RINCON CONSULTANTS TODD GROUNDWATER

2027 Indio Subbasin Water Management Plan Update

Sustainable Groundwater Management Act Alternative Plan



Volume 1: Alternative Plan

www.indiosubbasinsgma.org

Prepared for: Indio Subbasin Groundwater Sustainability Agencies

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WATER DISTRICT

COACHELLA WATER AUTHORITY & SANITARY DISTRICT
SERVICE. VALUE. QUALITY.

DWA DESERT WATER AGENCY

INDIO

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Acronyms and Abbreviations

˚F	degrees Fahrenheit
µg/L	micrograms per liter
2002 CVWMP	*2002 Coachella Valley Final Water Management Plan*
2010 CVWMP Update	*Coachella Valley Water Management Plan 2010 Update*
2022 Alternative Plan Update	*2022 Indio Subbasin Water Management Plan Update, Sustainable Groundwater Management Act Alternative Plan*
2027 Alternative Plan Update	*2027 Indio Subbasin Water Management Plan Update, Sustainable Groundwater Management Act Alternative Plan*
2018 Coachella Valley	*2018 Coachella Valley Integrated Regional Water Management & Stormwater*
IRWM/SWR Plan	*Resources (IRWM/SWR) Plan Update*
AB	Assembly Bill
ACS	American Community Survey
ACWA	Agua Caliente Water Authority
AD	Assessment District
ADA	Advanced Delivery Account
AEM	Airborne Electromagnetic
AF	acre-feet
AFY	acre-feet per year
AOB	area of benefit
AOP	Annual Operating Plan
ASR	aquifer storage and recovery
ASTM	American Society for Testing and Materials
AWAG	Agricultural Water Advisory Group
AWMP	Agricultural Water Management Plan
Basin	Coachella Valley Groundwater Basin
Basin Plan	Water Quality Control Plan for Plan for the Colorado River Basin—Region 7
BDCP	Bay-Delta Conservation Plan
bgs	below ground surface
BLM	U.S. Department of the Interior Bureau of Land Management
BMP	best management practice

BMWD	Berrenda Mesa Water District
BPO	basin plan objective
BPTC	best practicable treatment or control
BCF	Block Centered Flow
BCM	Basin Characterization Model
Bulletin 118	*California's Groundwater: Bulletin 118—Update 2003*
BWD	Borrego Water District
C2VSIM	California Central Valley Groundwater-Surface Water Simulation Model
CalEPA	California Environmental Protection Agency
Caltrans	California Department of Transportation
CalWARN	California Water and Wastewater Agency Response Network
CalWEP	California Water Efficiency Partnership
Canal	Coachella Canal
CAP	Central Arizona Project
CARB	California Air Resources Board
CAS	California Climate Adaptation Strategy
CASGEM Program	California Statewide Groundwater Elevation Monitoring Program
CAT	Climate Action Team
CCLP	Coachella Canal Lining Project
CCR	California Code of Regulations
CDC	California Department of Conservation
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife
CDPH	California Department of Public Health
CDPs	census-designated plates
CEC	California Energy Commission
Census Bureau	U.S. Census Bureau
CEQA	California Environmental Quality Act
CERES	California Environmental Resources Evaluation System
Cfs	Cubic feet per second
Chromium-6	Hexavalent chromium

CIB	capital improvement budget
CII	commercial, industrial and institutional
CIMIS	California Irrigation Management Information System
CIPs	Capital improvement plans
CMP	Consolidated Monitoring Program
CNRA	California Natural Resources Agency
CO2e	CO2 equivalents
COCs	constituents of concern
COD	College of the Desert
COVID-19	coronavirus disease 2019
CPUC	California Public Utility Commission
CRA	Colorado River Aqueduct
CRLA	California Rural Legal Assistance Inc.
CRW	Colorado River Water
CSD	Coachella Sanitation District
CUWCC	California Urban Water Conservation Council
CVAG	Coachella Valley Association of Governments
CVCC	Coachella Valley Conservation Commission
CVILC	Coachella Valley Irrigated Lands Coalition
CVIRWMP	Coachella Valley Integrated Regional Water Management Plan
CVMSHCP	Coachella Valley Multiple Species Habitat Conservation Plan
CVRWMG	Coachella Valley Regional Water Management Group
CVSC	Coachella Valley Stormwater Channel
CV-SNAP	Coachella Valley Salt and Nutrient Management Plan
CVWD	Coachella Valley Water District
CVWMP	Coachella Valley Water Management Plan
CVWMR	Coachella Valley Water Management Region
CWA	Coachella Water Authority
CWC	California Water Code
CWP	California Water Plan
CWSRF	Clean Water State Revolving Fund
CY	calendar year
DAC	disadvantaged community

DACE	Desert Alliance for Community Empowerment
DACI	Disadvantaged Communities Infrastructure
DBCP	dibromochloropropane
DCP	Delta Conveyance Project
DDW	California State Water Resources Control Board Division of Drinking Water
DEH	Riverside County Department of Environmental Health
Delta	Sacramento-San Joaquin River Delta
DEM	digital elevation model
DLR	detection limit for purposes of reporting
DMM	Demand Management Measures
DMS	Data Management System
DOF	California Department of Finance
DPR	Delivery Reliability Report
DWA	Desert Water Agency
DWR	California Department of Water Resources
East AOB	East Whitewater River Subbasin Area of Benefit
ECVWSP	East Coachella Valley Water Supply Project
EDA	Economic Development Agency
EDA	economically disadvantaged area
EDC	Endocrine Disrupting Compound
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EJ	environmental justice
EJCW	Environmental Justice Coalition for Water
EO	Executive Order
EOP	Emergency Operations Plan
EPA	U.S. Environmental Protection Agency
ERP	Emergency Response Plan
ESA	Endangered Species Act
ET	evapotranspiration
ETAF	evapotranspiration adjustment factor
ETc	ET of a crop

ETo	reference evapotranspiration
EVRA	East Valley Reclamation Authority
feet bgs	feet below ground surface
feet msl	feet above mean sea level
FEIR	Final Environmental Impact Report
FY	fiscal year
GAMA Program	Groundwater Ambient Monitoring and Assessment Program
Garnet Hill WMP	*Mission Creek/Garnet Hill Water Management Plan*
GDE	groundwater-dependent ecosystem
GHB	general head boundary
GHG	greenhouse gas
GIPSY-OASIS	GNSS-Inferred Positioning System and Orbit Analysis Simulation Software
GIS	geographic information system
GLC	Glorious Lands Company
GMS	Groundwater Modeling System
GNSS	Global Navigation Satellite Systems
gpcd	gallons per capita per day
gpd	gallons per day
gpd/conn	gallons per day per connection
gphud	gallons per housing unit per day
GPS	global positioning system
GRF	groundwater replenishment facility
GRP	Groundwater Replenishment Program
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GWMP	Groundwater Management Plan
HCF	hundreds of cubic feet
HCM	hydrogeologic conceptual model
HCP	Habitat Conservation Plan
HFB	horizontal flow barrier
HOA	homeowners' association
I-Bank	California Infrastructure and Economic Development Bank

IBWC	International Boundary and Water Commission
IC/ID	illicit connection/illicit discharge
ICS	intentionally created surplus
ID	Improvement District
ID-1	Improvement District 1 (Reclamation)
IID	Imperial Irrigation District
ILRP	Irrigated Lands Regulatory Program
Indio Subbasin GSAs	Groundwater Sustainability Agencies created by the Coachella Valley Water District, the Coachella Water Authority, the Desert Water Authority, and the Indio Water Authority, respectively
InSAR	interferometric synthetic aperture radar
IPCC	Intergovernmental Panel on Climate Change
IPR	indirect potable reuse
IRWM	integrated regional water management
IRWMP	Integrated Regional Water Management Plan
IWA	Indio Water Authority
IWFM	Integrated Water Flow Model
IWRIS	Integrated Water Resources Information System
K	conductivity
Kv	vertical conductivity
LC	local concern
LCP	Landscaper Certification Program
LDX	local data exchange
LID	low impact development
LOS	level of service
MAR	managed aquifer recharge
MC AOB	Mission Creek Subbasin Area of Benefit
MCGH WMP	Mission Creek-Garnet Hill Water Management Plan MC-GRF Mission Creek Groundwater Replenishment Facility
MCL	maximum contaminant level
MDWC	Myoma Dunes Water Company
MG	million gallons
mg/L	milligrams per liter
mgd	million gallons per day

MHI	median household income
MMRP	Mitigation Monitoring and Reporting Plan
MNW2	MODFLOW Multi-Node Well
MO	Measurable Objective
MOU	Memorandum of Understanding
MP	Mile Post
MS4	municipal separate storm sewer system
msl	mean sea level
MSWD	Mission Springs Water District
MT	Minimum Threshold
MVP	Mid-Valley Pipeline
MWA	Mojave Water Agency
MWD	Metropolitan Water District of Southern California
MWELO	Model Water Efficiency Landscape Ordinance
NAICS	North American Industry Classification System
Nancy Wright RWRF	Nancy Wright Regional Water Reclamation Facility
NASS	National Agricultural Statistics Service
NCCAG	Natural Communities Commonly Associated with Groundwater
NCCPA	California Natural Communities Conservation Planning Act
NCDC	National Climatic Data Center
NEPA	National Environmental Policy Act
NIMS	National Incident Management System
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPW	non-potable water
NRCS	Natural Resources Conservation Service
NTU	Nephelometric Turbidity Unit
NWT	Newton
O&M	operations and maintenance
OEHHA	Office of Environmental Health Hazard Assessment
OPR	California Governor's Office of Planning and Research
OWTS	Onsite Wastewater Treatment Systems

pCi/L	picocuries per liter
PD-GRF	Palm Desert Groundwater Replenishment Facility
PEIR	Programmatic Environmental Impact Report
PEST	parameter estimation
PFAS	per- and polyfluoroalkyl substance
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PHG	public health goal
Plan Area	Indio Subbasin Alternative Plan Area
PMAs	projects and management actions
ppb	parts per billion
ppm	parts per million
PPR	Present Perfected Rights
ppt	parts per trillion
Proposition 1	Water Quality, Supply, and Infrastructure Improvement Act of 2014
Proposition 84	Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006
PVID	Palo Verde Irrigation District
QSA	Quantification Settlement Agreement
RAC	replenishment assessment charges
RAP	region acceptance process
RCA	recommended action
RCAC	Rural Community Assistance Corporation
RCP	representative concentration pathways
RCFCWCD	Riverside County Flood Control and Water Conservation District
RCOA	Riverside County Operational Area
RCP-06	Riverside County Projections 2006
RECI	water contract recreation
RECII	water non-contact recreation
RMS	resource management strategies
RO	reverse osmosis
Rosedale	Rosedale Rio Bravo Water Storage District

RTP	regional transportation plan
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SCAG	Southern California Association of Governments
SCSD	Salton Community Services District
SDAC	severely disadvantaged community
SDWIS	Safe Drinking Water Information System
SEMS	California Standardized Emergency Management System
SGM	Sustainable Groundwater Management
SGMA	Sustainable Groundwater Management Act
SGPWA	San Gorgonio Pass Water Agency
SGWP	Sustainable Groundwater Planning Grant Program
SMCL	Secondary Maximum Contaminant Level
SNMP	Salt and Nutrient Management Plan
SOI	sphere of influence
SPEIR	Subsequent Programmatic Environmental Impact Report
SRWS	self-regenerating water softeners
Ss	specific storage
SS/TS	source of supply/treatment study
SSA	Salton Sea Authority
SSMP	Salton Sea Management Plan
SWAMP	Surface Water Ambient Monitoring Program
SWMP	Stormwater Management Plan
SWN	State Well Number
SWP	State Water Project
SWQIS	California Statewide Water Quality Information System
SWR	stormwater resources
SWRCB	California State Water Resources Control Board
SWS	small water system
Sy	specific yield
T	transmissivity
TAC	Technical Advisory Committee
TAG	Technical Advisory Group

TAZ	transportation analysis zone
TDML	total maximum daily load
TDS	total dissolved solids
TEL-GRF	Thomas E. Levy Groundwater Replenishment Facility, formerly the Dike 4 Recharge Facility
TM	technical memorandum
TMDL	total maximum daily load
TRS	Township range section
TSS	Technical Support Services
Tulare Lake	Tulare Lake Water Storage District
ULFT	ultra low flow toilet
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWMP	Urban Water Management Plan
Valley	Coachella Valley Water Management Region
VSD	Valley Sanitary District
WARM	Salton Sea's Warm Freshwater Habitat
WDL	Water Data Library
WDR	Waste Discharge Requirements
West AOB	West Whitewater River Subbasin Area of Benefit
WET-CAT	Climate Action Team, Water-Energy Group
WIIN	Water Infrastructure Improvements for the Nation
WMP	Water Management Plan
WMWC	Whitewater Mutual Water Company
Workplan	SNMP Development Workplan
WQO	water quality objective
WRCOG	Western Riverside Council of Governments
WRF	Water Reclamation Facility

WRFP	Water Recycling Funding Program
WRP	Water Reclamation Plant
WRSC	Whitewater River Stormwater Channel
WSA	Water Supply Assessment
WSV	Water Supply Verification
WUE	water use efficiency
WWR-GRF	Whitewater River Groundwater Replenishment Facility
WWTP	wastewater treatment plan
WY	water year

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Executive Summary

ES-1. Introduction

Groundwater is a critical resource for the sustainability of Coachella Valley communities, agriculture, economic activities, environmental benefits, and other beneficial uses. The Indio Subbasin (one of four subbasins of the Coachella Valley Groundwater Basin) provides groundwater supply and a vast groundwater storage capacity with the natural ability to convey water—through groundwater flow— from areas of recharge to wells where water is pumped. Since the early 1900s, the Indio Subbasin has been actively managed to address increasing water demands (with pumping for agricultural, urban, and rural demands), beginning with capture of local stormwater to supplement the limited natural groundwater replenishment and later implementing water importation (since 1949) and source substitution projects. This has been a dynamic process with periods of groundwater depletion followed by recovery. Groundwater levels and storage reached historical lows in about 2009, but this overdraft has been halted and increased groundwater storage has resulted from active water management planning and projects. In addition, local agencies have recognized the multi-faceted nature of groundwater issues (including subsidence, water quality, seawater intrusion, and potential impacts on environmental uses) and have developed relevant management plans, programs, and projects, including the *2002 Coachella Valley Final Water Management Plan (2002 CVWMP)* for the Indio Subbasin (Coachella Valley Water District [CVWD], 2002) and the *Coachella Valley Water Management Plan 2010 Update (2010 CVWMP Update)* (CVWD, 2012).

In 2014, the California Legislature enacted the Sustainable Groundwater Management Act (SGMA) to provide a framework for sustainable groundwater management. To implement SGMA in the Indio Subbasin, four local water agencies formed Groundwater Sustainability Agencies (GSAs): CVWD, Coachella Water Authority (CWA), Desert Water Agency (DWA), and Indio Water Authority (IWA). In 2016, the Indio Subbasin GSAs entered into a Memorandum of Understanding for collaborative management of the Indio Subbasin under SGMA.

On December 29, 2016, the Indio Subbasin GSAs submitted to the Department of Water Resources (DWR) the *2010 CVWMP* (CVWD, 2012a), accompanied by a Bridge Document (Indio Subbasin GSAs, 2016), as an Alternative Plan to a Groundwater Sustainability Plan (GSP) for the Indio Subbasin. On July 17, 2019, DWR approved the *2010 CVWMP Update* as an Alternative Plan. In compliance with SGMA, the GSAs have prepared Annual Reports which can be found on the program website (www.IndioSubbasinSGMA.org). SGMA also requires plan updates every 5 years to assess the implementation status of the Alternative Plan and ensure water supply in the Indio Subbasin reliably meets demands in a sustainable manner. The 2022 Alternative Plan Update was submitted to DWR in December 2021 and approved by DWR in 2024 with minor corrective actions identified. These recommended actions (RCAs) are identified as follows.

- ***RCA 1:*** *Explain interbasin conditions*
- ***RCA 2:*** *Ensure monitoring network is consistent with SGMA Portal Monitoring Network Module*
- ***RCA 3:*** *Continue with activities in Recommended Actions 4, 4a, and 6.* **.**
- ***Recommended Action 4:*** *Incorporate an approved Salt and Nutrient Management Plan .*

- ***Recommended Action 4A:*** *Evaluate salt in groundwater and implement sustainability .*
- ***Recommended Action 6:*** *Discuss subsurface drain flow as a minimum threshold*

As required by SGMA, the GSAs prepared a periodic evaluation within five years of submitting their Alternative Plan to evaluate monitoring data, assess plan performance, address DWR feedback, and determine if amendments are needed to achieve long-term sustainability. This Periodic Evaluation assessed the need for a Plan Amendment and determined the GSAs would prepare an update to their Alternative Plan to update basin conditions and respond to DWR's Corrective Actions. The recommended updates are incorporated in this *2027 Alternative Plan Update*. The Periodic Evaluation is included as **Appendix 1-A** of this *2027 Alternative Plan Update*.

The GSAs conducted extensive stakeholder coordination and public involvement during the development of the *Alternative Plan Update* to seek input from property owners/residents, disadvantaged communities, agricultural interests, and environmental interests. Development of the *Alternative Plan Update* was also guided by the SGMA Tribal Workgroup, which included representatives from the following five Native American Tribes: Agua Caliente Band of Cahuilla Indians, Augustine Band of Cahuilla Indians, Cabazon Band of Mission Indians, Torres-Martinez Desert Cahuilla Indians, and Twenty-Nine Palms Band of Mission Indians.

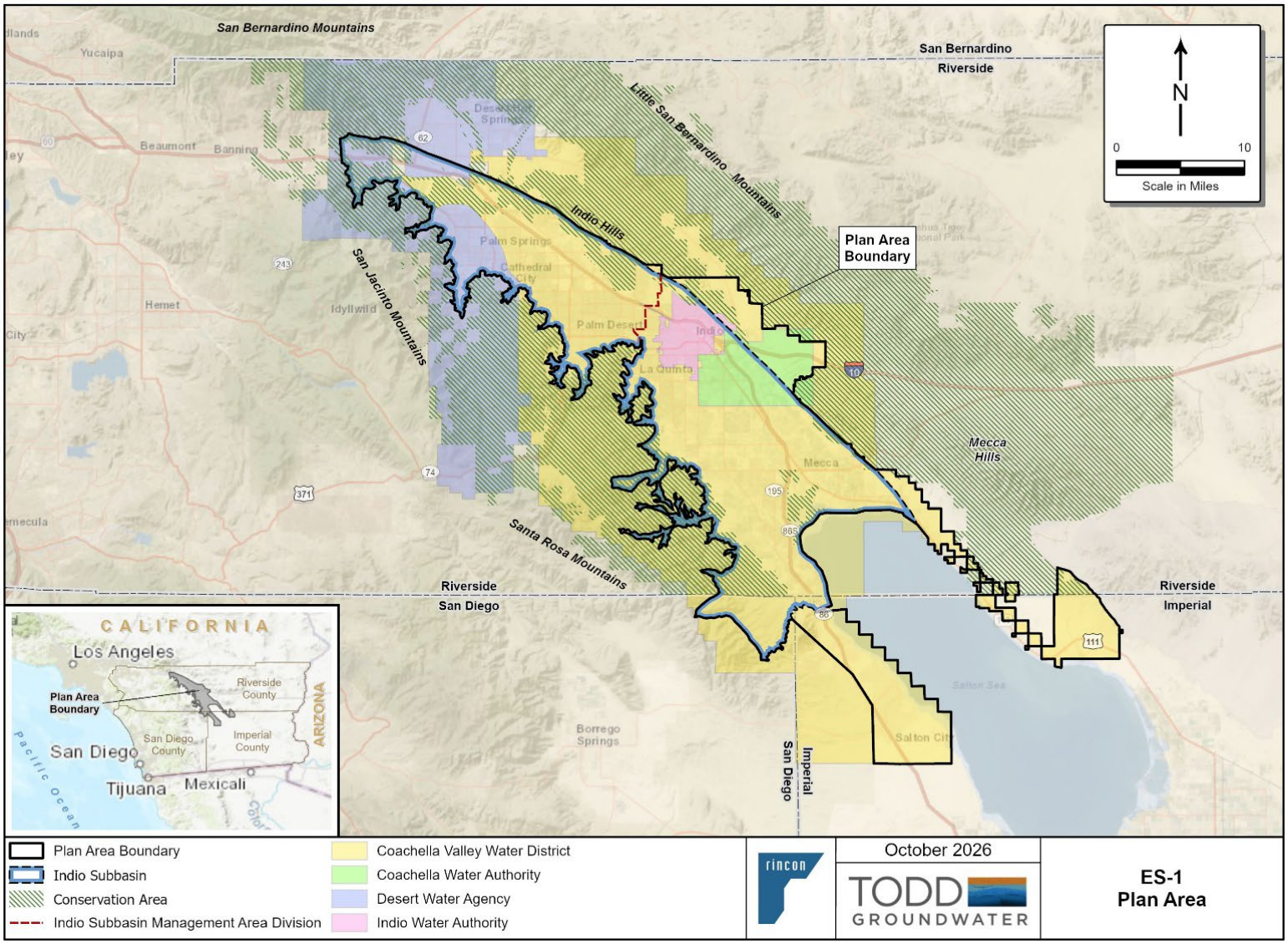
ES-2. Plan Area

The Indio Subbasin is one of four subbasins that compose the Coachella Valley Groundwater Basin (Basin). The Plan Area is based on the Indio Subbasin and the areas served by, or expected to be served by, groundwater from the Subbasin, as shown in Figure ES-1. This includes areas to the east of the Subbasin within the spheres of influence of the cities of Indio and Coachella that account for several proposed large developments, and areas along the western and eastern shores of the Salton Sea that are in CVWD's domestic service area and receive groundwater from CVWD. Undeveloped mountainous terrain and conservation areas in CVWD's and DWA's boundaries are not included in the Plan Area as they do not receive water from the Indio Subbasin. The Indio Subbasin is geographically divided into West Valley and East Valley.

