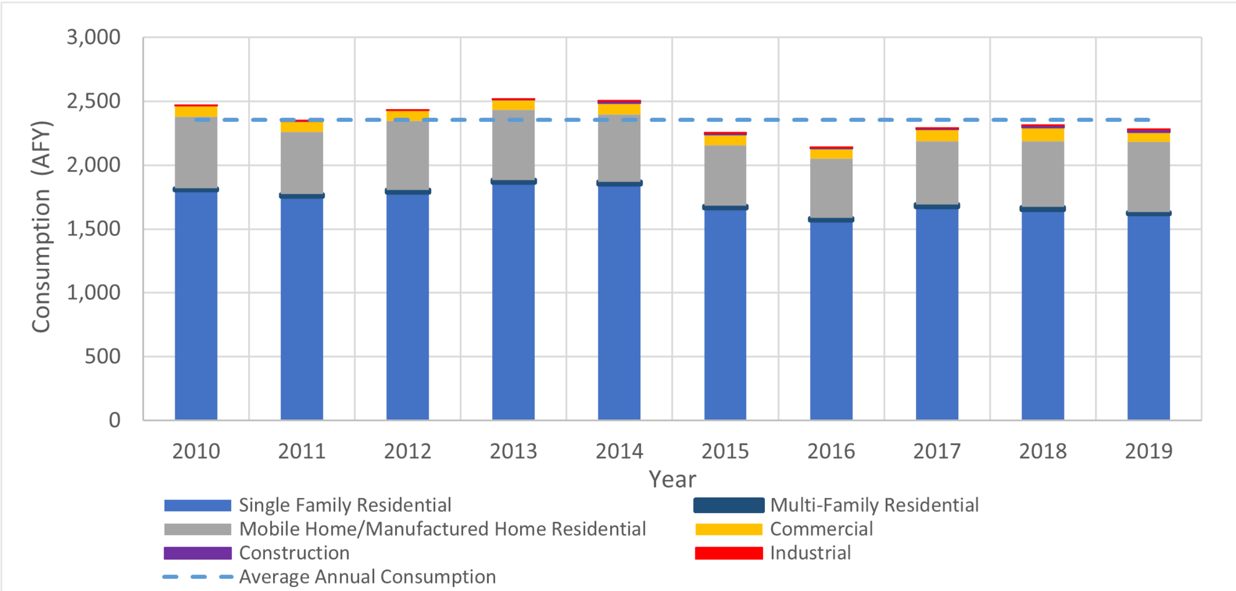


Figure C-3: Annual Consumption in the CVWD Planning Area from 2010 to 2019

Table C-1 lists the consumption by land use type within the CVWD Planning Area. Almost 96% of all consumption serves residential uses, with Single Family Residential representing 73.1% of all consumption in the CVWD Planning Area.

Table C-1: CVWD Planning Area Consumption by Land Use

Land Use	Total Area (acres)	Annual Average Consumption (AFY)	% Total Consumption
Single Family Residential	4,538	1,721	73.1%
Multi-Family Residential	36	20	0.8%
Mobile Home/Manufactured Home Residential	417	517	22.0%
Commercial	130	84	3.6%
Industrial	17	2	0.1%
Construction	--[1]	11	0.5%
Total	**5,139**	**2,355**	**100%**

[1]This land use was associated with meters that could not be geocoded, so no acreage is associated.

While some municipal meter accounts were located on the grounds of golf courses, they primarily serve the on-site clubhouse/commercial facilities (i.e., non-irrigation uses). Most golf course irrigation demand is currently met by metered private wells that report production to CVWD through the Replenishment Assessment Charge (RAC) program discussed in Section C.4.1.

MSWD/DWA Planning Area

(A) <u>Municipal Water System Overview</u>

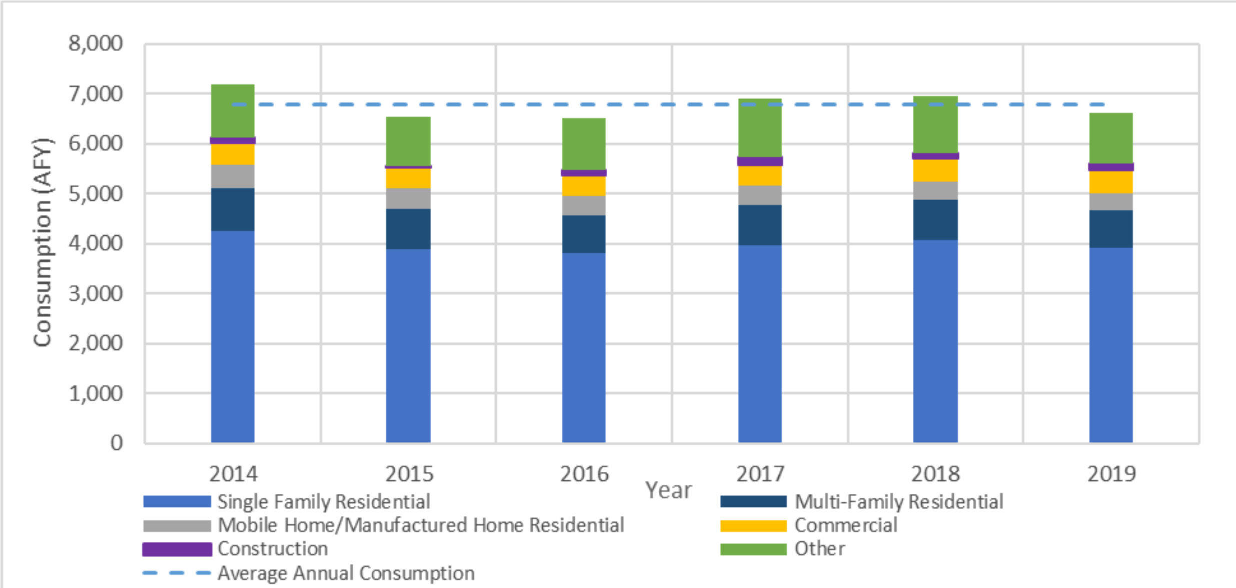
MSWD provides retail water service within the MSWD/DWA Planning Area. MSWD has a municipal distribution system in the more populated areas in and around the City of Desert Hot Springs overlying both the MCSB and the DHSSB. Most MSWD groundwater production is from the MCSB with a relatively small amount of production from the GHSA. MSWD's service area also overlies the DHSSB, which is served potable water from the MCSB. MSWD produces groundwater from 15 wells to provide water to the service area.

The MSWD meter dataset provided consumption by usage type for a 6-year period from 2014-2019 and was used to estimate municipal demand projections for the entire MSWD/DWA Planning Area. There were 13,140 accounts in the MSWD meter dataset associated with 12,168 parcels and 23,655 meters. A detailed review of the MSWD dataset indicates multiple meters are associated with a single parcel due to meter number and customer changes. The MSWD dataset also includes meters associated with irrigation or temporary construction meters that did not have parcel or address information.

97% of the MSWD meter data were geocoded and assigned a land use classification (e.g., Single-Family Residential, Multi-Family Residential, Mobile Home/Manufactured Home Residential, commercial, industrial, etc.). These geocoded meters accounted for 91% of the billed consumption. The 3% of the meters that could not be geocoded were identified as providing irrigation or construction water and accounted for 9% of the billed consumption.

<u>(B)Annual Consumption Based on Land Use Type</u>

Figure C-4 illustrates the proportions of consumption associated with each land use type based on geolocated meters, historical water consumption, and land use data for the 2014-2019 period. For the 6-year period, the area had an average annual consumption of 6,783 AFY, of which 58.7% was for Single-Family Residential and 76.2% of all consumption was for residential uses.



Note: Other is irrigation and other meters that could not be geocoded

Figure C-4: Annual Consumption in the MSWD/DWA Planning Area from 2014 to 2019

Table C-2 tabulates water consumption within the MSWD/DWA Planning Area for the MSWD meters based on Riverside County parcel data land use classifications for the geocoded meters.

Table C-2: MSWD/DWA Planning Area Consumption by Land Use

Land Use	Total Acreage (acres)	Total Annual Average Consumption (AFY)	% Total Consumption
Single Family Residential	2,925	3,980	58.7%
Multi-Family Residential	181	793	11.7%
Mobile Home/Manufactured Home Residential	233	396	5.8%
Commercial	459	443	6.5%
Industrial	60	0	0%
Construction	--[1]	98	1.5%
Other	--[1]	1,073[2]	15.8%
Total	**3,858**	**6,783**	**100%**

[1]These categories were associated with meters that could not be geocoded, so no acreage is associated.
[2]Includes MSWD meter data categorized as irrigation and other that could not be geocoded; these data were accounted for in adjustments to unit consumption.

As noted earlier, of the 13,140 accounts provided in the MSWD dataset, approximately 3% were not able to be geolocated within the Planning Area, corresponding to approximately 9% of the billed consumption. To account for this unlocated consumption, the remaining 9% of the billed consumption was redistributed across the SCAG Transportation Analysis Zones (TAZs), described in Section C.3.4. The amount of unlocated consumption that was redistributed was proportional to the total geolocated consumption within each TAZ.

Planning Area

For the Planning Area, historical consumption data from CVWD and MSWD/DWA Planning Areas are brought together as follows.

(A) Annual Consumption Based on Land Use Type

Figure C-5 shows the combined consumption for the Planning Area by land use type for 2014-2019.

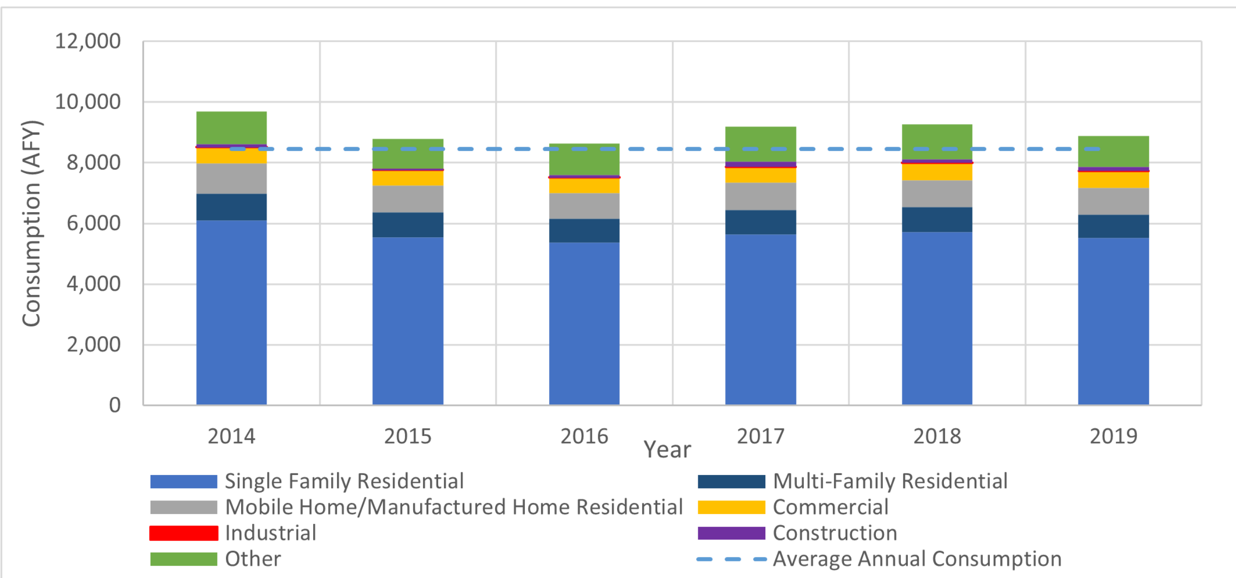


Figure C-5: Consumption by Land Use Type for the Planning Area for 2014-2019

Table C-3 provides water consumption for the Planning Area based on county parcel land use classifications. Upwards of 81% of the consumption within the Planning Area is residential usage.

Table C-3: Consumption by Land Use for the Planning Area

Land Use	Total Acreage (acres)	Total Annual Average Consumption (AFY)	% Total Consumption
Single Family Residential	7,463	5,701	62.4%
Multi-Family Residential	217	813	8.9%
Mobile Home/Manufactured Home Residential	650	913	10.0%
Commercial	589	527	5.8%
Industrial	77	2	0.02%
Construction	--[1]	109	1.2%
Other	--[1]	1,073[2]	11.7%
Total	**8,996**	**9,138**	**100%**

[1]These categories were associated with meters that could not be geocoded; no acreage is associated.
[2]Includes MSWD meter data categorized as irrigation and other that could not be geocoded; these data were accounted for in adjustments to unit consumption as described in the MSWD/DWA Planning Area description above.

C.3.2.2 Metered Consumption Summary

Averages of historical metered consumption for the CVWD Planning Area and MSWD/DWA Planning Area were calculated as the basis for demand projections. The majority of consumption for both areas is from single family residential usage, as illustrated in **Table C-4** below. Discussions of other land uses are addressed in Section C.3.3, below.

Table C-4: Historical Consumption by Land Use for the Planning Area

Agency	Consumption (AFY)			Total Consumption (AFY)
	Single-Family Residential	Multi-Family/Mobile and Manufactured Home Residential	All Other Categories[1]	
CVWD data (2010 – 2019 Average)	1,721	537	97	2,355
MSWD data (2014 -2019 Average)	3,980	1,189	1,614	6,783
Total For Planning Area	**5,701**	**1,726**	**1,711**	**9,138**

[1]Includes meters that could not be geolocated to specific parcel.

C.3.3 Land Use Inventories and Analysis

Land use data were used to categorize existing meters according to land use agency-specific land use factors. The municipal demand projections are then consistent with local general plans and do not exceed the allowable land uses within the Planning Area.

Land use data were downloaded from Riverside County's 2019 Parcel and Land Use GIS Portal (Riverside County, 2019). Riverside County GIS data includes Single Family Residential, Multi-Family Residential, Mobile Home/Manufactured Home Residential, commercial, industrial, and other uses which are assigned to each parcel.

Land Use data also included:

- Federal Lands and Multi-Species Habitat Conservation Plan (MSHCP) land use GIS data to identify areas unlikely to be developed; and
- Aerial imagery to verify land use classifications.

The land use data were analyzed and processed as follows:

1. Used GIS to clip all datasets so that all data fell within the defined Planning Area.
2. Used GIS to geospatially intersect meters with Riverside County parcels and assigned meters unique APN values if none were previously present.
3. Aggregated monthly meter data by APN and calculated annual and average annual consumption values in AFY.
4. Assigned Riverside County parcel land use values (the "ClassCode" field in the parcel shapefile dataset) to each geolocated meter based on which parcel each meter spatially intersected. For example, if a county parcel had a land use listed as "Single Family Dwelling," then the meter intersecting that parcel and its associated consumption was assumed to have a classification of "Single Family Dwelling."
5. Simplified Riverside County Land Use classifications into Single Family Residential, Multi-Family Residential, Mobile Home/Manufactured Home Residential, commercial, and industrial consumption categories. Aggregated consumption data by simplified land use categories.
    - All the land use categories were vetted based on current ownership from parcel-specific information and aerial imagery to verify that the land use classifications provided by Riverside County were a reasonable representation of the land use categories assigned to each parcel.
    - Parcels found to be inaccurately classified based on ownership or aerial imagery had their classifications adjusted accordingly or were removed from further analysis if the parcel was already developed and being utilized for an alternate purpose (transportation, energy, floodways, utility easements, etc.).

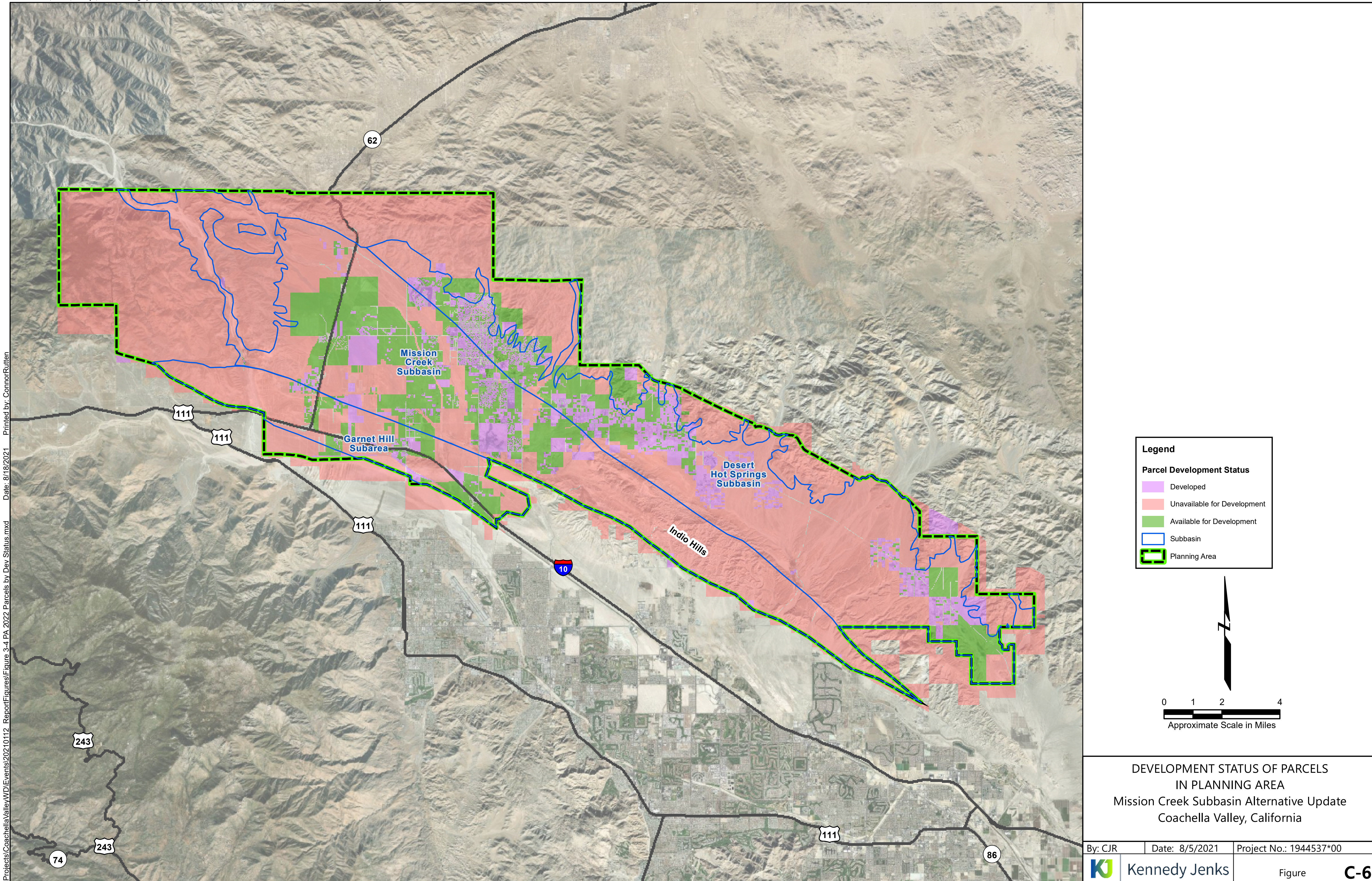
In addition, the analysis used a simplified development status to distinguish which parcels may develop in the future and result in additional demand. Each parcel in the Planning Area was assigned a development status to indicate the likelihood of development as described below and presented on **Figure C-6**:

- "**Developed**" parcels - have an existing structure (based on parcel taxable structures information) or a geolocated meter on the parcel based on APNs from CVWD and MSWD meter datasets. Developed parcels are assumed to be unavailable for development as they are already developed.
- "**Unavailable for Development**" parcels - include those located within MSHCP areas, owned by the federal government, or explicitly owned by an energy/utility company (solar panels or wind farm). Parcels that are likely precluded from development (rugged mountain terrain, etc.) were identified through use of aerial imagery.
- "**Available for Development**" parcels – consist of undeveloped (i.e., development could occur) parcels and parcels that do not fall within the previous two categories.

As shown on **Figure C-6**, nearly all the parcels that are "developed" or "available for development" are located in the central part of the MCSB, generally near the municipal service areas of CVWD and MSWD. This is consistent with typical patterns of urban growth which expands from existing developed areas. The parcels "unavailable for development" are primarily located in the Indio Hills area, as well as in the Whitewater River channel and the upper reaches of the Mission Creek channel.

Parcel analysis, in combination with the land use analysis, showed that most parcels available for development are Single Family Residential parcels, which aligns with the existing high proportion of residential use. In addition, a large amount of the acreage in the Planning Area is "unavailable for development" because it is federally owned or part of a dedicated conservation area (e.g., MSHCP).

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Z:\Projects\CoachellaValleyWD\Events\20210112_ReportFigures\Figure 3-4 PA 2022 Parcels by Dev Status.mxd Date: 8/18/2021 Printed by: ConnorRutten

DEVELOPMENT STATUS OF PARCELS IN PLANNING AREA
Mission Creek Subbasin Alternative Update
Coachella Valley, California

By: CJR	Date: 8/5/2021	Project No.: 1944537*00

Kennedy Jenks

Figure C-6

C.3.4 SCAG Population Projections for the Planning Area

Municipal demand projections require population projections to determine the rate of growth expected in the region. The SCAG regional growth forecast is currently the most recent and most detailed data available for the Planning Area. SCAG forecasts are based on jurisdictional general plans and intended to represent the most likely growth scenario, considering a combination of recent and past trends and regional growth policies. In the Coachella Valley, this forecast includes less growth than previous forecasts. In this analysis, population estimates for the Planning Area were coupled with existing average per person annual consumption (unit consumption, see Section C.3.5) to develop demand projections at 5-year increments through 2045.

Often, development of previously undeveloped land, referred to as "greenfield development," on the urban fringe has been the method of accommodating growth in the Coachella Valley. SCAG's recent forecasts have increasingly looked toward infill development on vacant land in urbanized areas and the redevelopment of existing properties as a mechanism for accommodating future growth. The Planning Area includes both greenfield and infill development. Within that context, the ratio of land use classifications and related water consumption in the CVWD Planning Area and MSWD/DWA Planning Area are expected to remain consistent over the planning horizon because of the high proportion of residential use.

Table C-5 and **Figure C-7** present the SCAG population projections for the Planning Area by agency area. The 2016 SCAG projections result in a population increase from 47,883 persons in 2016 to 88,310 persons in 2045, 84% growth from 2016 to 2045 or an annual growth rate of 2.1%. These projections result in roughly 20,000 fewer people by the year 2045 than the 2013 MC/GH WMP population projections, which are shown by the dashed blue line on **Figure C-7**. While the population growth rate in the 2013 MC/GH WMP is similar to that from the 2015 SCAG projection; following the 2008 economic recession, the large increase in population from 2010-2015 was not realized

Table C-5: Planning Area SCAG Population Projections from 2020-2045

Year	CVWD Planning Area		MSWD/DWA Planning Area		Total Planning Area		2013 MC/GH WMP Population Projections[3]
	Popula-tion	% Annual Increase[2]	Popula-tion	% Annual Increase[2]	Popula-tion	% Annual Increase[2]	
2016[1]	8,875	-	39,008	-	47,862	-	64,453
2020	9,454	1.58	43,539	2.75	52,971	2.57	70,995
2025	10,877	2.84	48,309	2.10	59,186	2.24	79,384
2030	12,515	2.84	53,601	2.10	66,116	2.24	87,774
2035	14,399	2.81	59,472	2.08	73,844	2.24	96,163
2040	15,288	1.21	65,472	1.94	80,761	1.80	102,978
2045	16,232	1.20	72,078	1.92	88,282	1.80	109,793

[1] 2016 Population values are estimated based on existing population census data (not projected values) (Ref. Southern California Association of Governments (SCAG) 6/11/2020 Draft SCAG TAZ Population Summary).
[2] Percent Annual Increases are assumed to be constant between listed time periods.
[3] 2013 MC/GH WMP Population shown for comparison.

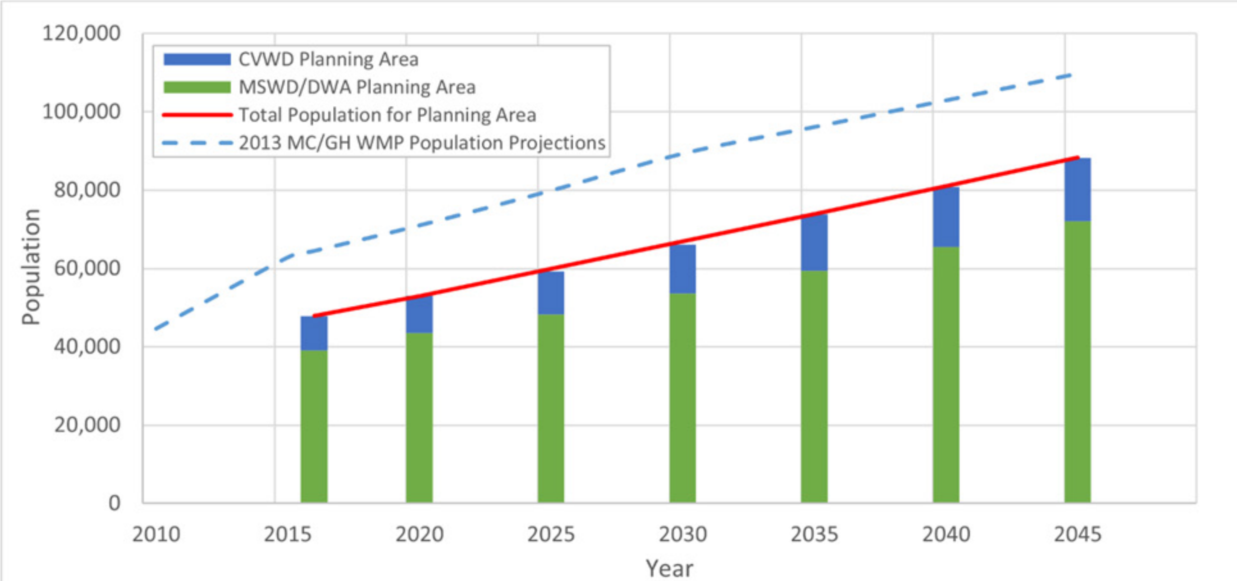


Figure C-7: Population Projections from 2010 to 2045

C.3.5 Municipal Unit Consumption per Person

The simplest and most direct means of forecasting water consumption is to use current per-capita water consumption multiplied by expected future population. Using meter data combined with the land area in the CVWD Planning Area and MSWD/DWA Planning Area, consumption can be calculated in terms of AFY/Ac for a range of land use types. Residential (single family, multi-family, mobile home/manufactured home) land use is the most prominent in the Planning Area and forms the primary basis and is adjusted for other land uses in the municipal unit consumption analysis.

For parcels with meters, using the average residential parcel size in acres per parcel and the average number of persons per residential parcel in persons per parcel, unit consumption in terms of AFY/person was calculated as shown in the equation below.

$$\boxed{\frac{Consumption\ (AFY)}{\cancel{Acres}} * \frac{\cancel{Average\ Area\ (Acres)}}{\cancel{Parcel}} * \frac{\cancel{Parcel}}{Average\ Persons} = \frac{Consumption\ (AFY)}{Person}}$$

From Existing Meter Data

From Existing Parcel Data

From SCAG Data

Projected consumption for a given year is calculated as:

Municipal Unit Consumption (AFY/person) * Persons Projected by SCAG for each year.

The methods used to estimate each component of the equation above are presented in the sections that follow. In addition, to provide projections for land use types other than residential, unit consumption factors were developed for commercial and industrial uses. This was done by using consumption associated with each land use divided by the acreage devoted to each land use as described as follows.

Consumption per Acre (AFY/Acre)

Using the data listed in **Table C-6** and **Table C-7**, average unit consumption in terms of AFY/Ac can be calculated based on historical usage. Using land use type and area to adjust unit consumption improves the accuracy of future demand projections by aligning projections with future land use developments identified in general and specific plans governing the Planning Area. **Table C-6** presents the unit consumption for each agency Planning Area that was used for the future demand estimate.

Table C-6: Unit Consumption by Land Use Type and Area[1]

Usage Type	CVWD Planning Area Average Unit Consumption (AFY[1]/Ac[2])	MSWD/DWA Planning Area Average Unit Consumption (AFY[3]/Ac[2])
Single Family Residential	1.20[4]	1.50
Multi-Family Residential	0.55	3.04
Mobile Home/ Manufactured Home Residential	1.24	1.47
Commercial	0.65	1.68
Industrial	0.09	0.70

[1] Average is for 2010 to 2019 meter data time period.
[2] Acreage data for each land use is based on 2019 Riverside County Land Use.
[3] Average is for 2014 to 2019 meter data time period.
[4] Value adjusted from historical value of 0.38 AFY/Ac based on future anticipated SFR split of 75% on <0.5 acre lots and 25% on 0.5-5.0 acre lots. See the "Average Area per Parcel" discussion for more detail.

Consumption by land use is influenced by average parcel size, which differs between the two municipal planning areas as described under the header Average Area per Parcel (Acres/Parcel).

Average Area per Parcel (Acres/Parcel)

In general, the analysis found the parcel sizes of customers in the CVWD Planning Area were much larger than the parcels of customers in the MSWD/DWA Planning Area for residential, commercial, and industrial customers. For example, the average CVWD residential parcel with an existing meter is approximately 3.4 acres, while the average MSWD/DWA Planning Area residential parcel with an existing meter is approximately 0.3 acres.

This results in higher population density and generally higher unit consumption in the MSWD/DWA Planning Area since acreage is in the denominator of the unit consumption calculation. However, based on correspondence with CVWD, the future distribution of residential developments may not mimic the historical trend of mostly larger "ranchette"-sized residential parcels. The "Average Area per Parcel" section below provides additional detail related to the adjustments made to this unit consumption for the CVWD Planning Area.

The values used for the average acres per parcel for Single Family Residential, Multi-Family Residential, and Mobile Home/Manufactured Home Residential parcels are presented in **Table C-7**. These values were calculated using existing parcel data and adjusted based on anticipated future residential lot sizes.

Table C-7: Average Acres/Parcel Values for Future Development [1]

Residential Usage Type	CVWD Planning Area Acres/Parcel	MSWD/DWA Planning Area Acres/Parcel
Single-Family Residential	0.40	0.27
Multi-Family Residential	5.18	0.71
Mobile Home/Manufactured Home Residential	13.46	0.42

For the MSWD Service Area, Water Supply Assessments (WSA) performed for planned developments were reviewed and show a trend toward denser, smaller Single Family Residential parcels. Based on discussions with CVWD staff, for the CVWD Planning Area, it was assumed that roughly 75% of the future population will reside on the smaller densified residential lots similar to the WSA developments identified in the MSWD Service Area. The acreage/parcel for these smaller lots was based on available WSA data considering the planned number of units and acreage for each development. The remaining 25% of the future CVWD population is expected to reside on larger "ranchette" lots. The acreage of these larger lots was based on the median residential parcel size of the remaining "available for development" parcels in the CVWD Planning area.

Average Persons per Residential Parcel (Persons/Parcel)

Lastly, the number of persons per residential parcel was estimated. While SCAG provided a base estimate of the number of persons per household for each service area, this number did not uniformly apply to Multi-Family Residential and Mobile Home/Manufactured Home Residential parcels, since some Multi-Family Residential and Mobile Home/Manufactured Home Residential parcels had a much higher units/parcel density compared to the Single Family Residential parcels. Aerial imagery as well as projected SCAG population numbers were used to estimate a corrected number of persons per parcel for the Multi-Family Residential and Mobile Home/Manufactured Home Residential land use types. The unadjusted SCAG persons per household estimate was used for Single Family Residential parcels. **Table C-8** presents the estimated persons/parcel used in the analysis.

Table C-8: Persons per Parcel by Residential Land Use

Land Use Type	CVWD Planning Area	MSWD/DWA Planning Area
Persons per Household (Single Family Residential)[1]	2.59	3.11
Persons per Household (Mobile Home/Manufactured Home Residential)[2]	1.16	1.16
Units per Multi-Family Residential Parcel[3]	6.50	3.19
Units per Mobile Home/Manufactured Home Residential Acre[4]	11.57	11.57
Persons per Multi-Family Residential Parcel	16.86	9.94
Persons per Mobile Home/Manufactured Home Residential Parcel	92.92	97.46

[1] SCAG 2016 numbers for Households and number of Persons for Single Family Residential.
[2] Value is back-calculated in order for the total calculated population to match the estimated SCAG 2016 population within the ID-8 Service Area. Same value was assumed for MSWD Service Area calculations.
[3] Estimated units per Multi-Family Residential parcel using aerial imagery.
[4] Estimated units per Mobile Home/Manufactured Home Residential acre using aerial imagery. Mobile Home/Manufactured Home Residential parcels vary greatly in size and needed to be calculated on a per acre basis rather than on a per parcel basis due to their highly variable parcel sizes.

Estimated Weighting of Residential Land Use Types in the Planning Area

Water consumption per person varies by type of housing/land use. However, since the final unit consumption of AFY/person is a singular value, a weighted average of the Single Family Residential, Multi-Family Residential, and Mobile Home/Manufactured Home Residential unit consumptions was used to calculate the final total consumption. The acreages of the remaining residential "available for development" areas in the Planning Area were totaled based on land use to compare what portion of future residential areas may develop as Single Family Residential, Multi-Family Residential, or Mobile Home/Manufactured Home Residential. As **Table C-9** shows, nearly all the remaining acreage was classified as Single Family Residential; therefore, the Single Family Residential calculated values are most heavily weighted in the final aggregate unit consumption.

Table C-9: Distribution of Remaining "For Future Development" Residential Parcels

Category	CVWD Planning Area			MSWD/DWA Planning Area		
	Acreage	No. Parcels	% By Area	Acreage	No. Parcels	% By Area
Single Family Residential	7,381	1,436	99.81%	12,018	6,133	99.96%
Multi-Family Residential	14	5	0.19%	4	8	0.03%
Mobile Home/ Manufactured Home Residential	0	0	0.00%	1	2	0.01%
Total	**7,395**	**1,441**	**100.00%**	**12,023**	**6,143**	**100.00%**

C.3.5.1 Adjustment to Unit Consumption for Commercial/Industrial Usage

The existing parcel data were also used to establish relationships between residential, commercial, and industrial land uses since residential growth is generally accompanied by commercial/industrial growth. **Table C-10** shows the ratios for the CVWD and MSWD/DWA Planning Areas which were used to establish AFY/person factors for commercial and industrial uses for each of the agency areas. For residential land uses, parcels in the CVWD Planning area parcels were larger than in the MSWD/DWA Planning Area parcels resulting in a higher Acres/Person value in the CVWD Planning Area than the MSWD/DWA Planning Area. Details regarding the estimates follow.

Table C-10: Commercial/Industrial Acreage Ratios to Residential Acreage

Usage Type	CVWD Planning Area			MSWD/DWA Planning Area		
	Total Acreage	Usage Type Area / Total Residential Area Ratio	Acres/ Person	Total Acreage	Usage Type Area / Total Residential Area Ratio	Acres/ Person
Commercial	130	**0.026**	0.004	459	**0.137**	0.0127
Industrial	17	**0.004**	0.001	60	**0.018**	0.0017
Total Residential[1]	4,944	**1.000**	0.16	3,339	**1.000**	0.092

[1] Includes Single Family Residential, Multi-Family Residential, and Mobile Home/Manufactured Home Residential.

In the CVWD Planning Area, for every one (1) acre of residential land developed, approximately 0.026 acres of commercial land will develop, and 0.004 acres of industrial land will develop based on existing development patterns. The area ratios were used to calculate how many acres of commercial and industrial area will develop alongside the development of residential acres as each person is added to the Planning Area. For example, adding one person to the CVWD Planning Area would result in 0.16 acres of residential land, 0.004 acres of commercial land, and 0.001 acres of industrial land developing within the CVWD Planning Area. These “acres/person” values are also presented in **Table C-11** for each usage type.

Using the developed Acres/Person values for residential and commercial/industrial land uses from **Table C-10**, the formula defined earlier in Section C.3.5 was applied to develop an AFY/person for all land uses as presented in **Table C-11**. A single “AFY/person” unit consumption value was calculated for the CVWD and MSWD/DWA Planning Areas. This AFY/person unit consumption value incorporates future residential, commercial, and industrial growth. **Table C-11** shows residential, commercial, industrial, and total calculated unit consumption values.

Table C-11: Estimated Unit Consumption Per Person

Consumption Category	CVWD Planning Area	MSWD/DWA Planning Area
Residential Consumption Per Person (AFY/person)	0.187[1]	0.128[1]
Commercial Consumption Per Person (AFY/person)	0.003	0.021
Industrial Consumption Per Person (AFY/person)	0.000	0.001
Total AFY/person	**0.189[2]**	**0.150**
Total AFY/person expressed as gallons per-capita per day (GPCD)	**169**	**134**

[1] Weighted average of Single Family Residential, Multi-Family Residential, and Mobile Home/Manufactured Home Residential.
[2] Total varies because of rounding.

C.3.6 Passive Conservation Adjustment

Conservation adjustments were used to refine demand projections. Passive conservation is the result of the inevitable replacement of indoor plumbing fixtures and appliances such as toilets, sinks, washers/dryers, and dishwashers with more efficient models over time. As new homes are constructed and older homes are upgraded/renovated, more water-efficient fixtures and appliances are anticipated, resulting in a decrease in overall per-capita municipal unit consumption. The impact of passive conservation was calculated to provide savings of approximately 837 AFY in municipal water consumption in the Planning Area by 2045 (136 AFY in the CVWD Planning Area and 701 AFY in MSWD/DWA Planning Area). Overall, passive conservation amounts to a reduction of approximately 5.4% in future municipal consumption in 2045. The methods used to estimate these savings are found below.

An in-depth water savings analysis was completed for the Indio Subbasin Water Management Plan Update (TODD Groundwater and Woodard & Curran [TODD/W&C, 2021]) to estimate the amount of water savings (i.e., reductions in consumption) via "passive conservation." The analysis considered housing age, fixture flow rate reductions over time, and fixture replace rates based on the State and Federal Plumbing Codes. The State and Federal Plumbing Codes assumptions for maximum flow rate fixture data, fixture useful life and replacement rate data, and frequency of use per fixture data, from the Indio Subbasin Alternative Plan Update, were adapted for the MCSB analysis.

Analysis of passive conservation focused on the replacement of indoor fixtures and appliances. While savings can be achieved by replacement of outdoor irrigation fixtures (e.g., drip irrigation, sprinkler heads, etc.), there is a limited amount of outdoor irrigation occurring in the Planning Area.

Housing Stock Age

Housing age data are important to estimate the effects of indoor passive conservation and were available only for the City of DHS within the Planning Area. The most recent housing stock data for DHS, which was assumed to be characteristic for the Planning Area, were downloaded from the California Department of Finance (DOF) database to estimate the approximate age of the housing stock within the Planning Area. **Figure C-8** shows the number of housing units (Single-

Family Residential, Multi-Family Residential, Mobile Home/Manufactured Home Residential) for DHS from 1990 to 2020.

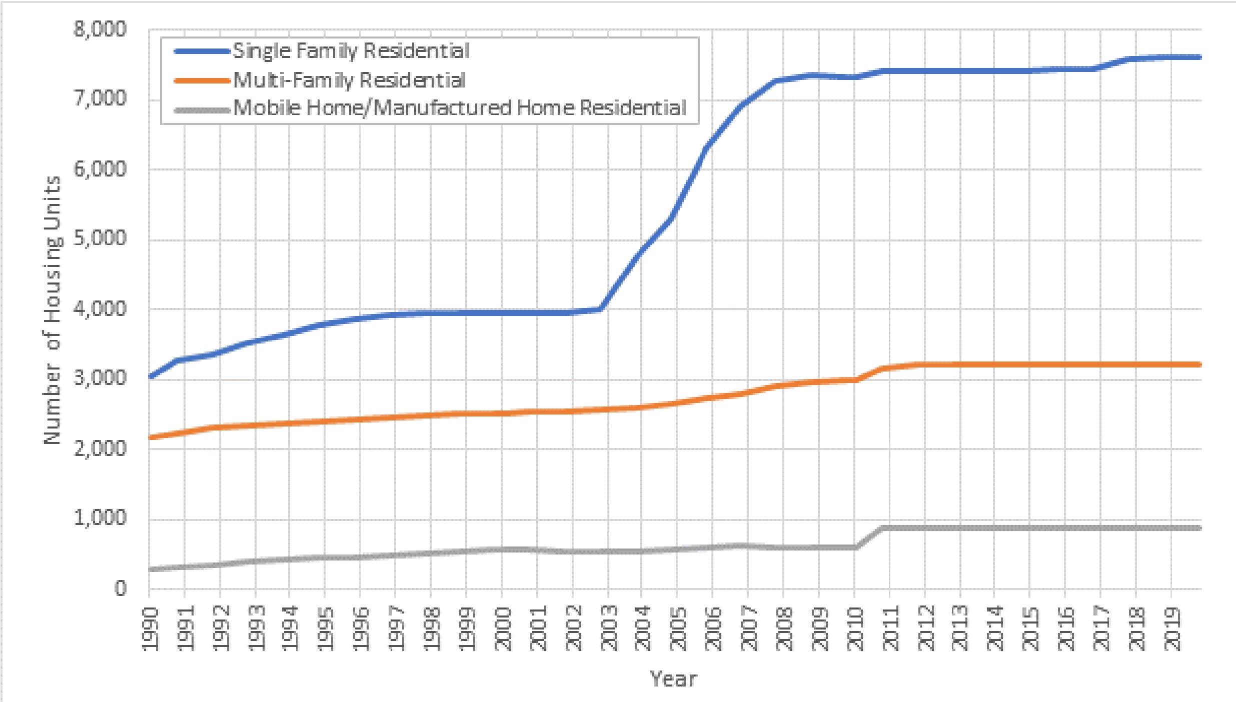


Figure C-8: Department of Finance Housing Unit Growth 1990 – 2020 for Desert Hot Springs

As **Figure C-8** shows, a significant portion of the housing stock in DHS was constructed beginning in 2003 during a period of high growth. For this passive conservation analysis, it was assumed that the majority of the housing stock was constructed in 2003 or later, and that all homes constructed prior to 2003 have replaced fixtures up to 2011 water fixture standards.

Fixture Flow Rate Assumptions

Fixture flow rates for existing and future homes were estimated based on typical fixture ages to represent the effect of indoor passive conservation. **Table C-12** shows the assumed fixture flow rates for a typical existing home in the Planning Area.

Table C-12: Fixture Flow Rates for Existing Homes in the Planning Area

Fixture/Appliance	Max Flow Rate	Flow Rate Unit	Effective Year[1]
Toilets	1.6	gallons per flush (gpf)	1992
Showerheads	2.5	gallon per minute (gpm)	1994
Standard washer	9.5	IWF (gal/cycle per/cf)[2]	2011
Regular dishwasher	6.5	gallons/cycle (gal/cycle)	2010

[1] Effective Year when plumbing code legislation implemented regulating maximum flow rate of fixture.
[2] IWF = integrated water factor (gallons per cycle per cubic foot).

For all future homes constructed in the year 2020 and onward, it was assumed that all fixtures installed meet the most current required plumbing codes. **Table C-13** shows the assumed fixture flow rates for a home constructed in 2020 or later.

Table C-13: Fixture Flow Rates for Future Homes in the Planning Area Constructed in 2020 or Later

Fixture/Appliance	Max Flow Rate	Flow Rate Unit	Effective Year[1]
Toilets	1.28	gallons per flush (gpf)	2014
Showerheads	1.8	gallon per minute (gpm)	2018
Standard washer	6.5	IWF (gal/cycle per/cf)[2]	2018
Regular dishwasher	5	gallons/cycle (gal/cycle)	2013

[1] Effective Year when plumbing code legislation implemented regulating maximum flow rate of fixture.
[2] IWF = integrated water factor (gallons per cycle per cubic foot).

Fixture Replacement and Per-Capita Passive Conservation Savings Estimates

Given the fixture flow rates of existing versus future homes, the savings (in gallons per capita per day (GPCD)) were calculated assuming all fixtures within an existing home are replaced. **Table C-14** summarizes the savings calculation, as well as the annual replacement rate assumed for each fixture type.

Table C-14: Savings Estimates for Fixture Replacement in Existing Homes

Fixture/ Appliance	Old Flow Rates	New Flow Rates	Flow Rate Unit	Savings per fixture/ appliance	Description of Frequency of Use	GPCD savings per fixture/ appliance	Replace-ment Rate (% per year)
Toilets	1.6	1.28	gpf	0.32	4.9 flushes per person per day	1.57	4%
Showerheads	2.5	1.8	gpm	0.7	7.8 minutes per use, 0.7 uses per person per day	3.82	12%
Standard washer	9.5	6.5	IWF	3	3.5 cubic feet per load, 0.3 cycles per person per day	3.15	8.3%
Regular dishwasher	6.5	5	gal/cycle	1.5	0.1 cycles per person per day	0.15	8%
					Total	**8.69**	

Fixture replacement estimates begin in the year 2016, the baseline year for the SCAG population growth estimates, with fixtures continuing to be replaced as their useful life expires. As the 2045 planning horizon approaches, the percentage of fixtures replaced will increase. **Table C-15** shows the calculated fixture replacement completed by 2020, 2035, and 2045 using the replacement rate shown in **Table C-14**.

Table C-15: Fixture Replacement by 2020, 2035, and 2045 from 2020 to 2045

Year	2020	2035	2045
% Toilets Replaced	16%	76%	100%
% Showerheads Replaced	48%	100%	100%
% Standard Washers Replaced	33%	100%	100%
% Regular Dishwashers Replaced	32%	100%	100%

Table C-16 shows the actual savings (in GPCD) that can be expected over the planning period based on the percent replacement rates for each fixture and the calculated savings shown in **Table C-15.** As **Table C-15** shows, all existing fixtures should be replaced by year 2045, indicating that the maximum savings due to indoor passive conservation should be achieved by 2045.

Table C-16: Calculated Savings (GPCD) from 2020 – 2045

Fixture Type	2020	2035	2045
Savings Due to Toilet Replacements	0.25	1.19	1.57
Savings Due to Showerhead Replacements	1.83	3.82	3.82
Savings Due to Washer Replacements	1.05	3.15	3.15
Savings Due to Dishwasher Replacements	0.05	0.15	0.15
Total Savings	**3.2**	**8.3**	**8.7**

The absolute savings (in GPCD) from **Table C-16** is applied to the calculated consumption to calculate a percent reduction for existing and future projected consumption for the Planning Area based on housing stock. Existing consumption is expected to decrease as existing homes continue to replace fixtures and appliances with more efficient devices. Additionally, unit consumption used to estimate future consumption (see Section C.3.5) is based on historic consumption and does not consider passive conservation savings. Therefore, the full savings of 8.7 GPCD is applied to all future consumption across the Planning Area.

Table C-17 shows existing and future consumption calculated in GPCD for CVWD's ID-8 Service Area and MSWD's Service Area. These GPCD values were used to calculate the percent reductions in consumption as shown in **Table C-18.** Future consumption calculated as GPCD was projected to be lower than existing consumption in GPCD. Applying the same absolute savings of 8.7 GPCD to both existing and future consumption resulted in a lower calculated percent reduction for existing consumption than for future consumption.

Table C-17: Existing and Future Consumption in Calculated GPCD by Agency

Area	Existing GPCD[1]	Future GPCD[2]
CVWD- ID-8 Service Area	316	169
MSWD Service Area	156	134

[1] Calculated by taking existing consumption (summed by TAZ) divided by applicable population.

[2] Calculated Unit Consumption (AFY/person) converted to GPCD; applicable to future population/ consumption increases only.

Table C-18: Calculated Percent Consumption Reduction Due to Indoor Passive Conservation

Year	CVWD Planning Area		MSWD/DWA Planning Area	
	% Reduction (Existing Homes)	% Reduction (Future Homes)	% Reduction (Existing Homes)	% Reduction (Future Homes)
2020	1.0%	5.1%	2.0%	6.5%
2035	2.6%	5.1%	5.3%	6.5%
2045	2.8%	5.1%	5.6%	6.5%

The actual savings from passive conservation from 2016 to 2045 is calculated by multiplying the population in 2045 times the estimated savings in GPCD in 2045 from **Table C-16**. Passive conservation is expected to save approximately 160 AFY in the CVWD Planning Area, and 700 AFY in MSWD/DWA Planning Area by 2045, which is a reduction of approximately 5.4% in future municipal consumptions compared to baseline. This reduction in consumption is conservative and appears reasonable given the anticipated growth in population and housing stock over the next 25 years.

C.3.7 Water Loss Adjustment

Water losses refer to real losses, such as leaks and spills, or the physical water lost from a utility's storage tanks and pressurized distribution system up to the point of measured customer consumption. To reduce water losses, the agencies conduct meter testing with a proactive meter replacement program, conduct leak detection and repair on agency infrastructure, and assist customers with leak detection. Although both MSWD and CVWD conduct annual water loss audits using American Water Works Association water audit software to evaluate losses, CVWD's audit is conducted on the entire water district and is not available for the subareas of the public water systems, such as ID-8.

To provide a uniform calculation of water loss for both agencies, water loss was calculated using a demand and consumption approach. This approach compares the demand, which is the metered source water (exclusively groundwater production in the Planning Area) with the metered consumption. The difference in the water produced (demand) for consumption and water consumed by the customer as measured by the customer meter is the water loss:

$$Demand - Consumption = Water\ Loss$$

A water loss adjustment is calculated by using the average annual water loss as a percent of average demand (Average annual water loss %) for recent years.

$$Average\ Annual\ Water\ Loss\ \% = \frac{Average\ Demand - Average\ Consumpion}{Average\ Demand}$$

The Average Annual Water Loss % was then applied to the annual projected consumption to calculate the annual projected demand as described in Section C.3.8:

$$Projected\ Consumption * \ (1 + Average\ Annual\ Water\ Loss\ \%\ ) \ = \ Projected\ Demand$$

Because future demand will be met by groundwater production, the calculation also provides an estimate of projected municipal groundwater production.

C.3.7.1 CVWD Planning Area

Groundwater pumped to meet demand averages 2,854 AFY from 2010 to 2019. Annual percent water loss ranged from 8.3% to 24.3%. The average percent water loss for the 10 years was 17.2% of groundwater production. The average quantity of water lost (average of groundwater production minus metered consumption for each year) was 489 AFY.

C.3.7.2 MSWD/DWA Planning Area

Groundwater pumped to meet demand averages 7,650 AFY from 2014 to 2019. Annual percent water loss ranged from 8.8% to 14.1% for this period. The average percent water loss for the 6 years was 11.3%. The average quantity of water lost (average of groundwater production minus metered consumption for each year) was 867 AFY.

C.3.8 Total Projected Municipal Demand

The total projected municipal demand is calculated by adjusting the projected municipal consumption for water loss. The consumption projections by agency are summarized in **Table C-19** by CVWD and MSWD/DWA, and Total Planning Areas.

Table C-19: Projected Consumption with Passive Conservation

Year	CVWD Planning Area Consumption			MSWD/DWA Planning Area Consumption			Total Planning Area Projected Consumption (AFY)
	Existing Users (AFY)	Future Users (AFY)	Total (AFY)	Existing Users (AFY)	Future Users (AFY)	Total (AFY)	
2020	2,303	104	2,407	6,671	638	7,309	9,715
2025	2,290	400	2,690	6,596	1,385	7,981	10,671
2030	2,278	696	2,974	6,521	2,133	8,654	11,628
2035	2,265	992	3,257	6,446	2,880	9,326	12,584
2040	2,264	1,157	3,421	6,438	3,768	10,206	13,626
2045	2,262	1,321	3,583	6,430	4,655	11,085	14,668

Consumption was then adjusted based on the average annual water loss % for each agency, calculated in Section C.3.7 as shown in **Table C-20**, to convert projected consumption into projected demand values.

Table C-20: Average Annual Water Loss % by Agency

CVWD	MSWD
17.2%	11.3%

The equation below was used to develop projected demand by agency area as shown in **Table C-20** and on **Figure C-9**.

$$Projected\ Consumption * (1 + Average\ Annual\ Water\ Loss\ \%) = Projected\ Demand$$

Total projected demand is estimated to increase from 10,485 AF in 2016 to 16,822 AF in 2045 in the Planning Area. Total demand for 2016 is based on actual demands from existing customers in the CVWD and MSWD municipal service areas. Demands from these existing customers continues into the future and has been adjusted for passive conservation**.** For year 2020 and future years, the demand for future development is forecasted by multiplying projected SCAG population within each TAZ (subdivided by Agency) by unit consumption and adjusting for passive conservation and water loss.

Table C-21: Projected Municipal Production (Demand) by Area

Year	CVWD Planning Area Production			MSWD/DWA Planning Area Production			Total Planning Area Projected Production (AFY)
	Existing (AFY)	Future (AFY)	Total (AFY)	Existing (AFY)	Future (AFY)	Total (AFY)	
2020	2,781	126	2,907	7,519	719	8,238	11,145
2025	2,766	483	3,249	7,435	1,562	8,997	12,245
2030	2,751	841	3,592	7,351	2,404	9,755	13,346
2035	2,735	1,198	3,933	7,266	3,247	10,513	14,447
2040	2,734	1,397	4,131	7,257	4,247	11,504	15,634
2045	2,732	1,596	4,328	7,247	5,247	12,494	16,822

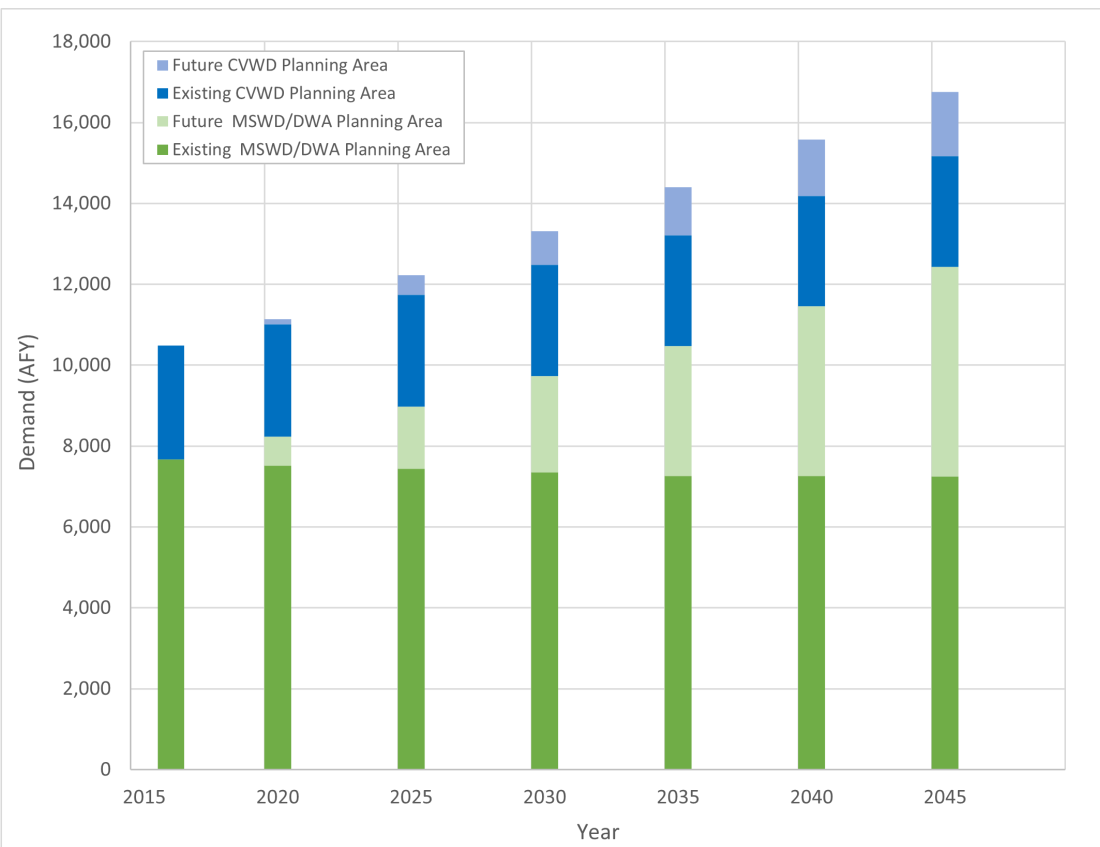


Figure C-9: Projected Municipal Demand by CVWD Planning Area and MSWD/DWA Planning Area

C.4 Private Groundwater Production

In addition to the municipal water demand, other types of demand must be accounted for when estimating the total demand in the Planning Area. Other demands in the Planning Area include private wells serving agricultural, golf and industrial demands, as well as residences and businesses. Private well production falls into two categories (see Section 2.4.1 of the Alternative Plan Update), including:

1. Metered well production from larger wells serving agricultural, golf, and industrial demands that is subject to the RAC levied by DWA or CVWD, and
2. Estimated unmetered production from smaller private wells that produce groundwater below the thresholds established for reporting by CVWD and DWA (25 AFY and 10 AFY respectively).

C.4.1 Metered Private Groundwater Production

Metered private groundwater pumping data for the years 2015-2019 were extracted from 15 private wells subject to CVWD or DWA RAC. Pumping from 14 of the wells averaged 3,490 AFY for the MCSB portion of the Planning Area (1,417 AFY in the CVWD Planning Area and 2,073 AFY in the MSWD/DWA Planning Area). The remaining private well, which is in the GHSA, has an average pumping of 13.9 AFY. These metered private wells provide irrigation for golf course properties (73%), agricultural uses such as fish farms and equestrian facilities (18%), and industrial uses (9%).

The average metered private groundwater demand in the Planning Area from 2015-2019 was 3,504 AFY. This metered private groundwater demand is used in the total demand projections and with one exception is assumed to remain constant through the planning horizon. The one exception is production from CVP Sentinel Energy Project. This project is anticipated to be complete by 2040. Therefore, based on the anticipated annual production associated with this project through 2040, the average metered private well demand will be reduced by 295 AFY starting in 2041.

C.4.2 Unmetered Private Groundwater Production Estimates

Unmetered groundwater demand is estimated to be a small percentage of the total water demand in the Planning Area. Estimates of this demand relied on extrapolation from available metered municipal and private pumping data. Most unmetered private well pumping is believed to occur for domestic purposes within the CVWD Planning Area of the MCSB.

Unmetered production is primarily from private groundwater pumpers that produce less than the reporting thresholds of 25 AFY and 10 AFY for the CVWD and DWA RAC Programs, respectively. As a result, these pumpers are not required to report production or pay the RAC.

The estimate of private pumping for the CVWD Planning Area was based on CVWD historical well records that indicated there may be over 150 private wells capable of producing groundwater but of unknown status. Assuming one-third are operational and pump an average of 10 AFY, the minimum production for private pumpers was estimated as 10 * (150/3) = 500 AFY (Wood, 2021). This assumption was carried over from each annual Water Supply and Replenishment Assessment Engineer's Report from 2015. The most recent Water Supply and

Replenishment Assessment Engineer's Report prepared for CVWD states that "the maximum groundwater pumping by the unmetered minimal pumpers in the management area is estimated to be less than 500 AFY" (WEI, 2020).

An estimate of unmetered private pumping was prepared using available data in an effort to corroborate the 500 AFY estimate. Using SCAG population estimates and CVWD meter data, the population in the CVWD Planning Area that is outside the ID-8 service area was assumed to be served by unmetered private pumping.

The SCAG population located within the CVWD Planning Area was given as 8,875 while the ID-8 Service Area's population was 6,565. The population within the Planning Area boundaries but outside of the existing ID-8 Service Area was calculated to be approximately 2,300 persons in 2016. This population represents residences that obtain water via private unmetered groundwater pumping and not from ID-8 municipal service.

Using the calculated CVWD average residential unit consumption factor (see Section C.3.2) and adjusting for the percent water loss (conservatively estimated to be 10% for private wells), the unmetered private pumping was estimated to be 479 AFY in 2016 and assumed to have no growth in production in the future but is adjusted for passive conservation.

This estimate of unmetered private pumping is very similar to the previous assumption of 500 AFY but is based on available data.

C.5 Total Projected Demand

The final water demand projections for the Planning Area (i.e., the amount of groundwater pumping needed to meet demand projections) are calculated by combining all types of demand including:

- Projected groundwater production required to meet future municipal demands.
- Historical private metered groundwater production subject to the RAC is assumed to remain constant through the planning horizon.
- Estimated unmetered private well demand is assumed to remain stable through the planning horizon but is adjusted for passive conservation.

As shown on **Figure C-9,** total municipal demand is expected to increase from 11,145 AFY in 2020 to 16,822 AFY in 2045, an increase of 5,677 AFY or approximately 50%. Estimated unmetered private well demand decreases slightly over the planning period from 474 AFY in 2020 to 466 AFY in 2045, as a result of passive conservation. Metered private well demand is assumed to be constant over the planning period (3,504 AFY).

In summary, total projected demand between 2020 and 2045 increases from 15,123 AFY (in 2020) to 20,792 AFY (in 2045), an increase of 5,669 AFY or approximately 37%.

Table C-22 presents water demand projections for the Planning Area in five-year increments.

Table C-22: Total Projected Demand for the Planning Area

Year	Municipal Demand (AFY)	Estimated Unmetered Private Well Demand (AFY)	Estimated Metered Private Well Demand (AFY)	Total Projected Demand (AFY)
2020	11,145	474	3,504	15,123
2025	12,245	472	3,504	16,221
2030	13,346	469	3,504	17,319
2035	14,447	466	3,504	18,417
2040	15,634	466	3,504	19,605
2045	16,822	466	3,504	20,792

Figure C-10 presents projected demand as a stacked graph. Existing municipal and unmetered private demand is carried forward in 5-year increments and declines slightly as it is adjusted for passive conservation adjustment over time (see green and purple areas on **Figure C-10**. No change in existing metered private pumping is assumed and no passive conservation adjustment is applied to this type of irrigation use (see gray area on **Figure C-10** The final demand component shown on **Figure C-10** (blue area) shows future municipal groundwater demand resulting from population growth and development. The total of the stacked graphs shows the projected total groundwater demand for the Planning Area.

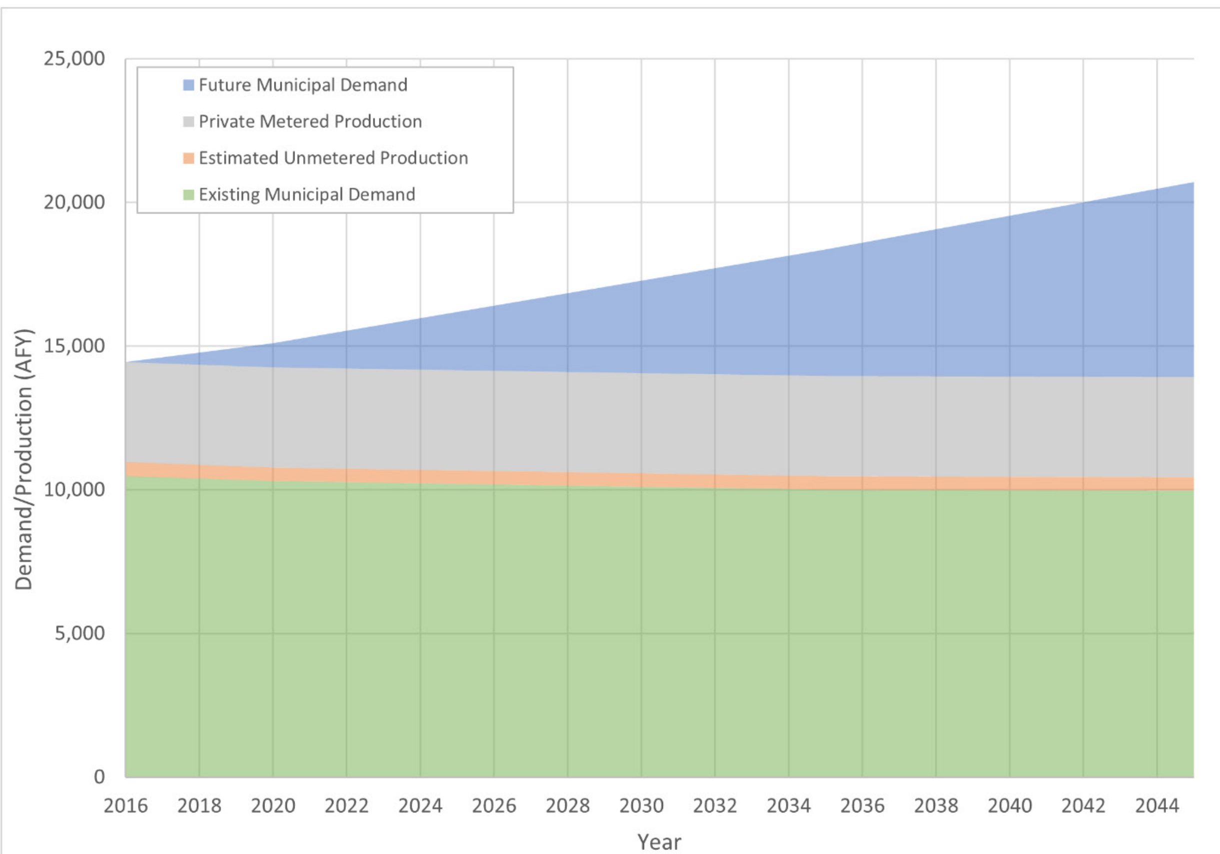


Figure C-10: Total Demand Projections for the Planning Area

Appendix D
Communications and Engagement Plan

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Acronyms and Abbreviations

Acronym	Definition
CDWR	California Department of Water Resources
CVWD	Coachella Valley Water District
DAC	Disadvantaged Community
DWA	Desert Water Agency
FAQ	frequently asked question
GSAs	Groundwater Sustainability Agencies
GSP	Groundwater Sustainability Plan
Kennedy Jenks	Kennedy/Jenks Consultants, Inc.
MC-GH WMP	Mission Creek-Garnet Hill Water Management Plan
MCSB	Mission Creek Subbasin
MHI	mean household income
MSWD	Mission Springs Water District
MWD	Metropolitan Water District of Southern California
NGO	nongovernmental organization
SGMA	Sustainable Groundwater Management Act
SWP	State Water Project

D.1 Introduction

On behalf of the Coachella Valley Water District (CVWD), Desert Water Agency (DWA), and Mission Springs Water District (MSWD) (collectively the Management Committee), Kennedy/Jenks Consultants, Inc. (Kennedy Jenks), has prepared this Communications and Engagement Plan to provide information to and seek feedback from stakeholder groups that use and benefit from the groundwater resources in and around the Mission Creek Subbasin. Stakeholder communication and engagement is a required element of the Sustainable Groundwater Management Act (SGMA) and this outreach is conducted as part of the SGMA-required five-year update of the Mission Creek Subbasin Alternative Plan (Alternative Plan Update).

In the case of the Mission Creek Subbasin (MCSB), the groundwater sustainability planning requirements of SGMA were met through an Alternative Plan, consisting of the 2013 Mission Creek-Garnet Hill Water Management Plan (2013 MC-GH WMP)[1] and the 2016 Bridge Document.[2] The 2013 MC-GH WMP was an existing water management plan that was implemented to manage water resources, including groundwater, in the MCSB and Garnet Hill Subarea. The 2016 Bridge Document showed how the 2013 MC-GH WMP is the functional equivalent of a Groundwater Sustainability Plan (GSP) under SGMA. Together, these documents form the Mission Creek Subbasin Alternative Plan, which was approved in July 2019 by the California Department of Water Resources (CCDWR). As part of the SGMA-required 5-year updates to Alternative Plans, an update to the MCSB Alternative Plan (Alternative Plan Update) is due for submittal to CDWR by January 1, 2022. The Alternative Plan Update will include a summary of the communications and engagement efforts with stakeholders.

This Communications and Engagement Plan was prepared in general conformance with the CDWR Guidance Document[3] for stakeholder communication and engagement. The subsections that follow provide the background and objectives of the Communications and Engagement Plan, stakeholder identification, key messages and discussion topics, venues for engagement, implementation timeline, and approach for evaluation and assessment of communications activities.

D.2 Background and Objectives

D.2.1 Background

The Alternative Plan Update Planning Area is shown on **Figure D1**. The Planning Area is located in the northwestern portion of the Coachella Valley Groundwater Basin that extends from the San Bernardino Mountains to the Salton Sea. The Planning Area is focused on the Mission Creek Subbasin, but also includes the Desert Hot Springs Subbasin that relies on the Mission Creek Subbasin for all of its potable water supply. The Desert Hot Springs Subbasin has higher salinity

1MWH, 2013, Mission Creek/Garnet Hill Water Management Plan Final Report, prepared for Coachella Valley Water District, Desert Water Agency, Mission Springs Water District, prepared by MWH, January.