The Indio Subbasin underlies the incorporated areas of nine cities as well as unincorporated areas in portions of Riverside, San Diego, and Imperial Counties. Large tracts of land in the Plan Area are owned and managed by state and federal governments. Five Tribal/Reservation areas for Native American tribes are also locatedwithin the Indio Subbasin. The major water agencies in the Plan Area are CVWD, CWA, DWA, and IWA. Mission Springs Water District (MSWD) and Myoma Dunes Water Company (MDWC) also serve smaller portions of the Indio Subbasin.

Local water resources management began with early (19th Century) agricultural development in the region, which was initially based on groundwater supply. However, local groundwater supply proved insufficient for irrigation and subsequent urban water demand, leading agencies to acquire and import surface water supplies. The Plan Area currently relies on a combination of local groundwater, Colorado River water, State Water Project (SWP) exchange water, local surface water, and recycled water to meet demands for four predominant water user groups: municipal, agriculture, golf, and other (e.g., fish farms, duck clubs, polo, etc.).

Figure ES-1 Plan Area



ES-3. Hydrogeologic Conceptual Model

The Coachella Valley Groundwater Basin (Basin) encompasses more than 800 square miles and extends from the San Gorgonio Pass in the San Bernardino Mountains to the northern shore of the Salton Sea. The Basin is composed of the San Gorgonio Pass, Mission Creek, Desert Hot Springs, and Indio Subbasins. The boundary between the San Gorgonio Pass and Indio Subbasins is a bedrock constriction and divide; otherwise, the boundaries between the Subbasins are generally defined by faults that represent barriers to the lateral movement of groundwater.

The Indio Subbasin is bounded on its northern, northwestern, southwestern, and southern margins by uplifted bedrock; subbasin sedimentary fill consists of thick sand and gravel sedimentary sequences eroded from the surrounding mountains. Sedimentary infill in the Indio Subbasin thickens from north to south, and depending on location within the Subbasin, is at least several thousand and as much as 12,000 feet thick. The upper approximately 2,000 feet constitute the aquifer system that is the primary source of groundwater supply.

Sources of inflow to the Indio Subbasin include infiltration of natural inflows through mountain-front and stream channel recharge, subsurface inflows, artificial recharge of imported water, wastewater percolation, and return flows from municipal/domestic use, agriculture, golf courses, and other sources. From 2000 to 2025, combined return flows have represented the largest source of recharge in the Subbasin, followed by imported water replenishment and natural watershed runoff and stream channel recharge. Indio Subbasin groundwater outflows include groundwater pumping, subsurface and drain flows to Salton Sea, and evapotranspiration. Groundwater pumping is the largest component of outflow from the Indio Subbasin.

Seven hydrogeologic cross sections were developed to illustrate hydrogeologic conditions across the Indio Subbasin. Overall, the longitudinal cross sections document a down-valley progression of alluvial sediment from predominantly sand and gravel to increasing fine sands with clay lenses and then to clay- dominated sediments at the Salton Sea. The perpendicular cross sections document the relatively narrow, bedrock or fault-bounded character of the Indio Subbasin in the northwest, the substantial thickness of the subbasin that occurs along the eastern margin of the Indio Subbasin or along the subbasin axis, and the coarse-grained sediments along the western mountain front and limit of regional clay to the west.

To understand the hydrogeologic setting of the Indio and San Gorgonio Pass (SGP) Subbasin boundary, Indio and SGP Subbasin teams worked together to establish a shared hydrogeologic understanding, perform independent analytical flow estimates, and support alignment of future numerical groundwater flow models. Todd Groundwater prepared a technical memorandum detailing this collaborative effort, included as **Appendix 3-A.** This *2027 Alternative Plan Update* implements several critical modeling improvements based on the technical consensus in the memorandum to better align the two subbasin frameworks.

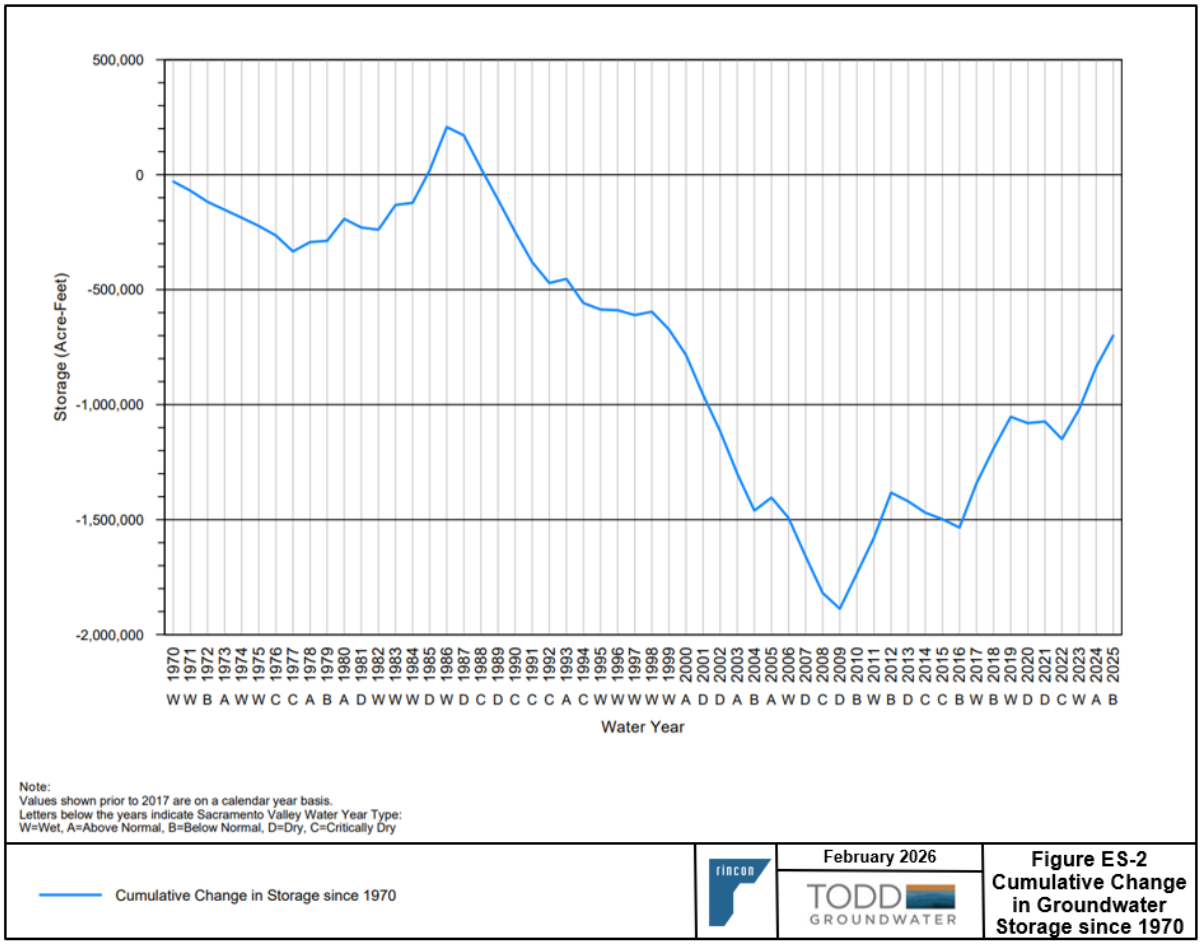
ES-4. Groundwater Conditions

Groundwater conditions are described with reference to the six sustainability indicators identified in SGMA: groundwater levels, groundwater storage, potential subsidence, groundwater quality, seawater intrusion, and interconnected surface water and groundwater dependent ecosystems (GDEs).

Regional groundwater flows are in a northwest-to-southeast direction through the Indio Subbasin. Groundwater elevations range from greater than 1,200 feet mean sea level (msl) near the San Gorgonio Pass Subbasin in the northwest to approximately -220 feet msl in the southeast along the northern shoreline of the Salton Sea. Average depth to water contours for the Indio Subbasin for WY 2024-25 show that greatest depths to water are observed in the western margins of the basin (250 to 300). Depths to groundwater generally decrease to about 100 to 250 feet in the mid-subbasin area and then to zero or above the ground surface in artesian wells near the Salton Sea. Long-term historical hydrographs depict the groundwater level response to historical pumping and water management activities identified and implemented in the *2002 CVWMP* and *2010 CVWMP Update*. Collectively, the hydrographs illustrate the effectiveness of groundwater replenishment, source substitution, and conservation programs under varying climatic and water use conditions.

Figure ES-2 shows the cumulative change in storage for the Indio Subbasin since 1970. Since 2009, the Indio Subbasin has recovered approximately 1.2 million acre-feet (AF) of groundwater in storage, or about 65 percent of the cumulative depletion observed from 1970 to 2009.

Figure ES-2 Cumulative Change in Groundwater Storage since 1970



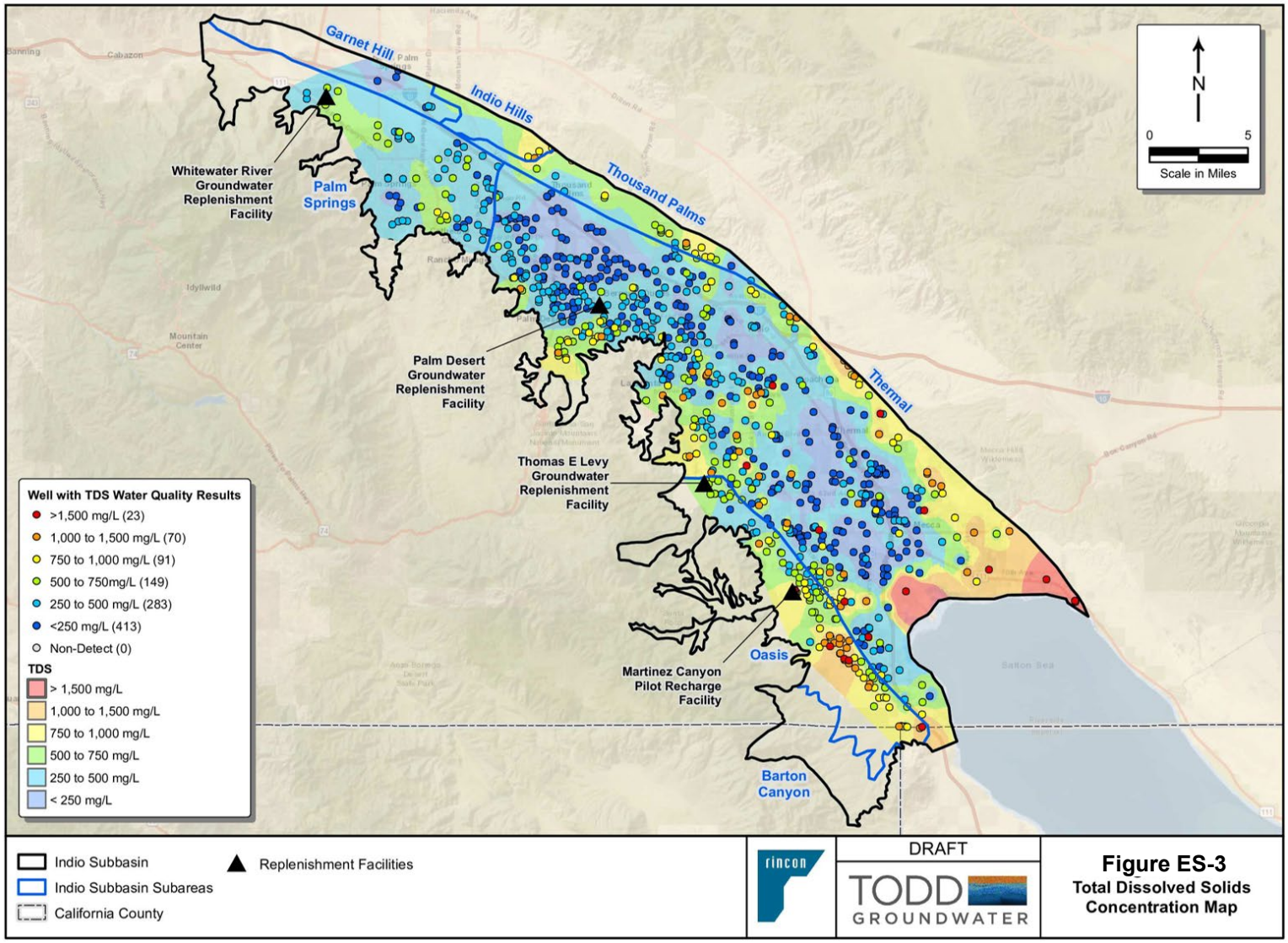
Land subsidence is the differential lowering of the ground surface, which can damage structures and facilities. This may be caused by regional tectonism or by declines in groundwater elevations due to pumping. Land subsidence, resulting from aquifer system compaction and groundwater level declines, has been a concern in the Coachella Valley since the mid-1990s and has been investigated since 1996 through an on-going cooperative program between CVWD and the United States Geological Survey (USGS) (Sneed and Brandt, 2020). Analysis of data collected by the USGS indicates that as much as 2.0 feet of land subsidence occurred in the Indio Subbasin from 1995 to 2010 near Palm Desert, Indian Wells, and La Quinta (Sneed and Brandt, 2020). Since 2010, groundwater levels have stabilized or increased, and although a few areas continued to subside (albeit at a slower rate), most areas stopped subsiding from 2010 to 2017 and some even uplifted.The GSAs and the USGS have established a partnership and a continuing subsidence monitoring program to collect and evaluate data between 2015 and 2023 with a report to be published by the USGS by late 2026.

Groundwater quality is documented in the Indio Subbasin focusing on eight water quality constituents, including total dissolved solids (TDS), nitrate, arsenic, chromium-6, uranium, fluoride, perchlorate, and dibromochloropropane (DBCP). Each of these is summarized in terms of sources and maps showing spatial distribution (see Figure ES-3). In addition, concentrations with depth are shown in 14 vertical cross-sections for TDS, nitrate, arsenic, and chromium-6; concentrations of these constituents vary with depth. Time-concentration plots are shown for TDS and nitrate. The primary (i.e., health- based) maximum contaminant levels (MCLs) are stated for each constituent with the exception of TDS, which is regulated by a range of Consumer Acceptance Contaminant Levels that are based on aesthetics (e.g., taste). While concentrations of nitrate, arsenic, or fluoride may exceed MCLs in some small water systems, County and GSA programs have been implemented to help provide better water quality. All four GSAs provide drinking water supplies that meet all state and federal health standards.

Elevated TDS and nitrate concentrations are linked to current and historical water and wastewater management, agricultural activity, urban land use, septic systems, and natural conditions. In the Indio Subbasin, arsenic, chromium-6, uranium, and fluoride are naturally occurring and show variable distribution. DBCP is a soil fumigant historically used in agriculture that has persisted in a few wells. Perchlorate has industrial, fertilizer, and natural sources with highly localized detections at low concentrations. Cross-sections showing the vertical distribution of TDS indicate that concentrations generally are less than 500 mg/L, lowest concentrations occur in deep wells in the central Indio Subbasin, and highest concentrations found near the Salton Sea. The time-concentration plots indicate increases in TDS concentrations since 1990, with lower rates of increase generally in deeper zones as well as in the central and eastern Thermal Subarea. Nitrate concentrations in the Indio Subbasin have a large range, with time-concentration plots demonstrating significant variability in shallow nitrate concentrations and local increases in nitrate concentrations, mostly in the western areas where concentrations are already elevated in shallow wells. Small water systems are a primary focus for projects and management actions addressing these elevated concentrations. Additionally, the Coachella Valley Salt and Nutrient Management Plan (CV-SNMP) Development Workplan was developed in 2021 to create strategies for the sustainable management of salts/total dissolved solids and nutrients, including nitrate, in the Coachella Valley Groundwater Basin. The Final CV-SNMP is scheduled for completion in 2027 as part of the ongoing multi-year update process.

The Indio Subbasin is potentially vulnerable to saltwater intrusion from the Salton Sea. Potential saltwater intrusion is monitored through two sets of nested monitoring wells. Results from these monitoring wells do not suggest current groundwater degradation due to saltwater intrusion.

Figure ES-3 TDS Concentration Map



Surface water connected to groundwater is generally not present in the West Valley because groundwater levels are much lower than the ground surface. Probable groundwater dependent ecosystems (GDEs) were identified in three upper canyon areas of the San Jacinto Mountains associated with springs, seeps, and stream channels that convey snowmelt from the San Jacinto mountain front. Probable non-GDEs include dry upland areas, cultivated and/or flooded agricultural land, obvious human-made ponds, lakes, and other features, channelized drains, and areas with no other indicators of groundwater presence near the surface. The mapping also identified Playa Wetland areas along the Salton Sea exposed seabed (playa). These wetlands occur generally downstream of stream, agricultural drain, or stormwater channel outlets. The recession of the Salton Sea is exposing thousands of acres of playa each year and water from irrigation ditches and other drainages that previously flowed directly into waters of the Sea now spreads out on the exposed playa of the Sea where new vegetation and wetlands now exist.

Due to their location in upper canyons where groundwater extraction is generally not occurring, the specific areas in the Indio Subbasin where Probable GDEs were identified do not have existing groundwater data available for review. Probable GDEs identified along the mountain-front may be associated with surface runoff, snowmelt, or springs and seeps from up-gradient sources.

ES-5. Demand Projections

To provide an adequate long-range forecast of future water demands, this *2027 Alternative Plan Update* uses a 25-year planning period from 2025 through 2050. This planning is subject to uncertainties and changes that could affect future water demands, including revised growth forecasts, conversions of agricultural lands to urban uses, development on Tribal lands, and long-term conservation regulations. Projected water demands are broken into four major categories: municipal, agricultural, golf, and other.

Total **municipal** demand for the Plan Area is 208,415 acre-feet per year (AFY) in 2050, which is an increase of 26,073 AF from the 2025 baseline. The forecast assumes a population increase from 519,084 in 2025 to 802,072 in 2050, primarily in the cities of Coachella and Indio. Overall, the Plan Area is projected to grow by 82,982 housing units by 2050, corresponding with increased residential and landscape water demands. The projection anticipates an increase of 54,885 employees located in the Plan Area by 2050, corresponding with increased future commercial, industrial and institutional (CII) water demands. The forecast accounts for water loss and includes adjustment factors for indoor passive conservation and outdoor water use savings.

Total **agricultural** demand in the Plan Area is projected to decline from 267, 653 AFY in 2025 to 247,703 AFY in 2050, a seven percent decrease. The forecast assumes that by 2050, there will be a decrease of 5,772 acres of projected conversion of agricultural to urban land uses.

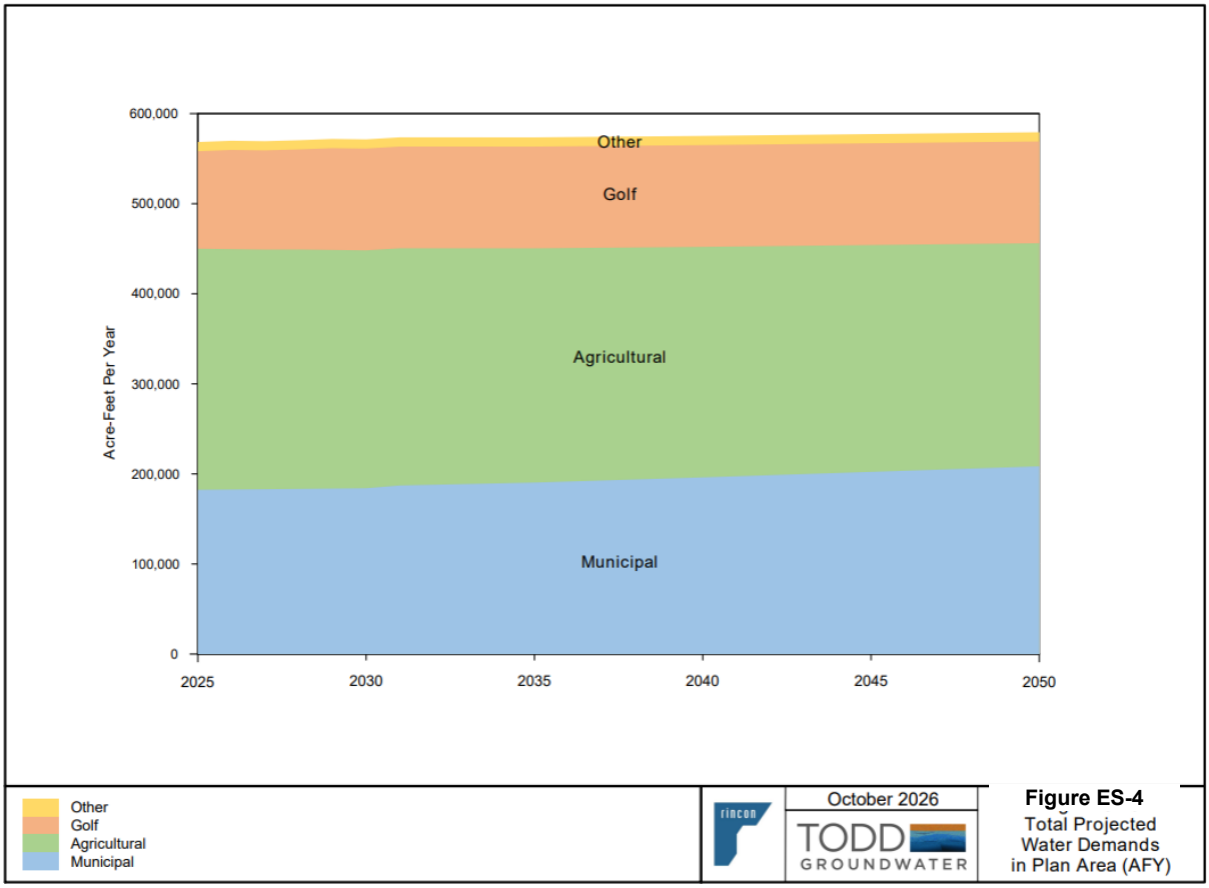
Total **golf** industry demand is estimated to increase from 108,203 AF in 2025 to 112,947 AF by 2050. The forecast assumes three future golf courses will come online during the planning horizon.