2Stantec, 2016, SGMA Alternative Groundwater Sustainability Plan Bridge Document for the Mission Creek Subbasin, prepared for Coachella Valley Water District, Desert Water Agency, and Mission Springs Water District, December.

3CDWR, 2018, Guidance Document for Groundwater Sustainability Plan Stakeholder Communication and Engagement, California Department of Water Resources, January.

groundwater that is generally not suitable for potable water supply but is known as a tourist destination with its small spa hotels supplied by hot mineral water from the Desert Hot Springs Subbasin. The Desert Hot Springs Subbasin has been designated a low priority basin by CDWR and does not require a GSP. The Planning Area also includes the Garnet Hill Subarea of the Indio Subbasin because this subarea has historically been included with the Mission Creek Subbasin for water management planning purposes and some groundwater is exported from this subarea to the Mission Creek Subbasin. The Indio Subbasin will also require submittal of an Alternative Plan Update on the same schedule as the Mission Creek Subbasin. The Garnet Hill Subarea will be included in the Indio Subbasin Water Management Plan Update for SGMA compliance.

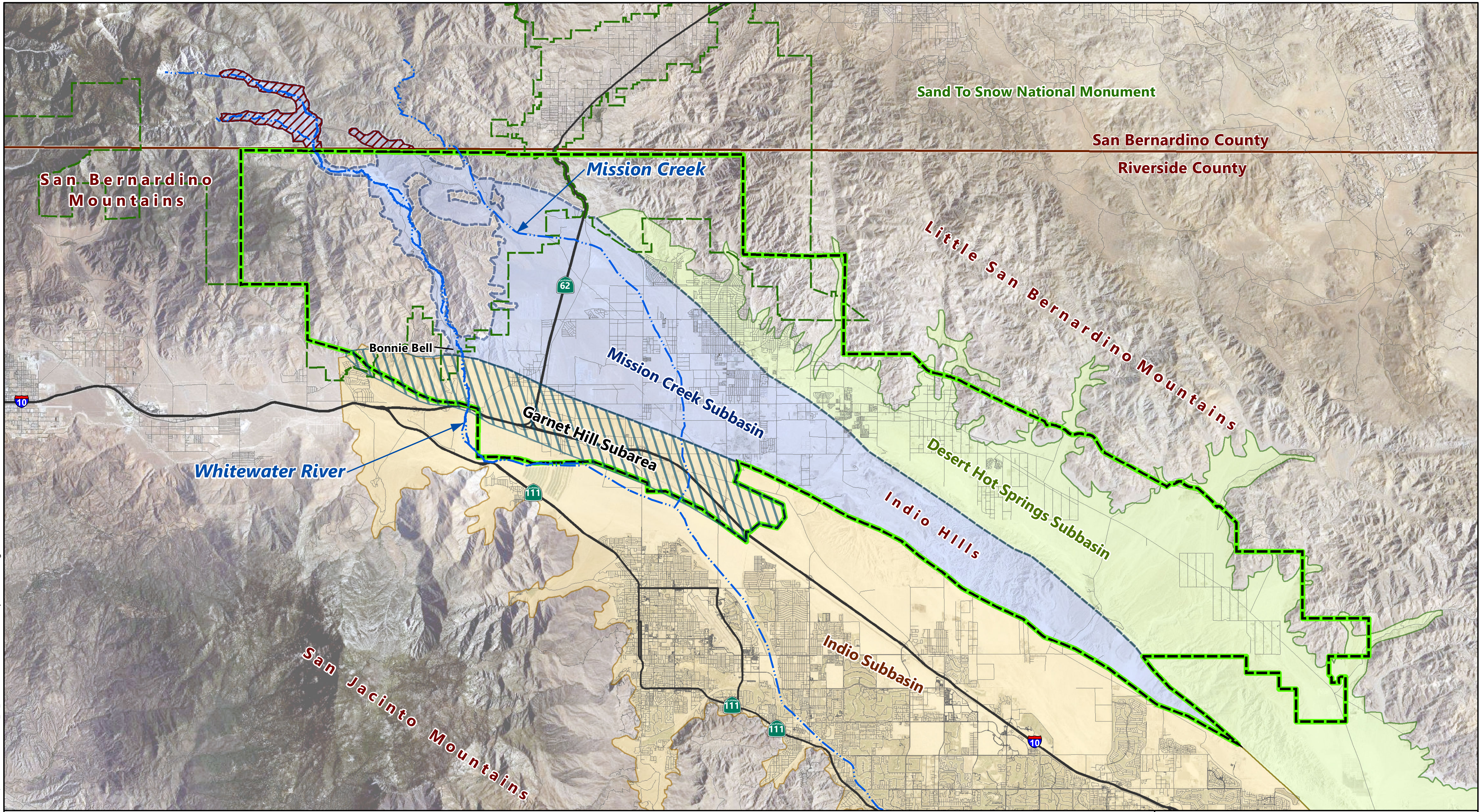
The Planning Area is located within the northwestern portion of the hot, arid Colorado Desert sub-region of the Sonoran Desert. Continued pumping of groundwater from the Mission Creek Subbasin in excess of natural recharge resulted in steadily declining groundwater levels since the 1950s until about 2004. To control the groundwater level declines, DWA and CVWD implemented a groundwater replenishment program in 2002 using imported water. DWA and CVWD entered into separate agreements with the State of California to purchase water from the State Water Project (SWP) in 1962 and 1963, respectively. However, there is currently no infrastructure to physically deliver SWP water to DWA or CVWD. As a result, DWA and CVWD signed a water exchange agreement with the Metropolitan Water District of Southern California (MWD) to deliver an equivalent amount of Colorado River Water in exchange for DWA's and CVWD's SWP water. DWA constructed spreading basins in the Mission Creek Subbasin and imported water deliveries began in 2002.

The Agencies submit annual reports in accordance with the SGMA reporting requirements. Based on the SGMA Annual Report for Water Year 2019-2020,[4] since 2004, the Mission Creek Subbasin has gained more than 37,000 acre feet of groundwater in storage. Since 2009, the 10-year running average of groundwater storage in the Mission Creek Subbasin has shown a net positive change in groundwater storage.

D.2.2 Management Committee

In 2004, CVWD, DWA, and MSWD signed a Settlement Agreement to create the Mission Creek Subbasin Management Committee, composed of at least one member or representative for each agency. The Settlement Agreement required the Management Committee to prepare a water management plan for the Mission Creek Subbasin and Garnet Hill Subarea.

4 Wood Environment & Infrastructure Solutions, Inc., 2021, Mission Creek Subbasin Annual Report for Water Year 2019-2020, prepared for Coachella Valley Water District, Desert Water Agency, and Mission Springs Water District, February.



Date: 8/14/2020 Printed by: pat.herring
Path: Y:\CM19167351 (Mission Creek Alternate)\Esri\Website+FAQ_tb_Mission-Creek-Alternative Update Planning Area.mxd

Explanation

- Planning Area
- Sand to Snow National Monument (Bureau of Land Management)
- Highway/road
- Mission Creek Subbasin
- Indio Subbasin
- Desert Hot Springs Subbasin
- Garnet HIll Subarea of Indio Subbasin
- Mission Creek Subbasin fringe area

0 7,500 15,000
Approximate Scale in Feet

Basemap modified from aerial photograph provided by National Agriculture Imagery Program (NAIP), dated 2018. GSA areas from SGMA.

ALTERNATIVE UPDATE PLANNING AREA
Mission Creek Subbasin Alternative Update
Coachella Valley, California

By: pah	Date: 8/14/2020	Project No.: CM19167351
wood.	Figure	D1

D.2.3 Water Management Plan/Alternative Plan Update

A memorandum of understanding among CVWD, DWA, and MSWD, was executed on July 27, 2009, to prepare a water management plan and develop a groundwater model for the Mission Creek Subbasin and Garnet Hill Subarea, and the 2013 MC-GH WMP was subsequently completed. Following the passage of the SGMA in 2014, the 2016 Bridge Document was prepared showing that the 2013 MC-GH WMP was in compliance with SGMA. This current effort, initiated in late 2019, is to prepare the Alternative Plan Update which is required to be submitted to CDWR by January 1, 2022.

The Management Committee intends to prepare the Alternative Plan Update to:

- Address CDWR's comments on the Alternative Plan,
- Complete updates to the groundwater model to reflect current information regarding demands and supplies,
- Demonstrate that the Alternative Plan can continue to "manage the water resources to meet demands reliably and protect water quality in a sustainable and cost effective manner" as described in the mission statement of the 2013 MC-GH WMP, and
- Meet SGMA sustainability goals.

As part of the Alternative Plan Update, public comment will be accepted throughout the update process via public meetings or e-mails. The Draft Alternative Plan Update public comment period will take place in the fall of 2021 and will be 30 days long. After responding to all comments received during the Draft Alternative Plan Update public comment period, the final Alternative Plan Update will be submitted to CDWR by January 1, 2022. CDWR will then have a 60--day public comment period for the Final Alternative Plan Update.

D.2.4 Communication Objective

The communication objective to support the Alternative Plan Update is to engage in public outreach that includes water users and stakeholders within the subbasin, including coordination with neighboring Groundwater Sustainability Agencies (GSAs) and state and federal agencies. The goals of public engagement are to understand the needs of stakeholders and communities within the Planning Area, increase awareness and understanding of the Alternative Plan Update, and encourage active participation in the update process. Stakeholder and general public engagement will be promoted throughout the planning process.

D.3 Stakeholder Identification

The term "stakeholder" refers to representatives of agencies, tribes, nonprofit groups, nongovernmental organizations (NGO), government organizations, private residents, and adjacent GSAs who are interested in or could be affected by the development and implementation of the Alternative Plan Update. CDWR has several categories of stakeholders that may be included in stakeholder engagement outlined in its SGMA Stakeholder Communication and Engagement Digital Toolkit. A separate Disadvantaged Community (DAC) outreach process, using existing avenues such as the NGO community, is also underway and discussed further below.

A stakeholder list, building on the Coachella Valley Integrated Regional Water Management stakeholder list, was assembled in consultation with the Public Information Officers from the Agencies and was updated throughout the preparation of the Alternative Plan Update. The organizations that are currently a part of the stakeholder list are found in **Attachment D1**.

Engagement with stakeholders has included an introductory letter targeted at the entities engaged in land use and water planning, private groundwater pumpers, and the Regional Water Quality Control Board. E-mail invitations for public Alternative Plan Update meetings have been sent to all stakeholders including land use agencies, public and private water users, the environmental community, tribes in the region, and others.

D.4 Stakeholder Input

Public meetings have included an opportunity for stakeholders to provide input regarding issues, interests, and challenges in verbal and written form and meet others who may have similar concerns. Following initial outreach, follow-up actions have included additional small group meetings and/or telephone calls on an as-needed basis.

D.4.1 DAC Outreach

DAC outreach is also being conducted in order to obtain input from groups that may be otherwise limited from participating in the Alternative Plan Update process and implementation due to barriers such as financial or language constraints. DACs are defined as areas having a mean household income (MHI) 80 percent or less than the statewide MHI. Targeted outreach to DACs is conducted to ensure that the Alternative Plan Update approach and concepts are understood and input about water-related issues is received. Outreach has been focused on residents in DAC areas and non-governmental organizations and others that work in the communities and have insight into DAC interests and challenges. Outreach methods include e-mail and phone call communications inviting these groups to attend all public workshops, a bi-lingual flyer about the Alternative Plan Update, and public workshops, as well as a Spanish-language version of the website described below and other outreach materials.

D.4.2 Tribal Outreach

Although there are no federally recognized tribes or Tribal lands in the MCSB Alternative Plan Update Planning Area, the Planning Area may include tribal ancestral lands and may also potentially impact neighboring subbasins that support overlying Tribal lands. Therefore, tribal representatives in the Coachella Valley region are included in the contact list to maintain an open line of communication regarding the public meetings and the Alternative Plan Update. The contact list includes representatives from the Agua Caliente Band of Cahuilla Indians, Augustine Band of Cahuilla Indians, Cabazon Band of Mission Indians, 29 Palms Band of Mission Indians, Morongo Band of Mission Indians, and Torres-Martinez Desert Cahuilla Indians.

D.5 Key Messages and Discussion Topics

The prior public meetings during the preparation of the 2013 MC-GH WMP identified that

> "Questions and comments from the public focused on water levels, water quality changes, water conservation, costs of sewer construction and water rates."

Messages and discussion topics during Public Outreach meetings have centered on the Alternative Plan, SGMA and the Alternative Plan Update content and process, and will be refined as questions arise during the outreach process. A Frequently Asked Questions (FAQ) document, which will be updated as appropriate, has been prepared and displayed on the Alternative Plan website: www.MissionCreekSubbasinSGMA.org.

D.6 Venues for Engaging

The initial stakeholder engagement consisted of an e-mail and/or outreach letter to stakeholder contacts. Agency representatives have continued to extend open invitations to the SGMA public meetings at other organization meetings. In addition, telephone contact will continue to be made with the DAC target organizations to encourage participation. Some stakeholders are familiar with the Alternative Plan Update effort as similar efforts are ongoing in neighboring subbasins.

A website to share information about the Mission Creek Subbasin and the Alternative Plan Update, Public Workshop materials, contact information, and answers to FAQs has been developed and maintained. The website URL is: www.MissionCreekSubbasinSGMA.org. The website has also been translated into Spanish and can be accessed at the same URL. Spanish translation for meeting materials and other documents can be provided upon request. The website was updated throughout the Alternative Plan Update process as new information became available.

Due to Covid-19 restrictions, a virtual initial public meeting open to all interested parties was held on July 15, 2020 to provide background and a roadmap to the Plan Update process. If a face-to-face meeting is feasible during the Alternative Plan Update period, based on consultation with the Public Information Officers for the Agencies, a single location in the Desert Hot Springs area with an early evening meeting time will be suggested for the public meetings to maximize likelihood of participation. After receiving feedback from the initial public meeting, follow-up public meetings with the stakeholders, DACs and other representatives will be planned at key times during the Alternative Plan Update process.

D.7 Implementation Timeline

The following is a timeline for the activities to date related to Communications and Engagement:

January 31, 2020: Letter to planning agencies and to Regional Water Quality Control Board provided via e-mail by Michael Nusser, Water Resources Associate, CVWD

March 10, 2020: Draft website content for Management Committee Review

May 6, 2020 – Spanish translation of website content received

May 26, 2020, Disadvantaged Community Outreach by direct telephone call initiated

June 22, 2020 – Initial e-mail to over 150 contacts issued

June 2020 – Website launch: ***www.MissionCreekSubbasinSGMA.org***

July 8, 2020 – Letter to groundwater producers subject to CVWD and DWA Replenishment Assessment Charges provided via e-mail by Michael Nusser, Water Resources Associate, CVWD and Ryan Molhoek, Senior Engineer, DWA

July 14, 2020 – Reminder e-mail for first public meeting

July 15, 2020 – Virtual Initial Public Meeting with 42 attendees Presentation available at: http://www.missioncreeksubbasinsgma.org/wp-content/uploads/2020/07/MCSB_Workshop-1-Presentation_v7.pdf

October 20, 2020 – Virtual Public Meeting with 28 attendees. Presentation available at: http://www.missioncreeksubbasinsgma.org/wp-content/uploads/2020/10/MCSB_Workshop-2-Presentation_102220_final.pdf

May 11, 2021 – Virtual Public Meeting with 31 attendees. Presentation available at: http://www.missioncreeksubbasinsgma.org/wp-content/uploads/2021/07/MCSB_Workshop-3_051121_final-1.pdf

October 27, 2021 – Virtual Public Meeting with 19 attendees. Presentation available at: http://www.missioncreeksubbasinsgma.org/wp-content/uploads/2021/10/Pdf-for_postingMCSB_Workshop-4_102521-final.pdf

The schedule for Alternative Plan Update activities is provided in **Table D1.**

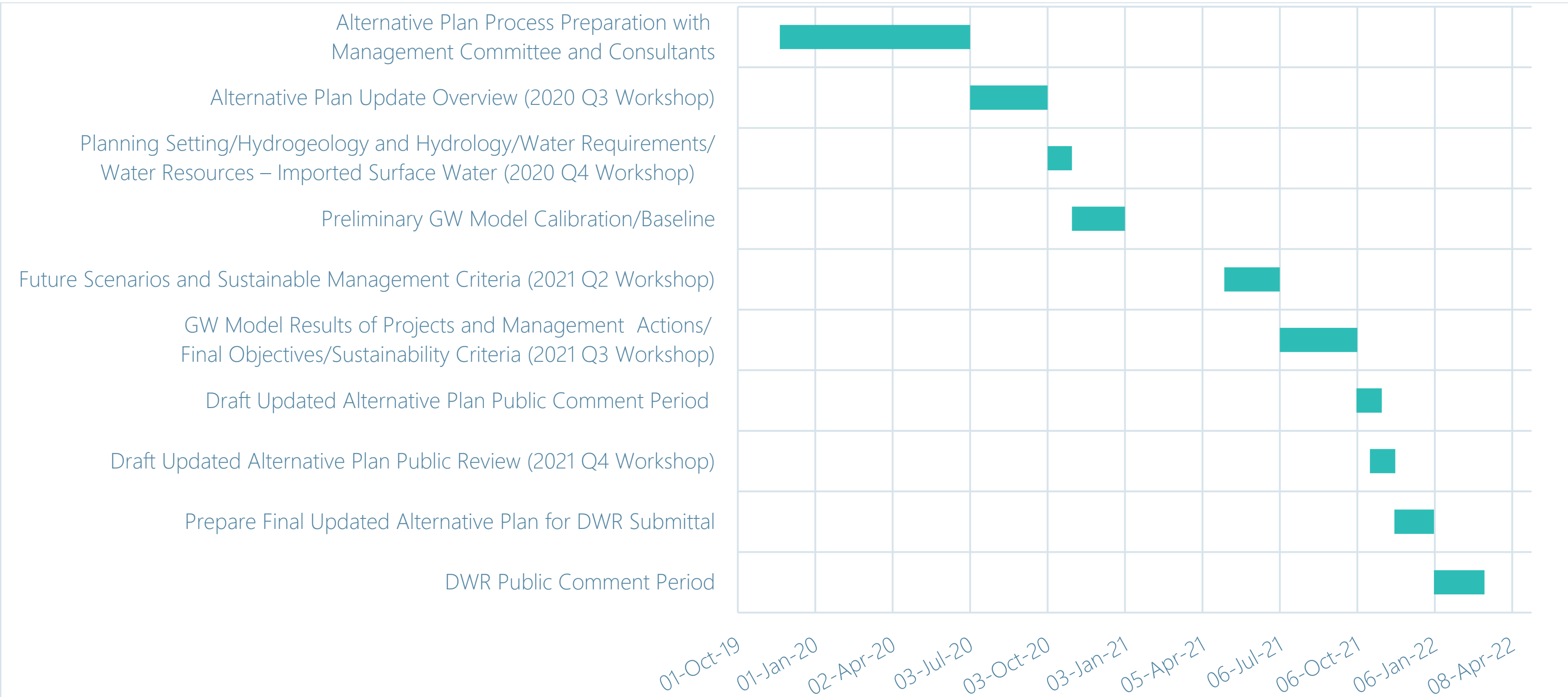
Stakeholder engagement activities that are planned to continue include:

- Maintaining the website http://www.missioncreeksubbasinsgma.org/.
- E-mail announcements:
  - When Annual Reports are available,
  - When presentations to Agency Boards are made, and
  - When Five-Year Alternative Plan Updates are under development.
- Public presentations regarding Annual Reports (e.g., during Agency Board Meetings).

D.8 Evaluation and Assessment

An adaptive management approach will be taken for communication and engagement for the Alternative Plan Update and this Communications and Engagement Plan may be revised as necessary. After discussions with stakeholders during public meetings, feedback on the means of communication, the content of communications and level of engagement will be evaluated, and adjustments will be made accordingly.

Table D1: Alternative Plan Update Schedule



Attachment D1

Stakeholder Organization Reference List

Organization Name
29 Palms Band of Mission Indians
Advancing Desert Hot Springs
Agua Caliente Band of Cahuilla Indians
Alianza Neighborhoods Action Team
Assemblyman Eduardo Garcia's Office
Augustine Band of Cahuilla Indians
Building Healthy Communities
Building Healthy Communities Neighborhoods Action Team
Bureau of Indian Affairs
CA Department of Housing and Community Development
Cabazon Band of Mission Indians
Cabazon Water District
California Department of Water Resources (CDWR)
Catholic Charities
City of Banning
City of Cathedral City
City of Desert Hot Springs
City of Palm Springs
Clean Water Action
Clinicas de Salud
Coachella Rural Legal Assistance
Coachella Valley Association of Governments: Conservation Commission
Coachella Valley Association of Governments
Coachella Valley Association of Governments / Coachella Valley MSHCP
Coachella Valley Cannabis Alliance Network (CVCAN)
Coachella Valley Economic Partnership
Coachella Valley Housing Coalition
Coachella Valley Mosquito and Vector Control District
Coachella Valley Resource Conservation District
Coachella Valley Water District
Coachella Valley Water District - Board of Directors
Coachella Water Authority
County of Riverside
County of Riverside Economic Development Agency
Desert Edge Community Council
Desert Healthcare District
Desert Hot Springs Chamber of Commerce
Desert Water Agency
Desert Hot Springs (DHS) Hoteliers
El Sol Neighborhood Education Center
Environmental Justice Coalition for Water

Organization Name
Friends of the Desert Mountains
Golf Course Superintendents Association of America
Golf Course Task Force (Coachella Valley Golf and Water Task Force)
Indio Water Authority
Jeff Stone - District Director
Leadership Council
Lideres Campesinas
Mission Springs Water District
Morongo Band of Mission Indians
Natural Science Collaborative of the Desert Region
Palm Springs Unified School District
Pueblo Unido Community Development Corporation (CDC)
Rural Community Assistance Corporation (RCAC)
Regional Water Quality Control Board, Colorado River Region
Representative from Supervisor Manuel Perez
Riverside County Department of Environmental Health (DEH)
Riverside County Economic Development Agency (EDA)
Riverside County Flood Control and Water Conservation District
Riverside County Transportation and Land Management Agency
San Gorgonio Pass Water Agency
South Coast Air Quality Management District Environmental Justice Advisory Committee (SCAQMD EJAC)
Sky Valley Community Council
Thousand Palms Community Council
Torres Martinez Desert Cahuilla Indians
United States Department of Agriculture (USDA)
USDA Rural Development
Wildland Conservancy

Appendix E
Monitoring and Reporting

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Acronyms and Abbreviations

Acronym	Definition
AF	Acre-Feet
AFY	Acre-Feet per Year
BMP	Best Management Practice
CASGEM	California Statewide Groundwater Elevation Monitoring
CDWR	California Department of Water Resources
COC	constituent of concern
CV-SNMP	Coachella Valley Groundwater Basin Salt and Nutrient Management Plan
CVWD	Coachella Valley Water District
DDW	Division of Drinking Water
DMS	Data Management System
DWA	Desert Water Agency
GAMA	Groundwater Ambient Monitoring and Assessment
GHSA	Garnet Hill Subarea of the Indio Subbasin
GMP Workplan	Groundwater Monitoring Program Workplan for the Coachella Valley Salt and Nutrient Management Plan Update
GPS	Global Positioning System
InSAR	Interferometric Synthetic Aperture Radar
MC-GRF	Mission Creek Groundwater Replenishment Facility
MCL	Maximum Contaminant Level
MCSB	Mission Creek Subbasin
MNM	Monitoring Network Module
MSWD	Mission Springs Water District
RWQCB	Colorado River Basin Regional Water Quality Control Board
SAR	Synthetic Aperture Radar
SDIS	Safe Drinking Water Information System
SGMA	Sustainable Groundwater Management Act
TDS	total dissolved solids
USGS	United States Geological Survey
WY	Water Year

E.1 Introduction

This Appendix describes the existing and proposed monitoring networks that will be used to monitor the Sustainable Management Criteria for the Mission Creek Subbasin (MCSB), which are described in Section 6 of this document. The monitoring networks for the Garnet Hill Subarea (GHSA) in the Indio Subbasin will be developed separately for the Indio Subbasin Water Management Plan Update (Todd Groundwater and Woodard & Curran [Todd/W&C, 2021]).

Data collected from the monitoring networks will be evaluated for short-term and long-term trends for the following sustainability groundwater indicators: groundwater levels, groundwater storage, subsidence, and groundwater quality. As described in Section 6, there is sufficient evidence to eliminate two of the sustainability indicators from further consideration – seawater intrusion and depletion of interconnected surface waters. Therefore, no monitoring network is proposed for these sustainability indicators.

This Appendix includes a description of the monitoring network, monitoring protocols, assessment and improvement of monitoring networks, and data storage and reporting procedures.

E.2 Description of the Monitoring Networks

This section includes an overview of the existing monitoring programs, their corresponding monitoring networks, and proposed new monitoring facilities. The section also includes a general description of monitoring procedures.

E.2.1 Overview of Existing Programs and Networks

The Agencies have existing programs in place to monitor groundwater levels and groundwater quality in the MCSB. Additionally, the California Department of Water Resources (CDWR) has a statewide program for monitoring ground levels to assess downward ground level vertical displacement (subsidence). These programs will be used for future data collection and will be coordinated with Sustainable Groundwater Management Act (SGMA) monitoring requirements. The relevant monitoring networks for groundwater levels, groundwater storage, land subsidence, and water quality are summarized in the following subsections.

E.2.1.1 Groundwater Levels

In response to 2010 legislation, the CDWR developed the California Statewide Groundwater Elevation Monitoring (CASGEM) program to track seasonal and long-term trends in groundwater elevations in California's groundwater basins. Four wells in the MCSB are monitored as part of the CASGEM program.[1]

Apart from the CASGEM program, the hydrologic system of the Coachella Valley has been extensively monitored by various agencies for many years. Monitoring data for the MCSB are available for some wells since the 1950s. In addition to monitoring groundwater levels for CASGEM compliance, Coachella Valley Water District (CVWD), Desert Water Agency (DWA), and Mission Springs Water District (MSWD) monitor groundwater levels in 20 additional wells in the

1 CDWR is replacing CASGEM with the Monitoring Network Module (MNM) for Alternative Plan reporting.

MCSB. As identified in Section 6 of this Alternative Plan Update, nine of these monitoring wells will be used as Key Wells for the purpose of establishing and monitoring Sustainable Management Criteria for water levels, storage, and subsidence. The other wells will be used to augment groundwater level data for groundwater contouring. **Table E-1** provides a summary of available information for the Key Wells and other monitoring wells in the MCSB. **Figure E-1** shows the locations of the monitoring wells including those designated as CASGEM or Key Wells.

MSWD monitors groundwater levels in its wells monthly while CVWD monitors groundwater levels in its wells three times per year. DWA monitors groundwater levels monthly in its monitoring well located near the Mission Creek Groundwater Replenishment Facility (MC-GRF) and monitors two private production wells, under static conditions monthly.

E.2.1.2 Groundwater Storage

Groundwater storage will be monitored in three ways:

(1) Through a MCSB water balance calculated annually based on MCSB inflows and outflows as described in Section 5 of the Alternative Plan Update and in the SGMA Annual Reports for MCSB (e.g., Wood, 2021). The water balance will incorporate the latest groundwater model estimate of long-term inflows from mountain front recharge and interbasin underflow,

(2) By preparation of a change in storage map comparing change in groundwater levels with the current year compared to 2009 groundwater levels, and

(3) By comparing average water levels in the Key Wells to the average of the Minimum Thresholds for groundwater levels. Because the nine Key Wells are spatially distributed in the main MCSB and the water level Minimum Thresholds are based on 2009 groundwater levels (but slightly lower to provide operational flexibility), this comparison will provide a general estimate of the groundwater storage for any given year relative to groundwater storage in 2009.

E.2.1.3 Land Subsidence

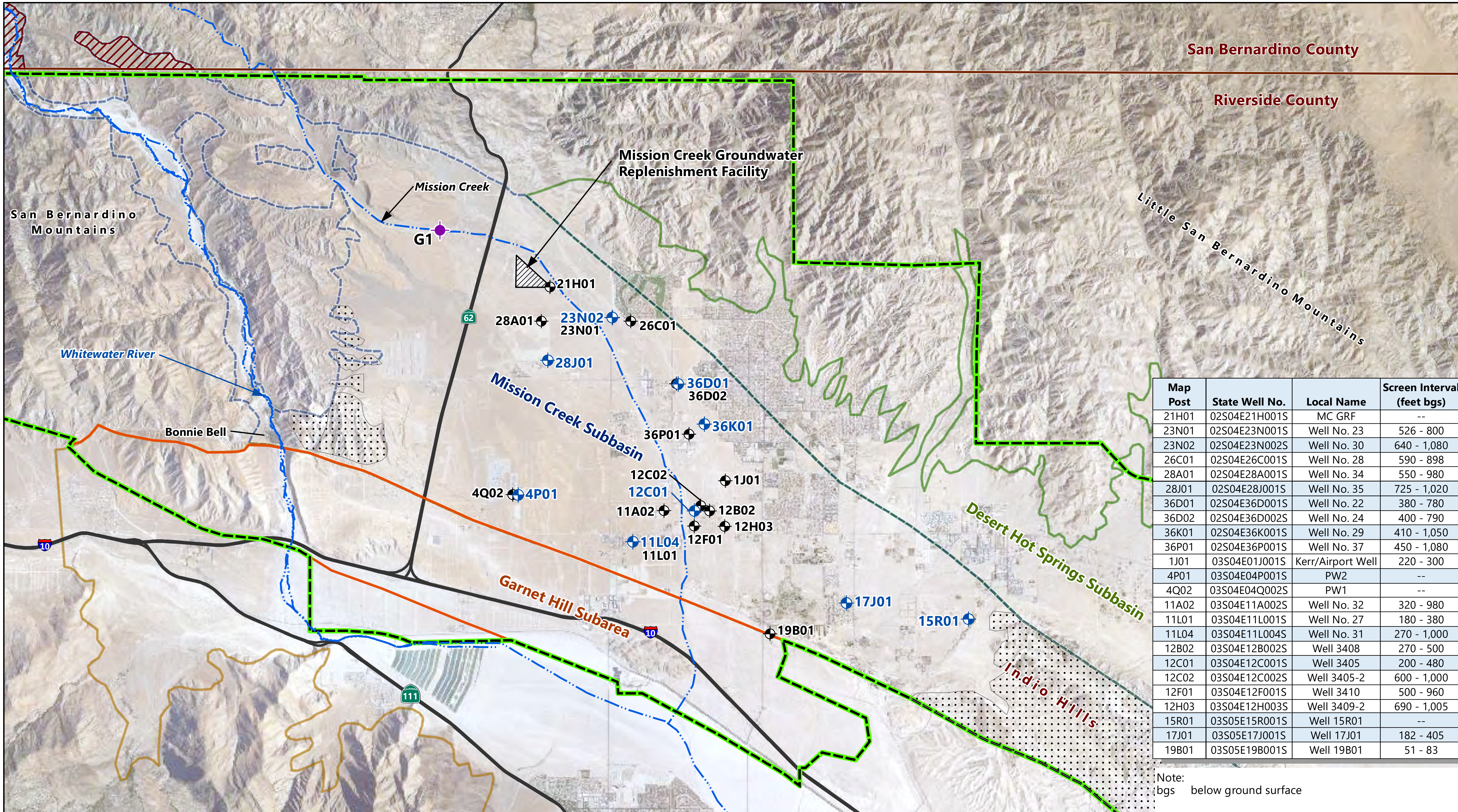
Ground level vertical displacement data based on Interferometric Synthetic Aperture Radar (InSAR) collected by the European Space Agency Sentinel-1A satellite and processed by TRE ALTAMIRA Inc., under contract with the CDWR is available for the MCSB. A summary of this information was included in most recent SGMA Annual Report (Wood, 2021) and will be included in future SGMA Annual Reports for the MCSB provided that CDWR continues to collect these data. Subsidence will be evaluated on a yearly basis and the results will be included in the SGMA Annual Reports for the MCSB.

CVWD, in collaboration with the other Agencies, has engaged the United States Geological Survey (USGS) to study land subsidence in the MCSB. A description of this new program is provided in Section 1.3.