Total **other** demand, historically composed of water demands from fish farm and duck clubs, polo/turf irrigation and environmental water, is estimated to be 10,236 AF in 2025 and anticipated to hold steady through 2050.

Figure ES-4 presents the updated water demand projections for the Plan Area. Total water demand projected for 2050 is approximately 579,300 AF. Projected water demand for 2050 is about 65,810 AF lower than the 644,610 AF projected in the *2022 Alternative Plan Update.* This reduction is a

result of reduced sociodemographic growth rate, increased water use efficiency reflected in baseline demands, and continued efforts in water conservation anticipated in the future.

Figure ES-4 Total Projected Water Demands in Plan Area (AFY)



ES-6. Water Supply

The Planning Area relies on a combination of local groundwater, Colorado River water, SWP exchange water, surface water, and recycled water to meet water demands.

Groundwater from the Indio Subbasin has been an important source of municipal, rural, and agricultural water supply to the Plan Area. Groundwater levels and storage are presented in Chapter 4, *Current and Historical Groundwater Conditions* and the water budget for the Indio Subbasin is summarized in Chapter 7, *Numerical Model and Plan Scenarios* for each planning scenario.

Natural surface water flow in the Coachella Valley occurs as a result of precipitation, precipitation runoff, and stream flow originating from the San Bernardino and San Jacinto Mountains, with lesser amounts from the Santa Rosa Mountains. This watershed runoff is diverted for direct use, percolates into the streambeds, or is captured in mountain-front debris basins where it recharges the groundwater basin. The 50-year hydrologic period from 1976 to 2025 had an annual average watershed runoff of 53,368 AFY (calculated from stream gages, precipitation, and ungaged tributary estimates), with approximately 51,594 AFY in natural infiltration when accounting for surface water diversions, ET loss, and outflows to Salton Sea. Runoff during the 15-year period from 2011 to 2025

was below average, with 34,513 AFY in watershed runoff and 33,061 AFY in natural infiltration. This 15-year hydrologic period contained multiple drought cycles with below average rainfall.

Colorado River (Canal) water has been a significant water supply source for the Indio Subbasin since the Coachella Canal was completed in 1949. CVWD is the only agency in the Indio Subbasin that receives Colorado River water allocations. Total available Colorado River deliveries will decrease to 456,000 AF in 2050, with delivery of 433,200 AFY after conveyance losses. This includes base entitlement from the 2003 Quantification Settlement Agreement (QSA), 1988 Metropolitan Water District of Southern California (MWD)/IID Approval Agreement, IID/CVWD First Transfer, IID/CVWD Second Transfer, Coachella Canal Lining, Indian Present Perfected Rights Transfer, and QSA SWP Transfer with MWD. Colorado River supplies face a number of challenges to long-term reliability including the extended Colorado River Basin drought and shortage sharing agreements, endangered species and habitat protection, and climate change.

SWP exchange water has been an important component of the region's water supply mix. In 1962 and 1963, DWA and CVWD, respectively, entered contracts with the State of California that defined a Table A allocation (i.e., the maximum annual amount of water each contractor can receive excluding certain interruptible deliveries). Table A deliveries vary annually based on factors including hydrology, reservoir storage, and environmental requirements for the Sacramento-San Joaquin Delta (Delta). DWA and CVWD currently have a combined maximum annual SWP Table A amount of 194,100 AFY. In 2008, CVWD and DWA entered into separate agreements with DWR for the purchase and conveyance of supplemental SWP water under the Yuba River Accord Dry Year Water Purchase Program (Yuba Accord). Over the 17-year period from 2008-2024, the average annual amount of Yuba Accord water purchased by the GSAs was 633 AFY by CVWD and 147 AFY by DWA. In 2012, CVWD also entered into an agreement with Rosedale-Rio Bravo Water Storage District (Rosedale Rio-Bravo) that provides a total of 252,500 AF to CVWD through 2035. In 2020, CVWD finalized a supplemental letter agreement with Rosedale Rio-Bravo and a Point of Delivery Agreement with DWR that increased the limit on the amount Rosedale Rio-Bravo can deliver to CVWD in any one year (from 16,500 to 20,000 AFY) but does not change the total volume delivered during the life of the agreement through 2035.The balance of Rosedale Rio-Bravo water due to CVWD from 2026 to 2035 is 130,500 acre-feet or an annual average of 13,050 AFY. No Rosedale Rio-Bravo supplies are assumed after year 2035.

Since 2007, SWP deliveries have averaged only 45 percent of Table A amounts. The Delta Conveyance Project (DCP) is a DWR project that would improve SWP reliability and result in increased deliveries in the future. CVWD and DWA have approved a 2-year agreement to advance their share of funding for DCP planning and design costs.. CVWD and DWA have also entered into agreements with the Sites Reservoir Authority for the purpose of obtaining 10,000 AFY and 6,500 AFY, respectively, from the Sites Reservoir Project.

There are currently eight wastewater treatment plants (WWTPs) or water reclamation plants (WRPs) within the Plan Area, with one fish farm operation. CVWD and DWA currently deliver recycled water from three WRPs for irrigation of golf courses, large landscaped areas, and various other irrigation uses. Forecasted recycled water deliveries from the three WRPs are anticipated to increase from 15,618 AF in 2025 to 19,564 AF in 2050.

A summary of future projected supplies is illustrated in Figure ES-5 and Figure ES-6. These graphs show available imported and local surface water supplies under moderate and severe climate conditions and does not include the groundwater supply; the available groundwater supply will vary under different management conditions and is quantified with simulations using the numerical model (see Chapter 7, *Numerical Modeling and Plan Scenarios*).

Figure ES-5 Indio Subbasin Total Existing + Projected Supplies under Moderate Climate Change Conditions

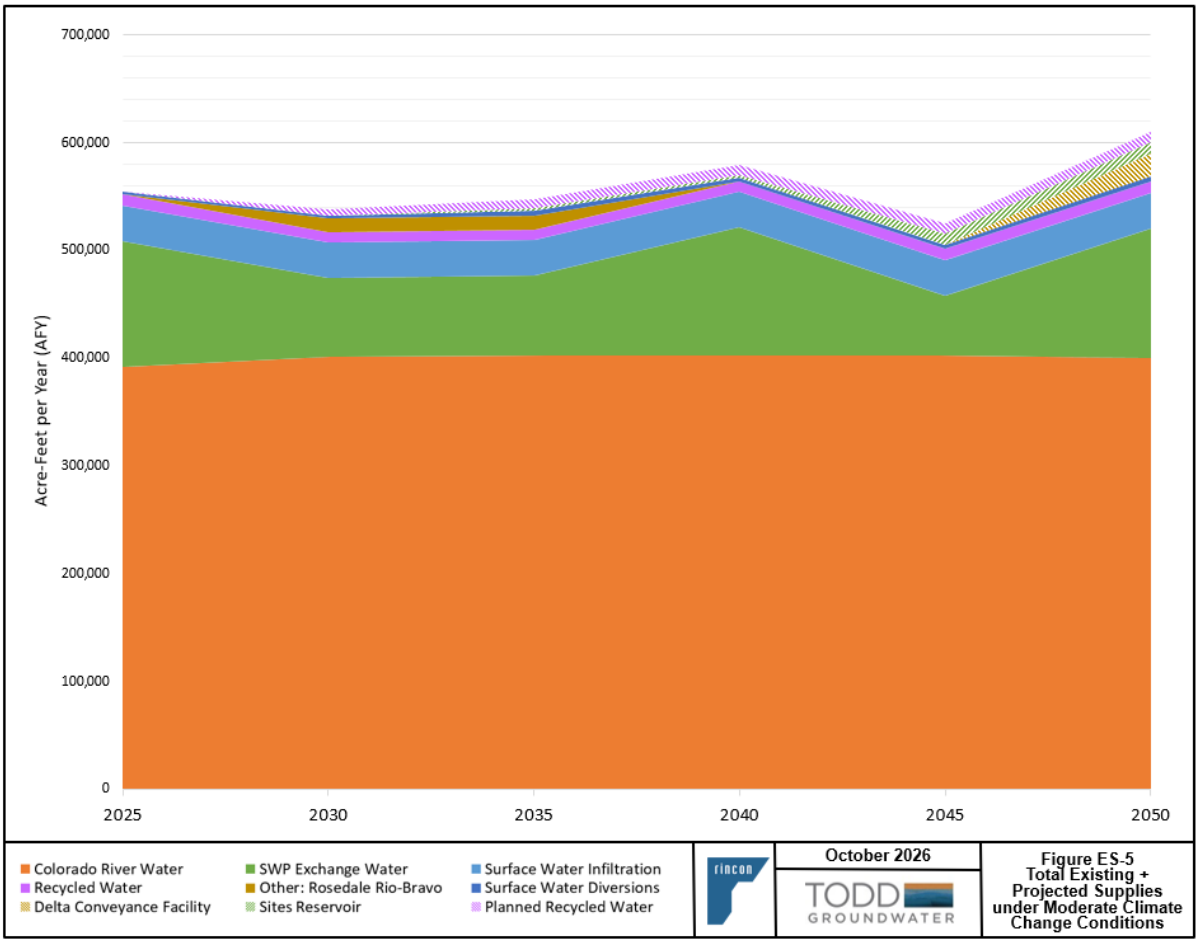
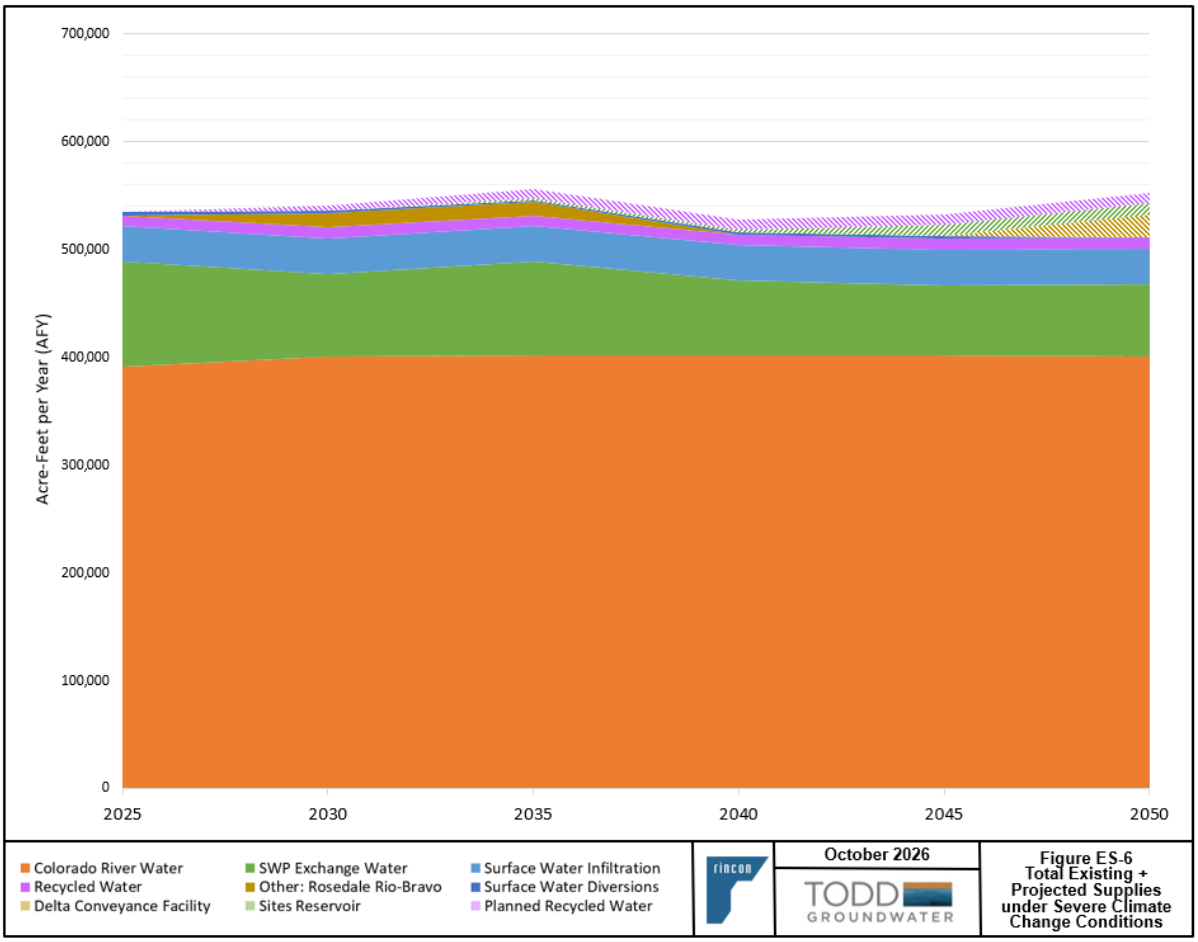


Figure ES-6 Indio Subbasin Total Existing + Projected Supplies under Severe Climate Change Conditions



ES-7. Numerical Model and Plan Scenarios

The Indio Subbasin numerical groundwater flow model and associated water budget were used to assess groundwater conditions and future sustainability. The groundwater flow model, originally developed in the mid-1990s and subsequently extended for the *2002 CVWMP, 2010 CVWMP Update*, and *2022 Alternative Plan Update*, was updated for this *2027 Alternative Plan Update* with inflow and outflow data through 2025. Additionally, the model grid was extended to the San Gorgonio Pass Subbasin boundary, and updated to use quarterly stress periods, allowing for reporting of water budgets for calendar years or water years.

The model assumes that the Indio Subbasin is recharged through a combination of subsurface inflow from the San Gorgonio Pass and Mission Creek Subbasins, mountain front and stream channel recharge, replenishment of imported water, wastewater percolation, and return flows from municipal/domestic, agricultural, and golf course irrigation, and from septic systems. Outflows include groundwater production from agricultural, municipal, golf course, and other pumping wells; drain flows; evapotranspiration; and groundwater outflows to the Salton Sea.

The updated Indio Subbasin model meets qualitative and quantitative calibration goals. As documented with groundwater level hydrographs, the simulations of shallow and deep aquifer water level trends throughout the Subbasin are consistent with observed groundwater conditions. Simulated groundwater elevation contour maps for shallow and deep aquifers are well matched with measured levels. The groundwater flow model is well calibrated with observed groundwater elevation and drain flow trends for both the historical and updated periods.

Six future conditions scenarios were developed for this *2027 Alternative Plan Update*. These include baseline scenarios, near-term scenarios, and future scenarios that address potential changes in land use and water supply conditions, as well as implementation of water management projects such as source substitution and new water supply projects. Future climate conditions were evaluated using the USGS Basin Characterization Model (BCM), which simulates watershed hydrologic response to projected changes in precipitation and temperature under several Representative Concentration Pathway (RCP) climate scenarios. For this *2027 Alternative Plan Update*, the following two RCPs were used:

- ***RCP 4.5:*** *Moderate Climate Change Conditions*
- ***RCP 8.5:*** *Severe Climate Change Conditions*

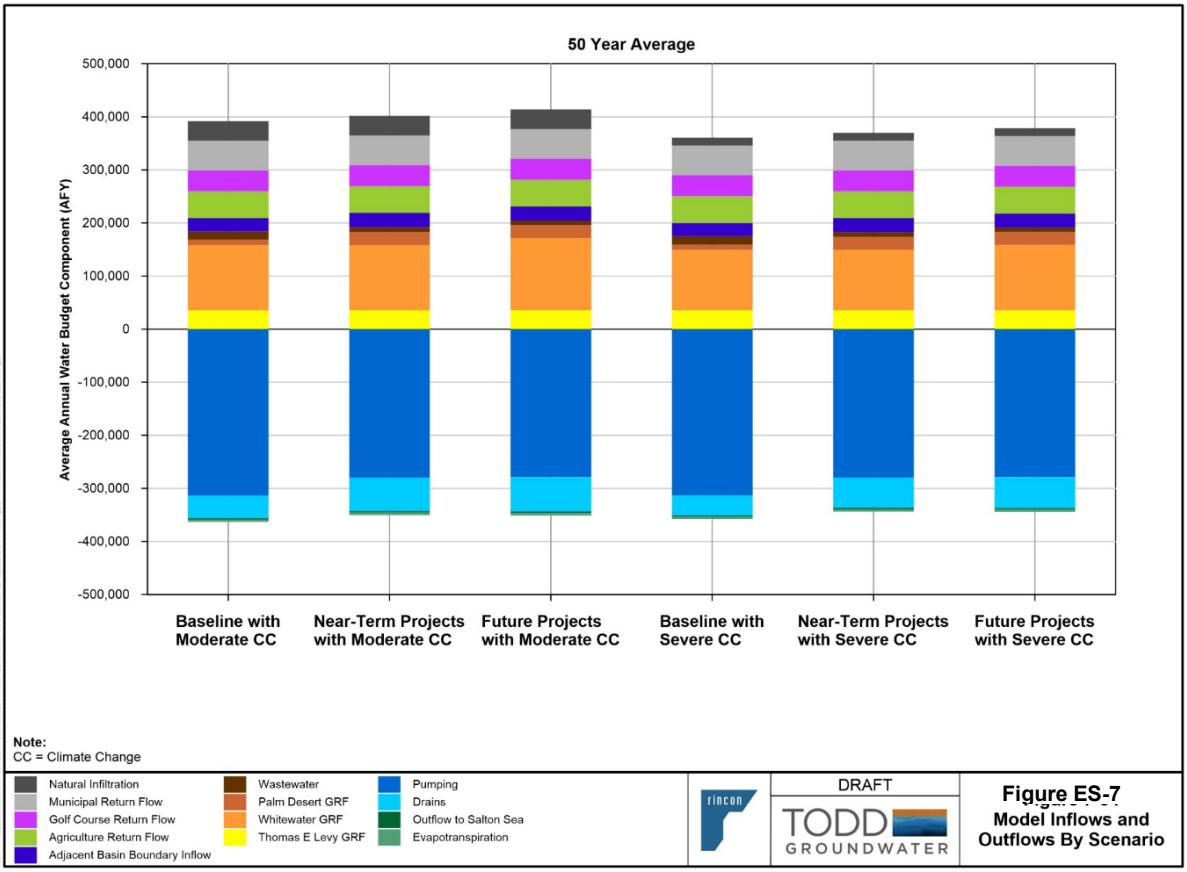
These RCPs were selected to capture a range of potential future hydrologic conditions, consistent with the Indio GSAs' commitment to achieving sustainability under changing climate conditions. The two future climate conditions applied to the three future water supply scenarios, creating the following six scenarios evaluated for this *2027 Alternative Plan Update*

1. Baseline under Moderate Climate Change Conditions
2. Baseline under Severe Climate Change Conditions
3. Near-term under Moderate Climate Change Conditions
4. Near-term under Severe Climate Change Conditions
5. Future Projects under Moderate Climate Change Conditions
6. Future Projects under Severe Climate Change Conditions

Each scenario was simulated over a 50-year period consistent with SGMA requirements, , covering a simulation period from WY 2026 to 2075. However, the planning assumptions were only projected for the first 25 years to the 2045 planning horizon. Thereafter, growth and supply assumptions were assumed to continue at the same rate for the second 25 years of the simulation. While extending beyond foreseeable land use and water resource planning projections, the second 25-year projections allow long-term evaluation of water supply and demand conditions, effectively testing Indio Subbasin sustainability under long-term hydrologic variability over 50 years.

Figure ES-7 illustrates the six scenarios in terms of the subbasin water budgets for each scenario including the average inflows (upper portion of graph) and average outflows (lower portion) over the 50-year predictive simulation period (WY 2025-2075). Across all six scenarios, average annual inflow exceeds average annual outflow.

Figure ES-7 Model Inflows and Outflows by Scenario



Modeling results are presented for all six scenarios, shown in terms of the respective water balances, cumulative change in storage, hydrographs at twelve representative wells across the subbasin, and groundwater level change maps. Results of these scenarios are shown together to allow comparison in terms of model inflows, simulated pumping, simulated drain flow, simulated net outflow to Salton Sea, hydrographs, and maps showing change in groundwater levels.

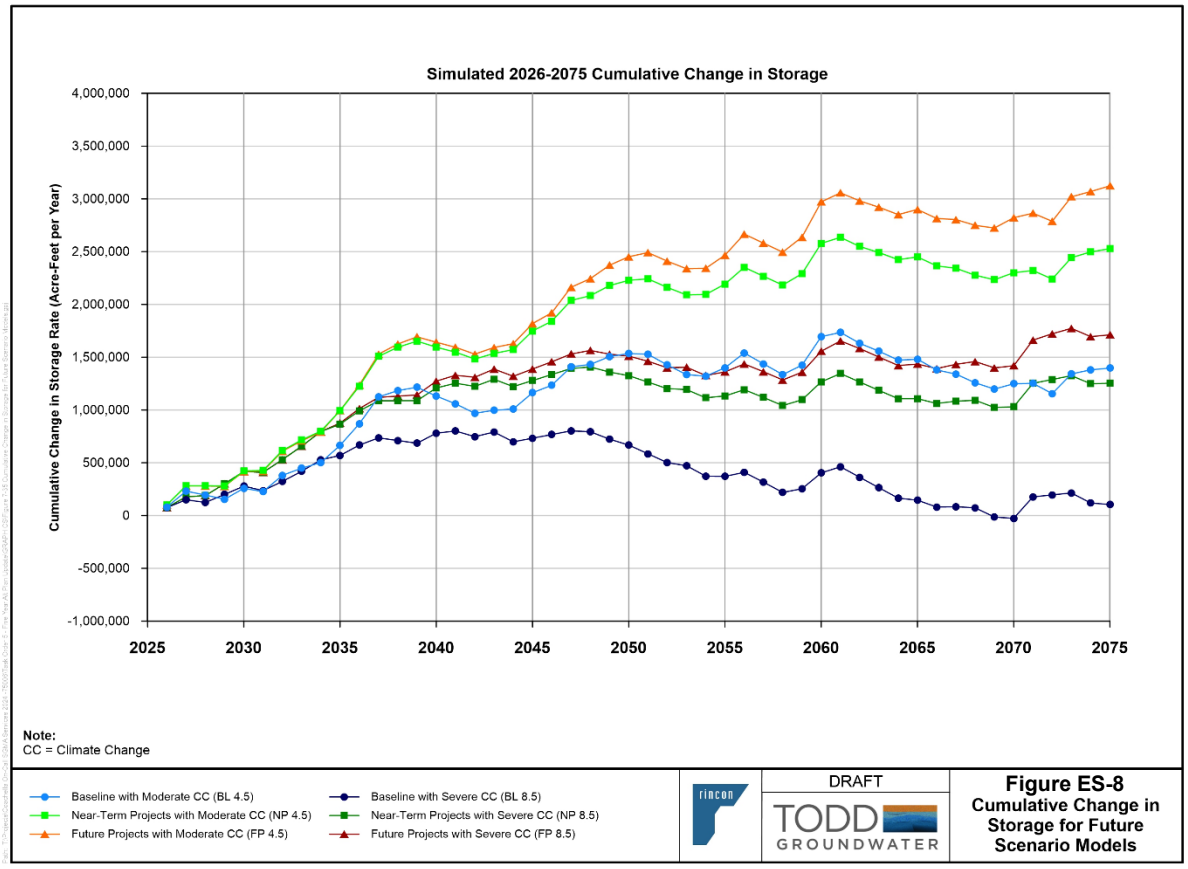
Figure ES-8 presents the simulated cumulative change in groundwater storage for all six scenarios over the WY2026-2075 predictive simulation period. The Cumulative storage increase ranges from a

high of approximately 3.1 million acre-feet under Future Projects under Moderate Climate Change Conditions to near zero under Baseline under Severe Climate Change Conditions.

Where possible, conservative assumptions were applied to the predictive scenarios to avoid overstating future Subbasin water balance benefits. These include a 10 percent buffer added to projected urban demand, and a reduced agricultural return flow factor (20 percent of applied water, compared to 30 percent in the historical model) reflecting an assumption of increasing irrigation efficiency over the planning period.

Collectively, the results for all six scenarios indicate that continued implementation of planned and future supply and recharge projects is important to maintaining a stable Subbasin water balance under a range of climate conditions. The Baseline under Severe Climate Change Conditions scenario is the only one of the six scenarios to show a net decline in cumulative groundwater storage over the 50-year simulation period, eroding a portion of the storage gained earlier in the simulation once demand is fully phased in. The other five scenarios generally maintain or increase Subbasin storage over the same period. These results demonstrate the importance of the GSAs' portfolio of planned and future projects and management actions in maintaining long-term Subbasin sustainability, particularly under less favorable climate conditions.

Figure ES-8 Cumulative Change in Storage for Future Scenarios



ES-8. Regulatory and Policy Issues

Implementation of the *2027 Alternative Plan Update* could be affected by regulatory policy and planning issues. While these issues may represent challenges, the GSAs have identified potential solutions, and considered opportunities. The *2022 Alternative Plan Update* described emerging issues which are again updated in this *2027 Alternative Plan Update*, with some topics described in detail in terms of current conditions, sustainable management, and implementation of projects and management actions.

Regulatory policies include water quality policies and planning regarding the Colorado River Basin Plan, anti-degradation policy, recycled water policy, Coachella Valley Salt and Nutrient Management Plan (CV- SNMP), salinity management, and agricultural discharge requirements. Policies and regulations of the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Board (RWQCB) are updated as part of the regular review by the GSAs.

The 2027 *Alternative Plan Update* addresses water quality constituents including salinity, arsenic, perchlorate, chromium-6, uranium, and nitrate, and also introduces the potential occurrence and adverse effects on water supply of per- and polyfluoroalkyl substances (PFAs), a group of human-made chemicals that are persistent in the environment and human body, with potential adverse health effects. Occurrence in Indio Subbasin of these constituents is summarized, along with monitoring and management actions to protect drinking water supplies. The GSAs continue to track the specific water quality issues, including the evolving regulations of emerging contaminants.

In addition, the *2027 Alternative Plan Update* addresses additional policy issues regarding availability of suitable water supply for small community water systems. Small water systems, often serving disadvantaged communities, may face challenges in providing safe, accessible, and affordable water because they may not have adequate resources to support maintenance, operation, and treatment costs. In response to these water supply issues, the GSAs with multiple small water systems in their respective jurisdictions have completed and continue to work on consolidating communities to a municipal water system to provide a reliable water supply source.

This *2027 Alternative Plan Update* also addresses changes in water conservation. The Water Conservation Act of 2009 required urban water suppliers to increase their water use efficiency. All six suppliers in the Plan Area exceeded the per capita water use reduction of 20 percent by 2020. Subsequently in 2018, the California Legislature enacted Assembly Bill 1668 and Senate Bill 606, which together lay out a new long- term water conservation framework that affects both urban and agricultural water providers. Urban water conservation is being promoted by local agencies to enhance cost-effectiveness and to prepare for water shortages, including drought.

ES-9. Sustainable Management

The *2010 CVWMP Update* developed an overarching goal for the Valley "to reliably meet current and future water demands in a cost-effective and sustainable manner." This *2027 Alternative Plan Update* continues to be guided by that goal with updated objectives as follows:

- To maintain a locally managed, economically viable, sustainable groundwater resource for existing and future beneficial uses in the Indio Subbasin by managing groundwater to avoid the occurrence of undesirable results.
- Meet current and future water demands with a 10 percent supply buffer

- Avoid chronic groundwater overdraft
- Manage and protect water quality
- Collaborate with tribes and state and federal agencies on shared objectives
- Manage future costs
- Minimize adverse environmental impacts
- Reduce vulnerability to climate change and drought impacts.

The *2027 Alternative Plan Update* incorporates a comprehensive approach to local groundwater management. Acknowledged as functionally equivalent to a GSP, it utilizes SGMA sustainability indicators and criteria as needed. SGMA provides a consistent, state-wide definition of sustainable management as the use and management of groundwater in a manner that can be maintained without causing undesirable results. Undesirable results are defined as significant and unreasonable effects caused by groundwater conditions occurring throughout a basin. Indicators of undesirable results include chronic lowering of groundwater levels, reduction of groundwater storage, seawater intrusion, land subsidence, degraded water quality, and depletions of interconnected surface water with adverse impacts on beneficial uses of the surface water.

SGMA also provides quantitative measures that support demonstration of sustainability. These include the Minimum Threshold (MT), a numeric value used to define undesirable results for each sustainability indicator, and the Measurable Objective (MO), a specific, quantifiable goal to track the performance of sustainable management. This *2027 Alternative Plan Update* provides quantitative MTs for groundwater levels, based on groundwater level monitoring data showing that chronic groundwater declines occurred until about 2009. The potential undesirable impacts on wells (especially shallow domestic wells) are discussed. No reports are known of wells adversely affected by low groundwater levels historically, including the years around 2009.

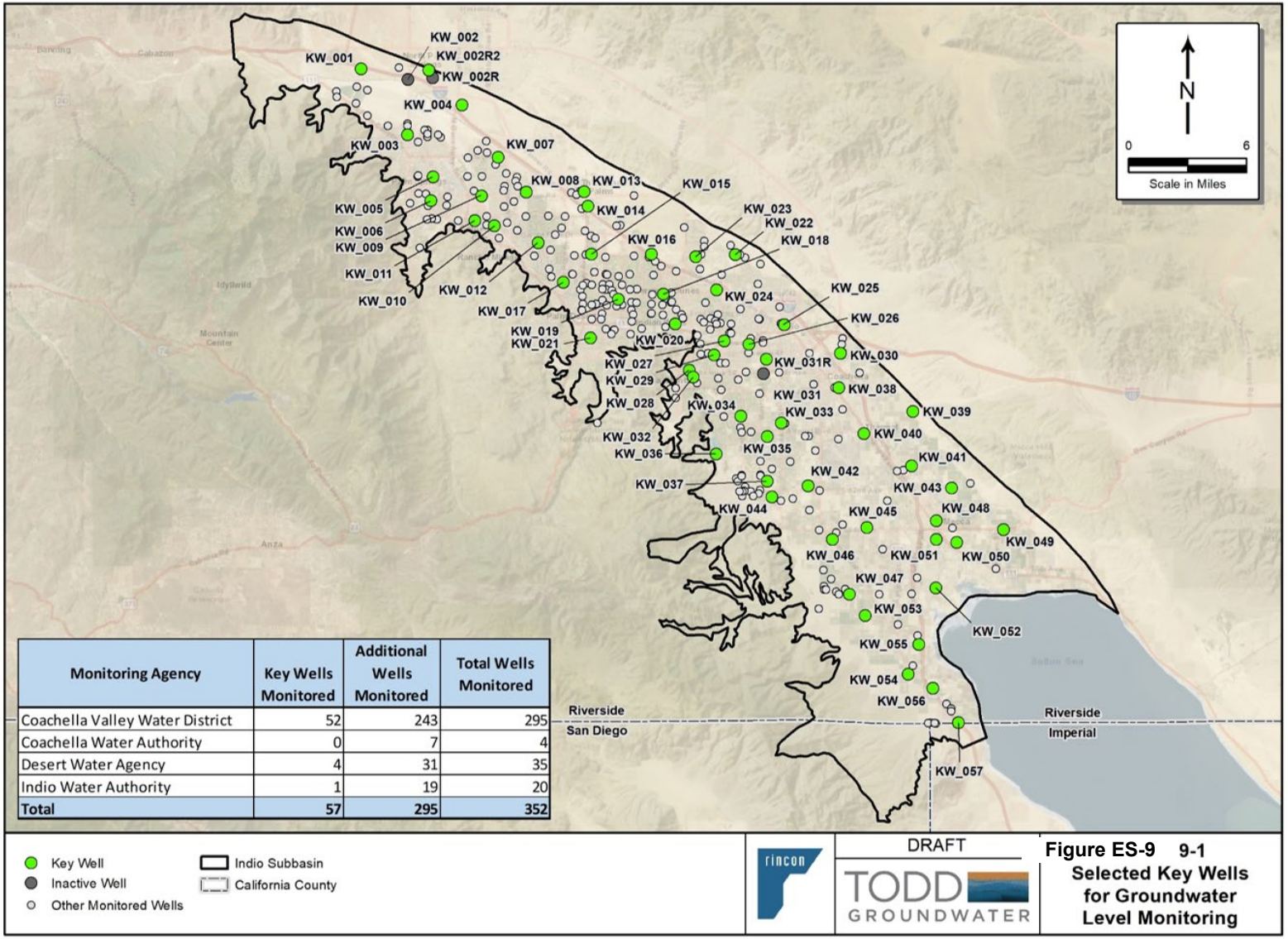
The Key Wells shown in Figure ES-9 are representative of local groundwater elevation conditions and are appropriate for monitoring groundwater levels relative to MTs. MTs are defined at each Key Well and undesirable results are defined to be protective of the basin. The MO is to maintain groundwater levels above the groundwater level MTs within the historical operating range.

Groundwater storage is the volume of water in the basin. The undesirable result associated with reduction in groundwater storage would be an insufficient supply to support beneficial uses during shortage and droughts. Groundwater levels and storage are directly related, as demonstrated by comparison of groundwater level and storage trends, which reveal similar patterns of historical overdraft, recovery, and response to different water year types including drought. As such, the groundwater level MTs will be used as proxy for storage MTs.

Land subsidence, the differential lowering of the ground surface, can damage structures and hinder surface water drainage. The land subsidence experienced historically in Indio Subbasin has been caused by declines in groundwater elevations due to an imbalance of pumping over recharge. As such, the groundwater level MTs will also be used as proxy for subsidence MTs.

As shown in the 2027 *Alternative Plan Update*, interconnected surface water generally is not present in the West Valley because groundwater levels are much lower than the ground surface. In the East Valley, a shallow semi- perched aquifer zone is present and potential GDEs may occur in this area along with non-GDE vegetation around agricultural fields and along drainage channels. Evapotranspiration from such vegetation is included in the numerical model.

Figure ES-9 Key Wells



Monitoring Agency	Key Wells Monitored	Additional Wells Monitored	Total Wells Monitored
Coachella Valley Water District	52	243	295
Coachella Water Authority	0	7	4
Desert Water Agency	4	31	35
Indio Water Authority	1	19	20
Total	**57**	**295**	**352**

Throughout the Alternative Plan process, the GSAs have addressed groundwater sustainability in terms of water quality, with maintenance of an extensive water quality monitoring program and implementation of applicable management responses. Specific topics addressed in the *2027 Alternative Plan Update* include selected water quality constituents of concern, the CV-SNMP, drain flows that represent salt outflow from the Subbasin, and seawater intrusion. Specific water quality constituents (including fluoride, arsenic, chromium-6, DBCP, TDS, nitrate, uranium, and perchlorate) are discussed in terms of sources, occurrence in the Indio Subbasin, and GSA actions to assist small water systems that are adversely affected.

In 2020, work to update the *Salt and Nutrient Management Plan for the Coachella Valley Groundwater Basin* (CV-SNMP) was initiated by the CV-SNMP agencies (including CVWD, CWA and Coachella Sanitary District, DWA, IWA, Myoma Dunes Mutual Water Company, VSD, MSWD, and City of Palm Springs) working in cooperation with RWQCB staff. This has involved preparing a *Groundwater Monitoring Workplan*, which was approved by the RWQCB in early 2021, and a *SNMP Development Workplan* that was subsequently adopted. The CV-SNMP update and *Alternative Plan Update* are coordinated efforts. Elements of this *2027 Alternative Plan Update* specifically supporting the CV-SNMP include (but are not limited to) organization of water quality data into a database; evaluation of the sources, and trends for TDS and nitrate; improvement of the monitoring program relative to TDS and nitrate; and identification of projects and actions relevant to water quality management. Additional study of salinity in groundwater—including analysis of the rate and level of increased salt contents in groundwater due to Colorado River importation—will be achieved in large part by the CV-SNMP update.

Seawater intrusion from the Salton Sea has been emphasized as a potentially substantial and irreversible consequence of overdraft. However, groundwater quality monitoring data (including chloride concentrations), show no evidence that seawater intrusion is occurring in the Subbasin. This *2027 Alternative Plan Update* shows modeled groundwater elevations near the Salton Sea, demonstrates the consistency of simulated levels with recent measured groundwater levels, and indicates minimal risk of saltwater intrusion. To be protective, MTs at Key Wells near the Salton Sea have been set to historic lows, as no impacts have been observed at that level. Moreover, modeling indicates a net outflow of groundwater to the Salton Sea, indicating no seawater intrusion. The 2027 *Alternative Plan* includes analysis of groundwater level data, modeling of groundwater storage change, and regular monitoring of groundwater quality data to detect seawater intrusion potential.

ES-10. Monitoring Program

The Indio Subbasin has been extensively monitored by the GSAs for decades, guided by the primary objective to evaluate the effectiveness of water management programs and projects and to modify actions and plans based on factual data. This *2027 Alternative Plan Update* continues and builds on the existing monitoring programs. Chapter 10 includes description of the monitoring network, methods and protocols for data collection, and update and maintenance of the data management system (DMS). The monitoring program has been assessed with reference to the sustainability goal and objectives, data gaps have been reviewed, and improvements have been identified for implementation. The monitoring program includes the following networks: climate, streamflow, subsidence, groundwater elevations, surface and groundwater quality, pumping, and drain flow.

Climate data are available from DWR's California Irrigation Management Information System (CIMIS) for five CIMIS stations and for the 12 Riverside County Flood Control and Water Conservation District precipitation monitoring stations. Data are used to support groundwater

conditions characterization and evaluation of irrigation water demands (agricultural and golf course).

Streamflow is measured by the United States Geological Survey (USGS) at 15 locations within the Indio Subbasin. Surface water diversions by DWA from Snow, Falls, Whitewater, and Chino watersheds are measured by DWA. Streamflow data are compiled annually to support tracking of basin conditions as part of the Indio Subbasin Annual Reports.

Subsidence is documented in a recently completed comprehensive USGS report of findings (Sneed and Brandt, 2020). The USGS, in cooperation with the GSAs, continues to study land subsidence in the Coachella Valley through the USGS land-subsidence monitoring network, which currently includes 24 stations. InSAR (Interferometric Synthetic Aperture Radar) data are also available that use radar images from satellites to provide broad spatial mapping of vertical displacement of the land surface.

Groundwater Elevations are available for selected wells in the Indio Subbasin dating back to 1910. Over 350 wells are currently monitored by the GSAs as part of their respective groundwater level monitoring programs. The data are used to characterize Subbasin conditions, evaluate pumping and recharge operations, and support groundwater modeling and model calibration. As part of this *2027 Alternative Plan Update*, 57 Key Wells were selected to assess sustainability in the Indio Subbasin.

Surface Water and Groundwater Quality monitoring is performed by multiple agencies in the Plan Area. For example, water purveyors are required by State law to monitor and report the quality of their water sources. These data are publicly available on the SWRCB's Groundwater Ambient Monitoring and Assessment Program (GAMA) website. In addition, Tribes monitor the quality of their wells and maintain records; not all these data are publicly available.

Groundwater Pumping is recognized as critical to Subbasin management. Accordingly, Division 2 Part 5 of the California Water Code requires each person (i.e., well owner/operator) within the counties of Riverside, San Bernardino, Los Angeles, and Ventura extracting more than 25 AFY of groundwater to file a "Notice of Extraction and Diversion of Water" with the SWRCB. In addition, the enabling legislation of CVWD and DWA respectively require that all production subject to replenishment assessment be reported monthly. The reporting threshold for pumpers (designated minimal producers) within the CVWD boundary is 25 AFY, while the threshold for DWA is 10 AFY; 550 wells are metered.

Drain Flows and the CVSC receive intercepted shallow groundwater from agricultural areas and convey the flow to the Salton Sea. A USGS gage station measures flow in the lower CVSC near the Salton Sea, while CVWD measures drain flows at 27 sites on a monthly basis. The CVSC and drain system also receive flows from CVWD's irrigation system in excess of requested deliveries (regulatory water), treated wastewater, and fish farm effluent. The drain flow data are used in tracking groundwater outflow and in calibrating the numerical groundwater flow model.

ES-11. Projects and Management Actions

A variety of projects and management actions (PMAs) are planned for implementation over the planning horizon (to 2050) to achieve sustainability in the Subbasin. Projects were identified by the GSAs through a several-month process involving the GSAs, the general public, and interested stakeholders. Project information was compiled into a draft list that was discussed and presented during the SGMA Tribal Workgroup and Public Workshops held on September 17, 2026. The project selection process included review and input from the GSAs and stakeholders, which was used to

refine the project list for inclusion in the Plan. While the order of PMAs has been retained from the *2022 Alternative Plan*, note that the numbering has been revised as PMAs are added, redefined, or removed. Since the *2022 Alternative Plan*, one PMA (PMA 2: Turf Irrigation Reduction) has been added, one PMA (PMA 18: EVRA Recycled Water Delivery, formerly PMA 9: EVRA Potable Reuse) has been revised, two PMAs (Mid-Canal Storage Project, formerly PMA 11, and TEL-GRF Expansion Project, formerly PMA 21) have been completed, and one PMA (Lake Perris Dam Seepage Recover Project, formerly PMA 6) has been deferred. The *2027 Alternative Plan Update* includes a final list, shown in Figure ES-10**,** of 28 possible PMAs representing a wide variety of activities by the four GSAs. Projects are classified into four categories based on project benefits: water conservation, water supply development, source substitution and replenishment, and water quality protection.

Figure ES-10 Categorized Projects and Management Actions

Water Conservation	Water Supply Development	Source Substitution & Replenishment	Water Quality Protection
▪ PMA 1: Urban Water Conservation ▪ PMA 2: Turf Irrigation Reduction ▪ PMA 3: Golf Water Conservation ▪ PMA 4: Agricultural Water Conservation	▪ PMA 5: Increased Surface Water Diversion ▪ PMA 6: Delta Conveyance Facility ▪ PMA 7: Sites Reservoir ▪ PMA 8: Future Supplemental Water Acquisitions	▪ PMA 9: Mid-Valley Pipeline Direct Customers ▪ PMA 10: East Golf Expansion ▪ PMA 11: Oasis Distribution System ▪ PMA 12: WRP-10 Recycled Water Delivery ▪ PMA 13: WRP-7 Tertiary Expansion ▪ PMA 14: Canal Water Pump Station Upgrade ▪ PMA 15: WRP-7 Recycled Water Delivery ▪ PMA 16: WRP-4 Tertiary Expansion and Delivery ▪ PMA 17: DWA WRP Recycled Water Delivery ▪ PMA 18: EVRA Recycled Water Delivery ▪ PMA 19: PD-GRF Phase 2 Expansion ▪ PMA 20: WWR-GRF Operation	▪ PMA 21: Eliminate Wastewater Percolation ▪ PMA 22: Wellhead Treatment ▪ PMA 23: Small Water System Consolidations ▪ PMA 24: Septic to Sewer Conversions ▪ PMA 25: Implement CV- SNMP Groundwater Monitoring Program Workplan ▪ PMA 26: Implement CV- SNMP Development Workplan ▪ PMA 27: Colorado River Salinity Forum ▪ PMA 28: Source Water Protection

ES-12. Plan Evaluation and Implementation

This *2027 Alternative Plan Update* describes the planning process for achieving a reliable and sustainable water supply. Using an adaptive management process, the GSAs can adjust project implementation if monitoring shows that water demands and supplies are higher or lower than projected or if tracking of groundwater levels indicates that undesirable results (including storage depletion and subsidence) could occur in the foreseeable future.