Table E-1: Key Wells and Other Monitoring Wells in the MCSB

State Well No.	Local Name	Well Owner	Screen Interval (feet bgs)	CASGEM Monitoring	Key Well
02S04E21H01S	MC-GRF	DWA	--		
02S04E23N01S	Well No. 23	MSWD	526 – 800		
02S04E23N02S	Well No. 30	MSWD	640 – 1080	Yes	Yes
02S04E26C01S	Well No. 28	MSWD	590 – 898		
02S04E28A01S	Well No. 34	MSWD	550 – 980		
02S04E28J01S	Well No. 35	MSWD	725 – 1020	Yes	Yes
02S04E36D01S	Well No. 22	MSWD	380 – 780		Yes
02S04E36D02S	Well No. 24	MSWD	400 – 790		
02S04E36K01S	Well No. 29	MSWD	410 – 1050		Yes
02S04E36P01S	Well No. 37	MSWD	450 – 1080		
03S04E04P01S	PW2	Private	--		Yes
03S04E04Q02S	PW1	Private	--		
03S04E11A02S	Well No. 32	MSWD	320 – 980		
03S04E11L01S	Well No. 27	MSWD	180 – 380		
03S04E11L04S	Well No. 31	MSWD	270 – 1000		Yes
03S04E12B02S	Well 3408	CVWD	270 – 500	Yes	
03S04E12C01S	Well 3405	CVWD	200 – 480		Yes
03S04E12C02S	Well 3405-2	CVWD	600 - 1000-		
03S04E12F01S	Well 3410	CVWD	500 – 960		
03S04E12H03S	Well 3409-2	CVWD	690 – 1005		
03S05E15R01S	15R01	Private	--		Yes
03S05E17J01S	17J01	Private	182 – 405	Yes	Yes
03S05E19B01S	19B01	Private	51 – 83		
03S04E01J01S	Kerr/Airport Well	MSWD	220 – 300		

bgs = below ground surface
CASGEM = California Statewide Groundwater Elevation Monitoring



Map Post	State Well No.	Local Name	Screen Interval (feet bgs)
21H01	02S04E21H001S	MC GRF	--
23N01	02S04E23N001S	Well No. 23	526 - 800
23N02	02S04E23N002S	Well No. 30	640 - 1,080
26C01	02S04E26C001S	Well No. 28	590 - 898
28A01	02S04E28A001S	Well No. 34	550 - 980
28J01	02S04E28J001S	Well No. 35	725 - 1,020
36D01	02S04E36D001S	Well No. 22	380 - 780
36D02	02S04E36D002S	Well No. 24	400 - 790
36K01	02S04E36K001S	Well No. 29	410 - 1,050
36P01	02S04E36P001S	Well No. 37	450 - 1,080
1J01	03S04E01J001S	Kerr/Airport Well	220 - 300
4P01	03S04E04P001S	PW2	--
4Q02	03S04E04Q002S	PW1	--
11A02	03S04E11A002S	Well No. 32	320 - 980
11L01	03S04E11L001S	Well No. 27	180 - 380
11L04	03S04E11L004S	Well No. 31	270 - 1,000
12B02	03S04E12B002S	Well 3408	270 - 500
12C01	03S04E12C001S	Well 3405	200 - 480
12C02	03S04E12C002S	Well 3405-2	600 - 1,000
12F01	03S04E12F001S	Well 3410	500 - 960
12H03	03S04E12H003S	Well 3409-2	690 - 1,005
15R01	03S05E15R001S	Well 15R01	--
17J01	03S05E17J001S	Well 17J01	182 - 405
19B01	03S05E19B001S	Well 19B01	51 - 83

Note:
bgs below ground surface

Explanation

Well proposed for Salt and Nutrient Management Plan (SNMP) monitoring (West Yost, 2020)

Monitoring Well

- Key well
- Well

- Facility
- 2022 Planning Area
- Streams
- Highway/road
- Garnet Hill Subarea of Indio Subbasin
- Mission Creek Subbasin fringe area
- Low permeability/non-water bearing sediments/bedrock
- Desert Hot Springs Subbasin
- Indio Subbasin
- Mission Creek Subbasin

0 4,000 8,000
Approximate Scale in Feet

Basemap modified from aerial photograph provided by Esri, dated November 9, 2016. GSA areas from SGMA. Water.CA.gov.

MONITORING WELL NETWORK
Mission Creek Subbasin Alternative Update
Coachella Valley, California

By: pah/jrw | Date: 10/5/2021 | Project No.: CM19167351

wood.

Figure E-1

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E.2.1.4 Groundwater Quality

Groundwater quality for the MCSB is described in Section 4.5 of the Alterative Plan Update. Groundwater quality data are collected by MSWD and CVWD in compliance with their State Water Resources Control Board, Division of Drinking Water (DDW) water supply permitting requirements. Other sources of water quality information include:

- US EPA: Safe Drinking Water Information System (SDWIS) database,
- State of California Groundwater Ambient Monitoring and Assessment (GAMA) Program database, and
- State of California GeoTracker and EnviroStor databases for wastewater discharge and contaminated sites.

Groundwater quality data review will be conducted each year as part of the SGMA Annual Report for constituents of concern (COCs) that have primary DDW Maximum Contaminant Levels (MCLs) including arsenic, fluoride, nitrate, and uranium for drinking water supply wells using data supplied by the Agencies and the SDWIS database. In addition, GeoTracker and EnviroStor databases will be reviewed on an annual basis for point source contaminants to groundwater.

In addition, pursuant to Section 6.2.3.1 of the 2018 Recycled Water Policy, the Salt and Nutrient Management Plan for the Coachella Valley Groundwater Basin (CV-SNMP) must include a monitoring and reporting program for nitrate and total dissolved solids (TDS). This program has been developed and is relevant to monitoring of TDS (nitrate will be monitored for exceedance of its MCL). A workplan entitled "*Groundwater Monitoring Program Workplan for the Coachella Valley Salt and Nutrient Management Plan Update*" (GMP Workplan) was prepared for the CV-SNMP Agencies, which include CVWD, DWA, MSWD, Coachella Water Authority and Coachella Sanitary District, Indio Water Authority, Myoma Dunes Mutual Water Company, Valley Sanitary District, and City of Palm Springs (West Yost, 2020). The Colorado River Basin Regional Water Quality Control Board (RWQCB) approved this workplan in February 2021. A copy of this workplan is provided as **Attachment E1** to this Appendix.

The GMP Workplan describes the physical understanding of how the Coachella Valley Groundwater Basin functions in order to develop a monitoring network that is capable of characterizing groundwater quality in all subbasins and subareas. 22 wells are identified in the monitoring program for the shallow and deep MCSB aquifer system. Although the MCSB aquifer system is considered a single aquifer system, stratification of water quality is likely to occur based on the shallow sources for nutrients and TDS. Wells identified include water supply wells for municipal, agricultural, and industrial use and groundwater monitoring wells associated with wastewater treatment plant compliance (West Yost, 2021). The RWQCB approved this workplan in October 2021.

The GMP Workplan specifies chemical analyses for TDS, nitrate, major cations (potassium, sodium, calcium, and magnesium), major anions (chloride and sulfate), and total alkalinity with ion speciation (bicarbonate, carbonate, and hydroxide). Laboratory results will be electronically reported annually in a format that is compatible with the GAMA information system. Beginning in 2022, the CV-SNMP Agencies will report the laboratory water quality results from the prior calendar year to the GAMA information system or its successor. The SNMP Agencies will provide progress reports to the RWQCB annually beginning in 2022.

E.2.2 Proposed New Facilities and Monitoring Procedures

The following subsections describe new monitoring facilities (e.g., wells, ground level survey monuments) proposed in the MCSB, as well as new procedures for monitoring.

E.2.2.1 Groundwater Levels

No new facilities are proposed for SGMA groundwater level monitoring. However, an additional monitoring well will be completed in the MCSB for CV-SNMP groundwater quality monitoring as described below. Water level data from the new monitoring well may be added to the groundwater level monitoring depending on the location and construction of the well.

E.2.2.2 Groundwater Storage

No new facilities are proposed for monitoring groundwater storage. The existing monitoring network is sufficient to monitor this sustainability indicator. As discussed in Section E1.1.2, water balance calculations will also be used to determine annual change in storage and groundwater levels will be used to estimate subbasin-wide groundwater level changes and resulting change in storage compared to 2009 groundwater conditions.

E.2.2.3 Groundwater Quality

The existing monitoring network is sufficient to monitor this sustainability indicator for SGMA. The CV-SNMP Groundwater Monitoring Workplan proposed one new monitoring well to address a spatial data gap in the MCSB. The new well was proposed to be located hydraulically upgradient from the MC-GRF to monitor subsurface inflows to the area of the MC-GRF (see **Figure E-1**).

E.2.2.4 Land Subsidence

CVWD, in collaboration with the other Agencies, has engaged the USGS to study land subsidence in the MCSB. The USGS and CVWD have cooperatively investigated land subsidence in the Coachella Valley since 1996 but this previous work was focused on the Indio Subbasin. The proposed work will continue efforts in the Indio Subbasin and also include the MCSB. The objectives of the study in the MCSB are to:

1. Assess land-surface elevations during the period 2015–2021 using available InSAR or other survey data,
2. Develop a subsidence monitoring plan for MCSB,
3. Detect and quantify land subsidence in MCSB, and
4. Evaluate the relation between changes in land-surface elevation and groundwater levels at selected sites.

To meet these objectives, the USGS will analyze available hydrogeologic and geodetic data for the area of unconsolidated sediments in the MCSB to (a) assess land-surface elevation conditions in the MCSB for the period 2015 through 2021, and (b) develop a subsidence monitoring plan for the MCSB based on the results from (a).

The assessment will involve review of existing land-subsidence information for the MCSB including 1) available InSAR interferograms provided by the USGS, the CDWR, and others, 2) publicly available continuous Global Positioning System (GPS) survey measurements from the University Navstar Consortium, Scripps Orbit and Permanent Array Center, and the Nevada Geodetic Laboratory at University of Nevada Reno, 3) available lithologic and geophysical logs from the CDWR, CVWD, and others, and 4) available groundwater-level data from the CDWR, CVWD, DWA, MSWD, and others.

If the assessment indicates that subsidence has not been documented or determined, and the geologic conditions are not conducive to subsidence, the study may indicate that monitoring of subsidence in the subbasin could be accomplished by examining periodic InSAR results.

If the USGS assessment indicates that subsidence has occurred and/or the geologic conditions are conducive to subsidence, the USGS will invoke a two-phased approach: 1) develop a subsidence monitoring plan, which may include the design and installation of a monument network for the GPS survey, and 2) conduct a detailed analysis of land-surface elevation and groundwater-level changes during the period 2017–2023. The USGS will use the results of the assessment (such as areas of subsidence, locations of clay deposits, and substantial groundwater-level declines) to identify key locations for monuments. The monument network will consist of monuments located in the unconsolidated sediments area of the MCSB. The monument network likely will be a combination of existing and newly constructed monuments. Existing monuments of interest will be identified by the USGS and initially be inspected by the CVWD survey crew by winter of 2021–2022 for condition and suitability for GPS surveys. Depending on site conditions, these monuments will be constructed similar to other deep-seated or surficial monuments previously built by the USGS in the Indio Subbasin in cooperation with CVWD.

Assuming that the monument network is needed for land subsidence monitoring, the USGS will conduct high-precision GPS surveys of the new monuments in 2022. This data will be used with future surveys to evaluate subsidence. In addition, the USGS will also evaluate CDWR-provided InSAR results to compute changes in land surface elevation during the period 2017 to 2023.

InSAR is a satellite-based remote sensing technique that can detect centimeter level ground-surface deformation over hundreds of square miles at a spatial resolution (pixel size) of 295 feet or less (Galloway and others, 2000). Synthetic Aperture Radar (SAR) imagery is produced by reflecting radar signals off a target area and measuring the two-way travel time back to the satellite. InSAR uses two or more SAR scenes of the same area taken at different times and "interferes" (differences) them, resulting in maps called interferograms that show relative ground-elevation change (range change) between the times of the two SAR scenes. Selected InSAR results available for the period 2017–2023 from the CDWR will be obtained and used to create time series of land-surface elevations to establish a subsidence history of the unconsolidated sediments area of the MCSB.

The USGS will document the results of their evaluation in a USGS interpretive report or journal article by June 30, 2025. The GPS data and results will be released through ScienceBase prior to publication of the report. Available data from the USGS will be summarized in the MCSB SGMA Annual Report.

E.2.3 Consistency with Standards

The data gathered through the monitoring networks will be consistent with the standards identified in 23 CCR §352.4. The main 23 CCR §352.4 requirements are outlined below:

- Data reporting units (water volumes including surface water deliveries, estimates of groundwater pumping, etc., reported in acre-feet [AF], etc.).
- Monitoring site information (site identification number, description of site location, etc.)
- Well information reporting (CASGEM well identification number or other unique identifier, measuring point elevation, casing perforations, etc.).
- Map standards (data layers, shapefiles, geodatabases submitted in accordance with the procedures described in Article 4 of the SGMA regulations.
- Hydrograph requirements (hydrographs shall use the same datum and scaling to the greatest extent practical, etc.). Hydrographs will also be plotted showing depth to water and groundwater elevation.

E.3 Protocols for Data Collection and Monitoring

Groundwater level monitoring will generally follow the protocols identified in the CDWR Best Management Practices for the Sustainable Management of Groundwater – Monitoring Protocols, Standards, and Sites (CDWR, 2016a). Each Agency has its own monitoring protocols that it will review at least every five years as part of the Alternative Plan updates and revise them as needed.

The following comments and exceptions to the Best Management Practices (BMPs) should be noted:

- Water level data will be collected and sounding equipment maintained using standard operating procedures. When feasible, well sounding equipment will be dedicated for either irrigation or domestic wells.
- Wells will be surveyed to a horizontal accuracy of 0.5 foot, and preferably to 0.1 foot or less.
- Labels with unique well identifiers will be placed on all public wells, and on private wells if permission is granted.
- The BMPs state that static groundwater elevation measurements for a basin or subbasin should be taken preferably within a 1- to 2-week period. This is not necessary in the MCSB because there is typically very little seasonal variation in groundwater levels. Consequently, average groundwater levels are used to prepare one annual groundwater elevation contour map for annual reporting purposes.

- The Agencies will use their respective sampling protocols for sampling of groundwater for water quality. These protocols are on file with the Agencies.
- The USGS will use existing internal protocols for monitoring subsidence. These protocols will be documented as part of the proposed workplan and monitoring efforts.

E.4 Assessment and Improvement of Monitoring Network

This section reviews and evaluates the adequacy of the monitoring network, identifies data gaps, and describes methods to fill data gaps.

E.4.1 Groundwater Levels

The groundwater monitoring network consists of nine Key Wells and 15 other monitoring wells to augment preparation of groundwater contour maps.

E.4.1.1 Monitoring Density and Frequency

The CASGEM Groundwater Elevation Monitoring Guidelines (CDWR 2010) were used to estimate the density of Key Wells needed for the MCSB per the CDWR's Best Management Practices for the Sustainable Management of Groundwater - Monitoring Networks and Identification of Data Gaps (CDWR, 2016b). CDWR references the Hopkins approach in this document (reference has since updated to Hopkins and Anderson, 2016), which incorporates a relative well density based on the amount of groundwater used within a given area. The densities range from one well per 150 square miles to one well per 25 square miles, based on the quantity of groundwater pumped. A minimum density of one well per 50 square miles is recommended for basins producing more than 10,000 acre-feet per year (AFY) but less than 100,000 AFY of groundwater. Groundwater use in the MCSB has averaged approximately 14,000 AFY for Water Years (WY) 2017 through 2019 in the main MCSB which has an area of unconsolidated sediments of approximately 45 square miles. The nine Key Wells proposed for the groundwater level monitoring network exceeds the minimum number of monitoring sites using the standard of one well per 50 square miles.

Key Wells are defined as wells with reliable access for water levels readings each year, known information on the well depth and perforated interval (or the GSA is reasonably certain of which aquifer zone a given wells is perforated in), and that have adequate depth to accommodate seasonal fluctuations. Wells that do not meet these guidelines may be maintained in the network as additional monitoring locations, as they can still provide useful information. Well construction information for these wells may be obtained in the future. The Key Wells identified for the MCSB meet the criteria for the representative monitoring site for the purposes of SMGA monitoring. Although two of the wells have unknown screen intervals, they are pumping wells that extract groundwater from the single aquifer within the MCSB.

Based on the lack of strong seasonal trends in the MCSB, a minimum of semi-annual water level monitoring is recommended. The Agencies' current frequency of measuring groundwater levels at least three times per year (tri-annual) meets this minimum requirement.

E.4.1.2 Identification of Data Gaps

No temporal or spatial data gaps are identified for groundwater level monitoring in the MCSB. Two data gaps for well information were identified as follows:

- The first information data gap is for the perforation interval of Key Wells 03S04E04P01S (4P01) and 03S05E15R01S (15R01). These two Key Wells provide spatial coverage in the MCSB and there are no known alternative wells for groundwater level monitoring with better information in the vicinity of these wells. Even though perforation intervals are unavailable, the wells are considered acceptable as Key Wells because the MCSB consists of a single aquifer and these two wells each have a sufficient perforated interval for use as pumping wells.
- The second information data gap is documentation that the same survey datum has been used by all the Agencies for their surveys.

E.4.1.3 Plans to Fill Data Gaps

Well information data gaps will be filled as follows:

- The Agencies will continue to try to obtain well screen information from private well owners.
- The Agencies will work together to document the survey data for their monitoring networks.

E.4.2 Groundwater Storage

The groundwater storage monitoring program includes the groundwater level monitoring described above and an annual water balance calculation of change in storage provided in the SGMA Annual Reports.

E.4.2.1 Monitoring Frequency and Density

Monitoring frequency and density are the same for groundwater storage monitoring as for groundwater level monitoring. The density and distribution of the Key Wells provide a spatially weighted representation of the main MCSB change in groundwater levels.

E.4.2.2 Identification of Data Gaps

A component of the water balance is groundwater pumping and a component of groundwater pumping is unknown pumping from minimal pumpers.[2] The lack of information on the volume of water that minimal pumpers extract from the MCSB is considered a data gap.

E.4.2.3 Plans to Fill Data Gaps

A majority of the minimal pumpers are located in the CVWD area (see Section 3 of the Alternative Plan Update). CVWD anticipates requiring additional well users to register their wells and report their production to a lower minimum level (e.g., 2 AFY) to provide a more accurate

2 Minimal pumpers are private well owners located in the CVWD and DWA boundaries that are not required to report their well production based on annual production falling below the agencies reporting limits of 25 and 10 AFY, respectively.

account of well pumping in the MCSB. DWA will evaluate the need to consider similar requirements.

E.4.3 Groundwater Quality

Groundwater quality data includes available data provided annually by the Agencies and downloaded from the SDWIS database. In addition, groundwater quality data from the GeoTracker and EnviroStor databases will be reviewed for contaminated environmental sites with groundwater impacts in the MCSB. Results of the groundwater quality review will be included in the SGMA Annual Reports.

E.4.3.1 Monitoring Frequency and Density

Groundwater quality data for municipal supply wells are collected as required by the respective DDW groundwater monitoring schedules. Most municipal production wells are sampled at least once every three years. This frequency of monitoring is adequate for the purposes of SGMA monitoring for COCs in the MCSB.

Monitoring frequency for the CV-SNMP Monitoring Program is similar to groundwater monitoring described above (i.e., based on DDW monitoring schedules) but also adds a requirement to sample private and inactive wells in the program at least once prior to 2023 and routine sampling of these wells at least once every three (3) years thereafter.

E.4.3.2 Identification of Data Gaps

The CV-SNMP Groundwater Monitoring Workplan proposed one new monitoring well to address a water quality spatial data gap upgradient of the MC-GRF as described in Section 1.2.3.

E.4.3.3 Plans to Fill Data Gaps

The CV-SNMP Groundwater Monitoring Program Workplan identifies the need for a new monitoring well that will be installed in the MCSB. This well is anticipated to be completed and sampled by December 31, 2026 (West Yost, 2020).

E.4.4 Land Subsidence

Land subsidence monitoring in the MCSB is currently limited to the CDWR publicly available InSAR data and groundwater level data used as a proxy for the potential for subsidence. The USGS will evaluate the potential for subsidence and if a potential is identified, install monuments for a GPS survey and begin collecting data as described in Section E1.2.4. Development of a monitoring frequency is premature at this stage of the evaluation. CDWR InSAR data and any updates on the USGS evaluation will be summarized in the SGMA Annual Report.

E.5 Data Storage and Reporting

The monitoring programs are coordinated between the Agencies where necessary through the MCSB Management Committee. Each Agency maintains their own Data Management System (DMS) and provides data to the consultant for preparation of the SGMA Annual Report. The consultant organizes and analyzes the data consistent with CDWR requirements.

The Agency DMSs include information on monitoring sites related to the Sustainable Management Criteria. The data will be subject to several levels of quality control; first, when the

Agencies enter and validate the data, again when the consultant evaluates the data when preparing SGMA Annual Reports, and finally when the results are reviewed by the Agencies.

If not already in place, Agency DMSs will be modified to include the following necessary elements:

- Well location and construction information (where available),
- Water level readings, and
- Estimated groundwater extraction by category.

The Agencies have prepared multiple SGMA Annual Reports for the MCSB and these Annual Reports provide all the data elements required for reporting under the SGMA. These elements include:

- Annual average groundwater elevation contours (seasonal fluctuations have been documented as minimal in the MCSB),
- Total water use by source, and
- Estimate of groundwater storage change, including maps, tables and graphs, groundwater use, and annual and cumulative storage change.

E.6 References

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Attachment E1

Groundwater Monitoring Program Workplan for the Coachella Valley Salt and Nutrient Management Plan Update

FINAL REPORT | DECEMBER 23, 2020

Groundwater Monitoring Program Workplan
Coachella Valley Salt and Nutrient Management Plan Update

PREPARED FOR

The Coachella Valley SNMP Agencies

PREPARED BY

WEST YOST
Water. Engineered.

Groundwater Monitoring Program Workplan
Coachella Valley Salt and Nutrient Management Plan Update

Prepared for

The Coachella Valley SNMP Agencies

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FINAL REPORT | DECEMBER 23, 2020

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CPS	City of Palm Springs
CV-SNMP	Salt and Nutrient Management Plan for the Coachella Valley Groundwater Basin
CVSC	Coachella Valley Stormwater Channel
CVWD	Coachella Valley Water District
CWA/CSD	Coachella Water Authority and Coachella Sanitary District
DWA	Desert Water Agency
DWR	California Department of Water Resources
ft-bgs	Feet below ground surface
IWA	Indio Water Authority
GAMA	Groundwater Ambient Monitoring & Assessment
MC-GRF	Mission Creek Groundwater Replenishment System
MDMWC	Myoma Dunes Mutual Water Company
MOU	Memorandum of Understanding
MSWD	Mission Springs Water District
PD-GRF	Palm Desert Groundwater Replenishment Facility
POTW	Publicly Owned Treatment Works
TDS	Total Dissolved Solids
TEL-GRF	Thomas E. Levy Groundwater Replenishment Facility
USGS	United States Geological Survey
VSD	Valley Sanitary District
WRP	Water Reclamation Plant
WW-GRF	White Water Groundwater Replenishment Facility

1.0 BACKGROUND AND OBJECTIVES

The Salt and Nutrient Management Plan for the Coachella Valley Groundwater Basin (CV-SNMP) must include a monitoring and reporting program pursuant to Section 6.2.4.1 of the 2018 Recycled Water Policy (Policy):

> 6.2.4.1. A basin- or subbasin-wide monitoring plan that includes an appropriate network of monitoring locations to provide a reasonable, cost effective means of determining whether the concentrations of salts, nutrients, and other constituents of concern as identified in the salt and nutrient management plans are consistent with applicable water quality objectives. The number, type, and density of monitoring locations to be sampled and other aspects of the monitoring program shall be dependent upon basin-specific conditions and input from the regional water board. Salts, nutrients, and the constituents identified in 6.2.1.1 shall be monitored. The frequency of monitoring shall be proposed in the salt and nutrient management plan for review by the regional water board pursuant to 6.2.3.
>
>> 6.2.4.1.1. The monitoring plan must be designed to effectively evaluate water quality in the basin. The monitoring plan must focus on water supply wells, areas proximate to large water recycling projects, particularly groundwater recharge projects, and other potential sources of salt and nutrients identified in the salt and nutrient management plan. Also, monitoring locations shall, where appropriate, target groundwater and surface waters where groundwater has connectivity with adjacent surface waters.
>>
>> 6.2.4.1.2. The monitoring plan may include water quality data from existing wells where the wells are located and screened appropriately to determine water quality throughout the most critical areas of the basin. The State Water Board supports monitoring approaches that leverage the use of groundwater monitoring wells from other regulatory programs, such as the Irrigated Lands Regulatory Program and the Sustainable Groundwater Management Act.
>>
>> 6.2.4.1.3. The monitoring plan shall identify those stakeholders responsible for conducting, compiling, and reporting the monitoring data. Where applicable, the regional water board will assist by encouraging other dischargers in the basin or subbasin to participate in the monitoring program. The data shall be electronically reported annually in a format that is compatible with a Groundwater Ambient Monitoring & Assessment (GAMA) information system and must be integrated into the GAMA information system or its successor.

In its evaluation of the 2015 CV-SNMP, the Colorado River Basin Regional Water Quality Control Board (Regional Board) perceived insufficiencies in the proposed monitoring program, including: (i) a lack of data necessary to characterize groundwater quality in all areas and sub-areas of the basin; (ii) a lack of data in critical areas of salt loading (e.g., water recycling and recharge projects); and (iii) it did not propose a plan/timeline to fill the data gaps (Regional Board letter; February 19, 2020). Hence, the Regional Board is requiring the CV-SNMP stakeholders (CV-SNMP Agencies) to prepare a revised Groundwater Monitoring Program Workplan (Workplan) for the Coachella Valley Groundwater Basin (Basin) by December 2020 (Regional Board letter; April 27, 2020).

The CV-SNMP Agencies include: Coachella Valley Water District (CVWD); Coachella Water Authority and Coachella Sanitary District (CWA/CSD); Desert Water Agency (DWA); Indio Water Authority (IWA); Myoma Dunes Mutual Water Company (MDMWC); Valley Sanitary District (VSD); Mission Springs Water District (MSWD); and City of Palm Springs (CPS).

To achieve the requirements of the Policy and address the concerns of the Regional Board, this Workplan describes the following:

1. The physical setting of the Coachella Valley which includes the basic hydrology and hydrogeology of the Basin and its subbasins. The physical understanding of how the groundwater basin functions is necessary to select a monitoring network that is capable of characterizing groundwater quality in all areas and subareas of the Basin, both spatially and vertically.
2. An initial sampling network, including the locations planned for sampling, justifications for the sampling locations, well construction details, and the SNMP Agencies responsible for conducting monitoring at each site.
3. The existing spatial and vertical gaps in the monitoring network, why the gaps were identified, and how the gaps will be filled.
4. A proposed plan to implement the monitoring program.

2.0 HYDROGEOLOGIC CONCEPTUAL MODEL OF THE BASIN

This section summarizes the physical characteristics and dynamics of the Basin regarding surface water, groundwater, and the origin, fate and transport of salts and nutrients within the Basin. Understanding the physical characteristics and dynamics of the Basin provides the foundation for selecting a monitoring network that will meet the objectives of the Policy.

This section was prepared from a review of past technical studies and reports; no original work or analyses were performed for this section of the workplan.

2.1 Basin Setting

Figure 2-1 is a map that shows the Basin as delineated by the California Department of Water Resources (DWR Groundwater Basin No. 7-021, excluding the San Gorgonio Pass Subbasin), which represents the area subject to the CV-SNMP. The Basin is located within the northwest portion of the Salton Sea Watershed (USGS Hydrologic Unit 18100200).

Figure 2-1 shows the surface geology as generalized into natural divisions with regard to groundwater:

> **Unconsolidated water-bearing sediments**. These are the pervious formations that comprise the Basin.
>
> **Bedrock formations**. These are the semi-consolidated sediments and the consolidated bedrock formations that come to the surface in the hills and mountains that surround and bound the Basin. The permeability of the bedrock formations is much less than the water-bearing sediments.

The upper 2,000 ft of the unconsolidated water-bearing sediments constitute the freshwater aquifer system that is the main source of groundwater supply in the region. The sediments tend to be finer-grained in the southeastern portions of the Basin due to the greater distance from the mountainous source areas and the lower-energy depositional environments, such as historical Lake Cahuilla.

The Whitewater River is the major drainage course in the Basin. The Whitewater River is an unlined channel, so surface water flows have the potential to infiltrate and recharge the Basin. In areas with shallow groundwater, the groundwater has the potential to discharge to interconnected surface water.

2.2 Hydrogeology

2.2.1 Subbasins and Subareas

Figure 2-2 is a map of the general hydrogeology of the area. The Basin is cross-cut by several geologic faults, which have created low-permeability zones within the water-bearing sediments that act as barriers to groundwater flow. These barriers impede, but do not eliminate, groundwater flow between subbasins. Groundwater flow can still occur across the barriers from areas of higher groundwater levels to areas of lower groundwater levels. The map identifies the locations of faults, subbasins, and subareas that comprise the Basin, and describes the general occurrence and movement of groundwater through the Basin.

The DWR has defined three main subbasins within the study area that are separated by geologic faults or changes in formation permeability that limit and control the movement of groundwater: the Indio Subbasin (DWR Subbasin 7-021.01), the Mission Creek Subbasin (7-021.02), and the Desert Hot Springs Subbasin (7-021.03).[1] These subbasins have been further subdivided into subareas based on one or more of the following geologic or hydrogeologic characteristics: type(s) of water-bearing formations, water quality, areas of confined groundwater, forebay areas, and groundwater or surface drainage divides.

Figure 2-2 shows groundwater-elevation contours for water-year 2019 (October 1, 2018 through September 30, 2019). Lateral groundwater flow is generally perpendicular to the contours from higher to lower elevation, as indicated by the arrows on the map. Generally, groundwater flows from areas of natural recharge along the surrounding mountain-fronts toward the valley floor and then southeast toward the distal portions of the Basin near the Salton Sea. Locally, the structural and compositional features within the Basin result in groundwater conditions and flow directions that vary significantly between subbasins. Anthropogenic activities such as artificial recharge and groundwater pumping also influence groundwater-flow directions.

2.2.2 Occurrence and Movement of Groundwater

Described below is the general occurrence of groundwater, and how groundwater flows through and discharges from each subbasin:

Desert Hot Springs Subbasin. In the Desert Hot Springs Subbasin, groundwater typically flows from the Little San Bernardino Mountains to the southeast, but is locally variable due to faulting. The aquifer system is poorly understood due to relatively poor water quality, which has limited the development of groundwater resources in the area. Faulting in the northern portion of the subbasin has resulted in thermal mineral waters in the aquifer with temperatures up to 250 degrees Fahrenheit. These thermal waters are used by several spas in the area. Groundwater discharge primarily occurs by pumping at wells or subsurface outflow. Generally, groundwater elevations in the Desert Hot Springs Subbasin are higher than in the Mission Creek and Indio Subbasins, and hence, the subsurface outflow from the Desert Hot Springs Subbasin occurs across the Mission Creek Fault into these downgradient subbasins. These subsurface flows are thought to be relatively minor based on the differences in groundwater quality on either side of the fault barriers that separate the subbasins.

Mission Creek Subbasin. In the Mission Creek Subbasin, groundwater typically flows from northwest to southeast. The aquifer system is up to 2,000 feet thick and is predominantly unconfined. Portions of the aquifer along the Banning Fault northwest of the Seven Palms Ridge area are semi-confined as evidenced by historically flowing-artesian wells in the area. Depth to groundwater in the Mission Creek Subbasin in 2019 ranged from an estimated 600 feet-bgs (ft-bgs) upgradient of the Mission Creek Groundwater Replenishment Facility (MC-GRF) to less than 5 feet-bgs in the southeast (west of the Indio Hills). Groundwater discharge primarily occurs by pumping at wells or subsurface flow across the Banning Fault into the Indio Subbasin.

Indio Subbasin. The Indio Subbasin is bordered on the southwest by the crystalline bedrock of the Santa Rosa and San Jacinto Mountains. It is separated from the Mission Creek Subbasin by the Banning Fault, and from the Desert Hot Springs Subbasin by the San Andreas Fault. Both faults are barriers to

[1] The DWR defines the San Gorgonio Pass Subbasin (7-021.04) as part the Basin, but it is not included in the CV-SNMP.

groundwater flow as evidenced by differences in groundwater levels across the faults. For example, groundwater-level differences across the Banning Fault, between the Mission Creek Subbasin and the Indio Subbasin, can be up to 250 feet. Subsurface flow between subbasins primarily occurs from the Desert Hot Springs and Mission Creek subbasins into the Indio subbasin.

In the Indio Subbasin, the aquifer system is generally unconfined in the forebay areas and across the northwestern portion of the subbasin. Generally, groundwater flows from the northwest toward the southeastern distal portions of the subbasin near the Salton Sea. In the southeast portion of the Indio Subbasin, the predominance of fine-grained sediments at depth has created three distinct aquifer systems, which are shown graphically in **Figure 2-3** and are described below:

> ***Perched***. A semi-perched aquifer up to 100 feet thick that is persistent across much of the area southeast of the City of Indio. The fine-grain units that cause the perched conditions are likely a barrier to deep percolation of surface water. The extent of the semi-perched aquifer is shown on **Figure 2-2**. Shallow groundwater within the semi-perched aquifer is conveyed away from the root zone by a network of privately-owned subsurface tile drainage systems that are distributed across the agricultural land uses in the southeastern portion of the Basin. CVWD maintains a regional network of surface and subsurface drains, shown on **Figure 2-4**, that accumulate and convey the drainage waters from the agricultural lands to the Salton Sea.
>
> ***Shallow***. An upper aquifer up to 300 feet thick that is present across most of the area. The upper aquifer is unconfined except in the areas of the semi-perched aquifer where it is semi-confined.
>
> ***Deep***. A lower aquifer that is 500-2,000 feet thick and is the most productive portion of the Basin. In the southeast portion of the Basin, the lower aquifer is confined and is separated from the upper aquifer by a fine-grained aquitard unit that is 100-200 feet thick. Figure **2-2** displays the extent of the aquitard unit.

Groundwater discharge primarily occurs by pumping at wells, shallow groundwater discharge to subsurface tile drainage systems on agricultural lands that ultimately discharge to the Salton Sea, and subsurface outflow to groundwater underlying the Salton Sea.

2.3 Origin, Fate and Transport of Salts and Nutrients

Figure 2-4 is a map that depicts the general areas and processes of salt and nutrient loading, transport, and discharge throughout the Basin.

2.3.1 Salt and Nutrient Loading

Salts, and in some cases nutrients, are loaded to the Basin via the following mechanisms:

- Subsurface inflow from saturated sediments and bedrock fractures in the surrounding mountains and hills and from upgradient groundwater subbasins.
- Recharge of precipitation runoff in unlined stream channels that cross the Basin.
- Artificial recharge of imported Colorado River Water at the Groundwater Replenishment Facilities (GRF).
- Percolation of treated wastewater discharge to unlined ponds.

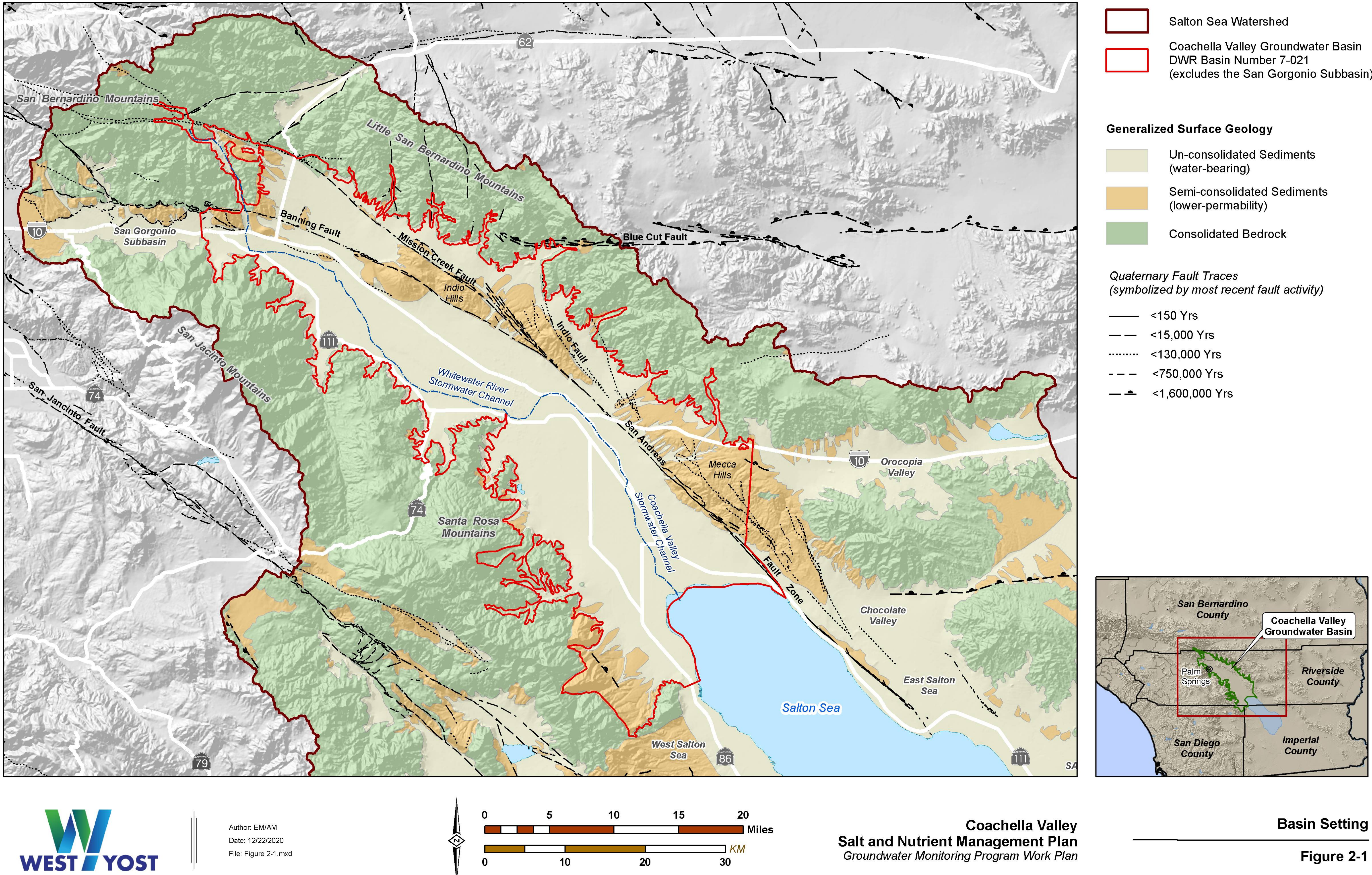
- Seepage from septic systems.
- Return flows from precipitation and irrigation waters applied to the overlying land uses (e.g., agriculture, golf courses, etc.). Loading from return flows is a complex process that is influenced by:
  - The combination of precipitation and irrigation waters that ultimately result in the return flows (and their associated TDS and nitrate concentrations) that migrate past the root zone.
  - During the downward migration of return flows through the unsaturated (vadose) zone, the TDS and nitrate concentrations of the return flows can be influenced by past TDS and nitrate loading to the vadose zone by historical overlying land uses.

Figure 2-4 shows the spatial distribution and location of these sources of salt and nutrient loading across the Basin.

2.3.2 Transport and Discharge of Salts and Nutrients

Once within the saturated zone, the dissolved salts and nutrients are transported through the aquifer system via the groundwater-flow systems shown on **Figure 2-2** and **Figure 2-4**. Ultimately, salts and nutrients are discharged from the Basin via the following mechanisms:

- Groundwater pumping.
- Discharge to agricultural drains. As described above, throughout the lower Basin, CVWD maintains a network of surface and subsurface drains to convey shallow groundwater away from the crop root zones. These drains convey water to the Coachella Valley Stormwater Channel (CVSC) and 26 smaller open channel drains that discharge directly to the Salton Sea.
- Subsurface outflow to downgradient subbasins. In the Indio Subbasin, subsurface outflow occurs to groundwater beneath the Salton Sea.
- Phreatophyte consumptive use.

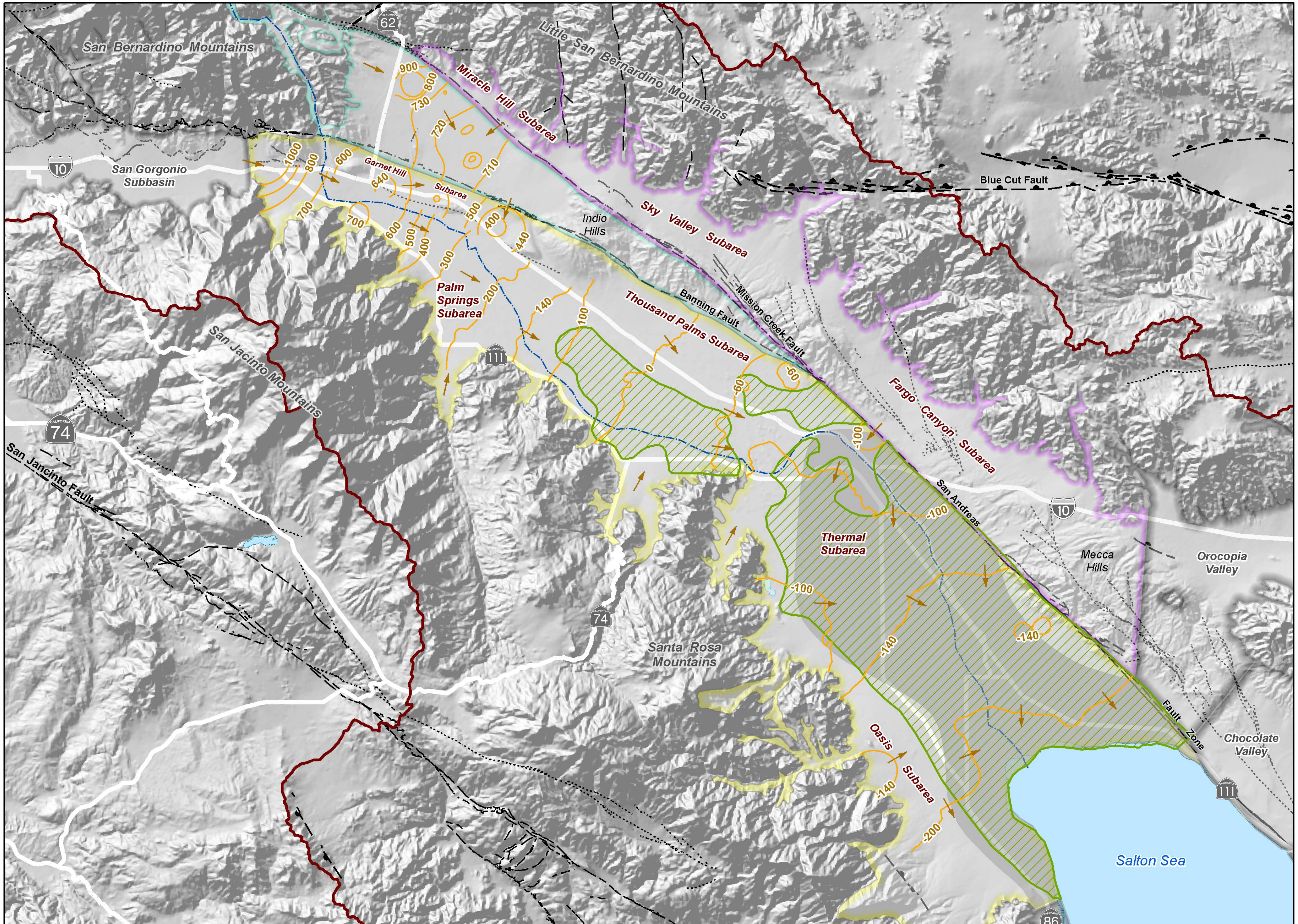


Author: EM/AM
Date: 12/22/2020
File: Figure 2-1.mxd

Coachella Valley
Salt and Nutrient Management Plan
Groundwater Monitoring Program Work Plan

Basin Setting

Figure 2-1



Subbasins of the Coachella Valley Groundwater Basin

- Indio Subbasin
- Mission Creek Subbasin
- Desert Hot Springs Subbasin

2019 Groundwater-Elevation Contours
feet above mean sea-level
Source: Todd Groundwater and Wood (drawn for SGMA annual reports)

General Direction of Groundwater Flow

Estimated Extent of Perched Aquifer

Estimated Extent of Regional Aquitard

Salton Sea Watershed

Other Groundwater Basin/Subbasin

0 5 10 Miles

0 10 20 KM

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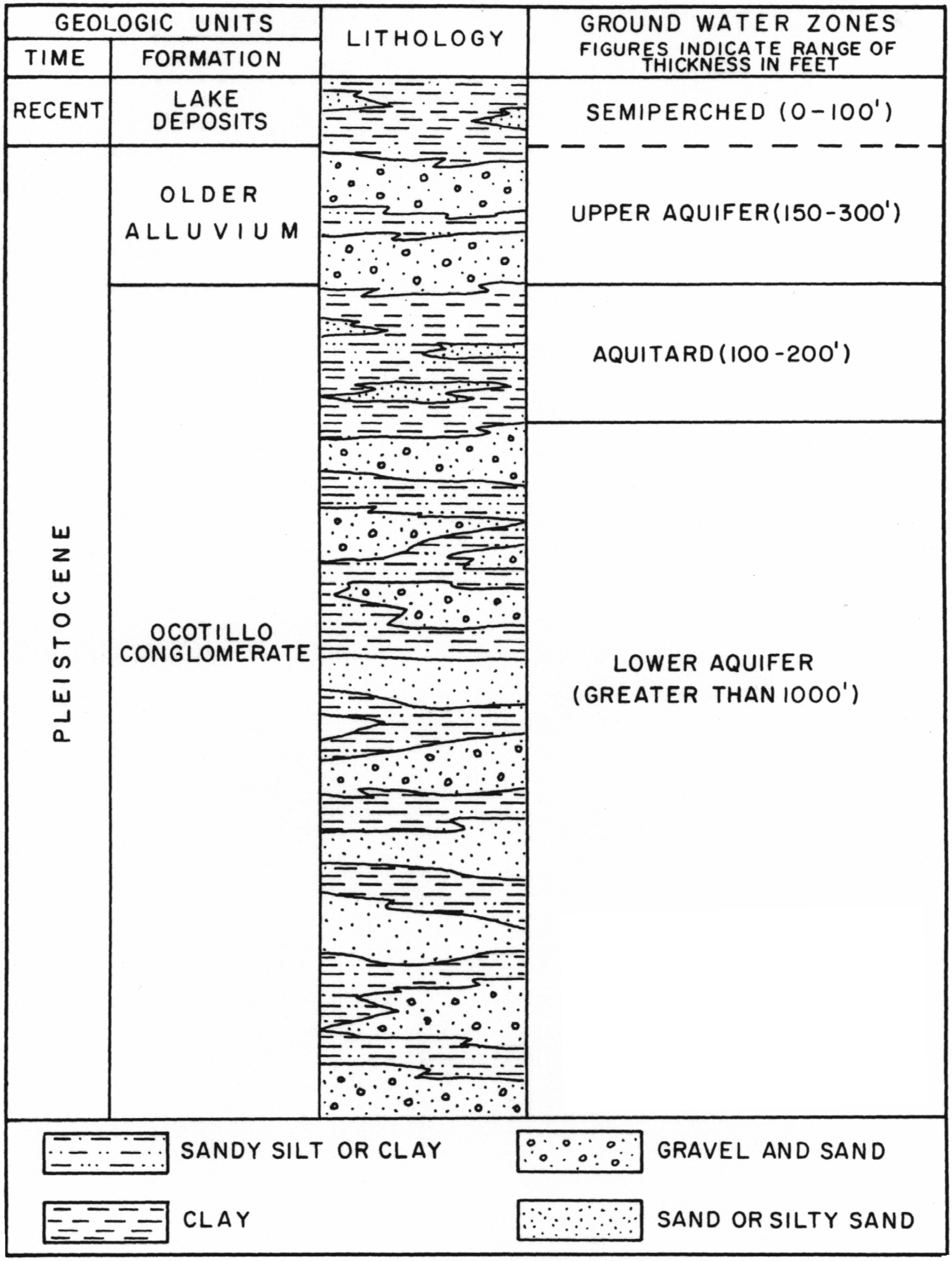
Author: EM/AM
Date: 12/22/2020
File: Figure 2-2.mxd

Coachella Valley
Salt and Nutrient Management Plan
Groundwater Monitoring Program Work Plan

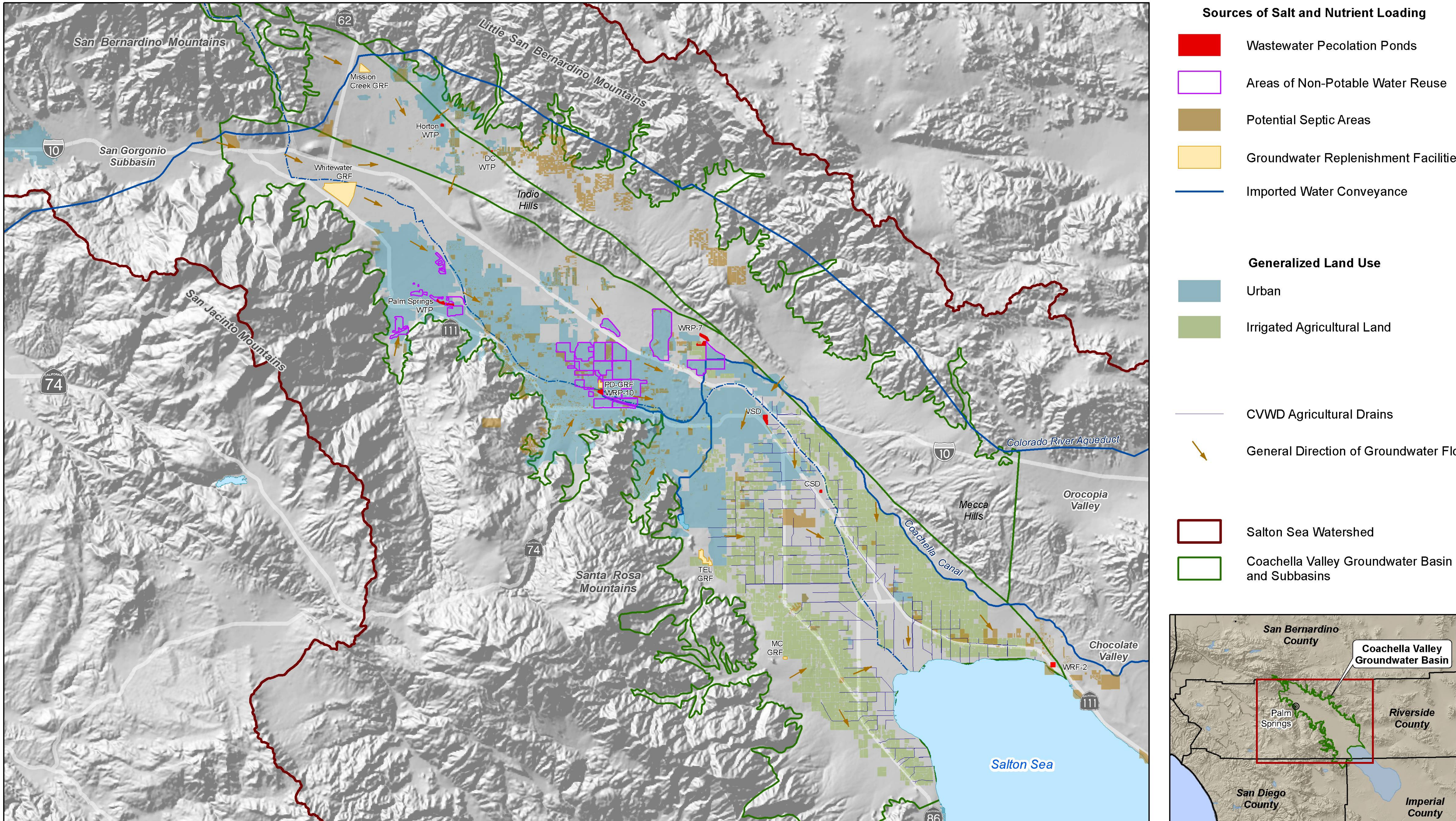
Hydrogeologic Map

Figure 2-2

Figure 2-3
Generalized Stratigraphic Column in Lower Coachella Valley



From DWR (1964)



WEST YOST

Author: EM/AM
Date: 12/22/2020
File: Figure 2-4.mxd

0 5 10 Miles
0 10 20 KM

Coachella Valley
Salt and Nutrient Management Plan
Groundwater Monitoring Program Work Plan

Salt and Nutrient Loading, Transport, and Discharge

Figure 2-4

3.0 GROUNDWATER MONITORING PROGRAM

The Groundwater Monitoring Program for the CV-SNMP consists of the following components, each further described below:

- Groundwater Monitoring Network
- Chemical Analytes and Sampling Frequency
- Monitoring and Reporting

3.1 Groundwater Monitoring Network

Section 6.2.4.1 of the Policy requires the implementation of a monitoring program that can determine whether the concentrations of salts and nutrients in groundwater are consistent with water quality objectives and are thereby protective of beneficial uses. The Policy also recognizes the monitoring program will be dependent upon basin-specific conditions and input from the Regional Board.

For the CV-SNMP Groundwater Monitoring Program, the Regional Board is requiring that the monitoring program:

- *Cover all subbasins and subareas within the Basin*. The updated SNMP will require periodic mapping of groundwater quality to estimate ambient water quality and assimilative capacity. A monitoring network that is spatially distributed across all subbasins and subareas of the Basin will provide the necessary data for technically defensible mapping of groundwater quality.
- *Include sampling from all three major aquifer systems: Deep, Shallow, and Perched*. Section 2 of this Workplan described the hydrogeologic stratification of the aquifer system in the Basin. Groundwater quality, and the physical processes that can alter groundwater quality over time, can be significantly different between aquifer systems. This is because: (i) anthropogenic loading of salts and nutrients occur primarily at the ground surface, and hence, can influence the quality of shallower groundwaters first before influencing the quality of deeper groundwaters; (ii) thick aquitards in the southeastern portion of the Basin restrict the vertical movement of groundwater between aquifer systems; and (iii) upward hydraulic gradients, as evidenced by flowing artesian conditions in the southeastern portion of the Basin, limit the downward migration of salts and nutrients to the Deep aquifer system in this region. For these reasons, monitoring of perched, shallow and deep groundwaters is proposed herein across most of the Basin.
- *Focus on critical areas near: (i) large water recycling projects, (ii) near large recharge projects, particularly where Colorado River water is used to replenish the Basin for water-supply and groundwater management purposes, and (iii) near other potential sources of salt and nutrients*. It is important that monitoring occurs hydraulically upgradient and downgradient from these sources of salt and nutrient loading to characterize their influence on groundwater quality.
- *Focus on critical areas near water supply wells*. The water-supply wells are the main points of extraction for the ultimate beneficial uses of the Basin.

- *Identify critical gaps in the monitoring network and develop a plan and timeline to fill the gaps*. The current gaps in the monitoring network are described in this section. The plan and timeline to fill the gaps are included in Section 4.
- *Identify the stakeholders responsible for conducting, compiling, and reporting the monitoring data*.

3.1.1 Methods for Selection of the Groundwater Monitoring Network

The criteria used to select the groundwater monitoring network included the following:

1. **Spatial Distribution**. The monitoring network was designed to cover all subbasins and subareas within the Basin.
2. **Hydrogeology**. The monitoring network was designed to monitor all three major aquifer systems: Deep, Shallow, and Perched. Water-supply wells in the Basin typically pump groundwater from the Deep aquifer system and were therefore more available for inclusion in the monitoring network. Wells with screens across the Shallow and Perched aquifer systems were less abundant. Hence, most "gaps" in the proposed monitoring network are within the Shallow and Perched aquifer systems.
3. **Areas of Salt or Nutrient Loading**. The network was designed to monitor the influence of known sources of salt or nutrient loading on groundwater quality within the Basin. These sources included: the GRFs; wastewater percolation ponds; areas with septic systems; overlying land uses with irrigation returns (e.g., golf, landscapes, agriculture); and areas served non-potable waters for irrigation (e.g., recycled and/or imported waters). Monitoring of non-point-source loading, such as returns from non-potable irrigation waters and septic systems, is intended to be representative of the influence of non-point-sources of loading on groundwater quality. It is not intended to be site-specific monitoring of every area of non-point-source loading across the Basin, which would be infeasible.
4. **Groundwater Flow**. The network was designed to monitor all major groundwater-flow systems, from areas of recharge to areas of discharge, and within and between the groundwater subbasins. This is necessary in order to track the subsurface migration of salts and nutrients through the Basin.
5. **Use of Existing Wells**. Wherever possible, active municipal production or monitoring wells were preferentially selected if they currently participate in a similar monitoring program (e.g., California Division of Drinking Water [DDW] or Regional Board orders). In some areas, such wells were not available for selection. In those areas, inactive municipal production wells or private wells were selected for inclusion in the monitoring network. The use of inactive or private wells in this monitoring program will require significant coordination with the private well owners and/or physical wellhead improvements to collect groundwater samples. Lastly, if no wells were identified in an area/depth that should be monitored, a "gap" was designated in the monitoring network.

3.1.2 Monitoring Network and Gaps – Shallow Aquifer System

Figure 3-1 is a map of the groundwater monitoring network for the Shallow aquifer system. Each well is labeled by a Map_ID. Because most production wells in the Basin have well screens across the Deep aquifer system, there were several identified "gaps" in the monitoring network, particularly in the Thermal Subarea of the Indio Subbasin. **Table 3-1** is a list of wells shown on **Figure 3-1** sorted by Map_ID. The table includes a summary justification for why each well was included in the monitoring program. **Table 3-4** is a list of the "gaps" in the monitoring network with a summary explanation of why each gap should be filled.

3.1.3 Monitoring Network and Gaps – Deep Aquifer System

Figure 3-2 is a map of the groundwater monitoring network for the Deep aquifer system. Each well is labeled by a Map_ID. Most production wells in the Basin have well screens across the Deep aquifer system; hence, there were no identified "gaps" in the Deep monitoring network. **Table 3-2** is a list of wells shown on **Figure 3-2** sorted by Map_ID. The table includes a summary justification for why the well was included in the monitoring program.

3.1.4 Monitoring Network and Gaps – Perched Aquifer System

Figure 3-3 is a map of the groundwater monitoring network for the Perched aquifer system. Each well is labeled by a Map_ID. The map shows the extent of the Perched aquifer system which is confined to the Thermal Subarea of the Indio Subbasin. The network of CVWD's agricultural drains that convey perched groundwater to the CVSC and the Salton Sea is also shown. The only existing wells with well screens across the Perched aquifer system are five monitoring wells owned by the CVWD; hence, there were several identified "gaps" in the Perched monitoring network. **Table 3-3** is a list of wells shown on **Figure 3-3** sorted by Map_ID. The table includes a summary justification for why each well was included in the monitoring program. **Table 3-4** is a list of the "gaps" in the monitoring network with a summary explanation of why each gap should be filled.

3.2 Chemical Analytes and Sampling Frequency

Table 3-5 lists the chemicals that will be analyzed for dissolved concentration in each groundwater sample for the monitoring program. The table describes the justification for each chemical analyte. Testing will be performed at a laboratory accredited by the State of California for the testing of inorganic chemistry of drinking water.

The minimum sampling frequency is once every three years. Many wells chosen for this monitoring program are sampled more frequently under other required or voluntary monitoring programs.

During each groundwater sampling event, the agency responsible for sampling will attempt to obtain a static (non-pumping) depth-to-water measurement. In instances when a static depth-to-water measurement cannot be obtained, it will be noted with a description for the reason.

3.3 Monitoring and Reporting

3.3.1 Groundwater Sampling and Laboratory Analysis

The SNMP Agencies have the following responsibilities for sampling of the wells in the monitoring network (described in Section 3.1) and the laboratory analysis of chemical analytes (described in Section 3.2):

- Municipal well owners are responsible for the groundwater sampling and laboratory analyses for their own wells.
- For private wells within their service area, the overlying SNMP Agency is responsible for coordinating with the private well owners to conduct groundwater sampling and the laboratory analyses. In areas of overlapping jurisdictions of SNMP Agencies, the agencies

must jointly coordinate to assign responsibility for sampling and analysis of private wells that fall within the overlapping jurisdictions. Agency responsibilities may include developing administrative agreements with the well owners (e.g., right-of-entry agreement) and making physical modifications to the wellhead to enable collection of a sample (e.g., installation of a sampling port on the well discharge pipe).

Table 3-6 lists all wells proposed for the monitoring program. For each well, the table includes a designation for the overlying SNMP Agency(ies).

3.3.2 Reporting of Laboratory Results

Section 6.2.4.1.3 of the Policy requires that all data collected for the monitoring program "shall be electronically reported annually in a format that is compatible with a Groundwater Ambient Monitoring & Assessment (GAMA) information system and must be integrated into the GAMA information system or its successor." This will centralize data generated from SNMPs at the State level and create consistency across regional water boards to allow for further analysis of monitoring data.

By March 31 of each year, the SNMP Agencies will report the laboratory water-quality results from the prior calendar year to the GAMA information system.

3.4 Filling of Gaps in the Monitoring Network

Table 3-4 lists the gaps in the monitoring network that were identified during the selection of the monitoring network.

Gaps in the monitoring network will be filled in one of two ways:

1. Field identification of an existing well that: (i) is located near the identified gap; (ii) can be sampled, and (iii) has well screens across the appropriate depth interval (e.g., across the Shallow aquifer system). This may require the following activities: field canvassing to identify a candidate well; research and/or exploratory well surveys to confirm well screen depth intervals; and constructing any well/wellhead modifications that are necessary to collect groundwater samples.
2. Construction of a new monitoring well with well screens across the appropriate depth interval. This may require the following activities: a well-siting study; well-site acquisition or easement; development of technical specifications for a monitoring well; conducting a bid process to select a well drilling/construction subcontractor; obtaining the necessary permits and CEQA clearance; performing well construction with oversight; performing well development and testing; preparing a well completion report; equipping the well for sampling, and wellhead completion including any needed site improvements.

In the first year, the SNMP Agencies will perform the necessary field work and research and develop a plan for how each gap in the monitoring program will be filled.

Filling the gaps in the monitoring network is likely the most expensive, complicated element of the monitoring program. Therefore, the filling of gaps will be executed over a six-year period, subject to funding availability. The SNMP Agencies will pursue grant funding to support the filling of gaps under State-run programs such as Integrated Regional Water Management and the Sustainable Groundwater Management Act. The SNMP Agencies also are developing a Memorandum of Understanding (MOU) to implement the CV-SNMP Monitoring Program Workplan. The MOU will assign responsibilities and cost-sharing agreements between the SNMP Agencies for the filling of the gaps in the monitoring network.

By March 31 of each year, the SNMP Agencies will report to the Regional Board on progress made toward the filling the gaps in the monitoring network over the preceding calendar year (see Section 4.2 below).

Table 3-1. SNMP Groundwater Monitoring Network -- *Shallow Aquifer System*								
Map_ID	SWN	Well Owner	Well Name	Well Status[(a)]	Well Use[(b)]	Screen Interval *ft-bgs*	Depth Code[(c)]	Justification for Inclusion in SNMP Monitoring Program
1	03S04E20F01S	USGS	335348116352701	Active	Monitoring	600-640	S	Northwest area at WW-GRF
2	03S04E20J01S	USGS	335339116345301	Active	Monitoring	550-590	S	Northeast area at WW-GRF
3	06S07E33G02S	Coachella Valley Water District	TEL-GRF MW-21S	Active	Monitoring	230-250	S	Adjacent to and downgradient of TEL-GRF
4	06S07E33J02S	Coachella Valley Water District	TEL-GRF MW-22S	Active	Monitoring	230-250	S	Adjacent to and downgradient of TEL-GRF
5	06S07E34N03S	Coachella Valley Water District	TEL-GRF MW-23S	Active	Monitoring	230-250	S	Adjacent to and downgradient of TEL-GRF
7	02S04E26C01S	Mission Springs Water District	Well 28	Inactive	MUN	590-898	S	Downgradient from Mission Creek GRF; near golf course and septic areas
8	02S04E28A01S	Mission Springs Water District	Well 34	Active	MUN	550-980	S	Downgradient from Mission Creek GRF
9	02S05E31L01S	Mission Springs Water District	Well 11	Inactive	Unknown	220-285	S	Downgradient of Desert Hot Springs (DHS) subbasin
10	03S04E04Q02S	CPV Sentinel	03S04E04Q02S	Active	Unknown		S	Upgradient portion of Mission Creek subbasin
11	03S04E11L01S	Mission Springs Water District	Well 27	Active	MUN	180-380	S	Upgradient of Garnet Hill subarea; near potential septic areas in N. Palm Springs
12	03S05E05Q01S	Hidden Springs Golf Course	P27	Active	Unknown	220-600	S	Downgradient of DHS subbasin; near golf course and septic areas
13		City of Palm Springs	Airport MW-2	Active	Monitoring	240-250	S	Center of Indio subbasin; near airport and areas served non-potable water (NPW)
14		City of Palm Springs	MW-1	Active	Monitoring	170-210	S	Downgradient of Palm Springs WTP percolation ponds
15		City of Palm Springs	MW-3	Active	Monitoring	140-215	S	Upgradient of Palm Springs WTP percolation ponds
16		City of Palm Springs	MW-4	Active	Monitoring	170-210	S	Downgradient of Palm Springs WTP percolation ponds
17		City of Palm Springs	MW-5	Active	Monitoring	170-210	S	Downgradient of Palm Springs WTP percolation ponds
18		City of Palm Springs	MW-6	Active	Monitoring	170-210	S	Downgradient of Palm Springs WTP percolation ponds
19	03S03E08M01S	Mission Springs Water District	Well 26	Active	MUN	225-553	S	Monitoring of subsurface inflow from San Gorgonio Pass subbasin
20	03S03E10P02S	Unknown	DWA P05	Active	Unknown	306-906	S	Upgradient of Whitewater GRF
21	03S04E12B02S	Coachella Valley Water District	CVWD Well 3408-1	Active	MUN	270-500	S	Central portion of Mission Creek subbasin; near potential septic areas
22	03S04E29F01S	USGS	335304116353001	Active	Monitoring	550-570	S	Monitoring at southwestern area of Whitewater GRF
23	03S04E29R01S	USGS	335231116345401	Active	Monitoring	431-551	S	Monitoring at southeastern area of Whitewater GRF
24	04S04E11Q01S	Desert Water Agency	DWA Well 5	Standby	MUN	302-402	S	Western portion of Indio subbasin; downgradient of septic areas
25	04S04E35A01S	Indian Canyons Golf Resort	04S04E35A01S	Active	Unknown	360-680	S	Near golf courses, septic, and areas served NPW
26	04S05E09F03S	Coachella Valley Water District	CVWD Well 4564-1	Active	MUN	410-670	S	Center of Indio subbasin; near golf courses and septic areas
27	04S05E29A02S	Desert Water Agency	DWA Well 25	Active	MUN	166-300	S	Downgradient of Palm Springs WTP percolation ponds; near golf courses and NPW areas
29	04S07E33L02S	Coachella Valley Water District	WRP7 MW-2S	Active	Monitoring	60-190	S	Near WRP-7 percolation ponds
30	05S06E09M03S	Coachella Valley Water District	WRP10 MW-7	Active	Monitoring	260-340	S	Upgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
31	05S06E09P02S	Coachella Valley Water District	PD-GRF MW 2	Active	Monitoring	260-340	S	Upgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
32	05S06E10J01S	Coachella Valley Water District	PD-GRF MW 1	Active	Monitoring	260-340	S	Downgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
33	05S06E13G03S	Coachella Valley Water District	WRP10 MW-8	Active	Monitoring	260-340	S	Downgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
34	05S06E14G03S	Coachella Valley Water District	WRP10 MW-5	Active	Monitoring	240-320	S	Downgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
35	05S06E14P03S	Coachella Valley Water District	WRP10 MW-6	Active	Monitoring	190-270	S	Downgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
36	05S06E15F01S	Coachella Valley Water District	WRP10 MW-2	Active	Monitoring	160-290	S	Downgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
37	05S06E15M01S	Coachella Valley Water District	WRP10 MW-1	Active	Monitoring	145-295	S	Upgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
38	05S06E15P01S	Coachella Valley Water District	WRP10 MW-3	Active	Monitoring	130-290	S	Downgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
39	05S06E16A03S	Coachella Valley Water District	WRP10 MW-4	Active	Monitoring	190-270	S	Upgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
40	05S06E21Q04S	Coachella Valley Water District	PD-GRF MW 3	Active	Monitoring	260-340	S	Cross-gradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
41	05S06E23M02S	Coachella Valley Water District	PD-GRF MW 4	Active	Monitoring	270-360	S	Cross-gradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
42	05S07E03D02S	Coachella Valley Water District	WRP7 MW-4S	Active	Monitoring	60-190	S	Near WRP-7 percolation ponds
43	05S07E04A04S	Coachella Valley Water District	WRP7 MW-3S	Active	Monitoring	50-180	S	Near WRP-7 percolation ponds
44	05S07E16K02S	Coachella Valley Water District	CVWD Well 5737-1	Inactive	Monitoring	200-415	S	Center of Indio subbasin; downgradient from areas served NPW
45	05S07E19D04S	Coachella Valley Water District	WRP10 MW-9	Active	Monitoring	260-340	S	West in Indio subbasin; near golf courses and areas served NPW
46	05S07E24M02S	Indio Water Authority	Well 1B	Active	MUN	190-410	S	Center of Indio subbasin; upgradient of VSD plant
47	06S06E12G01S	Coachella Valley Water District	CVWD Well 6650-1	Inactive	Monitoring	<370	S	Within center of The Cove
48	06S07E34A02S	Coachella Valley Water District	TEL-GRF MW-25	Active	Monitoring	115-135	S	Downgradient from TEL-GRF and golf courses
49	06S07E34D02S	Coachella Valley Water District	TEL-GRF MW-24	Active	Monitoring	180-200	S	Directly north and downgradient of TEL-GRF
50	07S08E29P03S	Coachella Valley Water District	MC-3	Active	Monitoring	380-440	S	At Martinez Canyon GRF
51	08S09E31R03S	Coachella Valley Water District	CVWD Well 8995-1	Active	MUN	260-390	S	Southern corner of the Indio basin; near agriculture; near Salton Sea