While overdraft has been reversed in terms of chronic groundwater level declines, storage depletion, subsidence, and seawater intrusion, the GSAs still face uncertainties in terms of forecasted demands and water supply availability. Accordingly, the *Alternative Plan Update* has focused on securing water reliability and resilience, namely the ability to provide consistent water supply and to respond to changing future conditions. Water supply reliability in the Indio Subbasin is the GSAs' ability to consistently provide adequate water supply to meet projected demands, both for groundwater replenishment and direct delivery, while sustainably managing the Subbasin. To maintain water reliability and resilience through the planning horizon, the GSAs established the following priorities (in no particular order) for use in selection of PMAs:

- Fully use available Colorado River water supplies
- Support improvement of the long-term reliability of SWP supplies, including participation in the Delta Conveyance Project (DCP)
- Continue developing recycled water as a reliable local water supply
- Implement source substitution and replenishment for resilience in response to changing conditions and for maintenance of long-term groundwater supply reliability
- Increase water-use efficiency across all sectors
- Participate in development of the Coachella Valley Salt and Nutrient Management Plan (CV-SNMP) to address salt and nutrient management in the Indio Subbasin.

The Indio Subbasin GSAs are working collaboratively to implement the *Alternative Plan Update* and ensure the sustainability of the Indio Subbasin. This includes implementing PMAs as well as ongoing Plan implementation and administrative activities. Alternative Plan implementation includes the program management, tribal coordination, public outreach, ongoing data collection and monitoring, monitoring network improvements, and funding activities necessary to implement this *2027 Alternative Plan Update*. Chapter 12 summarizes the timeline for each of these implementation activities.

GSA operations and Plan implementation will incur costs, which will require funding by the GSAs. The activities associated with Subbasin-wide management and Plan implementation will be borne by the four GSAs. Some activities (such as the Annual Reports and 5-Year Plan Updates) will be funded under the cost-sharing arrangement established by the Memorandum of Understanding signed in 2016, along with multiple supplements. Other management activities will be funded by individual GSAs or through other cost-sharing agreements or amendment to the MOU. Projects will be administered by the GSA project proponents. GSAs may elect to implement projects individually or jointly with one or more GSAs.

The overarching goal of the 2027 *Alternative Plan Update* is to reliably meet current and future water demands in a cost-effective and sustainable manner and builds on the Water Management Plans and Alternative Plans previously developed. With the passage of SGMA in 2014, the GSAs are addressing the sustainability indicators established in the legislation. This *2027 Alternative Plan*

Update establishes the groundwater conditions and hydrogeological conceptual model for the Indio Subbasin, forecasts water demands through the planning horizon, describes water supplies available to the GSAs, defines sustainable management for this region, presents water management projects and programs to ensure Subbasin sustainability, and models the simulated conditions that would result from implementation of those project portfolios. This planning process has demonstrated that with the proposed projects identified in this *2027 Alternative Plan Update* , and despite anticipated climate changes, the Indio GSAs are able to meet forecasted demands under a variety of conditions and maintain the Indio Subbasin in balance, even increasing groundwater storage over time. Subsidence and saltwater intrusion have been minimal and are not anticipated to cause undesirable results during Plan implementation.

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1 Introduction

Groundwater is a critical resource for the sustainability of Coachella Valley communities, agriculture, economic activities, environmental benefits, and other beneficial uses. The Indio Subbasin (one of four subbasins of the Coachella Valley Groundwater Basin) provides groundwater supply and a vast groundwater storage capacity with the natural ability to convey water—through groundwater flow—from areas of recharge to wells where water is pumped. Since the early 1900s, the Indio Subbasin has been actively managed to address increasing water demands (with pumping for agricultural, urban, and rural demands), beginning with capture of local stormwater to supplement the limited natural groundwater replenishment and later implementing water importation (since 1949) and source substitution projects. This has been a dynamic process with periods of groundwater depletion followed by recovery. Groundwater levels and storage reached historical lows in about 2009, but this overdraft has been stopped and replaced with increased groundwater storage as a result of active water management planning and projects. In addition, local agencies have recognized the multi-faceted nature of groundwater issues (including subsidence, water quality, seawater intrusion, and potential impacts on environmental uses) and have developed relevant management plans, programs, and projects.

In 2014, the California Legislature enacted the Sustainable Groundwater Management Act (SGMA) to provide a framework for sustainable groundwater management. SGMA defines sustainable management as the use and management of groundwater in a manner that can be maintained without causing overdraft or *undesirable results*, defined in terms of chronic lowering of groundwater levels, depletion of groundwater storage, seawater intrusion, land subsidence, degraded water quality, and depletion of interconnected surface water with adverse impacts on beneficial uses of the surface water.

SGMA promotes local management of groundwater resources in basins that it has designated as high or medium priority. The California Department of Water Resources (DWR) designated Indio Subbasin as a medium-priority basin. Lower priority basins are not required to comply with SGMA. To implement SGMA, local authorities have formed Groundwater Sustainability Agencies (GSAs) to manage the high- and medium-priority basins and to develop, submit, and implement Groundwater Sustainability Plans (GSPs) to manage local groundwater for long-term sustainability. For basins—such as Indio Subbasin—with established groundwater management, GSAs were empowered to submit Alternative Plans for GSP compliance.

Four local water agencies—Coachella Valley Water District (CVWD), Coachella Water Authority (CWA), Desert Water Agency (DWA), and Indio Water Authority (IWA)—manage groundwater in the Indio Subbasin in compliance with SGMA. These agencies have been designated as *Exclusive* GSAs over their respective areas and are referred to as the Indio Subbasin GSAs.

On July 17, 2019, DWR approved the Alternative Plan with a requirement to submit a Plan Update by January 1, 2022. The purpose of that Plan Update was to assess the implementation status of the Alternative Plan and, consistent with the goals of the *2010 CVWMP Update*, to evaluate whether water demands in the Indio Subbasin are being reliably met in a cost-effective and sustainable manner. The Plan Update was completed in accordance with GSP regulations and addressed DWR recommendations presented in the Indio Subbasin Alternative Assessment Staff Report. The *2022 Alternative Plan Update* was submitted to DWR in December 2021 and approved by DWR in 2024 with minor corrective actions identified.

This *2027 Alternative Plan Update* builds upon the *2022 Alternative Plan Update* by incorporating information, analyses, and management activities completed since that time. The update also documents actions taken in response to DWR's approval and corrective actions and evaluates basin conditions and groundwater management progress using the most recent available information.

Following the submittal and approval of the *2022 Alternative Plan Update*, the Indio Subbasin GSAs have continued to manage groundwater sustainability in the Subbasin. Consistent with SGMA, the GSAs prepare and submit Annual Reports that include updates to groundwater conditions and the water balance, document supply and demand, provide comparisons of Sustainable Management Criteria (SMCs) to recent conditions, summarize implementation progress for Projects and Management Actions (PMAs), and more. The following Annual Reports have been submitted to DWR since the *2022 Alternative Plan Update* (available on www.IndioSubbasinSGMA.org):

- *Indio Subbasin Annual Report for Water Year 2020-2021*, Todd Groundwater, 2022.
- *Indio Subbasin Annual Report for Water Year 2021-2022*, Todd Groundwater, 2023.
- *Indio Subbasin Annual Report for Water Year 2022-2023,* Todd Groundwater, 2024.
- *Indio Subbasin Annual Report for Water Year 2023-2024,* Todd Groundwater, 2025.

In addition, CVWD and the GSAs have completed special studies to assess information documented in the *2022 Alternative Plan Update* including:

- *East Coachella Valley Agricultural Drainage System Flow Study*, Todd Groundwater, July 2023.
- *CVWD Monitoring Audit and Recommendations*, Todd Groundwater, June 2025.

The GSAs are required to prepare a "periodic evaluation" of their plan performance, along with any updates or amendments, by January 1, 2027. This *2027 Alternative Plan Update* serves as the Plan Amendment, and the Periodic Evaluation prepared to assess SGMA implementation can be found in Appendix 1-A.

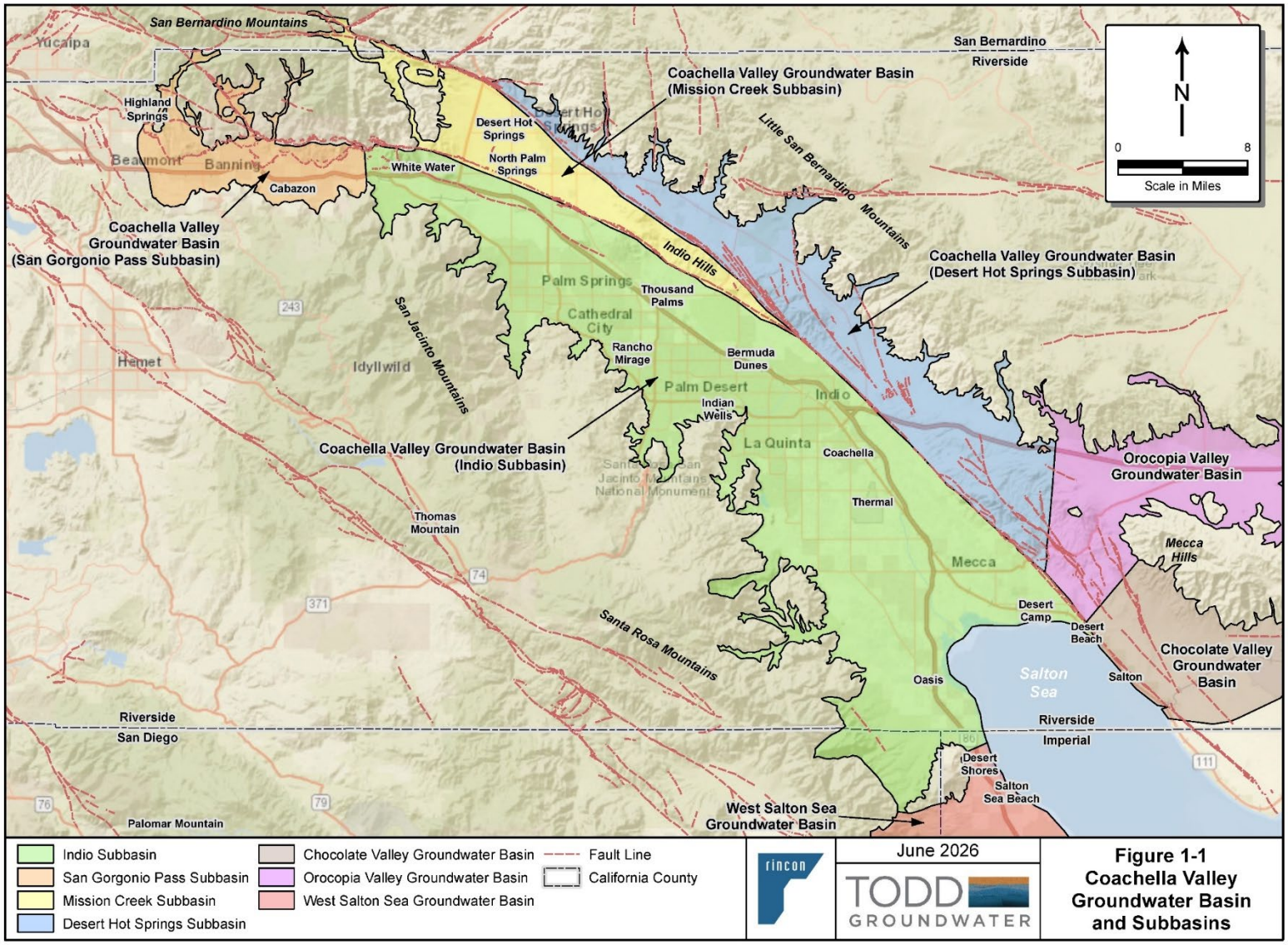
1.1 Background for Alternative Plan Update

1.1.1 Indio Subbasin

The Indio Subbasin is one of four subbasins of the Coachella Valley Groundwater Basin (Figure 1-1). The three neighboring subbasins include the San Gorgonio Pass Subbasin to the west, Mission Creek Subbasin to the north, and Desert Hot Springs Subbasin to the north/northeast. DWR designated the Indio Subbasin as medium priority, as it did the Mission Creek Subbasin and the San Gorgonio Pass Subbasin. DWR designated the Desert Hot Springs Subbasin as very low priority.

The Indio Subbasin, encompassing 525 square miles of the Coachella Valley Groundwater Basin, is bounded on its northern, northwestern, and southwestern margins by uplifted bedrock and on the south by the Salton Sea. The Indio Subbasin is filled with sediments, deposited mostly by the Whitewater River and its tributaries, that include mostly sand and gravel sequences on the north with increasingly thick layers of silt and clay on the south. These sediments are as much as 12,000 feet in thickness with the upper 2,000 feet representing substantial groundwater storage and the primary source of groundwater supply.

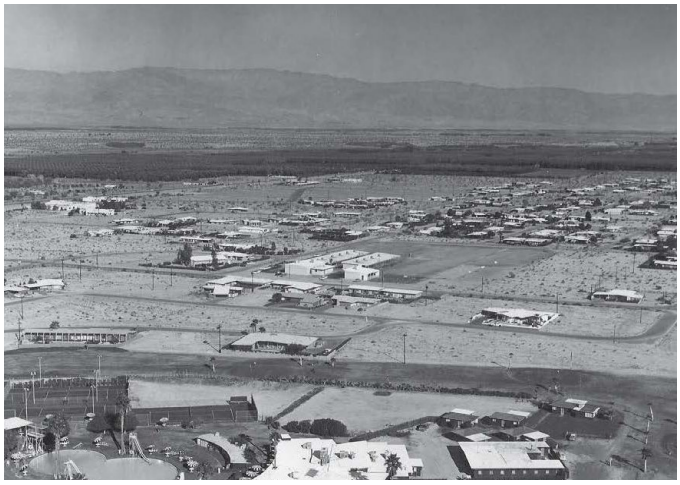
Figure 1-1 Groundwater Basins



Situated in an arid area with limited sources of natural recharge, the groundwater basin currently receives most of its inflow from groundwater replenishment facilities and from agricultural and urban return flows. Groundwater flow is generally from northwest to southeast. Discharge from the Indio Subbasin occurs mostly through pumping wells, evapotranspiration (ET), outflows from agricultural drainage facilities to the Salton Sea, and subsurface groundwater outflows to the Salton Sea. Groundwater historically has been and currently is used for multiple beneficial uses including agricultural, rural, domestic, municipal, golf course, and environmental purposes.

1.1.2 Historical Water Management Planning

The Coachella Valley has a long history of agricultural and resort-oriented municipal development, in which the groundwater resources of the Indio Subbasin have played a central role. While natural recharge in this arid area is limited, the groundwater basin provides vast groundwater storage capacity and the natural ability to convey water—through groundwater flow—from areas of recharge to production wells.



Early development in Coachella Valley included agricultural, urban, and rural land uses.

Since the early 1900s, local water management has addressed increasing water demands (agricultural, urban, and rural) by supplementing the limited natural recharge with multiple projects. These have involved conducting replenishment operations along the Whitewater River (since 1918), importing Colorado River water (1949), contracting for State Water Project (SWP) supplies (1962/1963), implementing water recycling, instituting water conservation, and other activities. Throughout the history of developing water supplies to meet demands, the groundwater basin has provided groundwater from storage for periods when demands have exceeded available supplies. In general, groundwater levels (and storage) declined until Colorado River water import in 1949 provided a substitute for groundwater pumping for agriculture in the East Valley, and groundwater levels subsequently increased. In 1973, artificial recharge of imported water from the Colorado River Aqueduct (SWP exchange water) began at the Whitewater River Groundwater Replenishment Facility (WWR-GRF), helping to increase and stabilize groundwater levels. However, the period from the early 1980s to the late 2000s was characterized by increased municipal development leading to chronic groundwater level declines, groundwater storage depletion, and demand exceeding available supply. Groundwater in storage in the Indio Subbasin reached



Construction of the Coachella Canal began in the 1930s.

its minimum in 2009, coinciding with historical groundwater level lows throughout much of the Subbasin. Groundwater levels have since increased or at least stabilized. This reflects the cumulative effect of active water management planning and projects, as described in the next section.

1.1.3 2002 Coachella Valley Water Management Plan

The *2002 CVWMP* (CVWD, 2002) and the *2010 CVWMP Update* (CVWD, 2012a) have been critical to addressing overdraft in the Indio Subbasin. These plans were based on the 1992 Groundwater Management Planning Act (now superseded by SGMA).

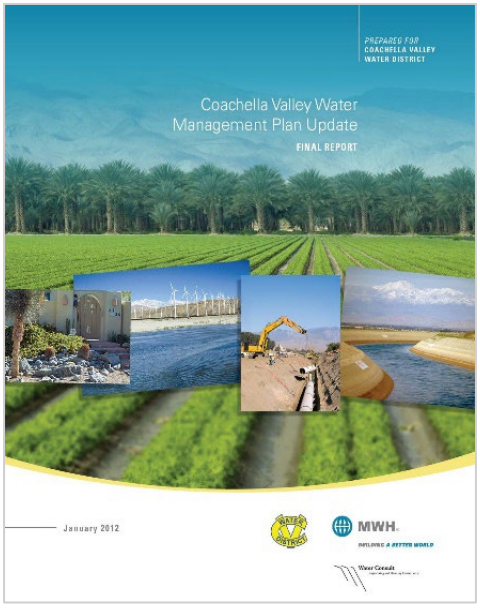
CVWD began development of the *2002 CVWMP* (CVWD, 2002) in 1994 with the general goal of providing adequate quantities of safe, high-quality water at the lowest cost to local water users. The *2002 CVWMP* identified the groundwater overdraft that had occurred and the threat of continued overdraft, based on projections of growth and water demand. The primary objective was to eliminate overdraft and associated adverse impacts including basin storage depletion, declining groundwater levels, subsidence, and water quality degradation. Additional objectives were to maximize conjunctive use opportunities, to minimize adverse economic impacts to water users, and to minimize environmental impacts. These objectives were used as criteria to evaluate four alternatives and select a preferred alternative. The selected alternative, which was subsequently implemented, involved a combination of water conservation (municipal, agricultural, and golf course), increased water importation, increased groundwater recharge including new facilities, and source substitution, which is the delivery of an alternate surface water supply in lieu of pumping groundwater.

1.1.4 2010 Coachella Valley Water Management Plan Update

The *2010 CVWMP Update* was prepared to respond to changes affecting water supplies, water demands, and evolving federal and state laws and regulations. Significant changes perceived at the time included local population growth and land use changes, and external factors including fluctuations in SWP allocation due to Bay-Delta restrictions, uncertainty of future Colorado River supplies as the Quantification Settlement Agreement (QSA) was negotiated and litigated, and climate change affecting not only local water demand, but also supplies from the Sierra Nevada and Colorado River watershed.

The *2010 CVWMP Update* objectives were stated as follows:

1. Meet current and future water demands with a 10 percent supply buffer.
2. Eliminate long-term groundwater overdraft.
3. Manage and protect water quality.
4. Comply with state and federal laws and regulations.
5. Manage future costs.
6. Minimize adverse environmental impacts.



2010 Coachella Valley Water Management Plan Update

Each objective was defined to contribute to improved water supply reliability for the Coachella Valley by ensuring adequate supplies to meet current and future demands, eliminating the long-term depletion of groundwater storage, and protecting basin water quality. Accordingly, the *2010 CVWMP Update* addressed future land use development, potential reductions in imported water supply reliability, climate change, water quality issues and changing regulations, subsidence, water conservation, and other issues. It also included an update and application of a numerical groundwater flow model. Most importantly, it described projects and management actions for implementation. Environmental review of projects was provided in the *Subsequent Program EIR* for the *2010 CVWMP Update* (CVWD, 2012b).

1.1.5 SGMA and Alternative Plan Development – 2017 Alternative Plan Bridge Document

SGMA affords GSAs a 20-year timeframe to implement a GSP or Alternative Plan. SGMA confirms existing authorities and powers of GSAs and provides tools for GSAs to monitor and manage groundwater levels and quality, land subsidence, and changes in surface water flow or quality affecting groundwater levels or quality. SGMA also establishes authority for GSAs to require well registration and reporting of annual groundwater extractions and surface water diversions for subsurface storage. Additionally, GSAs have authority to impose limits on groundwater extractions from individual wells, assess fees to implement local GSPs (and Alternative Plans), and request revisions of basin boundaries and create new subbasins. As stated in SGMA (§10728.6), the California Environmental Quality Act (CEQA) is not applicable to Plan preparation and adoption. However, it is applicable to a project that would be implemented as an action pursuant to this Plan Update, noting that projects included in the *2010 CVWMP Update* have been addressed in the *Subsequent Program EIR* (CVWD, 2012b).

In December 2016, CVWD, CWA, DWA, and IWA submitted a *SGMA Alternative Groundwater Sustainability Plan Bridge Document for the Indio Subbasin (Bridge Document)* (Indio Subbasin GSAs, 2016), which included submittal of the *2010 CVWMP Update. The Bridge Document* explained to DWR how the *2010 CVWMP Update* was functionally equivalent to the requirements for a GSP and meets the requirements of SGMA.

The *Bridge Document* submitted to DWR identified the following water management elements for implementation:

- Water conservation measures
- Acquisition of additional water supplies
- Conjunctive use programs to maximize supply reliability
- Source substitution programs
- Groundwater recharge programs
- Water quality protection measures
- Other management activities

In its review and subsequent approval of the *Bridge Document*, DWR provided an *Alternative Assessment Staff Report* (DWR, 2019) for the Indio Subbasin. This DWR Assessment summarized the principles of its review, the materials submitted as the Alternative Plan, and the required conditions for approval. The DWR Assessment also provided detailed description and evaluation of the Alternative Plan contents as a functional equivalent to a GSP. Lastly, the DWR Assessment presented seven recommendations for improvements to be included in the first five-year update of the Alternative Plan, prepared in 2022.