Table 3-1. SNMP Groundwater Monitoring Network -- *Shallow Aquifer System*

Map_ID	SWN	Well Owner	Well Name	Well Status[a]	Well Use[b]	Screen Interval *ft-bgs*	Depth Code[c]	Justification for Inclusion in SNMP Monitoring Program
52	03S04E17K01S	Valley View MWC	03S04E17K01S	Undetermined	Unknown	340-375	S	Cross-gradient from Whitewater GRF in Garnet Hill subarea
53	03S04E22A01S	Erin Miner	03S04E22A01S	Active	Unknown	180-230	S	Downgradient of Whitewater GRF in Garnet Hill subarea; upgradient of West Valley WWTP
54	03S05E08P02S	Bluebeyond Fisheries	03S05E08P02S	Active	Fish Farm	200-400	S	Central Mission Creek subbasin; near golf course and septic areas
55	03S05E15N01S	Too Many Palms LLC	03S05E15N01S	Active	Irrigation	158-320	S	Distal area in Mission Creek subbasin; downgradient of DHS subbasin
56	03S05E18J01S	Desert Dunes Golf Club	03S05E18J01S	Active	Irrigation	76-340	S	Upgradient of Garnet Hill subarea; near golf course and septic areas
57	03S06E21G01S	Sky Valley Mobile Home Park	03S06E21G01S	Undetermined	Unknown	188-248	S	Western portion of Sky Valley subarea; near septic areas
58	04S05E04F01S	So Pacific Trans Co #32601	04S05E04F01S	Active	Irrigation	276-576	S	Eastern edge of Indio subbasin; downgradient from Garnet Hill subarea; near septic areas
59	04S05E23F01S	Westin Mission Hills Resort	04S05E23F01S	Active	Irrigation	275-1165	S	Center of Indio subbasin; near golf courses and septic areas
60	04S05E34C01S	Manufacture Home Community Inc	04S05E34C01S	Active	Irrigation	240-500	S	Western edge of Indio subbasin; near septic and areas served NPW
61	04S05E35Q01S	Tamarisk Country Club	04S05E35Q01S	Active	Irrigation	171-518	S	Western edge of Indio subbasin; near septic and areas served NPW
62	04S05E36L02S	Annenberg Estate	04S05E36L02S	Active	Irrigation	252-650	S	Center of Indio subbasin; near golf, septic, and areas served NPW
63	04S06E20C01S	Shenandoah Ventures LP	04S06E20C01S	Inactive	Irrigation	250-790	S	Upgradient in Thousand Palms area; upgradient of septic areas
66	05S05E12D01S	Thunderbird Country Club	05S05E12D01S	Active	Irrigation	125-360	S	Western edge of Indio subbasin; near septic and areas served NPW
67	05S06E12M01S	Palm Desert Resort Country Club	05S06E12M01S	Active	Irrigation	140-650	S	Center of Indio subbasin; near areas served NPW
68	05S07E08Q01S	Bermuda Dunes Airport	05S07E08Q01S	Active	Domestic	203-654	S	Center of Indio subbasin; near areas served NPW
69	05S07E28H02S	Tricon/COB Riverdale LP	05S07E28H02S	Active	Domestic	162-636	S	Center of Indio subbasin
70	05S08E28M02S	JS Cooper	05S08E28M02S	Undetermined	Unknown	208-268	S	Eastern edge of Indio subbasin; downgradient of VSD discharge point
71	05S08E30N03S	Carver Tract Mutual Water Co	05S08E30N03S	Active	Domestic	270-330	S	Eastern portion of Indio subbasin; downgradient from VSD plant
72	06S07E07B01S	Traditions Golf Club	06S07E07B01S	Active	Irrigation	200-480	S	Downgradient from The Cove; near golf courses and septic areas
73	06S08E02L01S	Prime Time International	06S08E02L01S	Undetermined	Irrigation	216-407	S	Eastern edge of Indio subbasin; near agriculture; upgradient from CWA/CSD WWTP
74	06S08E05K01S	Peter Rabbit Farms	06S08E05K01S	Active	Irrigation	126-375	S	Eastern portion of Indio subbasin in Coachella
75	06S08E32L01S	Guillermo Torres	06S08E32L01S	Undetermined	Unknown	127-227	S	Downgradient from TEL-GRF; agricultural area
76	07S08E27A01S	Gimmway Enterprises Inc	07S08E27A01S	Active	Domestic	147-215	S	Downgradient from Martinez Canyon GRF; near septic areas
77	07S09E14C01S	Tudor Ranch Inc.	07S09E14C01S	Active	Domestic	93-290	S	Southeastern corner of Indio subbasin; near agriculture and septic areas; near Salton Sea
78	08S08E15G02S	Thermiculture Management LLC	08S08E15G02S	Active	Irrigation	260-500	S	Southern corner of Indio subbasin; near agriculture; near Salton Sea
79		Mission Springs Water District	Well 25	Active	MUN	330-455	S	Monitoring of subsurface inflow from San Gorgonio Pass subbasin
80		Mission Springs Water District	Well 1	Inactive	Monitoring		S	Northern Miracle Hill subarea; upgradient of Mission Creek subbasin
81		Mission Springs Water District	Horton WWTP MW-1	Active	Monitoring	186-236	S	Monitoring wells upgradient and downgradient of the Horton WWTP
82		Mission Springs Water District	Horton WWTP MW-2	Active	Monitoring	220-270	S	Monitoring wells upgradient and downgradient of the Horton WWTP
83		Mission Springs Water District	Horton WWTP MW-3	Active	Monitoring	200-250	S	Monitoring wells upgradient and downgradient of the Horton WWTP

(a) Well Status: Well Status: "Active" means well is known to exist and currently used for original purpose; "Standby" means active backup well; "Inactive" means well exists but is no longer used as a water-supply.

(b) Well Use: MUN = municipal and domestic supply

(c) Depth Code: This monitoring program assigns wells to aquifer layers by depth. P = Perched aquifer system, mainly in the Thermal subarea. S = Shallow aquifer system. D = Deep aquifer system

Table 3-2. SNMP Groundwater Monitoring Network -- *Deep Aquifer System*

Map_ID	SWN	Well Owner	Well Name	Well Status[a]	Well Use[b]	Screen Interval *ft-bgs*	Depth Code[c]	Justification for Inclusion in SNMP Monitoring Program
84	03S04E20F02S	USGS	335348116352702	Active	Monitoring	850-890	D	Northwest area at WW-GRF
85	03S04E20J03S	USGS	335339116345303	Active	Monitoring	850-890	D	Northeast area at WW-GRF
86	06S07E33G01S	Coachella Valley Water District	TEL-GRF MW-21D	Active	Monitoring	390-410	D	Adjacent to and downgradient of TEL-GRF
87	06S07E33J01S	Coachella Valley Water District	TEL-GRF MW-22D	Active	Monitoring	520-540	D	Adjacent to and downgradient of TEL-GRF
88	06S07E34N02S	Coachella Valley Water District	TEL-GRF MW-23D	Active	Monitoring	525-545	D	Adjacent to and downgradient of TEL-GRF
89	07S09E30R03S	Coachella Valley Water District	Peggy	Active	Monitoring	730-770	D	Downgradient of WRP-4; near agriculture; area of subsurface outflow toward Salton Sea
90	08S09E07N02S	Coachella Valley Water District	Rosie	Active	Monitoring	720-780	D	Near agriculture; area of subsurface outflow toward Salton Sea
91	05S07E24L03S	Indio Water Authority	Well 1E	Active	MUN	552-815	D	Center of Indio subbasin; upgradient of VSD plant
92	02S04E28J01S	Mission Springs Water District	Well 35	Active	MUN	725-1020	D	Downgradient from Mission Creek GRF
93	02S04E36P01S	Mission Springs Water District	Well 37	Active	MUN	450-1080	D	Downgradient of DHS subbasin; possibly downgradient of Horton WWTP
94	02S05E31H01S	Mission Springs Water District	Well 5	Inactive	Monitoring	274-784	D	Northern Miracle Hill subarea; upgradient of Mission Creek subbasin
95	03S03E07D01S	Mission Springs Water District	Well 25A	Active	MUN	500-740	D	Monitoring of subsurface inflow from San Gorgonio Pass subbasin
96	03S04E04P01S	CPV Sentinel	03S04E04P01S	Active	Unknown		D	Upgradient portion of Mission Creek subbasin
97	03S04E11A02S	Mission Springs Water District	Well 32	Active	MUN	320-980	D	Center of Mission Creek subbasin; near potential septic areas
98	03S03E08A01S	Mission Springs Water District	Well 26A	Active	MUN	320-600	D	Monitoring of subsurface inflow from San Gorgonio Pass subbasin
99	03S03E10P01S	Unknown	DWA P04	Active	Unknown	476-776	D	Upgradient of Whitewater GRF
100	03S04E14J01S	Mission Springs Water District	Well 33	Active	MUN	360-650	D	Along boundary of Mission Creek subbasin/Garnet Hill subarea
101	03S04E19L01S	Desert Water Agency	DWA Well 43	Active	MUN	500-900	D	Upgradient of Whitewater GRF
102	03S04E34H02S	Desert Water Agency	DWA Well 35	Active	MUN	600-1000	D	Upgradient of urban land uses in Palm Springs; downgradient of WW-GRF
103	03S04E36Q01S	Desert Water Agency	DWA Well 38	Active	MUN	620-1000	D	Upgradient of urban land uses in Palm Springs; downgradient of WW-GRF
104	04S04E02B01S	Desert Water Agency	DWA Well 22	Active	MUN	570-1003	D	Upgradient of urban land uses in Palm Springs; downgradient of WW-GRF
105	04S04E11Q02S	Desert Water Agency	DWA Well 18	Standby	MUN	535-948	D	Western portion of Indio subbasin; downgradient of septic areas
106	04S04E13C01S	Desert Water Agency	DWA Well 23	Active	MUN	512-912	D	Center of Indio subbasin; near airport
107	04S04E24E01S	Desert Water Agency	DWA Well 32	Active	MUN	600-1000	D	Western portion of Palm Springs subarea; near areas served non-potable water (NPW)
108	04S04E24H01S	Desert Water Agency	DWA Well 29	Active	MUN	600-1000	D	Upgradient of Palm Springs WTP percolation ponds
109	04S04E25C01S	Desert Water Agency	DWA Well 39	Active	MUN	580-750	D	Downgradient of Indian Canyon; near golf, septic, and areas served NPW
110	04S05E05A01S	Coachella Valley Water District	CVWD Well 4568-1	Active	MUN	800-955	D	Eastern edge of Indio subbasin; downgradient from Garnet Hill; upgradient of septic areas
111	04S05E08N01S	Desert Water Agency	DWA Well 41	Active	MUN	610-1000	D	Center of Indio subbasin; near airport, near golf courses and areas served NPW
112	04S05E09R01S	Coachella Valley Water District	CVWD Well 4567-1	Active	MUN	855-1150	D	Center of Indio subbasin; near golf courses and septic areas
113	04S05E15G01S	Coachella Valley Water District	CVWD Well 4521-1	Active	MUN	500-800	D	Center of Indio subbasin; near golf courses and septic areas
114	04S05E17Q02S	Desert Water Agency	DWA Well 31	Active	MUN	600-1000	D	Center of Indio subbasin; near airport, golf courses, and areas served NPW
115	04S05E25D02S	Coachella Valley Water District	CVWD Well 4507-2	Active	MUN	860-1320	D	Center of Indio subbasin; near golf courses and septic areas
116	04S05E27K01S	Coachella Valley Water District	CVWD Well 4527-1	Active	MUN	850-1155	D	Western edge of Indio subbasin; near NPR and septic areas
117	04S05E29H01S	Desert Water Agency	DWA Well 26	Active	MUN	590-990	D	Downgradient of Palm Springs WTP percolation ponds; near golf and areas served NPW
118	04S05E35G04S	Coachella Valley Water District	CVWD Well 4504-1	Active	MUN	600-1000	D	Western edge of Indio subbasin; near septic and areas served NPW
119	04S06E18Q04S	Coachella Valley Water District	CVWD Well 4630-1	Active	MUN	480-990	D	Upgradient in Thousand Palms area; upgradient of septic areas
120	04S06E28K04S	Coachella Valley Water District	CVWD Well 4629-1	Active	Monitoring	496-796	D	Thousand Palms area; near septic and areas served NPW
121	04S07E31H01S	Coachella Valley Water District	CVWD Well 4722-1	Active	MUN	570-1160	D	Thousand Palms area; near septic and areas served NPW
122	04S07E33L01S	Coachella Valley Water District	WRP7 MW-2D	Active	MUN	245-395	D	Near WRP-7 percolation ponds
123	05S06E02C01S	Coachella Valley Water District	CVWD Well 5664-1	Active	MUN	500-930	D	Thousand Palms area; near septic and areas served NPW
124	05S06E06B03S	Coachella Valley Water District	CVWD Well 5630-1	Active	Monitoring	455-890	D	Center of Indio subbasin; near golf, septic, and areas served NPW
125	05S06E09A01S	Coachella Valley Water District	CVWD Well 5682-1	Active	Monitoring	850-1300	D	Upgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
126	05S06E09F01S	Coachella Valley Water District	CVWD Well 5637-1	Inactive	MUN	450-830	D	Upgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
127	05S06E14B02S	Coachella Valley Water District	CVWD Well 5665-1	Inactive	MUN	400-600	D	Downgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
128	05S06E14P02S	Coachella Valley Water District	CVWD Well 5603-2	Active	MUN	720-975	D	Downgradient of WRP-10/PD-GRF; near golf courses and areas served NPW
129	05S06E16A04S	Coachella Valley Water District	CVWD Well 5620-2	Active	MUN	1040-1360	D	Upgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
130	05S06E16K03S	Coachella Valley Water District	CVWD Well 5681-1	Active	Monitoring	900-1200	D	Upgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
131	05S06E17L01S	Coachella Valley Water District	CVWD Well 5667-1	Active	Monitoring	470-800	D	Western edge of Indio subbasin; near golf, septic, and areas served NPW
132	05S06E20A02S	Coachella Valley Water District	CVWD Well 5674-1	Inactive	Monitoring	750-1050	D	South/cross-gradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
133	05S07E03D01S	Coachella Valley Water District	WRP7 MW-4D	Active	MUN	245-395	D	Near WRP-7 percolation ponds
134	05S07E04A01S	Coachella Valley Water District	WRP7 MW-1 Dave Price	Active	Monitoring	147-367	D	Near WRP-7 percolation ponds

Table 3-2. SNMP Groundwater Monitoring Network -- *Deep Aquifer System*

Map_ID	SWN	Well Owner	Well Name	Well Status[(a)]	Well Use[(b)]	Screen Interval *ft-bgs*	Depth Code[(c)]	Justification for Inclusion in SNMP Monitoring Program
135	05S07E15N01S	Indio Water Authority	Well AA	Active	MUN	550-1230	D	Center of Indio subbasin; downgradient from areas served NPW
136	05S07E19A01S	Coachella Valley Water District	CVWD Well 5708-1	Inactive	MUN	450-970	D	Western portion of Indio subbasin; near golf courses and areas served NPW
137	05S07E20J01S	Indio Water Authority	Well T	Active	MUN	580-1305	D	Western portion of Indio subbasin; near golf courses and areas served NPW
138	05S07E26E02S	Indio Water Authority	Well 3B	Active	MUN	500-1200	D	Center of Indio subbasin
139	05S07E27P01S	Indio Water Authority	Well Z	Active	MUN	580-1290	D	Center of Indio subbasin
140	05S07E33E01S	Indio Water Authority	Well S	Active	MUN	460-1260	D	Western portion of Indio subbasin; near golf courses and septic areas
141	05S07E34P04S	Indio Water Authority	Well V	Active	MUN	460-1270	D	Western portion of subbasin; near golf courses and septic areas
142	05S07E35R02S	Indio Water Authority	Well U	Active	MUN	480-1190	D	Center of Indio subbasin
143	05S07E36D03S	Coachella Water Authority	Well 19	Active	MUN	650-1250	D	Center of Indio subbasin
144	05S08E31C03S	Coachella Water Authority	Well 11	Active	MUN	513-818	D	Eastern portion of Indio subbasin; downgradient from VSD plant
145	06S07E06B01S	Coachella Valley Water District	CVWD Well 6701-1	Active	MUN	580-800	D	Downgradient from The Cove; near golf courses and septic areas
146	06S07E22B02S	Coachella Valley Water District	CVWD Well 6726-1	Active	MUN	640-1160	D	North/downgradient of TEL-GRF; near golf courses, septic, and agricultural areas
147	06S07E34A01S	Coachella Valley Water District	CVWD Well 6728-1	Active	MUN	500-750	D	Downgradient from TEL-GRF; near golf courses
148	06S07E34D01S	Coachella Valley Water District	CVWD Well 6729-1	Active	MUN	500-780	D	Directly north/downgradient of TEL-GRF
149	06S08E06K02S	Coachella Water Authority	Well 12	Active	MUN	500-1010	D	Eastern portion of Indio subbasin
150	06S08E09N02S	Coachella Water Authority	Well 16	Active	Monitoring	480-730	D	Eastern portion of Indio subbasin; upgradient from CWA/CSD WWTP
151	06S08E19D05S	Coachella Valley Water District	CVWD Well 6808-1	Active	MUN	675-1200	D	Center of Indio subbasin; near septic and agricultural areas
152	06S08E22D02S	Coachella Valley Water District	CVWD Well 6803-1	Inactive	MUN	500-1100	D	Downgradient from CWA/CSD WWTP; near septic and agricultural areas
153	06S08E25P04S	Coachella Valley Water District	CVWD Well 6807-1	Active	MUN	665-1300	D	Upgradient of WRP-4; downgradient of CWA WWTP; near agriculture and septic areas
154	06S08E28N06S	Coachella Water Authority	Well 18	Active	Monitoring	900-1190	D	Eastern edge of Indio subbasin; downgradient of VSD discharge point
155	07S08E17A04S	Coachella Valley Water District	CVWD Well 7803-1	Active	MUN	250-710	D	Downgradient from TEL-GRF; in agricultural and septic areas
156	07S09E23N01S	Coachella Valley Water District	CVWD Well 7990-1	Inactive	Unknown	530-560	D	Southeastern corner of the basin; near agricultural and septic areas; near Salton Sea
157		Indio Water Authority	Well 13A	Active	Irrigation	550-1171	D	East in subbasin; downgradient from WRP-7 ponds and NPR areas
158	03S05E08B01S	R.C Roberts	03S05E08B01S	Undetermined	Irrigation	356-516	D	Downgradient of DHS subbasin; near golf course and septic areas
159	03S05E17M01S	Desert Dunes Golf Club	03S05E17M01S	Active	Unknown	305-412	D	Upgradient of Garnet Hill subarea; near golf course and septic areas
160	03S05E20H02S	Donald Franklin	03S05E20H02S	Active	Irrigation	240-360	D	Distal area in Mission Creek subbasin; upgradient of Garnet Hill subarea; near septic
161	03S06E21R01S	Joel Rosenfeld	03S06E21R01S	Undetermined	Irrigation	355-495	D	Western portion of Sky Valley subarea; near septic
162	05S05E12B03S	Tandika Corp	05S05E12B03S	Active	Irrigation	410-800	D	Western edge of Indio subbasin; near NPR and septic areas
163	05S06E13F01S	PD Golf Operations LLC	05S06E13F01S	Active	Irrigation	400-700	D	Downgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
164	05S06E15H01S	Toscana Country Club	05S06E15H01S	Active	Irrigation	430-950	D	Downgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
165	05S06E22C02S	Desert Horizons Country Club	05S06E22C02S	Active	Irrigation	550-990	D	Downgradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
166	05S06E27A01S	El Dorado Country Club	05S06E27A01S	Active	MUN	458-596	D	South/cross-gradient of WRP-10/PD-GRF; near golf, septic, and areas served NPW
167	05S06E29P04S	Bighorn Golf Club	05S06E29P04S	Active	MUN	530-720	D	Upgradient of Palm Desert; near golf courses and septic areas
168	05S07E07F04S	Myoma Dunes Mutual Water Company	Well 4	Active	MUN	430-730	D	Center of Indio subbasin; near areas served NPW
169	05S07E08L01S	Myoma Dunes Mutual Water Company	Well 11	Active	Unknown	500-1060	D	Center of Indio subbasin; near areas served NPW
170	05S07E17K01S	Myoma Dunes Mutual Water Company	Well 12	Active	Irrigation	450-950	D	Center of Indio subbasin; near areas served NPW
171	05S08E09N03S	Jamie Brack	05S08E09N03S	Undetermined	Unknown	480-580	D	Downgradient of septic areas in Fargo subarea; upgradient of Indio subbasin
172	06S07E27B01S	Andalusia Golf Club	06S07E27B01S	Active	Irrigation	300-780	D	Downgradient of TEL-GRF; near golf course and agricultural areas
173	06S07E35L02S	Castro Bros	Castro Bros	Active	Unknown	300-400	D	Downgradient from TEL-GRF; near golf courses and agricultural areas
174	06S08E11A01S	Cocopah Nurseries Inc	06S08E11A01S	Active	Unknown	400-842	D	Eastern edge of Indio subbasin; near agriculture; upgradient from CWA/CSD WWTP
175	06S08E31P01S	Deer Creek	Deer Creek	Active	Irrigation	400-550	D	Downgradient from TEL-GRF, in agricultural area
176	06S08E35E02S	Otto L. Zahler	06S08E35E02S	Undetermined	Unknown	521-596	D	Center of Indio subbasin; directly upgradient of WRP-4; in agricultural area
177	07S07E02G02S	Warren Webber	Warren Webber	Active	Irrigation	380-700	D	Downgradient from TEL-GRF; in agricultural area
178	07S08E01L02S	Bill Wordon	07S08E01L02S	Undetermined	Domestic	500-880	D	Center of Indio subbasin; downgradient of WRP-4, in agricultural area
179	07S08E27A02S	Gimmway Enterprises Inc	07S08E27A02S	Active	MUN	491-811	D	Downgradient from Martinez Canyon GRF; in agricultural area
180	07S09E10F01S	Prime Time International	07S09E10F01S	Active	Unknown	360-500	D	Southeast Indio subbasin; in agricultural area; near Salton Sea
181		Mission Springs Water District	Well 31	Active	MUN	270-670	D	Upgradient of Garnet Hill subarea; near potential septic areas in N. Palm Springs

(a) Well Status: Well Status: "Active" means well is known to exist and currently used for original purpose; "Standby" means active backup well; "Inactive" means well exists but is no longer used as a water-supply.

(b) Well Use: MUN = municipal and domestic supply

(c) Depth Code: This monitoring program assigns wells to aquifer layers by depth. P = Perched aquifer system, mainly in the Thermal subarea. S = Shallow aquifer system. D = Deep aquifer system

Table 3-3. SNMP Groundwater Monitoring Network -- *Perched Aquifer System*								
Map_ID	SWN	Well Owner	Well Name	Well Status[(a)']	Well Use[(b)]	Screen Interval *ft-bgs*	Depth Code[(c)]	Justification for Inclusion in SNMP Monitoring Program
182		Coachella Valley Water District	WRP2 MW3	Active	Monitoring	<90	P	At WRP-2; represents subsurface discharge to Salton Sea
183	06S07E27J03S	Coachella Valley Water District	TEL-GRF MW-8	Active	Monitoring	25-45	P	North/downgradient of TEL-GRF; near golf course and agriculture
184	06S07E34A03S	Coachella Valley Water District	TEL-GRF MW-9	Active	Monitoring	25-45	P	Downgradient from TEL-GRF and golf course
185	06S08E31R01S	Coachella Valley Water District	TEL-GRF MW-10	Active	Monitoring	25-45	P	Downgradient from TEL-GRF; agricultural area
186	07S08E06P01S	Coachella Valley Water District	TEL-GRF MW-11	Active	Monitoring	25-45	P	Downgradient from TEL-GRF; agricultural area
187		Coachella Valley Water District	PEW-1	Active	Monitoring	10-55	P	At WRP-4; agricultural area

(a) Well Status: "Active" means well is known to exist and currently used for original purpose; "Standby" means active backup well; "Inactive" means well exists but is no longer used as a water-supply.

(b) Well Use: MUN = municipal and domestic supply

(c) Depth Code: This monitoring program assigns wells to aquifer layers by depth. P = Perched aquifer system, mainly in the Thermal subarea. S = Shallow aquifer system. D = Deep aquifer system

Table 3-4. Gaps in SNMP Groundwater Monitoring Network

Map_ID	Depth Code[a]	Justification for Inclusion in SNMP Monitoring Program	Approx. Depth of Well Screens	Overlying SNMP Agency[b]
G1	S	Monitoring of subsurface inflows from areas upgradient of Mission Creek GRF	700-1000 ft-bgs	DWA, MSWD
G2	S	Monitoring directly downgradient of the planned MSWD West Valley WWTP	200-300 ft-bgs	MSWD, DWA
G3	S	Monitoring of southern Miracle Hill subarea; near septic; upgradient of Desert Crest WWTP	100-300 ft-bgs	CVWD
G4	S	Monitoring of the Fargo subarea of DHS subbasin; near septic	100-300 ft-bgs	CVWD
G5	S	Monitoring upgradient of urban land uses in Palm Springs; downgradient of WW-GRF	300-500 ft-bgs	DWA
G6	S	Monitoring center of Indio subbasin; near airport, golf courses, and areas served non-potable water (NPW)	250-350 ft-bgs	DWA
G7	S	Monitoring a spatial gap in western portion of Indio subbasin; near golf courses, septic and areas served NPW	200-300 ft-bgs	CVWD
G8	S	Monitoring of subsurface inflows from areas upgradient of urban land uses in Palm Desert Canyon	250-400 ft-bgs	CVWD
G9	S	Monitoring a spatial gap in western portion of Indio subbasin; near golf courses and septic	100-250 ft-bgs	CVWD, IWA
G10	S	Monitoring downgradient from CWA/CSD WWTP; near septic areas and agriculture	100-250 ft-bgs	CVWD
G11	S	Monitoring a spatial gap downgradient of TEL-GRF; near golf courses, septic, and agricultural areas	85-160 ft-bgs	CVWD
G12	S	Monitoring a spatial gap in center of Indio subbasin; near septic areas and agriculture	100-235 ft-bgs	CVWD
G13	S	Monitoring a spatial gap downgradient from TEL-GRF; in agricultural areas	50-150 ft-bgs	CVWD
G14	S	Monitoring a spatial gap downgradient of WRP-4; in agricultural area; near Salton Sea	100-250 ft-bgs	CVWD
G15	S	Monitoring a spatial gap directly upgradient of WRP-4; in agricultural area	100-275 ft-bgs	CVWD
G16	S	Monitoring a spatial gap upgradient of WRP-4; downgradient of CWA/CSD WWTP; near agriculture, septic	100-250 ft-bgs	CVWD
G17	P	Monitoring a spatial gap in northern portion of Perched area; downgradient from Fargo subarea	<100 ft-bgs	CVWD, IWA, VSD
G18	P	Monitoring a spatial gap on eastern side of Perched area; in agricultural area	<70 ft-bgs	CVWD, CWA/CSD
G19	P	Monitoring a spatial gap in center of Perched area; near agricultural and septic areas	<90 ft-bgs	CVWD, CWA/CSD
G20	P	Monitoring a spatial gap in southern basin; may represent subsurface discharge to Salton Sea	<70 ft-bgs	CVWD
G21	P	Monitoring a spatial gap in southern basin; may represent subsurface discharge to Salton Sea	<70 ft-bgs	CVWD
G22	P	Monitoring a spatial gap in southern basin; may represent subsurface discharge to Salton Sea	<90 ft-bgs	CVWD
G23	S	Monitoring a spatial gap in Thousand Palms area; near septic and areas served NPW	150-300 ft-bgs	CVWD

(a) Depth Code: This monitoring program assigns wells to aquifer layers by depth. P = Perched aquifer system, mainly in the Thermal subarea. S = Shallow aquifer system.

(b) CVWD = Coachella Valley Water District; CWA/CSD = Coachella Water Authority and Sanitary District; DWA = Desert Water Agency; IWA = Indio Water Authority; VSD = Valley Sanitary District; MSWD = Mission Springs Water District

Table 3-5. Analyte List for the SNMP Groundwater Monitoring Program

Analytes	Justification	Method	Cost/Sample
Total Dissolved Solids	Measure of total dissolved salt content in water	E160.1/SM2540C	$14
Nitrate as Nitrogen	Primary nutrient in groundwater	EPA 300.0	$12
Major cations: K, Na, Ca, Mg	Useful in source water characterization	EPA 200.7	$20
Major anions: Cl, SO_4	Useful in source water characterization	EPA 300.0	$18
Total Alkalinity (HCO_3, CO_3, OH)	Useful in source water characterization	SM 2320B/2330B	$13

Table 3-6. Responsibilities for Groundwater Sampling and Laboratory Analyses								
Map_ID	SWN	Well Owner	Well Name	Well Status[a]	Well Use[b]	Screen Interval *ft-bgs*	Depth Code[c]	Overlying SNMP Agency[d]
1	03S04E20F01S	USGS	335348116352701	Active	Monitoring	600-640	S	CVWD
2	03S04E20J01S	USGS	335339116345301	Active	Monitoring	550-590	S	CVWD
3	06S07E33G02S	Coachella Valley Water District	TEL-GRF MW-21S	Active	Monitoring	230-250	S	CVWD
4	06S07E33J02S	Coachella Valley Water District	TEL-GRF MW-22S	Active	Monitoring	230-250	S	CVWD
5	06S07E34N03S	Coachella Valley Water District	TEL-GRF MW-23S	Active	Monitoring	230-250	S	CVWD
7	02S04E26C01S	Mission Springs Water District	Well 28	Inactive	MUN	590-898	S	MSWD
8	02S04E28A01S	Mission Springs Water District	Well 34	Active	MUN	550-980	S	MSWD
9	02S05E31L01S	Mission Springs Water District	Well 11	Inactive	Unknown	220-285	S	MSWD
10	03S04E04Q02S	CPV Sentinel	03S04E04Q02S	Active	Unknown		S	DWA, MSWD
11	03S04E11L01S	Mission Springs Water District	Well 27	Active	MUN	180-380	S	MSWD
12	03S05E05Q01S	Hidden Springs Golf Course	P27	Active	Unknown	220-600	S	DWA, MSWD
13		City of Palm Springs	Airport MW-2	Active	Monitoring	240-250	S	CPS
14		City of Palm Springs	MW-1	Active	Monitoring	170-210	S	CPS
15		City of Palm Springs	MW-3	Active	Monitoring	140-215	S	CPS
16		City of Palm Springs	MW-4	Active	Monitoring	170-210	S	CPS
17		City of Palm Springs	MW-5	Active	Monitoring	170-210	S	CPS
18		City of Palm Springs	MW-6	Active	Monitoring	170-210	S	CPS
19	03S03E08M01S	Mission Springs Water District	Well 26	Active	MUN	225-553	S	MSWD
20	03S03E10P02S	Unknown	DWA P05	Active	Unknown	306-906	S	DWA
21	03S04E12B02S	Coachella Valley Water District	CVWD Well 3408-1	Active	MUN	270-500	S	CVWD
22	03S04E29F01S	USGS	335304116353001	Active	Monitoring	550-570	S	CVWD
23	03S04E29R01S	USGS	335231116345401	Active	Monitoring	431-551	S	CVWD
24	04S04E11Q01S	Desert Water Agency	DWA Well 5	Standby	MUN	302-402	S	DWA
25	04S04E35A01S	Indian Canyons Golf Resort	04S04E35A01S	Active	Unknown	360-680	S	DWA
26	04S05E09F03S	Coachella Valley Water District	CVWD Well 4564-1	Active	MUN	410-670	S	CVWD
27	04S05E29A02S	Desert Water Agency	DWA Well 25	Active	MUN	166-300	S	DWA
29	04S07E33L02S	Coachella Valley Water District	WRP7 MW-2S	Active	Monitoring	60-190	S	CVWD
30	05S06E09M03S	Coachella Valley Water District	WRP10 MW-7	Active	Monitoring	260-340	S	CVWD
31	05S06E09P02S	Coachella Valley Water District	PD-GRF MW 2	Active	Monitoring	260-340	S	CVWD
32	05S06E10J01S	Coachella Valley Water District	PD-GRF MW 1	Active	Monitoring	260-340	S	CVWD
33	05S06E13G03S	Coachella Valley Water District	WRP10 MW-8	Active	Monitoring	260-340	S	CVWD
34	05S06E14G03S	Coachella Valley Water District	WRP10 MW-5	Active	Monitoring	240-320	S	CVWD
35	05S06E14P03S	Coachella Valley Water District	WRP10 MW-6	Active	Monitoring	190-270	S	CVWD
36	05S06E15F01S	Coachella Valley Water District	WRP10 MW-2	Active	Monitoring	160-290	S	CVWD
37	05S06E15M01S	Coachella Valley Water District	WRP10 MW-1	Active	Monitoring	145-295	S	CVWD
38	05S06E15P01S	Coachella Valley Water District	WRP10 MW-3	Active	Monitoring	130-290	S	CVWD
39	05S06E16A03S	Coachella Valley Water District	WRP10 MW-4	Active	Monitoring	190-270	S	CVWD
40	05S06E21Q04S	Coachella Valley Water District	PD-GRF MW 3	Active	Monitoring	260-340	S	CVWD
41	05S06E23M02S	Coachella Valley Water District	PD-GRF MW 4	Active	Monitoring	270-360	S	CVWD
42	05S07E03D02S	Coachella Valley Water District	WRP7 MW-4S	Active	Monitoring	60-190	S	CVWD
43	05S07E04A04S	Coachella Valley Water District	WRP7 MW-3S	Active	Monitoring	50-180	S	CVWD
44	05S07E16K02S	Coachella Valley Water District	CVWD Well 5737-1	Inactive	MUN	200-415	S	CVWD, IWA, VSD
45	05S07E19D04S	Coachella Valley Water District	WRP10 MW-9	Active	Monitoring	260-340	S	CVWD
46	05S07E24M02S	Indio Water Authority	Well 1B	Active	Monitoring	190-410	S	IWA
47	06S06E12G01S	Coachella Valley Water District	CVWD Well 6650-1	Inactive	Monitoring	<370	S	CVWD
48	06S07E34A02S	Coachella Valley Water District	TEL-GRF MW-25	Active	Monitoring	115-135	S	CVWD
49	06S07E34D02S	Coachella Valley Water District	TEL-GRF MW-24	Active	MUN	180-200	S	CVWD
50	07S08E29P03S	Coachella Valley Water District	MC-3	Active	Unknown	380-440	S	CVWD
51	08S09E31R03S	Coachella Valley Water District	CVWD Well 8995-1	Active	Unknown	260-390	S	CVWD
52	03S04E17K01S	Valley View MWC	03S04E17K01S	Undetermined	Fish Farm	340-375	S	DWA, MSWD
53	03S04E22A01S	Erin Miner	03S04E22A01S	Active	Irrigation	180-230	S	DWA
54	03S05E08P02S	Bluebeyond Fisheries	03S05E08P02S	Active	Irrigation	200-400	S	CVWD
55	03S05E15N01S	Too Many Palms LLC	03S05E15N01S	Active	Unknown	158-320	S	CVWD
56	03S05E18J01S	Desert Dunes Golf Club	03S05E18J01S	Active	Irrigation	76-340	S	CVWD
57	03S06E21G01S	Sky Valley Mobile Home Park	03S06E21G01S	Undetermined	Irrigation	188-248	S	CVWD
58	04S05E04F01S	So Pacific Trans Co #32601	04S05E04F01S	Active	Irrigation	276-576	S	CVWD
59	04S05E23F01S	Westin Mission Hills Resort	04S05E23F01S	Active	Irrigation	275-1165	S	CVWD
60	04S05E34C01S	Manufacture Home Community Inc	04S05E34C01S	Active	Irrigation	240-500	S	CVWD