1.1.6 2022 Alternative Plan Update

DWR approved the 2017 Alternative Plan for the Indio Subbasin, concluding that:

> *…technical information in the 2002 and 2010 [CVWMPs] and related documents demonstrate a detailed understanding of the geology and hydrology of the Subbasin, the direct and indirect adverse effects of past groundwater management practices that led to overdraft conditions, and that the Agencies have demonstrated a commitment to eliminating overdraft to stop those adverse effects and to prevent them from occurring in the future. The Alternative quantifies objectives for sustainable management and for correcting groundwater problems and contains a robust set of plans and management actions designed to eliminate overdraft and associated adverse impacts to groundwater conditions. Department staff find the Agencies have set forth a reasonable and feasible approach to eliminating overdraft, which will, in turn, have a beneficial effect to the overall groundwater conditions in the Indio Subbasin, sufficient to avoid undesirable results.*

While noting that the Alternative Plan elements are functionally equivalent to GSP elements, DWR also provided seven recommendations to be addressed in the *2022 Alternative Plan Update*, which would facilitate DWR's ongoing evaluation and determination of whether implementation of the Alternative Plan is achieving the sustainability goal. The GSAs recognize and incorporate applicable and useful elements of the SGMA framework and GSP preparation process. The *2022 Alternative Plan Update* followed the sequence and elements of a GSP (as provided in Article 5 of the GSP Regulations) but also provided chapters on water supplies, water demands, and regulatory and policy issues. These additional topics were provided in the *2010 CVWMP Update* and are recognized as fundamental to local water management. In preparing this *Alternative Plan Update*, the DWR evaluation and recommendations have been carefully considered and addressed, consistent with local adaptive management. Responses to DWR evaluation and recommendations were incorporated as appropriate throughout this *2027 Alternative Plan Update* and addressed specifically in Chapter 9, *Sustainable Management*.

On July 17, 2019, DWR approved the Alternative Plan with a requirement to submit a Plan Update by January 1, 2022. The purpose of that Plan Update was to assess the implementation status of the

Alternative Plan and, consistent with the goals of the *2010 CVWMP Update*, to evaluate whether water demands in the Indio Subbasin are being reliably met in a cost-effective and sustainable manner. The Plan Update was completed in accordance with GSP regulations and addressed DWR recommendations presented in the Indio Subbasin Alternative Assessment Staff Report. The *2022 Alternative Plan Update* was submitted to DWR in December 2021 and approved by DWR in 2024 with minor corrective actions identified. The GSAs are required to prepare a "periodic evaluation" of their plan performance, along with any updates or amendments, by January 1, 2027.

1.1.7 2027 Periodic Evaluation

As required by SGMA, GSAs prepared a periodic evaluation within five years of submitting their Alternative Plan to evaluate monitoring data, assess plan performance, address DWR feedback, and determine if amendments are needed to achieve long-term sustainability. The *Indio Subbasin Periodic Evaluation,* included in this plan as Appendix 1-A, considers the *2022 Alternative Plan Update*, the subsequent Annual Reports, and additional studies to document the implementation and highlight additional analysis or planning that may be needed. This *Periodic Evaluation* assessed the need for a Plan Amendment and the updates recommended are incorporated in this *2027 Alternative Plan Update*.

This *Periodic Evaluation* assessed the need for a Plan Amendment and determined the GSAs would prepare an update to their Alternative Plan to update basin conditions and respond to DWR's Corrective Actions. The updates recommended are incorporated in this *2027 Alternative Plan Update*.

1.2 Recommended Corrective Actions

Initial corrective actions for the *2017 Alternative Bridge Document* were included in DWR's July 17, 2019, *Statement of Findings Regarding the Approval of the Indio Subbasin Alternative.* A subsequent determination letter with comments on the *2022 Alternative Plan Update* was provided by DWR on June 27, 2024, *Statement of Findings Regarding the Approval of the Coachella Valley – Indio Subbasin Alternative Groundwater Sustainability Plan*. A summary of all of the corrective actions in both letters is shown in Table 1-1.

Table 1-1 Summary of Recommended Corrective Actions

Alternative Plan	Recommended Corrective Action			Addressed
2017	Action 1	2017-01	Incorporate information on Garnet Hill area	Yes
	Action 2	2017-02	Describe groundwater levels as threshold for land subsidence	Yes
	Action 3	2017-03	Provide maps showing water quality constituents of concern	Yes
	Action 4	2017-04	Incorporate an approved Salt and Nutrient Management Plan	See RCA 3 below
	Action 4a	2017-04a	Evaluate salt in groundwater and implement sustainability	See RCA 3 below
	Action 5	2017-05	Assess saltwater intrusion near the Salton Sea	Yes
	Action 6	2017-06	Discuss subsurface drain flow as a minimum threshold	See RCA 3 below
	Action 7	2017-07	Identify groundwater-dependent ecosystems	Yes
2022	RCA 1	2022-01	Explain interbasin conditions	Yes, ongoing
	RCA 2	2022-02	Ensure monitoring network is consistent with SGMA Portal Monitoring Network Module	Yes, ongoing
	RCA 3	2022-03	Continue with activities in Recommended Actions 4, 4a, and 6.	Ongoing
		Same as 2017-04	Incorporate an approved Salt and Nutrient Management Plan	Ongoing
		Same as 2017-04a	Evaluate salt in groundwater and implement sustainability	Ongoing
		Same as 2017-06	Discuss subsurface drain flow as a minimum threshold	Yes

1.2.1 Status of Recommended Corrective Actions for 2017 Alternative Plan

In the determination letter (2024) for the *2022 Alternative Plan Update*, previous corrective actions and the actions taken to satisfy them were summarized. From the *2017 Alternative Plan*, Corrective Actions 1, 2, 3, 5, and 7 were deemed to be sufficiently addressed and are not discussed in this Periodic Evaluation. Corrective Actions 4, 4a, and 6 are noted to be tentatively addressed. These tentatively addressed corrective actions from the past cycle (*2017 Alternative Plan*) were included in the recommendations on the *2022 Alternative Plan Update*.

1.2.2 Recommended Corrective Actions for 2022 Alternative Plan Update and Work to Address

1.2.2.1 Recommended Corrective Action 1

RCA 1: Provide an explanation in future Alternative updates how inter-basin items, such as: thresholds across basin boundaries; monitoring networks; hydrogeologic conceptual models, including principal aquifer designations; water budgets; and management of interconnected surface water along basin boundaries have been coordinated.

The *2022 Alternative Plan Update* included close coordination with the neighboring Mission Creek Subbasin. Coordination with the other adjacent major groundwater subbasin, San Gorgonio Pass, began during the preparation of the *2022 Alternative Plan Update* and continues to develop. The GSAs are currently working with the GSAs of San Gorgonio Pass to coordinate the hydrogeologic conceptualization of the boundary, and water budgets. Both subbasins have only one principal aquifer and no interconnected surface water at the boundary, so additional coordination is not needed. The Indio Subbasin model has been revised to reflect this hydrogeologic and water budget coordination. All updates to the model and water budget are documented in Chapter 7, Numerical Model and Plan Scenarios.

1.2.2.2 Recommended Corrective Action 2

RCA 2: Ensure the monitoring network details included in the Alternative are consistent with the information contained in the Department's SGMA Portal Monitoring Network Module.

For each Annual Report, the Indio Subbasin GSAs submit all water level data and confirm that the Key Well network is up to date on the SGMA Portal. In addition, the GSAs update the water level data for the Key Wells in late spring to meet the bi-annual monitoring requirements. CVWD also plans to upload the existing water quality site information during the next Annual Report cycle. While these monitoring locations are not linked to specific SMCs, they do inform the groundwater management through the *Coachella Valley Salt and Nutrient Management Plan (CV-SNMP)*.

1.2.2.3 Recommended Corrective Action 3

RCA 3: Department staff suggest that the GSAs persist with activities related to the tentatively addressed Recommended Actions 4, 4a, and 6, and integrate the outcomes of these activities into future updates to the Alternative.

- ***Recommended Action 4:*** *Staff recommend that the Agencies incorporate an approved Salt and Nutrient Management Plan into future iterations of the Alternative.*
- ***Recommended Action 4a:*** *Staff recommend that the Agencies continue efforts to study the rate and level of increased salt contents in groundwater due to the importation of Colorado River water, identify limits for the Subbasin, and begin to develop and implement plans and management actions that will achieve and maintain the Subbasin within those limits.*
- ***Recommended Action 6:*** *Staff recommend that the Agencies clarify whether there is a minimum threshold associated with the amount of flow in the subsurface drains, below which significant and unreasonable undesirable results would occur, what that quantified minimum threshold is, if applicable, and the implementation horizon for when the goal for the amount of subsurface flow will be achieved, so as to avoid undesirable results.*

The CV-SNMP is still under development, and the latest findings from the CV-SNMP process will be incorporated into the Plan Amendment as needed. Additional PMAs will be added to reflect proposed actions from the CV-SNMP.

CVWD prepared a study on the agricultural drain network to determine if SMCs should be developed for the subsurface drains (Todd, 2023). A major conclusion of the study was that drain flow is not directly linked to groundwater sustainability, and there is no threshold below which significant and unreasonable undesirable results would occur. As a result, SMCs are not recommended for drain flow and will not be included in the Plan Amendment.

1.3 Plan Goals and Objectives

The basic goal of this *2027 Alternative Plan Update* remains the same as the prior iterations of the CVWMP:

- *To reliably meet current and future water demands in a cost-effective and sustainable manner.*

During the planning process, and to align with SGMA, the GSAs also established a sustainability goal (see Chapter 9, *Sustainable Management* for more detail):

- *To maintain a locally managed, economically viable, sustainable groundwater resource for existing and future beneficial uses in the Indio Subbasin by managing groundwater to avoid the occurrence of undesirable results.*

The underlying Plan objectives were also refined from the *2010 CVWMP Update* to reflect the water supply uncertainties facing the Indio Subbasin:

1. Meet current and future municipal water demands with a ten percent supply buffer
2. Avoid chronic groundwater overdraft
3. Manage and protect water quality
4. Collaborate with tribes, state, and federal agencies on shared objectives
5. Manage future costs
6. Minimize adverse environmental impacts
7. Reduce vulnerability to climate change and drought impacts

1.4 GSA Governance

The GSAs responsible for managing the Indio Subbasin in compliance with SGMA are listed in Table 1-2 and include the following:

- **Coachella Valley Water District (CVWD)** is a public agency of the State of California organized and operating under the County Water District Law, California Water Code section 30000, et seq, and Coachella Valley Water District Merger Law, Water Code section 33100, et seq. CVWD has groundwater management powers across a portion of the Indio Subbasin and manages replenishment assessment programs under Water Code section 31630-31639. CVWD is governed by a board of five directors, elected by district voters to 4-year terms.
- **Coachella Water Authority (CWA)** is a joint powers authority formed as a component of the City of Coachella and the Housing Authority of the City of Coachella and has statutory authority over water supply.
- **Desert Water Agency (DWA)** is one of the statutorily named, exclusive local agencies given the power to comply with SGMA (Section 10723(c)(1)). DWA is an independent special district created by an act of the State Legislature as set forth in Chapter 100 of the appendix to the California Water Code. DWA has groundwater management powers across a portion of the Indio Subbasin and manages a replenishment assessment program in addition to provision of retail water service to a portion of its service area. DWA is led by a publicly elected, five-member Board of Directors.
- **Indio Water Authority (IWA)** is a joint powers authority formed as a component of the City of Indio and Housing Authority of the City of Indio and has statutory authority over water supply.

CVWD, CWA, DWA, and IWA each successfully filed a Notice of Election to become exclusive GSAs within their respective jurisdictional areas in the Indio Subbasin.

CVWD has served as the Plan Manager for this *2027 Alternative Plan Update*, led by Joanne Le, Director of Environmental Services, JLe@cvwd.org.

Table 1-2 Indio Subbasin Groundwater Sustainability Agencies

Name and Address of GSA	Contact with Plan Implementation Authority
Coachella Valley Water District 75525 Hovley Ln E Palm Desert, CA 92211	Joanne Le jle@cvwd.org
Coachella Water Authority 53-462 Enterprise Way Coachella, CA 92236	Castulo Estrada cestrada@coachella.org
Desert Water Agency 1200 S Gene Autry Trail Palm Springs, CA 92264	Sarah Rapolla srapolla@dwa.org
Indio Water Authority 83101 Avenue 45 Indio, CA 92201	Roman Gonzalez rcgonzalez@indioca.gov

1.5 Relationship to Other Planning Efforts

This *2027 Alternative Plan Update* builds on a history of regional collaboration on water management planning and implementation. The GSAs have coordinated and shared information with each of the following planning efforts described below.

1.5.1 Mission Creek Subbasin Alternative Plan Update

The Mission Creek Subbasin of the Coachella Valley Groundwater Basin is coordinated by a management committee made up of: CVWD, DWA, and Mission Springs Water District (MSWD). CVWD and MSWD have public water systems that rely on groundwater from the Mission Creek Subbasin. CVWD and DWA are GSAs with groundwater replenishment authority for this region and conduct an active recharge program utilizing SWP exchange water. In December 2004, MSWD, CVWD, and DWA signed a Settlement Agreement, in which the agencies agreed to jointly prepare a water management plan for the Mission Creek and Garnet Hill Subbasins.

The *Mission Creek-Garnet Hill WMP* (CVWD et al., 2013) was completed in January 2013 and was adopted by CVWD, DWA, and MSWD. The purpose of the *Mission Creek-Garnet Hill WMP* was to manage water resources to reliably meet demands and protect water quality in a sustainable and cost-effective manner. The General Managers of MSWD, CVWD, and DWA met regularly to discuss development of the *Mission Creek-Garnet Hill WMP* and continue to meet quarterly to discuss plan implementation and other water management issues associated with the Mission Creek Subbasin and Garnet Hill Subarea. CVWD and DWA coordinated the planning efforts to ensure consistency between the *Mission Creek-Garnet Hill WMP* and the *2010 CVWMP Update*.

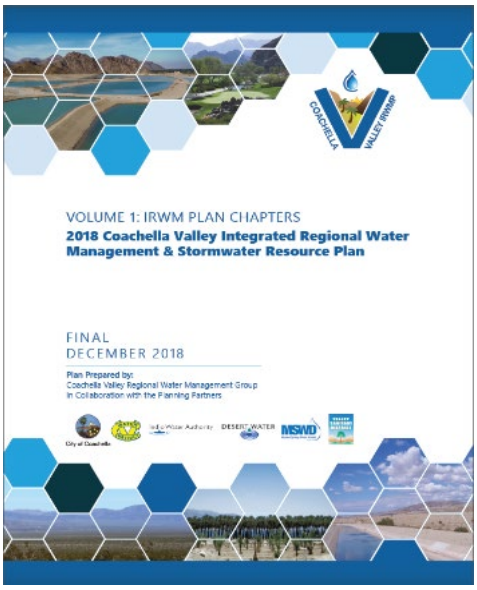
Using the same approach as in the Indio Subbasin, the Mission Creek Management Committee submitted the *Mission Creek-Garnet Hill WMP*, along with a Bridge Document (Mission Creek

management committee, 2016), as an Alternative Plan to a GSP for the Mission Creek Subbasin. On July 17, 2019, DWR approved the Alternative Plan.

Similar to Indio, the Mission Creek Management Committee prepared an Alternative Plan Update in 2022 (*2022 Mission Creek Subbasin Alternative Plan Update*), which was submitted to DWR in December 2021 and approved by DWR in 2024 with minor corrective actions identified. At the time of writing, the Mission Creek committee is preparing their Periodic Evaluation and Plan Amendment. Throughout the course of this *2027 Alternative Plan Update*, there has been ongoing communication, coordination, and information sharing among the two planning teams.

1.5.2 Coachella Valley Integrated Regional Water Management Plan

The Coachella Valley Integrated Regional Water Management (IRWM) Program was established in 2009 by the Coachella Valley Regional Water Management Group (CVRWMG). At that time, the CVRWMG was composed of CVWD, CWA, DWA, IWA, and MSWD, but has since expanded to include Valley Sanitary District (VSD) as well. The *2018 Coachella Valley Integrated Regional Water Management & Stormwater Resources (IRWM/SWR) Plan Update* (*2018 Coachella Valley IRWM/SWR Plan*) (CVRWMG, 2018) serves as a combined plan that addresses the requirements of DWR's IRWM Program Guidelines and the State Water Resources Control Board's (SWRCB's) Stormwater Resource Plan Guidelines. Both State programs provide grant funding to support multi-benefit water management projects that align with the program goals of expanding water supply reliability, improving water quality, and protecting water-based natural resources. The *2018 Coachella Valley IRWM/SWR Plan* presents an integrated regional approach for addressing water management issues through a process that identifies and involves water management stakeholders from the Coachella Valley. Given that the Indio Subbasin GSAs are all CVRWMG members, this *2027 Alternative Plan Update* was coordinated with and shared information with the IRWM program.



2018 Coachella Valley Integrated Regional Water Management & Stormwater Resources Plan

1.5.3 Urban Water Management Plan

Under the Urban Water Management Planning Act, DWR requires that urban water suppliers develop Urban Water Management Plans (UWMPs) every 5 years. In the 2015 cycle, each of the water purveyors within the Indio Subbasin prepared and submitted 2015 UWMPs. These UWMPs define their current and future water use, water use targets, sources of supply, source reliability, and existing conservation measures. The Water Conservation Act of 2009 set a goal for the State to reduce urban water use by 20 percent by the year 2020. As documented in the *2015 UWMPs*, all the GSAs surpassed their established 2015 water use targets. The *2010 CVWMP Update* and *Mission Creek/Garnet Hill Water Management Plan* (*Mission Creek/Garnet Hill WMP*) (CVWD et al., 2013) were used as references for development of *2015 UWMPs* within their study areas.

In the 2020 and 2025 cycles, all the region's water purveyors – CVWD, CWA, DWA, IWA, MSWD, and Myoma Dunes Mutual Water Company – prepared a regional *2020 UWMP* (CVWD et al., 2021) and 2025 UWMP (CVWD et al., 2026).

The latest *2025 Regional UWMP* (RUWMP) built on the demand forecasting and supply analysis prepared for the 2027 Alternative Plan Updates for the Indio and Mission Creek Subbasins. Water supply reliability analysis and drought assessment were completed at the regional scale assuming supplies available to each water purveyor. Throughout the planning process for this *2027 Alternative Plan Update*, the GSAs have ensured ongoing communication, coordination, and information sharing with the *2025 RUWMP* team. As documented in the *2025 RUWMP*, all the GSAs successfully surpassed their respective 20 percent by 2020 water use targets.

1.5.4 Coachella Valley Multiple Species Habitat Conservation Plan

The *Coachella Valley Multiple Species Habitat Conservation Plan* (*CVMSHCP*) (CVAG, 2016) is a multi-agency conservation plan for the entire Coachella Valley and surrounding mountains to address State and Federal Endangered Species Act (ESA) compliance in the region. The *CVMSHCP*, last amended in 2016, defines a shared regional vision for balanced growth to enhance and maintain biological diversity and ecosystem processes while also fostering economic growth. The *CVMSHCP* protects 240,000 acres of open space and 27 species; enhances infrastructure without environmental conflicts; offers opportunities for recreation, tourism, and job creation; and ensures the survival of endangered species (CVAG, 2016). The *CVMSHCP* was considered in the development of this *2027 Alternative Plan Update*, with emphasis on the groundwater dependent ecosystem analysis.

1.5.5 Coachella Valley Salt and Nutrient Management Plan

While encouraging the use of recycled water, the Recycled Water Policy states that salts and nutrients from all sources must be managed on a basin-wide or watershed-wide basis to attain water quality objectives and protect beneficial uses. This is typically achieved through the development of a Salt and Nutrient Management Plan (SNMP). Required components of a SNMP include a monitoring network and plan, water recycling use goals and objectives, salt and nutrient source identification, implementation measures, and an antidegradation analysis to ensure adherence to the Antidegradation Policy.

In 2015, CVWD, DWA, and IWA created the CV-SNMP for the Coachella Valley Groundwater Basin (CVWD, et al., 2015). Subsequently, the *2015 CV-SNMP* was evaluated by the Colorado River Regional Water Quality Control Board (RWQCB). The RWQCB provided comments and recommendations on the 2015 CV-SNMP's compliance with the updated Recycled Water Policy (Colorado River Basin RWQCB, 2020). In response, the CV-SNMP was restarted in 2020 by an expanded CV-SNMP agency group that includes all major water and wastewater agencies in the Coachella Valley. These agencies include CVWD, CWA and Coachella Sanitary District, DWA, IWA, Myoma Dunes Mutual Water Company, Valley Sanitary District, MSWD, and City of Palm Springs, collectively the CV-SNMP Agencies. In 2021, CV-SNMP Agencies submitted a Development Workplan (CV-SNMP Agencies, 2021) that describes a detailed scope of work for updating the CV-SNMP, including a new groundwater monitoring program to support implementation of the CV-SNMP. The RWQCB approved the Groundwater Monitoring Program Workplan (CV-SNMP Agencies. 2020) in February 2021, and the program was implemented later that year. The RWQCB subsequently approved the CV-SNMP Development Workplan in October 2021.

Progress on the CV-SNMP is being reported in a series of technical memoranda with guidance from a CV-SNMP Stakeholder Group and Technical Advisory Committee. Stakeholder outreach includes provision of a webpage (https://www.cvsnmp.com/) and workshops. Implementation of the CV-SNMP was incorporated into the *2022 Alternative Plan* as PMAs 27 and 28, with progress reporting included in subsequent Annual Reports.

Final technical memoranda published to date can be found at https://www.cvsnmp.com/resources/ and include the following:

- Final Task 1 – Characterize TDS/N Mass Loading to the Coachella Valley Groundwater Basin
- Final Task 2 – Characterize Current Groundwater Quality
- Final Task 3 – Delineate Draft Management Zones and Describe Metrics to Characterize Beneficial Use Protection
- Final Task 4 – Develop Technical Approach for Forecasting TDS/N Concentrations in Groundwater
- Task 5. Construct N/TDS Forecasting Tools and Evaluate the Baseline Scenarios
- Task 6. Forecast N/TDS for SNMP Scenarios
- Task 7. Characterize and Compare the Cost of Baseline and SNMP Scenarios

Upcoming technical memoranda will present a baseline scenario, summarize computer modeling scenarios for forecasting TDS/N, and characterize and compare costs of baseline and forecasting scenarios. The Final CV-SNMP will present the entire CV-SNMP; completion of the CV-SNMP is scheduled for 2027.

Following approval of the CV-SNMP Development Workplan, the CV-SNMP Agencies have continued implementation through ongoing stakeholder engagement, technical advisory committee coordination, groundwater quality monitoring, and preparation of several technical memoranda.

1.6 Interbasin Coordination

The Indio Subbasin GSAs continually coordinate among themselves; with GSAs in the neighboring San Gorgonio Pass and Mission Creek subbasins; with land use planning, well permitting and regulatory agencies, and with wholesalers such as the Metropolitan Water District.

1.6.1 San Gorgonio Subbasin GSAs

The Indio Subbasin GSAs are currently working with San Gorgonio Pass Subbasin GSAs to further refine the hydrogeology of the shared basin boundary. The San Gorgonio Pass Subbasin is located northwest of the Indio Subbasin (Figure 1-1), and as described in Section 3, groundwater flows from the San Gorgonio Pass Subbasin into the Indio Subbasin through a bedrock constriction. This coordination supports consistent characterization and management of groundwater conditions across the basin boundary and responds to DWR Recommended Corrective Action 1. The corrective action directs the GSAs to describe interbasin issues and coordination related to thresholds across basin boundaries; monitoring networks; hydrogeologic conceptual models, including principal aquifer designations; water budgets; and management of interconnected surface water.

The Indio Subbasin GSAs, San Gorgonio Pass Water District, and their respective consultants met during the development of the 2022 Alternative Plan Update and again through the development of this Alternative Plan. Representatives of the two subbasins developed a shared understanding of

hydrogeology of the boundary and how the boundary was simulated in the respective models. The two models now use consistent methodologies and flow volumes for basin interflow.

The Indio Subbasin GSAs prepared a technical memorandum to provide the scientific justification and background for updates to both models (but focused on the Indio Subbasin model), included as an appendix to this Plan. The subbasins coordinated the development and updates of their respective numerical scenarios and future scenarios for this Alterative Plan. The subbasins will continue to work together to coordinate the update of the San Gorgonio Pass GSP and the implementation of this Alternative Plan Update through Annual Reports.

1.6.2 Mission Creek Subbasin Management Agencies

Subsurface inflow to the Indio Subbasin occurs from the Mission Creek Subbasin across the Banning Fault. The Mission Creek Subbasin of the Coachella Valley Groundwater Basin is coordinated by a management committee made up of: CVWD, DWA, and MSWD. CVWD and MSWD have public water systems that rely on groundwater from the Mission Creek Subbasin. CVWD and DWA are GSAs with groundwater replenishment authority for this region and conduct an active recharge program utilizing SWP exchange water. The General Managers of MSWD, CVWD, and DWA met quarterly to discuss development of the *Mission Creek-Garnet Hill WMP* and continue to meet to discuss plan implementation and other water management issues associated with the Mission Creek Subbasin and Garnet Hill Subarea. CVWD and DWA coordinated the planning efforts to ensure consistency in SGMA implementation.

Indio and Mission Creek Subbasins continue to coordinate on the model development and update. Local adjustments for fault conductance and inflow rates from the Mission Creek Subbasin were made to ensure consistency in interbasin flow. Future climate change scenarios use the same climate projections to further coordinate the models.

1.7 Notice and Communication

This *Alternative Plan Update* has been developed with input from all five tribes located within the Indio Subbasin, stakeholders, and members of the public. The GSAs established a program website (www.IndioSubbasinSGMA.org), initiated regular stakeholder communications, provided program updates, and solicited input at public workshops and tribal workgroups.

1.7.1 Participating Agencies and Coordination

The four GSAs—CVWD, CWA, DWA, and IWA—led all stakeholder outreach and communications in accordance with a Communications Plan that was developed at program outset. The 2027 Outreach and Engagement Plan (Appendix 1-B) provides the framework for stakeholder, Tribal, and public engagement during development and implementation of the Alternative Plan Update. The plan identifies outreach goals, target audiences, communication methods, and opportunities for participation to support transparent groundwater management and informed decision-making. Outreach activities include public workshops, SGMA Tribal Workgroup meetings, website and email communications, and coordination with agencies, community organizations, and other interested stakeholders.

1.7.2 GSAs' Decision Making Process

The GSAs are the designated decision-making entities for the *Alternative Plan Update* process. On October 5, 2016, the GSAs entered into a Memorandum of Understanding (MOU) to establish an agreement for collaboration and cost-share for management of the Indio Subbasin under SGMA. Each GSA is responsible for the portion of the Indio Subbasin within their respective jurisdictional area (see Figure 2-1). The MOU establishes that its intent is to foster cooperation, coordination, and communication among the GSAs regarding management of the Indio Subbasin.

The 2016 MOU established the GSAs' intent to collaborate in developing and submitting the Alternative Plan to DWR. On April 3, 2018, the GSAs approved a Supplement to the MOU that outlined the GSAs' intent to prepare an Annual Report for Water Year 2017. On October 29, 2018, the GSAs approved a Second Supplement to the MOU that allowed for ongoing preparation of Annual Reports by April 1 of each water year, along with preparation of a *2022 Indio Subbasin Alternative Plan Update* (see Appendix 1-C). The MOU remains in effect without a specified termination date and therefore provides the framework for preparing future five-year Alternative Plan updates, unless a party ends its participation by providing at least 30 days' written notice. The Second Supplement directs CVWD to serve as the managing entity for selected consultants but allows for input and review of all SGMA-related deliverables and transmittal of all data and files to each of the four GSAs.

The GSAs met monthly to discuss *Alternative Plan Update* development and implementation activities, assignments and consultant management, milestones, and ongoing work progress. The GSAs participated in all public workshops and directed outreach meetings. Public input, no matter the method received (e.g., phone, email, public meeting), was shared with all the GSAs for consideration throughout the planning process.

1.7.3 Stakeholder Involvement

Public engagement includes both stakeholder coordination and general public involvement. The goal of the public engagement effort was to understand the needs of stakeholders, increase awareness and understanding of the *Alternative Plan Update*, and promote active involvement in the process. Tribes and stakeholders with interest in water management—including agency representatives, municipalities, agricultural representatives, golf course industry representatives, Homeowners Associations, other large irrigators, environmental justice groups, and non-governmental organizations—are the primary audience for the *Alternative Plan Update*. The general public was engaged throughout the planning process to share information about the Indio Subbasin and water management decisions and solicit input to the *Alternative Plan Update*.

As the best way to communicate with and consider the interests of all beneficial uses and users of groundwater in the Subbasin, the GSAs established a program website (www.IndioSubbasinSGMA.org). The website provides information to stakeholders during plan development and implementation. From the website, stakeholders can sign up to receive email updates and announcements. Public workshop and meeting announcements, agendas, and materials are posted on the website in advance of each meeting.

To encourage stakeholder involvement in the planning process, the GSAs also provided outreach documents, including the program website, in both English and Spanish to accommodate the primary languages of many community members.



Indio Subbasin SGMA Website, March 2026

Additionally, an email list was compiled and maintained throughout the planning process to communicate with stakeholders. Announcements were sent in English and Spanish to announce workshops or release of new planning materials. A project-specific email address was advertised and maintained to receive input and feedback from stakeholders.

The GSAs will continue using the stakeholder email list to communicate items of interest to stakeholders during Plan implementation, including upcoming workshops, release of Annual Reports, and GSA Board meetings addressing SGMA topics.



Dear Indio Community,

We're excited to invite you to the **first community workshop** for the 2027 Indio Subbasin Alternative Plan Update! RSVP at the link below.

Date: Monday, October 20th, 2025
Time: 10:00 AM – 12:00 PM
In-Person: Forbes Auditorium, 51501 Tyler Street, Coachella, CA 92236
Virtual Location: https://us06web.zoom.us/webinar/register/WN_KAXZNOxxRKSze-4UAh3HQw
Spanish translation available upon request.

Why Join?

According to the Sustainable Groundwater Management Act (SGMA), every five years the Indio Subbasin updates its Groundwater Sustainability Plan. This is your opportunity to:
- Learn more about local water sustainability efforts
- Hear project goals and the timeline
- Share your experiences and input
- Ask questions directly

Stay Connected

Visit our **website** to learn more, explore the region's groundwater history, and stay up to date on upcoming events!

We look forward to seeing you there!

Visit our Website



Estimada comunidad de Indio:

Nos complace invitarlos al **primer taller comunitario** para la actualización del Plan Alternativo de la Subcuenca Indio de 2027. Confirma tu asistencia en el enlace abajo.

Fecha: Lunes 20 de octubre de 2025
Hora: 10:00 a. m. a 12:00 p. m.
En Persona: Auditorio Forbes, 51501 Tyler Street, Coachella, CA 92236
Ubicación virtual: https://us06web.zoom.us/webinar/register/WN_KAXZNOxxRKSze-4UAh3HQw
Traducción español disponible si se solicita.

¿Por qué asistir?

De acuerdo con la Ley de Gestión Sostenible de Aguas Subterráneas (SGMA), cada cinco años la Subcuenca Indio actualiza su Plan de Sostenibilidad de Aguas Subterráneas. Esta es su oportunidad para:
- Conocer más sobre las iniciativas locales de sostenibilidad hídrica
- Conocer los objetivos y el cronograma del proyecto
- Compartir sus experiencias y comentarios
- Hacer preguntas directamente

Manténgase informado

Visite nuestro **sitio web** para obtener más información, explorar la historia de las aguas subterráneas de la región y mantenerse al día sobre los próximos eventos.

¡Esperamos verlos allí!

Visita nuestro sitio de web

Example of stakeholder email announcement (English on left; Spanish on right).

1.7.4 Public Workshops

Four public workshops were held (generally on a quarterly basis) during plan development. The public workshops were intended to inform stakeholders and the general public of the *Alternative Plan Update* progress, solicit data and information to support planning and analysis for the Subbasin, and seek input on key decisions made throughout the planning process. The GSAs recognized the need for and importance of public participation and worked diligently to make sure that tribes, stakeholders, and participants were heard. Based on feedback from participants, one workshop was held in person with a virtual attendance option, and three workshops were conducted exclusively in a virtual (video/Zoom) format.

Public workshops were announced through the email list, the website, and via social media posts from participating GSAs. The first workshop announcement was sent approximately 30 days prior to an upcoming workshop, and a reminder announcement with the agenda was sent approximately 72 hours in advance. Meeting materials (agenda and presentation) were uploaded to the website approximately 72 hours in advance of each workshop.

At public workshops, members of the public were invited to provide input and comments on *Alternative Plan Update* materials and analysis. GSAs accepted verbal comments and questions from any participant at meetings and encouraged written comments at any time during the planning process. At each public workshop, the GSA team provided an overview and update on different technical topics and asked for feedback. The workshops topics are summarized in Table 1-2 below.



Public Workshop #1 was held in October 2025.

1.7.5 SGMA Tribal Workgroup

The *Alternative Plan Update* process represents an opportunity for communication and cooperation among GSAs, tribal governments, and other interested parties. Accordingly, implementation of the Outreach and Engagement Plan has included outreach to the following six tribes:

- Agua Caliente Band of Cahuilla Indians
- Augustine Band of Mission Indians
- Cabazon Band of Cahuilla Indians
- Morongo Band of Mission Indians
- Torres-Martinez Desert Cahuilla Indians

Twenty-Nine Palms Band of Mission Indians Representatives of the tribal governments and Federal Bureau of Indian Affairs have participated in the *Alternative Plan Update* process through quarterly meetings of the SGMA Tribal Workgroup. The meetings have provided regular updates and opportunities for discussion and input. Tribal-specific workshops were held on the same dates as the community workshops and followed the same formats, including hybrid meetings (in-person with a virtual attendance option) and virtual-only meetings.

A tribal email list was also compiled with representatives of all six tribal governments and the Bureau of Indian Affairs. SGMA Tribal Workgroup meetings were announced through the tribal email list and the website. The first announcement was sent approximately 30 days prior to an

upcoming meeting, and a reminder announcement with the agenda was sent approximately 72 hours in advance. Meeting materials (agenda and presentation) were uploaded to the website approximately 72 hours in advance of each meeting.

At the SGMA Tribal Workgroup meetings, tribal representatives have been invited to provide input and comments on *Alternative Plan Update* materials and analysis. GSAs accepted verbal comments and questions from any participant at meetings and encouraged written comments following the meetings. The SGMA Workgroup discussion topics generally followed the same outline as for the public workshops (see Table 1-2 below), with some additional detail focused on tribal interests.

The GSAs will continue to coordinate and collaborate with the tribal governments through the SGMA Tribal Workgroup during implementation of the *Alternative Plan Update*.

1.7.6 List of Public Meetings Where the Alternative Plan Update was Discussed

Table 1-3 lists the schedule for *2027 Alternative Plan Update* meetings. Meeting agendas and summaries from public meetings are provided in Appendix 1-D. Due to local and state restrictions during the COVID-19 pandemic, in-person meetings were changed to videoconferences as of March 2020.

Table 1-3 Public Meetings on the Alternative Plan Update

Meeting Group/Type	Meeting Date or Proposed Date	Meeting Topics
SGMA Tribal Workgroup 1	October 20, 2025	Overview of SGMA, Water Management Planning in the Indio Subbasin, Indio Subbasin *Alternative Plan Update*
Public Workshop 1	October 20, 2025	Overview of SGMA, Water Management Planning in the Indio Subbasin, Indio Subbasin *Alternative Plan Update*
SGMA Tribal Workgroup 2	April 29, 2026	*Alternative Plan Update* Status, Annual Report for Water Year 2024-2025.
Public Workshop 2	April 29, 2026	*Alternative Plan Update* Status, Plan Area, Hydrogeologic Conceptual Model, 2010 Plan Assessment, Groundwater Model Assessment and Approach
SGMA Tribal Workgroup 3	September 17, 2026	*Alternative Plan Update* Status, Groundwater Model Update, Projects and Management Actions, Plan Implementation
Public Workshop 3	September 17, 2026	*Alternative Plan Update* Status, Groundwater Model Update, Projects and Management Actions, Plan Implementation
SGMA Tribal Workgroup 4	November 2, 2026	*Alternative Plan Update* Status, Groundwater Model Results, Overview of Alternative Plan Update
Public Workshop 4	November 3, 2026	*Alternative Plan Update* Status, Groundwater Model Results, Overview of Alternative Plan Update
CVWD Board of Directors	December 8, 2026	*Overview and adoption of Alternative Plan Update*
CWA Board of Directors	December 9, 2026	*Overview and adoption of Alternative Plan Update*
DWA Board of Directors	December 15, 2026	*Overview and adoption of Alternative Plan Update*
IWA Board of Directors	December 16, 2026	*Overview and adoption of Alternative Plan Update*

1.7.7 Comments Received and Response Summary

Comments to the GSAs from tribal representatives, stakeholders, and the public were accepted directly via email. These comments were transferred into a tracking matrix, which was organized by applicable topic or chapter. Comments were then reviewed by the GSAs and consulting team for consideration during finalization of the *Alternative Plan Update*. The following letters, as listed below, were received on the *Alternative Plan Update*. Responses to the comments are provided in Appendix 1-E.

<<Response summary will be added here after the public comment period>>

1.8 Plan Update Adoption

Each of the GSAs held a public hearing to consider adoption of the final Alternative Plan Update, as listed in Table 1-2 above. The adoption hearings were publicly noticed under the Brown Act for each individual GSA, as well as published collectively in The Public Record. Additionally, prior to each adoption hearing, an announcement with the hearing date and GSA website link was sent to the Indio Subbasin tribal and stakeholder email lists. The GSAs received several comment letters before the adoption hearings, included in Appendix 1-F.

The final Alternative Plan Update is scheduled to be adopted by all four GSAs in December 2026. Appendix 1-G has been added with the adoption resolutions.

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2 Plan Area

This chapter describes the Indio Subbasin Alternative Plan Area (Plan Area), including its geographic, institutional, land use planning, and water resources management context.

2.1 Geographic Area

The Plan Area is based on the Indio Subbasin and the areas served by, or expected to be served by, groundwater from the Subbasin. The California Department of Water Resources (DWR), in *California's Groundwater Bulletin 118—Update 2025* (Bulletin 118) (DWR, 2025), defines the Coachella Valley Groundwater Basin (known as Basin 7-021) as having four subbasins, including the Indio Subbasin (Subbasin 7-021.01). The other subbasins in this region are the Mission Creek, San Gorgonio Pass, and Desert Hot Springs Subbasins. The Indio Subbasin is identified by the U.S. Geological Survey (USGS) as the Whitewater River Subbasin. Subbasins are further described in Chapter 3, *Hydrogeologic Conceptual Model*.

As shown in Figure 2-1, the Plan Area encompasses the entire Indio Subbasin, including the Garnet Hill Subarea. The Garnet Hill Subarea is included in the *2012 Mission Creek/Garnet Hill Water Management Plan* (*2012 MC/GH WMP*) (Coachella Valley Water District [CVWD], Desert Water Agency [DWA], and Mission Springs Water District [MSWD], 2013), which was developed in coordination with the *Coachella Valley Water Management Plan 2010 Update* (*2010 CVWMP Update*) (CVWD, 2012). The Garnet Hill Subarea is also included in the *2022 Mission Creek Subbasin Alternative Plan Update* (Mission Creek GSAs, 2021) and the *2027 Mission Creek Subbasin Alternative Plan Update* currently underway. Garnet Hill Subarea data collection, analysis, modeling, and planning efforts are being coordinated to ensure consistency between this *Alternative Plan Update* and the *2027 Mission Creek Subbasin Alternative Plan*.

Figure 2-1 shows Groundwater Sustainability Agency (GSA) boundaries in the Indio Subbasin. The four GSAs have been formed by CVWD, Coachella Water Authority (CWA), DWA, and Indio Water Authority (IWA). In this *2027 Alternative Plan Update*, these GSAs are referred to as the Indio Subbasin GSAs.

Figure 2-2 shows the incorporated areas of the nine cities that overlie the Indio Subbasin and identifies communities in the Subbasin's unincorporated areas. As indicated on both maps, the Plan Area includes portions of Riverside, San Diego, and Imperial Counties.

While encompassing the Indio Subbasin, the Plan Area also includes lands beyond the Subbasin that are, or in the future may be, reliant on groundwater pumped from the Subbasin. This includes areas to the east within the spheres of influence of the cities of Indio and Coachella that account for proposed large developments such as Citrus Ranch and La Entrada. The Plan Area also includes areas along the western and eastern shores of the Salton Sea that are in CVWD's domestic service area (i.e., Area 23 and the former Improvement District 11) that receive groundwater from CVWD.

As shown in Figure 2-1, portions of CVWD's and DWA's boundaries are not included in the Plan Area; these include undeveloped mountainous terrain, conserved lands within conservation areas (shown by shading), and areas in other subbasins that do not receive water from the Indio Subbasin.