Table 3-6. Responsibilities for Groundwater Sampling and Laboratory Analyses								
Map_ID	SWN	Well Owner	Well Name	Well Status[(a)]	Well Use[(b)]	Screen Interval *ft-bgs*	Depth Code[(c)]	Overlying SNMP Agency[(d)]
61	04S05E35Q01S	Tamarisk Country Club	04S05E35Q01S	Active	Irrigation	171-518	S	CVWD
62	04S05E36L02S	Annenberg Estate	04S05E36L02S	Active	Unknown	252-650	S	CVWD
63	04S06E20C01S	Shenandoah Ventures LP	04S06E20C01S	Inactive	Irrigation	250-790	S	CVWD
66	05S05E12D01S	Thunderbird Country Club	05S05E12D01S	Active	Domestic	125-360	S	CVWD
67	05S06E12M01S	Palm Desert Resort Country Club	05S06E12M01S	Active	Domestic	140-650	S	CVWD
68	05S07E08Q01S	Bermuda Dunes Airport	05S07E08Q01S	Active	Unknown	203-654	S	CVWD, MDMWC
69	05S07E28H02S	Tricon/COB Riverdale LP	05S07E28H02S	Active	Domestic	162-636	S	CVWD, IWA, VSD
70	05S08E28M02S	JS Cooper	05S08E28M02S	Undetermined	Irrigation	208-268	S	CVWD, CWA/CSD
71	05S08E30N03S	Carver Tract Mutual Water Co	05S08E30N03S	Active	Irrigation	270-330	S	CVWD, VSD
72	06S07E07B01S	Traditions Golf Club	06S07E07B01S	Active	Irrigation	200-480	S	CVWD
73	06S08E02L01S	Prime Time International	06S08E02L01S	Undetermined	Unknown	216-407	S	CVWD, CWA/CSD
74	06S08E05K01S	Peter Rabbit Farms	06S08E05K01S	Active	Domestic	126-375	S	CVWD, CWA/CSD
75	06S08E32L01S	Guillermo Torres	06S08E32L01S	Undetermined	Domestic	127-227	S	CVWD
76	07S08E27A01S	Gimmway Enterprises Inc	07S08E27A01S	Active	Irrigation	147-215	S	CVWD
77	07S09E14C01S	Tudor Ranch Inc.	07S09E14C01S	Active	MUN	93-290	S	CVWD
78	08S08E15G02S	Thermiculture Management LLC	08S08E15G02S	Active	Monitoring	260-500	S	CVWD
79		Mission Springs Water District	Well 25	Active	Monitoring	330-455	S	MSWD
80		Mission Springs Water District	Well 1	Inactive	Monitoring		S	MSWD
81		Mission Springs Water District	Horton WWTP MW-1	Active	Monitoring	186-236	S	MSWD
82		Mission Springs Water District	Horton WWTP MW-2	Active	Monitoring	220-270	S	MSWD
83		Mission Springs Water District	Horton WWTP MW-3	Active	Monitoring	200-250	S	MSWD
84	03S04E20F02S	USGS	335348116352702	Active	Monitoring	850-890	D	CVWD
85	03S04E20J03S	USGS	335339116345303	Active	Monitoring	850-890	D	CVWD
86	06S07E33G01S	Coachella Valley Water District	TEL-GRF MW-21D	Active	Monitoring	390-410	D	CVWD
87	06S07E33J01S	Coachella Valley Water District	TEL-GRF MW-22D	Active	Monitoring	520-540	D	CVWD
88	06S07E34N02S	Coachella Valley Water District	TEL-GRF MW-23D	Active	Monitoring	525-545	D	CVWD
89	07S09E30R03S	Coachella Valley Water District	Peggy	Active	MUN	730-770	D	CVWD
90	08S09E07N02S	Coachella Valley Water District	Rosie	Active	MUN	720-780	D	CVWD
91	05S07E24L03S	Indio Water Authority	Well 1E	Active	MUN	552-815	D	IWA
92	02S04E28J01S	Mission Springs Water District	Well 35	Active	Monitoring	725-1020	D	MSWD
93	02S04E36P01S	Mission Springs Water District	Well 37	Active	MUN	450-1080	D	MSWD
94	02S05E31H01S	Mission Springs Water District	Well 5	Inactive	Unknown	274-784	D	MSWD
95	03S03E07D01S	Mission Springs Water District	Well 25A	Active	MUN	500-740	D	MSWD
96	03S04E04P01S	CPV Sentinel	03S04E04P01S	Active	MUN		D	DWA, MSWD
97	03S04E11A02S	Mission Springs Water District	Well 32	Active	Unknown	320-980	D	MSWD
98	03S03E08A01S	Mission Springs Water District	Well 26A	Active	MUN	320-600	D	MSWD
99	03S03E10P01S	Unknown	DWA P04	Active	MUN	476-776	D	DWA
100	03S04E14J01S	Mission Springs Water District	Well 33	Active	MUN	360-650	D	MSWD
101	03S04E19L01S	Desert Water Agency	DWA Well 43	Active	MUN	500-900	D	DWA
102	03S04E34H02S	Desert Water Agency	DWA Well 35	Active	MUN	600-1000	D	DWA
103	03S04E36Q01S	Desert Water Agency	DWA Well 38	Active	MUN	620-1000	D	DWA
104	04S04E02B01S	Desert Water Agency	DWA Well 22	Active	MUN	570-1003	D	DWA
105	04S04E11Q02S	Desert Water Agency	DWA Well 18	Standby	MUN	535-948	D	DWA
106	04S04E13C01S	Desert Water Agency	DWA Well 23	Active	MUN	512-912	D	DWA
107	04S04E24E01S	Desert Water Agency	DWA Well 32	Active	MUN	600-1000	D	DWA
108	04S04E24H01S	Desert Water Agency	DWA Well 29	Active	MUN	600-1000	D	DWA
109	04S04E25C01S	Desert Water Agency	DWA Well 39	Active	MUN	580-750	D	DWA
110	04S05E05A01S	Coachella Valley Water District	CVWD Well 4568-1	Active	MUN	800-955	D	CVWD
111	04S05E08N01S	Desert Water Agency	DWA Well 41	Active	MUN	610-1000	D	DWA
112	04S05E09R01S	Coachella Valley Water District	CVWD Well 4567-1	Active	MUN	855-1150	D	CVWD
113	04S05E15G01S	Coachella Valley Water District	CVWD Well 4521-1	Active	MUN	500-800	D	CVWD
114	04S05E17Q02S	Desert Water Agency	DWA Well 31	Active	MUN	600-1000	D	DWA
115	04S05E25D02S	Coachella Valley Water District	CVWD Well 4507-2	Active	MUN	860-1320	D	CVWD
116	04S05E27K01S	Coachella Valley Water District	CVWD Well 4527-1	Active	MUN	850-1155	D	CVWD
117	04S05E29H01S	Desert Water Agency	DWA Well 26	Active	MUN	590-990	D	DWA
118	04S05E35G04S	Coachella Valley Water District	CVWD Well 4504-1	Active	MUN	600-1000	D	CVWD
119	04S06E18Q04S	Coachella Valley Water District	CVWD Well 4630-1	Active	MUN	480-990	D	CVWD
120	04S06E28K04S	Coachella Valley Water District	CVWD Well 4629-1	Active	Monitoring	496-796	D	CVWD

Table 3-6. Responsibilities for Groundwater Sampling and Laboratory Analyses								
Map_ID	SWN	Well Owner	Well Name	Well Status[a]	Well Use[b]	Screen Interval *ft-bgs*	Depth Code[c]	Overlying SNMP Agency[d]
121	04S07E31H01S	Coachella Valley Water District	CVWD Well 4722-1	Active	MUN	570-1160	D	CVWD
122	04S07E33L01S	Coachella Valley Water District	WRP7 MW-2D	Active	MUN	245-395	D	CVWD
123	05S06E02C01S	Coachella Valley Water District	CVWD Well 5664-1	Active	MUN	500-930	D	CVWD
124	05S06E06B03S	Coachella Valley Water District	CVWD Well 5630-1	Active	Monitoring	455-890	D	CVWD
125	05S06E09A01S	Coachella Valley Water District	CVWD Well 5682-1	Active	Monitoring	850-1300	D	CVWD
126	05S06E09F01S	Coachella Valley Water District	CVWD Well 5637-1	Inactive	MUN	450-830	D	CVWD
127	05S06E14B02S	Coachella Valley Water District	CVWD Well 5665-1	Inactive	MUN	400-600	D	CVWD
128	05S06E14P02S	Coachella Valley Water District	CVWD Well 5603-2	Active	MUN	720-975	D	CVWD
129	05S06E16A04S	Coachella Valley Water District	CVWD Well 5620-2	Active	MUN	1040-1360	D	CVWD
130	05S06E16K03S	Coachella Valley Water District	CVWD Well 5681-1	Active	Monitoring	900-1200	D	CVWD
131	05S06E17L01S	Coachella Valley Water District	CVWD Well 5667-1	Active	Monitoring	470-800	D	CVWD
132	05S06E20A02S	Coachella Valley Water District	CVWD Well 5674-1	Inactive	Monitoring	750-1050	D	CVWD
133	05S07E03D01S	Coachella Valley Water District	WRP7 MW-4D	Active	MUN	245-395	D	CVWD
134	05S07E04A01S	Coachella Valley Water District	WRP7 MW-1	Active	Monitoring	147-367	D	CVWD
135	05S07E15N01S	Indio Water Authority	Well AA	Active	MUN	550-1230	D	IWA
136	05S07E19A01S	Coachella Valley Water District	CVWD Well 5708-1	Inactive	MUN	450-970	D	CVWD
137	05S07E20J01S	Indio Water Authority	Well T	Active	MUN	580-1305	D	IWA
138	05S07E26E02S	Indio Water Authority	Well 3B	Active	MUN	500-1200	D	IWA
139	05S07E27P01S	Indio Water Authority	Well Z	Active	MUN	580-1290	D	IWA
140	05S07E33E01S	Indio Water Authority	Well S	Active	MUN	460-1260	D	IWA
141	05S07E34P04S	Indio Water Authority	Well V	Active	MUN	460-1270	D	IWA
142	05S07E35R02S	Indio Water Authority	Well U	Active	MUN	480-1190	D	IWA
143	05S07E36D03S	Coachella Water Authority	Well 19	Active	MUN	650-1250	D	CWA/CSD
144	05S08E31C03S	Coachella Water Authority	Well 11	Active	MUN	513-818	D	CWA/CSD
145	06S07E06B01S	Coachella Valley Water District	CVWD Well 6701-1	Active	MUN	580-800	D	CVWD
146	06S07E22B02S	Coachella Valley Water District	CVWD Well 6726-1	Active	MUN	640-1160	D	CVWD
147	06S07E34A01S	Coachella Valley Water District	CVWD Well 6728-1	Active	MUN	500-750	D	CVWD
148	06S07E34D01S	Coachella Valley Water District	CVWD Well 6729-1	Active	MUN	500-780	D	CVWD
149	06S08E06K02S	Coachella Water Authority	Well 12	Active	MUN	500-1010	D	CWA/CSD
150	06S08E09N02S	Coachella Water Authority	Well 16	Active	Monitoring	480-730	D	CWA/CSD
151	06S08E19D05S	Coachella Valley Water District	CVWD Well 6808-1	Active	MUN	675-1200	D	CVWD
152	06S08E22D02S	Coachella Valley Water District	CVWD Well 6803-1	Inactive	MUN	500-1100	D	CVWD
153	06S08E25P04S	Coachella Valley Water District	CVWD Well 6807-1	Active	MUN	665-1300	D	CVWD
154	06S08E28N06S	Coachella Water Authority	Well 18	Active	Monitoring	900-1190	D	CWA/CSD
155	07S08E17A04S	Coachella Valley Water District	CVWD Well 7803-1	Active	MUN	250-710	D	CVWD
156	07S09E23N01S	Coachella Valley Water District	CVWD Well 7990-1	Inactive	Unknown	530-560	D	CVWD
157		Indio Water Authority	Well 13A	Active	Irrigation	550-1171	D	IWA
158	03S05E08B01S	R.C Roberts	03S05E08B01S	Undetermined	Irrigation	356-516	D	DWA
159	03S05E17M01S	Desert Dunes Golf Club	03S05E17M01S	Active	Unknown	305-412	D	CVWD
160	03S05E20H02S	Donald Franklin	03S05E20H02S	Active	Irrigation	240-360	D	CVWD
161	03S06E21R01S	Joel Rosenfeld	03S06E21R01S	Undetermined	Irrigation	355-495	D	CVWD
162	05S05E12B03S	Tandika Corp	05S05E12B03S	Active	Irrigation	410-800	D	CVWD
163	05S06E13F01S	PD Golf Operations LLC	05S06E13F01S	Active	Irrigation	400-700	D	CVWD
164	05S06E15H01S	Toscana Country Club	05S06E15H01S	Active	Irrigation	430-950	D	CVWD
165	05S06E22C02S	Desert Horizons Country Club	05S06E22C02S	Active	Irrigation	550-990	D	CVWD
166	05S06E27A01S	El Dorado Country Club	05S06E27A01S	Active	MUN	458-596	D	CVWD
167	05S06E29P04S	Bighorn Golf Club	05S06E29P04S	Active	MUN	530-720	D	CVWD
168	05S07E07F04S	Myoma Dunes Mutual Water Company	Well 4	Active	MUN	430-730	D	MDMWC
169	05S07E08L01S	Myoma Dunes Mutual Water Company	Well 11	Active	Unknown	500-1060	D	MDMWC
170	05S07E17K01S	Myoma Dunes Mutual Water Company	Well 12	Active	Irrigation	450-950	D	MDMWC
171	05S08E09N03S	Jamie Brack	05S08E09N03S	Undetermined	Unknown	480-580	D	CVWD, IWA
172	06S07E27B01S	Andalusia Golf Club	06S07E27B01S	Active	Irrigation	300-780	D	CVWD
173	06S07E35L02S	Castro Bros	Castro Bros	Active	Unknown	300-400	D	CVWD
174	06S08E11A01S	Cocopah Nurseries Inc	06S08E11A01S	Active	Unknown	400-842	D	CVWD, CWA/CSD
175	06S08E31P01S	Deer Creek	Deer Creek	Active	Irrigation	400-550	D	CVWD
176	06S08E35E02S	Otto L. Zahler	06S08E35E02S	Undetermined	Unknown	521-596	D	CVWD
177	07S07E02G02S	Warren Webber	Warren Webber	Active	Irrigation	380-700	D	CVWD
178	07S08E01L02S	Bill Wordon	07S08E01L02S	Undetermined	Domestic	500-880	D	CVWD

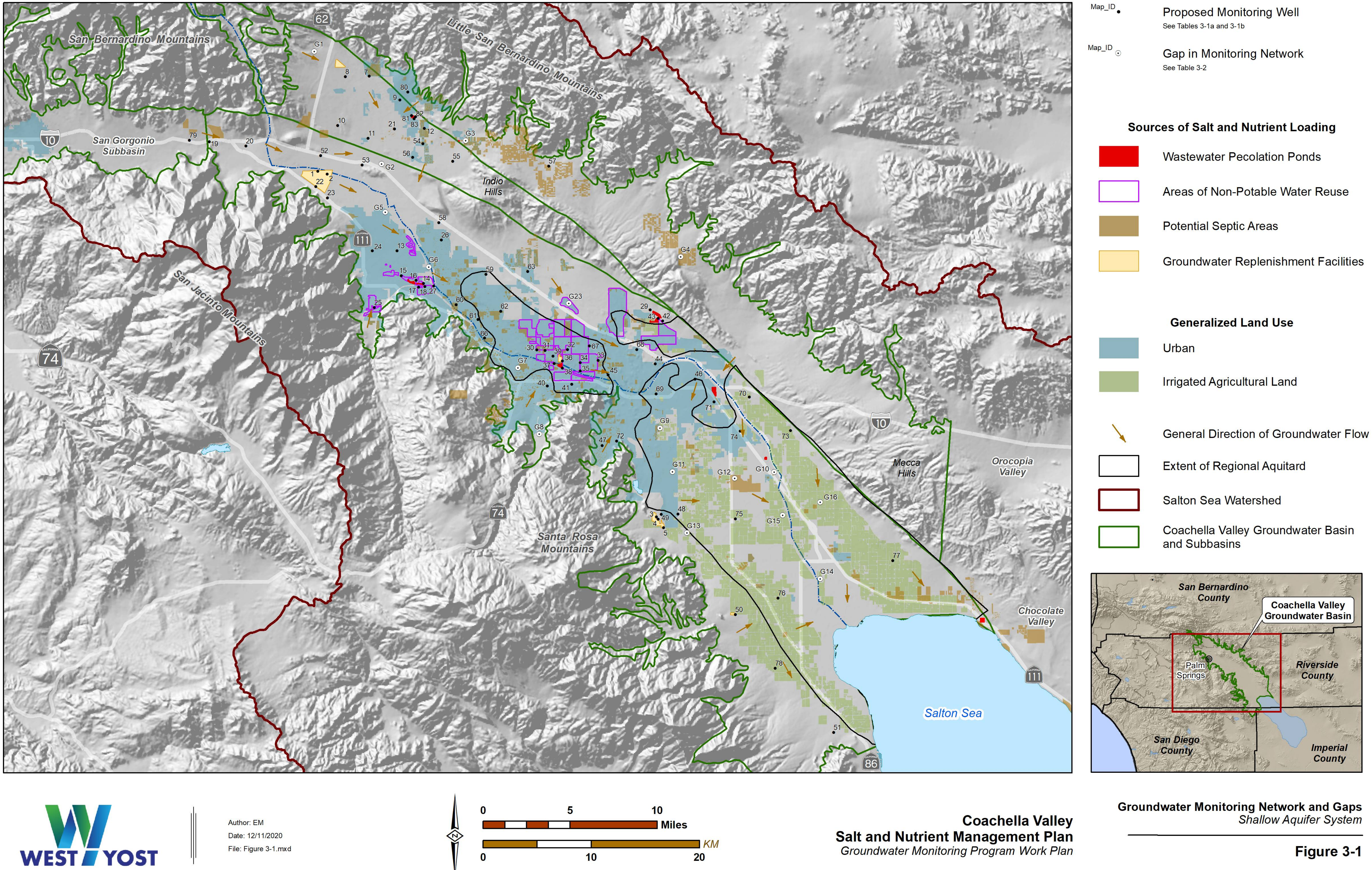
Table 3-6. Responsibilities for Groundwater Sampling and Laboratory Analyses								
Map_ID	SWN	Well Owner	Well Name	Well Status[(a)]	Well Use[(b)]	Screen Interval *ft-bgs*	Depth Code[(c)]	Overlying SNMP Agency[(d)]
179	07S08E27A02S	Gimmway Enterprises Inc	07S08E27A02S	Active	MUN	491-811	D	CVWD
180	07S09E10F01S	Prime Time International	07S09E10F01S	Active	Monitoring	360-500	D	CVWD
181		Mission Springs Water District	Well 31	Active	Monitoring	270-670	D	MSWD
182		Coachella Valley Water District	WRP2 MW3	Active	Monitoring	<90	P	CVWD
183	06S07E27J03S	Coachella Valley Water District	TEL-GRF MW-8	Active	Monitoring	25-45	P	CVWD
184	06S07E34A03S	Coachella Valley Water District	TEL-GRF MW-9	Active	Monitoring	25-45	P	CVWD
185	06S08E31R01S	Coachella Valley Water District	TEL-GRF MW-10	Active	Monitoring	25-45	P	CVWD
186	07S08E06P01S	Coachella Valley Water District	TEL-GRF MW-11	Active	Monitoring	25-45	P	CVWD
187		Coachella Valley Water District	PEW-1	Active	Monitoring	10-55	P	CVWD

(a) Well Status: "Active" means well is known to exist and currently used for original purpose; "Standby" means active backup well; "Inactive" means well exists but is no longer used as a water-supply.

(b) Well Use: MUN = municipal and domestic supply

(c) Depth Code: This monitoring program assigns wells to aquifer layers by depth. P = Perched aquifer system. S = Shallow aquifer system. D = Deep aquifer system

(d) CVWD = Coachella Valley Water District; CWA/CSD = Coachella Water Authority and Sanitary District; DWA = Desert Water Agency; IWA = Indio Water Authority; MDMWC = Myoma Dunes Mutual Water Company; VSD = Valley Sanitary District; MSWD = Mission Springs Water District; CPS = City of Palm Springs



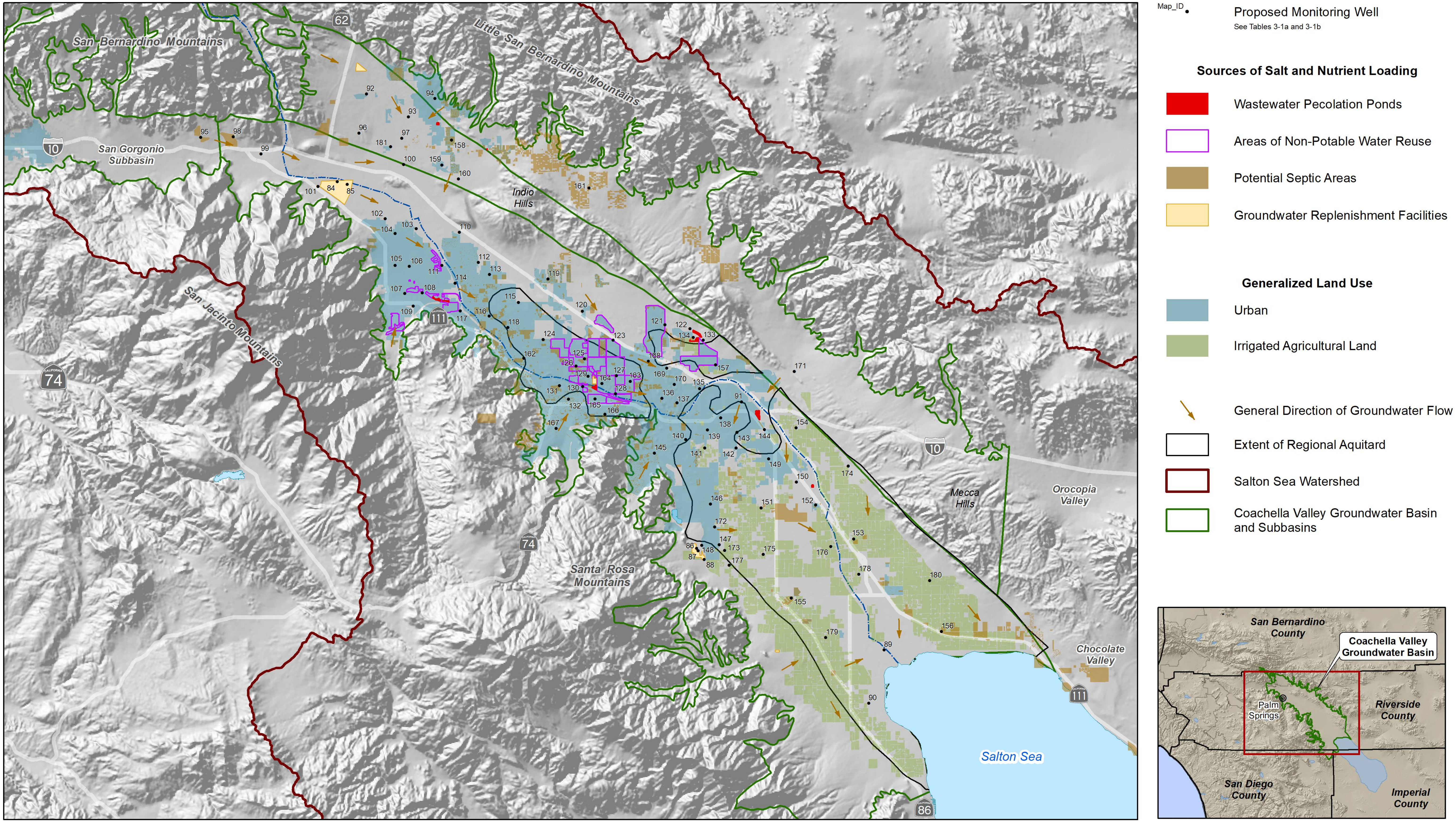
WEST YOST

Author: EM
Date: 12/11/2020
File: Figure 3-1.mxd

Coachella Valley
Salt and Nutrient Management Plan
Groundwater Monitoring Program Work Plan

Groundwater Monitoring Network and Gaps
Shallow Aquifer System

Figure 3-1



WEST YOST

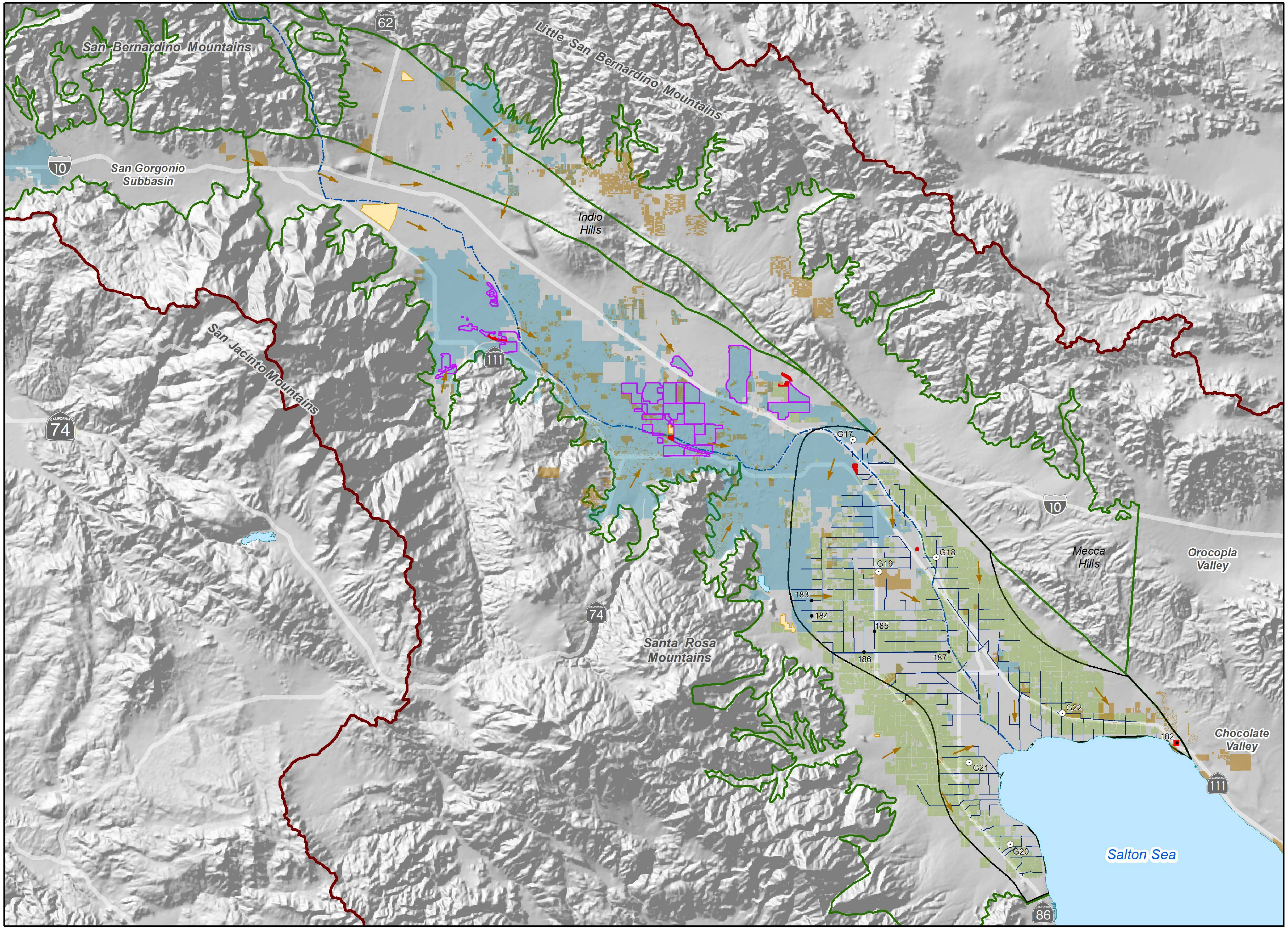
Author: EM/AM
Date: 12/11/2020
File: Figure 3-2.mxd

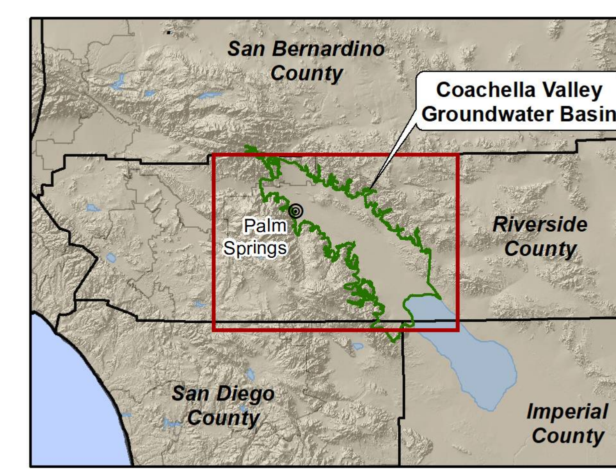
0 5 10 Miles
0 10 20 KM

Coachella Valley
Salt and Nutrient Management Plan
Groundwater Monitoring Program Work Plan

Groundwater Monitoring Network
Deep Aquifer System

Figure 3-2





Map_ID Proposed Monitoring Well
See Tables 3-1a and 3-1b

Map_ID Gap in Monitoring Network
See Table 3-2

Sources of Salt and Nutrient Loading

- Wastewater Pecolation Ponds
- Areas of Non-Potable Water Reuse
- Potential Septic Areas
- Groundwater Replenishment Facilities

Generalized Land Use

- Urban
- Irrigated Agricultural Land
- CVWD Agricultural Drains
- General Direction of Groundwater Flow
- Extent of Perched Aquifer System
- Salton Sea Watershed
- Coachella Valley Groundwater Basin and Subbasins

Author: EM/AM
Date: 12/11/2020
File: Figure 3-3.mxd

0 5 10 Miles
0 10 20 KM

Coachella Valley
Salt and Nutrient Management Plan
Groundwater Monitoring Program Work Plan

Groundwater Monitoring Network and Gaps
Perched Aquifer System

Figure 3-3

4.0 IMPLEMENTATION PLAN

4.1 Schedule of Activities

The objective of the SNMP Agencies is to have a fully functioning groundwater monitoring program by March 31, 2027, including: (i) implementing the monitoring program at existing wells in the monitoring network; (ii) filling all gaps in the monitoring network identified in this Workplan; (iii) analysis of at least one groundwater sample for the constituents listed in **Table 3-5** from all monitoring wells in the network; and (iv) reporting of all laboratory results to the GAMA information system or its successor.

The schedule of activities to implement the groundwater monitoring program is described below:

- **Active and standby municipal production wells.**
  - All active and standby municipal production wells, identified in this SNMP groundwater monitoring program under a DDW monitoring order, will be sampled pursuant to their existing DDW Groundwater Monitoring Schedules. Most municipal production wells are sampled at least once every three years, or more frequently for some analytes like nitrate.
  - By March 31 of each year beginning in 2022, the SNMP Agencies will report to the GAMA information system the laboratory results from all groundwater samples collected during the prior calendar year for the analytes listed in **Table 3-5**.
- **Active monitoring wells.**
  - All monitoring wells identified in this SNMP groundwater monitoring program that are participating in regulatory or voluntary monitoring programs will be sampled pursuant to their existing monitoring schedules. Typically, such monitoring wells are sampled at least once every three years, and most are sampled more frequently. At least one sample must be analyzed for the constituents listed in **Table 3-5** every three years.
  - By March 31 of each year beginning in 2022, the SNMP Agencies will report to the GAMA information system the laboratory results from all groundwater samples collected during the prior calendar year for the analytes listed in **Table 3-5**.
- **Private wells and inactive wells.**
  - Starting 2021, SNMP Agencies responsible for sampling at private wells or inactive wells will initiate steps to collect the first groundwater sample from these wells. This may include executing access agreements and devising and/or implementing a method to collect a groundwater sample.
  - By the end of 2023, the responsible SNMP Agencies will collect and analyze one groundwater sample for every private and inactive well in the monitoring network, where feasible. By March 31 of each year beginning in 2022, the SNMP Agencies will report to the GAMA information system the laboratory results from all groundwater samples collected during the prior calendar year for the analytes listed in **Table 3-5**.
  - Thereafter, each private and inactive well will be sampled at least once every three years. It is the objective of this program to collect and analyze at least two groundwater samples for all private and inactive wells during the initial six-year implementation period.

- **Filling of Gaps in the Monitoring Network.**
  - In 2021, the SNMP Agencies that are responsible for filling gaps in the monitoring network will perform the necessary research and field work and develop plans to fill each gap. These plans will be summarized in the first annual progress report to the Regional Board by March 31, 2022.
  - Starting in 2022, the SNMP Agencies will initiate steps to fill the gaps. The objective is to fill all gaps in the monitoring network and collect and analyze at least one groundwater sample by December 31, 2026.
  - By March 31 of each year beginning in 2023, the SNMP Agencies will report to the GAMA information system the laboratory results from all groundwater samples collected during the prior calendar year for the analytes listed in **Table 3-5**.
  - It should be expected that new gaps in the monitoring network may be identified during implementation of the monitoring program. This may occur if a well in the monitoring network can no longer be sampled because it was destroyed, becomes inoperable, or otherwise is no longer available for monitoring. In such cases, the SNMP Agencies will attempt to identify a suitable replacement well (similar location and well construction) or develop a plan to fill this new gap in the monitoring network. These challenges and plans to address new data gaps will be summarized in the annual progress reports to the Regional Board (see Section 4.2 below).

4.2 Progress Reporting to the Regional Board

To keep the Regional Board informed of progress and future activities during implementation of the monitoring program, the SNMP Agencies will submit an *Annual Progress Report on Implementation of the CV-SNMP Groundwater Monitoring Program* to the Regional Board. The first progress report will be due by March 31, 2022 to report progress achieved during calendar year 2021. The contents of the progress report will include:

Section 1. Summary of Groundwater Monitoring Program and Implementation Schedule

Section 2. Activities Accomplished or In-Progress during the Prior Calendar Year

- Sampling and analysis of existing municipal production wells and monitoring wells.
- Progress made towards sampling and analysis of inactive and private wells.
- Progress made towards filling gaps in the monitoring network.
- Wells that can no longer be sampled and other challenges in sampling.

Section 3. Activities Planned for the Next Calendar Year

- Plans for sampling at wells, including addressing sampling challenges.
- Activities to replace wells that can no longer be sampled and fill gaps in the monitoring network.

Figures.

- Updated map of Groundwater Monitoring Network – *Shallow Aquifer System*.
- Updated map of Groundwater Monitoring Network – *Deep Aquifer System*.
- Updated map of Groundwater Monitoring Network – *Perched Aquifer System.*

Tables.

- Updated list of wells in Groundwater Monitoring Network.
- Updated list of gaps in Groundwater Monitoring Network.

Appendix A. 2020 CV-SNMP Groundwater Monitoring Program Workplan

4.3 Cost Estimates

Cost estimates were derived for the first six-year period of monitoring program implementation. Costs were estimated for only those additional activities that the monitoring program would cause the SNMP Agencies to perform (that they otherwise would not perform). These activities include: (i) sampling and analysis of private wells; (ii) filling of gaps in the monitoring program; and (iii) preparing the annual progress reports to the Regional Board.

Table 4-1 summarizes the cost estimates by task and subtask. The costs described herein are first-order estimates. Actual costs may vary because monitoring program implementation may unfold differently than assumed herein. For example, a gap in the monitoring network may be filled by identifying an existing suitable well, as opposed to constructing a new well. In addition, these costs do not include land acquisition costs for new monitoring well sites or any needed site improvements, including grading, block walls, or fencing.

Sampling of private wells. **Table 3-6** indicates there are 58 private wells that are proposed to participate in the monitoring program. Each well is assumed to be sampled twice over the first six years (116 samples).

The main activities associated with the sampling of private wells include:

1. Performing a field canvass of each well to: initiate coordination with the well owners; document the condition of the well; and determine the current ability to collect a water-quality sample.
2. Developing and executing an access agreement with the private well owner.
3. If necessary, hiring a subcontractor to construct wellhead improvements to enable sample collection. It is assumed that about half of the private wells will require such improvements at $3,000 per well.
4. Perform two sampling events and laboratory analyses over the six-year period. Laboratory costs are about $77 per sample.

Total costs for sampling of private wells over the first six-year implementation period are estimated at about $260,000.

Filling gaps in the monitoring network. **Table 3-4** indicates that there are 23 gaps in the monitoring network that need to be filled over the first six-year period. For cost estimating purposes, it is assumed that each gap will be filled with the construction of a new monitoring well.

Six of the proposed monitoring wells are targeted for the Perched aquifer system with well depths of less than about 100 ft-bgs—these well boreholes are assumed to be drilled via a sonic method. Sixteen of the proposed wells are targeted for the Shallow aquifer system with well depths of less than about 500 ft-bgs—these well boreholes are assumed to be drilled via a mud-rotary method. One of the proposed wells is estimated to have a total depth of about 1,000 ft-bgs—this well borehole is assumed to be drilled via a mud-rotary method.

The main activities associated with the drilling and construction of new monitoring wells are listed below.

1. Perform a well-siting study to select 23 available and appropriate well sites.
2. Prepare two sets of standard technical specifications for the drilling, construction, and development of two types of monitoring wells: (i) a monitoring well in the Perched aquifer system and (ii) a monitoring well in the Shallow or Deep aquifer systems.
3. Acquire well-site property and/or execute easements. The cost associated with land purchase or long-term land leases are unknown at this time and were therefore not estimated; however, such costs are likely to be significant.
4. Prepare bid package and conduct the bid process to select a well drilling/construction subcontractor. It is assumed that one contractor will construct all 23 wells.
5. Obtain all permits and CEQA clearance.
6. Drill, construct, and develop 23 monitoring wells. The wells are assumed to be comprised of 4" PVC Schedule 80 pipe with 40 feet of well screens. Well head completions are assumed to be an above ground 10-inch diameter stovepipe casing with a locking cap. Any needed well-site improvements are unknown at this time and were therefore not estimated; however, such costs are likely to be significant.
7. Prepare well completion reports for 23 new monitoring wells and file Well Completion Reports with the California Department of Water Resources. New monitoring wells will be added to the SNMP database.

Total costs to fill all gaps in the monitoring network over the first six-year implementation period are estimated to be about $2,900,000. These estimates do not include land acquisition costs for new monitoring well sites or any needed site improvements.

Task 3 – Preparing the Annual Progress Report to the Regional Board. As described above in Section 4.2, the SNMP Agencies will prepare an *Annual Progress Report on Implementation of the CV-SNMP* Groundwater *Monitoring Program* to the Regional Board each year to keep it abreast of progress and future activities.

Total costs to prepare five annual progress reports over the first six-year implementation period are estimated to be about $140,000.

Total Costs. Total costs for the first six-year period of monitoring program implementation are estimated to be about $4,100,000 (including a contingency of 25%). Total costs are likely to be higher because these estimates do not include land acquisition or site improvement costs for new monitoring well sites.

Table 4-1. Cost Estimates -- *Initial Six-Year Implementation Period of CV-SNMP Groundwater Monitoring Program*

Task and Subtask Descriptions	Notes	Labor Cost		Other Direct Costs								Total Project Costs	
										Total Reimbursable Expenses			
		Sub-Task	Task	Travel	Well Construction Services (Sub)	E-Logging Services (Sub)	Permits and CEQA	Field Equip	Lab	Sub-Task	Task	Sub-Task	Task
Task 1 - Sampling and Analysis of Private Wells			**$152,146**								**$108,030**		**$260,175**
1.1 Perform field canvass of private wells; develop access agreements		$19,529		$1,472						$1,472		$21,001	
1.2 Development/execution of private well access agreements		$79,924								$0		$79,924	
1.3 Devise and construct and wellhead improvements to enable sample collection		$16,733			$87,000					$87,000		$103,733	
1.4 Perform two sampling and laboratory analysis events over the five-year period		$35,960						$10,626	$8,932	$19,558		$55,518	
Task 2 - Filling of Gaps in the Monitoring Network			**$1,089,443**								**$1,769,514**		**$2,858,957**
2.1 Perform field work and research; prepare plan to fill gaps in monitoring network		$53,776								$0		$53,776	
2.2 Prepare well-siting study to identify 23 well sites		$50,828								$0		$50,828	
2.3 Prepare technical specifications for of two monitoring well types		$32,378								$0		$32,378	
2.4 Acquire well sites and/or execute lease agreements		$14,996								$0		$14,996	
2.5 Conducting a bid process to select a well drilling/construction subcontractor		$5,988		$184						$184		$6,172	
2.6 Obtain permits and CEQA clearance		$3,299					$24,600			$24,600		$27,899	
2.7 Drill, construct, and develop six wells in the Perched aquifer system	a	$94,608		$1,536	$89,820	$42,000			$3,180	$136,536		$231,144	
2.8 Drill, construct, and develop 16 wells in the Shallow aquifer system	a	$555,712		$8,192	$1,314,720	$112,000			$8,480	$1,443,392		$1,999,104	
2.9 Drill, construct, and develop one deep monitoring well	a	$51,492		$512	$158,260	$5,500			$530	$164,802		$216,294	
2.10 Prepare well completion reports for 23 new monitoring wells/file with DWR		$226,366										$226,366	
Task 3 - Preparing Annual Progress Reports to the Regional Board			**$139,800**								**$0**		**$139,800**
Project Subtotals			**$1,381,389**	**$11,896**	**$1,649,800**	**$159,500**	**$24,600**	**$10,626**	**$21,122**		**$1,877,544**		**$3,258,932**
Contingency (25%)													**$814,733**
Project Total													**$4,073,665**

Notes:

a = These estimates do not include land acquisition costs for new monitoring well sites or any needed site improvements, including grading, block walls, or fencing.

Appendix F
Completed Projects, Deferred Projects, and Removed Projects

The tables that follow identify the projects that were excluded from further consideration or incorporated in other projects after discussion with the Agencies.

The project identifier used in the 2013 MC/GH WMP includes a letter that is associated with a category of project listed below, followed by a sequential number (e.g., A-1 was the first conservation project).

A. Conservation
B. Water Supply
C. Imported Water Replenishment
D. Water Quality Protection
E. Monitoring
F. Data Management and Reporting
G. Other.

This identifier has been modified in this Alternative Plan Update for the Active Projects to include a new more descriptive letter combination, listed below, followed by a sequential number (e.g., WC-1 is the first water conservation project).

WC. Water Conservation
WS. Water Supply
WQ. Water Quality Protection, including CV-SNMP activities
SGMA. SGMA Implementation
WELL. Well Management

The projects excluded from further consideration retain the original numbering system from the 2013 MC/GH WMP (e.g., A-1, A-2, etc.) while Active Projects are listed with the current project number (described in the Alternative Plan Update, Section 8, Projects and Management Actions. A cross-reference table of the prior identification and the current identification for Active Projects is provided in **Table G-1 of Appendix G**.

Completed Projects, found in **Table F-1**, are those that are fully completed and include construction of additional wells by MSWD to meet demands, planning for improved water supply reliability, preparation of a Water Shortage Contingency Plan as has been included in the 2020 Regional Urban Water Management Plan, working cooperatively with Riverside County Department of Environmental Health (RCDEH) including recent completion of a Regional Well Retrofit and Abandonment Program, and completion of monitoring wells near mesquite hummocks.

Deferred Projects, found in **Table F-2**, are those that may not be currently needed or are not currently economically feasible. Deferred projects include expansion of the recharge basin, septic conversion in the CVWD area, and need for additional geophysical surveys or stream gauging.

Removed Projects found in **Table F-3**, are those that are performed or incorporated as part of an Active project (e.g., periodically review imported water supply availability and needs is part of the SGMA Alternative Update), or are no longer being pursued (e.g., expansion of the Horton WWTP by MSWD and installation of groundwater level data loggers).

TABLE F-1: COMPLETED PROJECTS

2013 MC/GH WMP Project No	Project/Program	Status
B-1	Construct additional wells as needed to meet future demands	MSWD completed design and permitting for new well; construction began in January 2021.
B-4	Acquire additional imported water supplies as needed	CVWD/DWA have entered into agreements to participate in DCF and Sites Reservoir to improve SWP reliability, and Lake Perris Seepage as an additional imported water supply. These specific projects are identified in the active project list (Active Projects B-4a, B-4b and B-4c) until deliveries are initiated upon project completion.
B-6	Develop water supply and conservation contingency programs to provide supply buffer	Addressed by Water Shortage Contingency Plan under preparation as part of the 2020 Regional Urban Water Management Plan.
D-13	Work cooperatively with Riverside County Department of Health (RCDEH) to ensure well construction, abandonment, destruction policies are followed	CVWD completed administration of CVRWMG grant funding for the 2017 Regional Well Retrofit and Abandonment Program. Issued 23 rebates for retrofit or destruction of improperly sealed or abandoned wells in the Coachella Valley (See also Active Project D-13).
D-14	Develop a cooperative program with RCDEH to identify and cap/destroy unused wells	
E-11	Construct 1-3 new monitoring wells to document groundwater levels near mesquite hummocks	Completed; groundwater level monitoring is ongoing.
F-1	Improved reporting of water resources data in Engineer's Reports	Completed, and continuing as SGMA Annual Report (new Active project).

TABLE F-2: DEFERRED PROJECTS

2013 MC/GH WMP Project No	Project/Program	Notes/Status
A-2	Private pumper conservation program	Deferred until need is demonstrated.
B-7	Evaluate viability and stakeholder support for a SWP extension	Deferred until need is demonstrated.
C-3	Expand recharge basin capacity (if needed)	Deferred until need is demonstrated.
C-4	Work with planning entities and RCFCWCD on local stormwater capture and low impact development	New drainage plan on hold.
D-5	Evaluate conversion of septic to sewer in CVWD area	Deferred until sufficient growth occurs to justify cost.
D-17	Desalination of Colorado River recharge water	Deferred until need is demonstrated.
E-2	Install a California Irrigation Management Information System (CIMIS) station in DHS area	Deferred until need is demonstrated.
E-8	Monitor local surface runoff quality	Deferred until need is demonstrated.
E-9	Investigate viability of conducting geophysical survey near recharge basin	Deferred until need is demonstrated.

TABLE F-3: REMOVED PROJECTS

2013 MC/GH WMP Project No.	Project/Program	Notes
B-2	Locate new wells to minimize interference with adjacent wells	Occurs during planning for new wells.
B-3	Periodically review imported water supply availability and needs	Incorporated in SGMA-5 Five-year Alternative Plan Update.
B-4	Future Supplemental Water Acquisitions	Incorporated in WS-3 – SWP Delta Conveyance Facility Project, WS-4 – SWP Lake Perris Dam Seepage Recovery Project, and WS-5 – Sites Reservoir Delivery.
B-5	Develop recycled water system(s) if feasible	Incorporated in WS-2 – Recycled water for reuse in MCSB.
C-2	Evaluate need for increased imported water supplies to stabilize groundwater levels	Incorporated into SGMA-4 SGMA Annual Report and SGMA-5-Five-year Alternative Plan Updates.
D-2	Expand Horton WWTP and install nitrogen removal	Horton WWTP expansion is on hold and new Regional WWTP under construction to provide additional treatment capacity.
D-6	Evaluate occurrence and risk of nitrate migration	Incorporated into WQ-7 Implement CV-SNMP Development Workplan and WQ-8 Implement CV-SNMP Groundwater Monitoring Program Workplan.
D-7	Participate in valley-wide salt/nutrient management plan (SNMP)	Incorporated into WQ-7 Implement CV-SNMP Development Workplan and WQ-8 Implement CV-SNMP Groundwater Monitoring Program Workplan.
D-8	Develop and calibrate water quality model in conjunction with CV-SNMP Update	Incorporated into WQ-7 Implement CV-SNMP Development Workplan.
D-9	Manage groundwater levels in MCSB to minimize migration of warm brackish water from Desert Hot Springs (DHS) Subbasin	Removed because management actions address this concern.
D-10	Evaluate occurrence and risk of uranium migration	Renumbered WQ-10.
D-14	Develop cooperative program with RCDEH to identify and cap/destroy unused wells	Incorporated in OTH-1 Well construction, abandonment, and destruction management.
D-18	Desalination of East MCSB groundwater	Removed as current Management Committee has no knowledge of project.

2013 MC/GH WMP Project No.	Project/Program	Notes
E-1	Summarize precipitation data annually to estimate natural inflows to basins	Incorporated in SGMA-4 SGMA Annual Report and SGMA-5-Five-year Alternative Plan Updates.
E-4	Continue to monitor public and private wells for groundwater level and quality	Incorporated in SGMA-3 Maintain water related data, SGMA-4 SGMA Annual Report), SGMA-5 Five-Year Alternative Plan Update, and WQ-7 Implement CV-SNMP Development Workplan.
E-5	Incorporate additional private wells in routine groundwater level and quality monitoring	Incorporated in SGMA-3 Maintain water related data, SGMA-4 SGMA Annual Report), SGMA-5 Five-Year Alternative Plan Update, and WQ-7 Implement CV-SNMP Development Workplan.).
E-7	Install groundwater level data loggers in 5-10 monitoring wells	Data loggers are not needed as groundwater levels do not vary significantly; current water level monitoring is sufficient.
E-10	Construct 1-2 new monitoring wells to document recharge activities	One new well constructed and data incorporated in SGMA-4 SGMA Annual Report and SGMA-5 Five-Year Alternative Plan Update,
E-12	Conduct flow loss study on Whitewater River	Removed at direction of Management Committee as no longer needed.
E-13	Periodic groundwater model update and recalibration; combine with Whitewater model	Incorporated in SGMA-5: Five-year Alternative Plan Updates.
E-16	Investigate additional stream gauging in MCSB	Removed as there are no other locations in MCSB with sufficient flow.
G-2	Develop adaptive management procedures to monitor management progress and adjust as needed	Incorporated into Section 8.3

Appendix G
Project Identification Cross-Reference Table

TABLE G-1: PROJECT NUMBER CROSS REFERENCE

Alternative Plan Update Numbering	2013 MC/GH WMP Project No.	Description
WC-1	A-1	Continue to implement urban water conservation and education programs
WC-2	A-3	Track water conservation effectiveness through the Urban Water Management Plans (UWMPs)
WC-3	n/a	Regional water savings study
WC-4	n/a	Implement Water Shortage Contingency Plan
WS-1	C-1	Continue existing imported water replenishment program
WS-2	D-4	Recharge Regional WWTP Effluent in MCSB
WS-3	n/a	State Water Project (SWP) – Delta Conveyance Facility
WS-4	n/a	SWP – Lake Perris Dam Seepage Recovery Project
WS-5	n/a	SWP – Sites Reservoir Delivery
WQ-1	D-1	Convert from septic to sewer in MSWD area
WQ-2	D-3	Construct Regional WWTP with nitrogen removal
WQ-3	D-11	Track potential regulatory actions of CDPH and USEPA that could affect drinking water regulation compliance
WQ-4	D-12	Coordinate with appropriate regulatory agencies responsible for preventing contaminating activities in well capture and recharge zones
WQ-5	D-15	Review and comment on development proposals, environmental documents and land use plans to protect water quality
WQ-6	D-16	Support Groundwater Guardian Program to educate public on water quality
WQ-7	D-7	Participate in valley-wide salt/nutrient management plan (SNMP)
WQ-8	n/a	Implement CV-SNMP Groundwater Monitoring Program Workplan
WQ-9	E-15	Construct 1-3 new monitoring wells to document basin inflows
WQ-10	D-10	Evaluate occurrence and risk of uranium migration
SGMA-1	G-1	Continue existing subbasin management committee structure
SGMA-2	E-14	Conduct ground surface elevation surveys
SGMA-3	F-2	Develop valley-wide water resources database
SGMA-4	n/a	SGMA Annual Report
SGMA-5	n/a	Five-Year Alternative Plan Update

Alternative Plan Update Numbering	2013 MC/GH WMP Project No.	Description
SGMA-6	n/a	Pursue Funding Opportunities
WELL-1	D-13	Work cooperatively with Riverside County DEH to ensure well construction, abandonment, destruction policies are followed
WELL-2	E-3	Update well canvas and determine well operational status
WELL-3	E-6	Continue requiring that all private production wells meeting production criteria install meters and report production

Appendix H
Comments and Responses

Comments on the public draft were solicited from October 18, 2021 to November 18, 2021. The following comments were received

Name of Commenter	Date of Comment	Section/ Appendix #	PDF Page Number	PDF Line Number or Figure Number	Comment	Comment Responses
Amy McNeill, Riverside County Flood Control and Water Conservation District	10/27/2021	Appendix F	456	Table F-2	I want to confirm that Project C-4 is referring to the proposed/draft West Desert Hot Springs Master Drainage Plan the District has been worked collaboratively with the City to incorporated water conservation and water quality features into the flood control master drainage plan. These feature have the potential to benefit groundwater recharge in the future. Based on the notes in the table, I assume until the plan is final, Project C-4 will continue to remain in the deferred project list. It was noted that these deferred projects were added here becuase they may not be needed and the October 27, 2021 update meeting showcased future projects with great forecasted water sustainability making this case. As an update, completion of the draft West Desert Hot Springs Master Drainage Plan is still on hold. I have attached the latest version dated August 2014. We appreciate the inclusion of the draft West Desert Hot Springs Master Drainage Plan as Project C-4 within the updated documents.	Thank you for confirming the status of the project.

Appendix I
Agency Resolutions Adopting the Alternative Plan Update

Coachella Valley Water District
Board of Directors

Resolution No: 2021-45

**COACHELLA VALLEY WATER DISTRICT
GROUNDWATER SUSTAINABILITY AGENCY
RESOLUTION NO. 2021-45
ADOPTION OF THE 2022 MISSION CREEK SUBBASIN
ALTERNATIVE PLAN UPDATE
IN COMPLIANCE WITH THE
SUSTAINABLE GROUNDWATER MANAGEMENT ACT**

WHEREAS, the California Legislature enacted a statewide framework for sustainable groundwater management, known as the Sustainable Groundwater Management Act (California Water Code section 10720 et seq.), pursuant to Senate Bill 1168, Senate Bill 1319, and Assembly Bill 1739, which was approved by the Governor and Chaptered by the Secretary of State on September 16, 2014; and

WHEREAS, the Sustainable Groundwater Management Act (SGMA) went into effect on January 1, 2015; and

WHEREAS, SGMA requires all medium- and high-priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed pursuant to a Groundwater Sustainability Plan or an approved Alternative Plan; and

WHEREAS, DWR has designated the Mission Creek Subbasin of the Coachella Valley Groundwater Basin as a medium-priority basin (DWR Bulletin 118 No. 7-021.02); and

WHEREAS, on October 13, 2015 Coachella Valley Water District elected to become a GSA for the Mission Creek Subbasin of the Coachella Valley Groundwater Basin; and

WHEREAS, the Coachella Valley Water District, Desert Water Agency, and Mission Springs Water District (Parties) comprise the Management Committee pursuant to the 2004 Settlement Agreement; and

WHEREAS, on December 29, 2016, Desert Water Agency, Coachella Valley Water District and Mission Springs Water District together submitted to DWR a proposed Alternative to a Groundwater Sustainability Plan (Alternative Plan) for the Mission Creek Subbasin in accordance with Water Code section 10733.6; and

WHEREAS, on July 17, 2019, DWR determined that the Mission Creek Subbasin Alternative Plan satisfies the objectives of SGMA and notified the Parties that the Alternative Plan was approved, and that it would be necessary to submit an assessment and update of the Alternative Plan by January 1, 2022, and every five years thereafter; and

Coachella Valley Water District
Board of Directors

Resolution No: 2021-45

WHEREAS, the Parties have jointly developed the Mission Creek Subbasin Alternative Plan Update, and released a draft for public comment on October 18, 2021; and

WHEREAS, the Board of Directors of Coachella Valley Water District conducted a public hearing on December 7, 2021 for the purpose of receiving public comments and considering adoption of the Mission Creek Subbasin Alternative Plan Update; and

WHEREAS, Water Code section 10733.6 requires the Alternative Plan Update to be submitted to DWR for review; and

WHEREAS, this resolution and approval of the Alternative Plan Update are not subject to the California Environmental Quality Act (CEQA) pursuant to California Code of Regulations (CCR) 15262 and SGMA 10728.6 because CEQA does not apply to planning studies for possible future actions not yet approved, adopted, or funded by this Agency (CCR 15262) or to the preparation and adoption of plans pursuant to SGMA (SGMA 10728.6), and because projects to implement actions taken pursuant to the Alternative Plan Update will be analyzed in accordance CEQA based on the nature of the project, environmental setting and potential environmental impacts before those projects are approved.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of Coachella Valley Water District GSA as follows:

1. The foregoing recitals are true and correct and made an operative part of this Resolution.

2. The 2022 Mission Creek Subbasin Alternative Plan Update is hereby approved and adopted, subject to such minor, non-substantive modifications to the text as the Parties may find necessary or appropriate prior to submittal to DWR on or before December 31, 2021. A copy of the 2022 Alternative Plan Update is attached hereto and incorporated herein by reference.

3. This Board of Directors hereby designates J. M. Barrett, or his designee, to be the Plan Manager who is authorized and directed to timely provide notification of this approval and adoption to DWR, including a copy of this Resolution, the approved Alternative Plan Update, and any additional information/documentation required by law.

4. Pursuant to CEQA, the Board of Directors directs staff to file a Notice of Exemption with the Riverside County Clerk within five (5) working days of adoption of this Resolution.

Coachella Valley Water District
Board of Directors

Resolution No: 2021-45

PASSED AND ADOPTED by the Board of Directors of the Coachella Valley Water District GSA, this 7th day of December 2021, by the following vote:

AYES: Powell, Nelson, Aguilar, Bianco, Estrada

NOES: None

ABSENT: None

ABSTAIN: None

John P. Powell, Jr.
President
Coachella Valley Water District

Sylvia M. Bermudez, MMC
Clerk of the Board
Coachella Valley Water District

RESOLUTION NO. 1268

RESOLUTION OF THE BOARD OF DIRECTORS OF DESERT WATER AGENCY ADOPTING THE 2022 MISSION CREEK SUBBASIN ALTERNATIVE PLAN UPDATE IN COMPLIANCE WITH THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT

WHEREAS, the California Legislature enacted a statewide framework for sustainable groundwater management, known as the Sustainable Groundwater Management Act (California Water Code section 10720 et seq.), pursuant to Senate Bill 1168, Senate Bill 1319, and Assembly Bill 1739, which was approved by the Governor and Chaptered by the Secretary of State on September 16, 2014; and

WHEREAS, the Sustainable Groundwater Management Act (SGMA) went into effect on January 1, 2015; and

WHEREAS, SGMA requires all medium- and high-priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed pursuant to a Groundwater Sustainability Plan or an approved Alternative Plan; and

WHEREAS, DWR has designated the Mission Creek Subbasin of the Coachella Valley Groundwater Basin as a medium-priority basin (DWR Bulletin 118 No. 7-021.02); and

WHEREAS, on November 17, 2015 Desert Water Agency elected to become a GSA for the Mission Creek Subbasin of the Coachella Valley Groundwater Basin as provided in SGMA and DWR has accepted the Agency as a GSA within the Mission Creek Subbasin; and

WHEREAS, the Coachella Valley Water District, Desert Water Agency, and Mission Springs Water District (Parties) comprise the Management Committee pursuant to the 2004 Settlement Agreement; and

WHEREAS, on December 29, 2016, Desert Water Agency, Coachella Valley Water District and Mission Springs Water District together submitted to DWR a proposed Alternative to a Groundwater Sustainability Plan (Alternative Plan) for the Mission Creek Subbasin in accordance with Water Code section 10733.6; and

WHEREAS, on July 17, 2019, DWR determined that the Mission Creek Subbasin Alternative Plan satisfies the objectives of SGMA and notified the Parties that the Alternative Plan was approved, and that it would be necessary to submit an assessment and update of the Alternative Plan by January 1, 2022, and every five years thereafter; and

WHEREAS, the Parties have jointly developed the Mission Creek Subbasin Alternative Plan Update, and released a draft for public comment on October 18, 2021; and

WHEREAS, the Board of Directors of Desert Water Agency conducted a public hearing on December 7, 2021 for the purpose of receiving public comments and considering adoption of the Mission Creek Subbasin Alternative Plan Update; and

WHEREAS, Water Code section 10733.6 requires the Alternative Plan Update to be submitted to DWR for review; and

WHEREAS, this resolution and approval of the Alternative Plan Update are not subject to the California Environmental Quality Act (CEQA) pursuant to California Code of Regulations (CCR) 15262 and SGMA 10728.6 because CEQA does not apply to planning studies for possible future actions not yet approved, adopted, or funded by this Agency (CCR 15262) or to the preparation and adoption of plans pursuant to SGMA (SGMA 10728.6), and because projects to implement actions taken pursuant to the Alternative Plan will be analyzed in accordance CEQA based on the nature of the project, environmental setting and potential environmental impacts before those projects are approved.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of Desert Water Agency as follows:

1. The foregoing recitals are true and correct and made an operative part of this Resolution.

2. The 2022 Mission Creek Subbasin Alternative Plan Update is hereby approved and adopted, subject to such minor, non-substantive modifications to the text as the Parties may find necessary or appropriate prior to submittal to DWR on or before December 31, 2021. A copy of the 2022 Alternative Plan Update is attached hereto and incorporated herein by reference.

3. This Board of Directors hereby designates Coachella Valley Water District as the Party authorized to provide notification of this approval and adoption to DWR, including a copy of this Resolution, the approved Alternative Plan Update, and any additional information/documentation required by law.

ADOPTED this 7th day of December 2021.

Kristin Bloomer

Kristin Bloomer, President

ATTEST:

Joseph K. Stuart

Joseph K. Stuart, Secretary-Treasurer

DESERT WATER

RESOLUTION NO. 1268
LINK TO MISSION CREEK SUBBASIN ALTERNATIVE PLAN

http://www.missioncreeksubbasinsgma.org/wp-content/uploads/2021/11/Vol_I_MCSB_AltPlanUpdate_Report_Final_112321.pdf

AND

http://www.missioncreeksubbasinsgma.org/wp-content/uploads/2021/11/Vol_II_Appendices_A-H_Combined_112321.pdf

RESOLUTION NO. 2021-22

RESOLUTION OF THE BOARD OF THE DIRECTORS OF MISSION SPRINGS WATER DISTRICT TO ADOPT THE 2022 MISSION CREEK SUBBASIN ALTERNATIVE PLAN UPDATE IN COMPLIANCE WITH THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT

WHEREAS, the California Legislature enacted a statewide framework for sustainable groundwater management, known as the Sustainable Groundwater Management Act (California Water Code section 10720 et seq.), pursuant to Senate Bill 1168, Senate Bill 1319, and Assembly Bill 1739, which was approved by the Governor and Chaptered by the Secretary of State on September 16, 2014; and

WHEREAS, the Sustainable Groundwater Management Act (SGMA) went into effect on January 1, 2015; and

WHEREAS, SGMA requires all medium- and high-priority groundwater basins, as designated by the California Department of Water Resources (DWR) Bulletin 118, to be managed pursuant to a Groundwater Sustainability Plan or an approved Alternative Plan; and

WHEREAS, DWR has designated the Mission Creek Subbasin of the Coachella Valley Groundwater Basin as a medium-priority basin (DWR Bulletin 118 No. 7-021.02); and

WHEREAS, the Mission Springs Water District, Coachella Valley Water District, and Desert Water Agency (Parties) comprise the Management Committee pursuant to the 2004 Settlement Agreement; and

WHEREAS, on December 29, 2016, Mission Springs Water District, Coachella Valley Water District, and Desert Water Agency together submitted to DWR a proposed Alternative to a Groundwater Sustainability Plan (Alternative Plan) for the Mission Creek Subbasin in accordance with Water Code section 10733.6; and

WHEREAS, on July 17, 2019, DWR determined that the Mission Creek Subbasin Alternative Plan satisfies the objectives of SGMA and notified the Parties that the Alternative Plan was approved, and that it would be necessary to submit an assessment and update of the Alternative Plan by January 1, 2022, and every five years thereafter; and

WHEREAS, the Parties have jointly developed the Mission Creek Subbasin Alternative Plan Update, and released a draft for public comment on October 18, 2021; and

WHEREAS, the Board of Directors of the Mission Springs Water District conducted a public hearing on December 20, 2021 for the purpose of receiving public comments and considering adoption of the Mission Creek Subbasin Alternative Plan Update; and

WHEREAS, Water Code section 10733.6 requires the Alternative Plan Update to be submitted to DWR for review; and

WHEREAS, this resolution and approval of the Alternative Plan Update are not subject to the California Environmental Quality Act (CEQA) pursuant to California Code of Regulations (CCR) 15262 and SGMA 10728.6 because CEQA does not apply to planning studies for possible future actions not yet approved, adopted, or funded by this Agency (CCR 15262) or to the preparation and adoption of plans pursuant to SGMA (SGMA 10728.6), and because projects to implement actions taken pursuant to the Alternative Plan will be analyzed in accordance CEQA based on the nature of the project, environmental setting and potential environmental impacts before those projects are approved.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Mission Springs Water District as follows:

1. The foregoing recitals are true and correct and made an operative part of this Resolution.

2. The 2022 Mission Creek Subbasin Alternative Plan Update is hereby approved and adopted, subject to such minor, non-substantive modifications to the text as the Parties may find necessary or appropriate prior to submittal to DWR on or before December 31, 2021. A copy of the 2022 Alternative Plan Update is attached hereto and incorporated herein by reference.

3. This Board of Directors hereby designates Coachella Valley Water District as the Party authorized to provide notification of this approval and adoption to DWR, including a copy of this Resolution, the approved Alternative Plan Update, and any additional information/documentation required by law.

ADOPTED this 20th day of December 2021, by the following vote:

Ayes: Duncan, Grasha, Martin, Sewell, Wright
Noes:
Abstain:

ATTEST:

Nancy Wright
President of Mission Springs Water District
and its Board of Directors

Arden Wallum
Secretary of Mission Springs Water District
and its Board of Directors

CERTIFICATION OF ADOPTION

STATE OF CALIFORNIA)
)
COUNTY OF RIVERSIDE)

I, Arden Wallum, Secretary of the Board of Directors of Mission Springs Water District, certify that the foregoing is a full, true and correct copy of Resolution No. **2021-22** which was adopted by the Board of Directors of said District at its regular meeting held December 20, 2021.

It has not been amended or repealed.

Dated: December 21, 2021

Arden Wallum
Secretary of Mission Springs Water District
and its Board of Directors