Figure 2-1 Plan Area

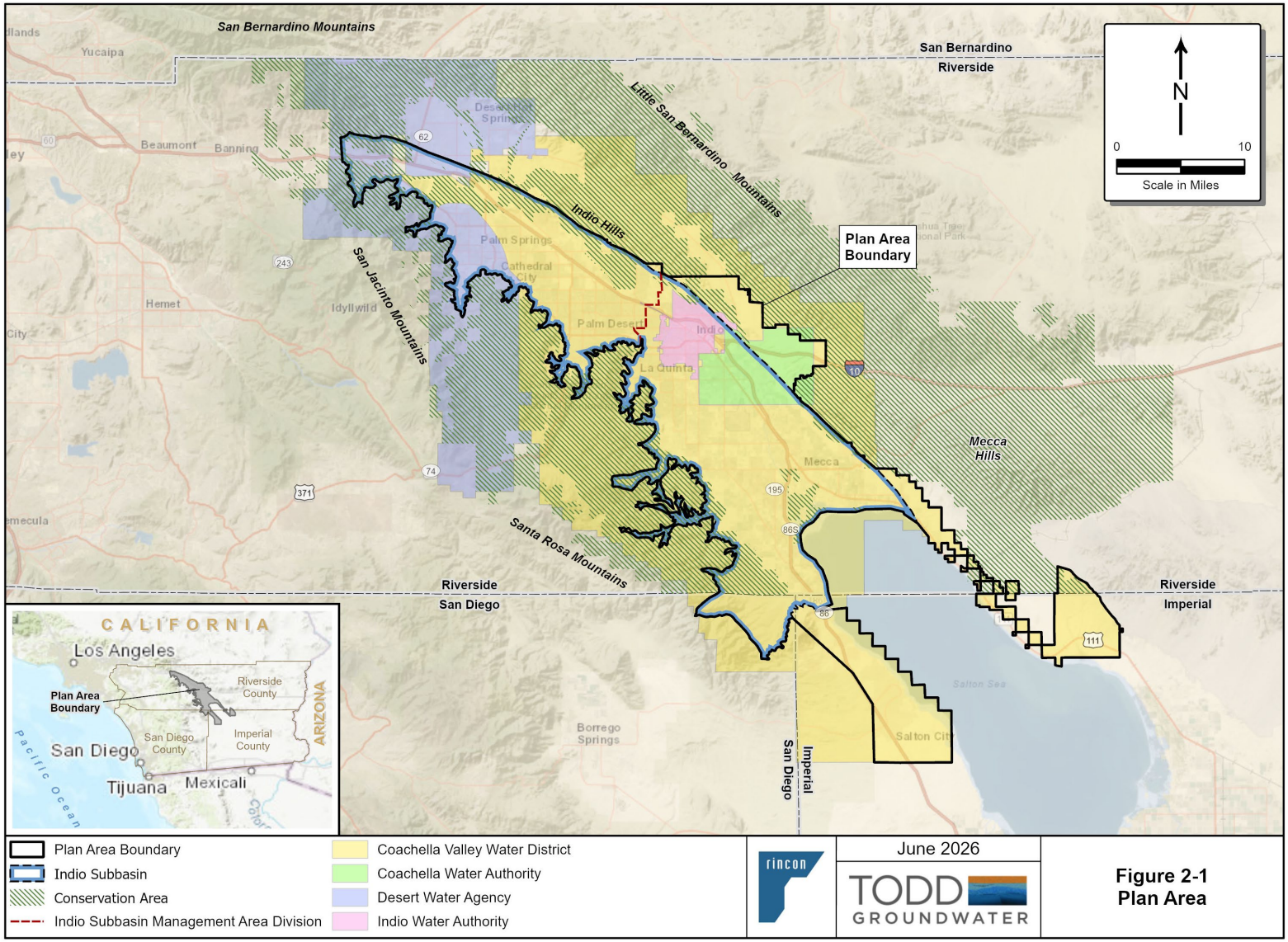
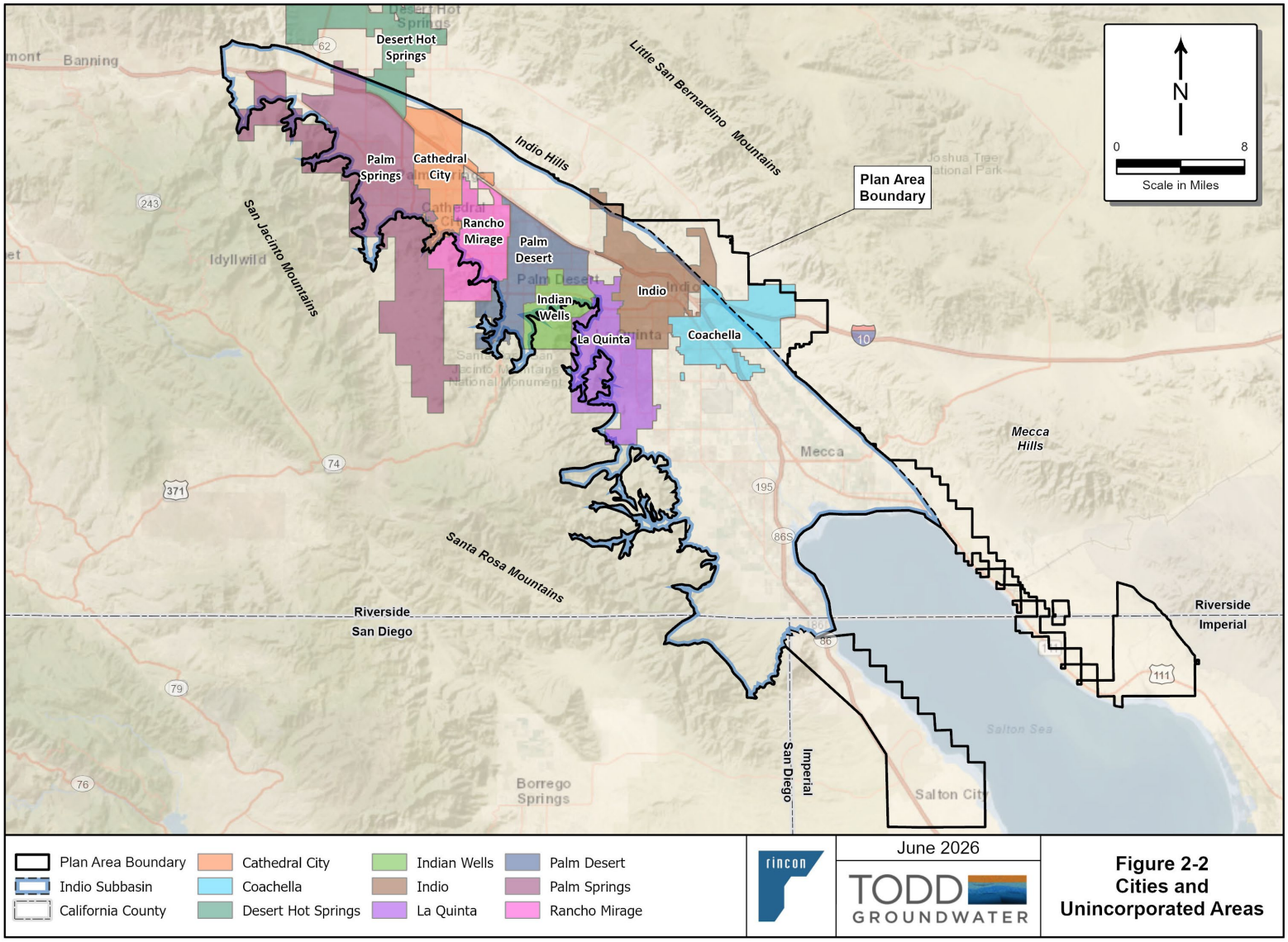


Figure 2-2 Cities and Unincorporated Areas



The Indio Subbasin is geographically divided into the West Valley and the East Valley. The West Valley, which includes the cities of Palm Springs, Cathedral City, Rancho Mirage, Indian Wells, and Palm Desert, has a predominantly resort/recreation-based economy that relies on groundwater as its principal water source. The East Valley, which includes the cities of Coachella, Indio, and La Quinta, and the unincorporated communities of Mecca, Thermal, and Oasis, has a predominantly agricultural economy using groundwater and Colorado River water imported via the Coachella Canal (Canal). The East Valley is southeast of a boundary line extending from Washington Street and Point Happy northeast to the Indio Hills near Jefferson Street, and the West Valley is northwest of this line (shown in red on Figure 2-1).

2.2 Water Management and Land Use Planning Agencies

This section introduces the key water resource management agencies and shows portions of the Plan Area under the jurisdiction of water management and land use planning agencies at the local, state, and federal levels. As discussed below, some agencies have both water and land use management roles. Consistent with Sustainable Groundwater Management Act (SGMA) requirements and local management, the Indio Subbasin GSAs maintain ongoing collaborative relationships with multiple agencies at local, state, and federal levels. Cooperative efforts among water agencies have included data sharing and collaboration on water budget analyses and numerical model development for the Indio, Mission Creek, and San Gorgonio Pass Subbasins, respectively (see Figure 1-1 for Subbasin locations). Land use plans are listed in Section 2.5, *Land Use Planning*.

2.2.1 Water Agencies

The major water agencies in the Plan Area are CVWD, CWA, DWA, and IWA (refer to Figure 2-1). MSWD and Myoma Dunes Mutual Water Company (MDMWC) also serve portions of the Indio Subbasin. CVWD was formed in 1918 under the County Water District Act provisions of the California Water Code. The water-related services provided by CVWD include irrigation water delivery and agricultural drainage, domestic water delivery, wastewater reclamation and recycling, stormwater and flood protection, and groundwater management achieved through replenishment, source substitution, and conservation. CVWD imports Colorado River water via the Coachella Canal (Canal) primarily for agricultural and golf course irrigation and for groundwater replenishment. CVWD is a California State Water Project (SWP) contractor and imports SWP water through an exchange of Colorado River Aqueduct (CRA) water with Metropolitan Water District of Southern California (MWD). SWP exchange water is used for groundwater replenishment. CVWD operates more than 95 wells for domestic supply and five wastewater reclamation plants, two of which provide recycled water for irrigation.

The City of Coachella established its water department in 1957 following the consolidation of three private water companies to address low water pressure issues. The City then formally established the CWA in 2003 to allow issuance of bonds to make improvements to the City's water system. CWA is a retail water supplier that meets its demand through groundwater pumped from six CWA-owned and operated wells. The water-related services provided by Coachella include domestic water delivery, wastewater collection and reclamation, and local drainage control. Coachella also operates a secondary treatment wastewater facility.

DWA was founded in 1961 as a groundwater management agency. DWA provides domestic water delivery, irrigation water delivery, recycled water service, and groundwater replenishment. DWA is a SWP contractor and imports SWP water through an exchange of CRA water with MWD for groundwater replenishment. DWA pumps groundwater from more than 25 wells for delivery to its retail customers in Cathedral City and Palm Springs. It also uses local surface water from Whitewater River and three mountain streams in its service area. DWA's local surface water is diverted to Whitewater River Groundwater Replenishment Facility (WWR-GRF) for subsurface storage and is recovered by means of nearby production wells. DWA receives secondary treated wastewater from Palm Springs, treats it to tertiary standards for water recycling, and delivers it to large irrigation customers, including the Palm Springs golf course, public properties, parks, and schools.

IWA was formed in 2000 as a Joint Powers Authority to serve as the legislative and policy entity responsible for delivering water to City of Indio residents for all municipal water programs and services. IWA provides water supply to most of Indio, and some unincorporated areas of Indio Hills, operating more than 20 wells throughout its service area to meet its customers' domestic water needs.

As described above, these four water agencies are the Indio Subbasin GSAs, and together have a long history of coordinated groundwater management in the region. In 2016, they submitted the approved *2010 CVWMP Update* as the region's Alternative to a Groundwater Sustainability Plan (Alternative Plan) to comply with SGMA. In 2022, they submitted the approved *2022 Alternative Plan Update* as their five-year update. Since then, the Indio Subbasin GSAs have been collaborating on the Alternative Plan implementation. While the Indio Subbasin GSAs also collaboratively led development of this *2027 Alternative Plan Update*, other public agencies are also responsible for and involved in water and land use management both in and near the Plan Area.

The MSWD service area overlies a portion of the northernmost Indio Subbasin, including part of the Garnet Hill Subarea, which is included in the *2013 MC/GH WMP* and the *2022 Mission Creek Subbasin Alternative Plan Update* (Mission Creek GSAs, 2021).

Other local water purveyors include the MDMWC, which is a retail urban water supplier serving the community of Bermuda Dunes with groundwater from five wells.

In addition, approximately 830 small private water systems serve local communities (e.g., mobile home parks) and rural businesses within the Indio Subbasin.

2.2.2 Local Agencies: Cities and Counties

Figure 2-2 identifies the incorporated areas of the nine cities overlying portions of the Plan Area. Two of these cities, Coachella and Indio, have water management roles in addition to land use planning authority.

As shown in Figure 2-1 and Figure 2-2, the Plan Area overlaps Riverside, Imperial, and San Diego Counties. Riverside County encompasses most of the Plan Area, with small portions in San Diego and Imperial Counties. County governments have direct local groundwater management roles in well permitting and regulation of small water systems. Most relevant to Indio Subbasin, Riverside County has Well Ordinance No. 682 (County of Riverside, 2021), administered by the Riverside County Department of Environmental Health that regulates construction, reconstruction, abandonment, and destruction of wells throughout the county. The Riverside County Department of Environmental Health is also the permitting agency for small water systems.

SGMA enabled county governments to elect to become GSAs; Riverside County did not elect to become a GSA for the Indio Subbasin, nor did San Diego County. San Diego County portions of the Indio Subbasin are within CVWD's boundaries. CVWD is the exclusive GSA for these areas. Imperial County elected to become GSA for all groundwater basin areas within its boundaries. CVWD and Imperial County resolved overlap issues through a Memorandum of Understanding such that CVWD is the exclusive GSA for Indio Subbasin areas in Imperial County.

2.2.3 State and Federal Agencies

Figure 2-3 shows that large tracts of land in the Plan Area are owned and managed by state and federal governments. Areas under State jurisdiction include State Parks and State Refuges, plus California Department of Fish and Wildlife (CDFW)-owned and operated lands and conservation easements.

Federal agencies with significant lands in the Plan Area include the U.S. Department of the Interior Bureau of Land Management , the U.S. Forest Service , the U.S. Fish and Wildlife Service , and the Bureau of Reclamation.

2.2.4 Tribal Governments

Figure 2-4 shows Tribal Reservation boundaries for the following five Native American tribes: the Agua Caliente Band of Cahuilla Indians, the Augustine Band of Cahuilla Indians, the Cabazon Band of Cahuilla Indians, the Torres Martinez Desert Cahuilla Indians, and the Twenty-Nine Palms Band of Mission Indians. The largest of these lands is the Agua Caliente Reservation, which covers 31,500 acres, and the Torres- Martinez Reservation that covers 24,800 acres; however, much of these Tribal/Reservation lands are located outside the Plan Area. Table 2-1 lists the acreage of Tribal Reservation lands within the Plan Area, which totals 28,070 acres.

Table 2-1 Tribal Reservation Lands within Plan Area

Tribe	Acres
Agua Caliente Band of Cahuilla Indians	10,184
Augustine Band of Mission Indians	649
Cabazon Band of Cahuilla Indians	707
Torres Martinez Desert Cahuilla Indians	15,852
Twenty-Nine Palms Band of Mission Indians	678
Total	**28,070**

The *2018 Coachella Valley Integrated Regional Water Management & Stormwater Resources (IRWM/SWR) Plan Update* (2018 Coachella Valley IRWM/SWR Plan) (Coachella Valley Regional Water Management Group [CVRWMG], 2018) provides detailed information about regional Tribal nations, Tribal water resources, and key water resources issues, including Tribal water rights, groundwater quality, potential for long-term overdraft, and Tribal participation in regional water planning. Tribal government representatives and the Federal Bureau of Indian Affairs have participated in the *Alternative Plan Update* process via regular meetings of the SGMA Tribal Workgroup (see Section 1.7.5).

In 2019, the Agua Caliente Band of Cahuilla Indians established the Agua Caliente Water Authority (ACWA) to regulate and administer groundwater in which the Tribe holds federally reserved water rights. ACWA has established a system of permits and fees and engages in monitoring activities.

The Agua Caliente Band of Cahuilla Indians, CVWD, and DWA signed a Settlement Agreement to a water rights dispute on May 19, 2025. To promote the cooperative management of groundwater within the Parties' jurisdictions, the Settlement Agreement includes a Memorandum of Cooperation (MOC) that outlines specific activities to monitor, record, and present both physical hydrologic metrics and management activities. The MOC also establishes a Technical Advisory Committee (TAC) to advise the Parties in administering the Settlement Agreement and to prepare a TAC Annual Report. The first TAC Annual Report for water year 2024-2025 was completed in March 2026 (Stetson Engineers, 2026) and documented hydrologic and groundwater conditions, groundwater pumping volumes, and deliveries of imported water and recycled water to tribal Trust and Fee Lands.

Figure 2-3 Federal, State, and Local Government Land

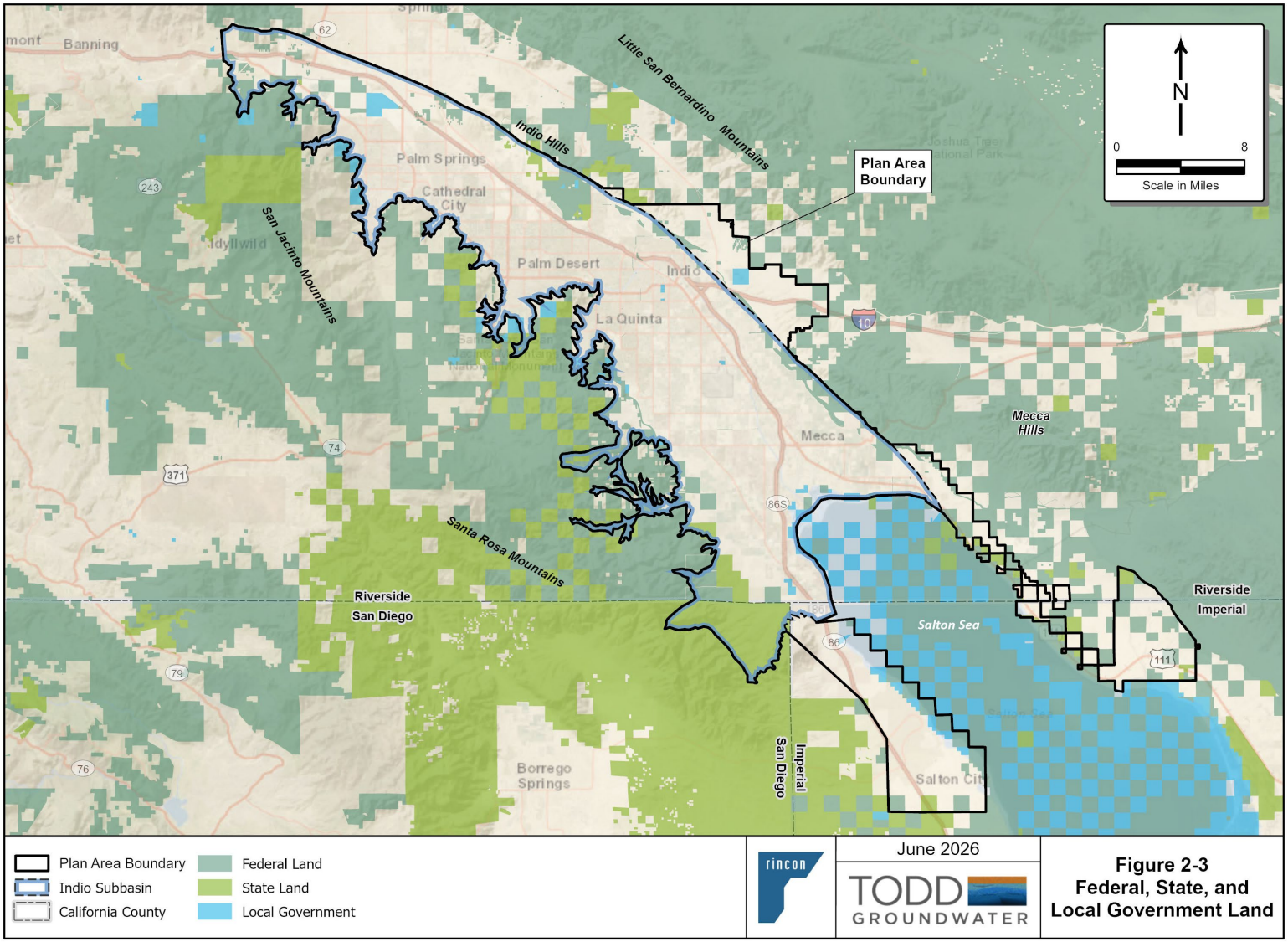
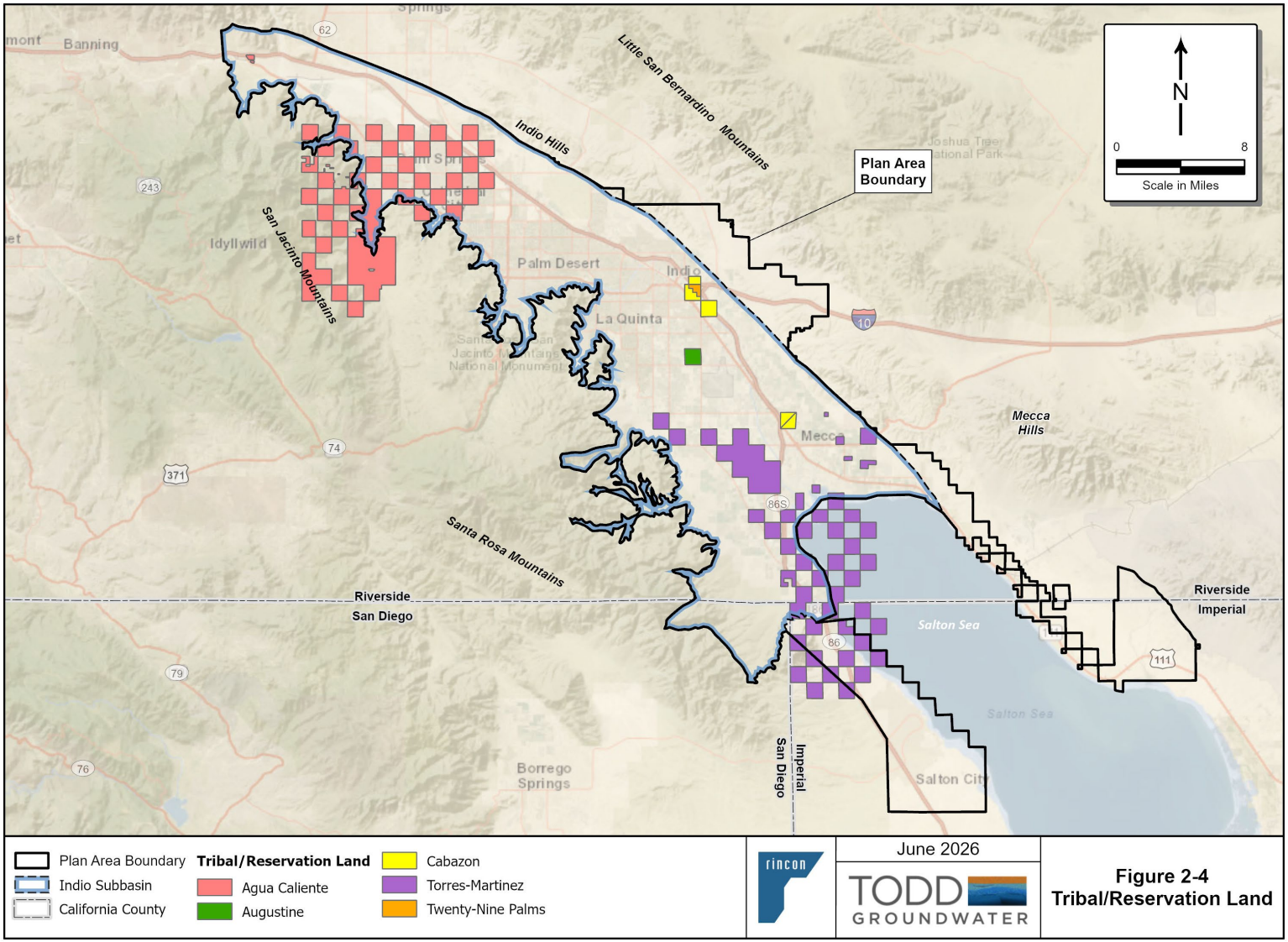


Figure 2-4 Tribal Reservation Lands



2.3 Water Resources Management

Local water resources management began with early (19th Century) agricultural development in the region, which was initially based on groundwater supply. However, local groundwater supply proved insufficient for irrigation and subsequent urban water demand, leading agencies to acquire and import surface water supplies. These early development efforts included the following:

- Developing local surface water for replenishment (e.g., Whitewater River) or diversion (e.g., from Snow, Falls, and Chino Canyon creeks);
- Importing Colorado River water supply through the Canal beginning in 1949 delivered to farmland, golf courses, and replenishment facilities;
- Contracting for SWP supply, exchanged for water from the CRA and used for replenishment beginning in 1973; and
- Developing recycled water used for landscape and golf irrigation.

Water sources are further described in Section 2.4, Water Sources.

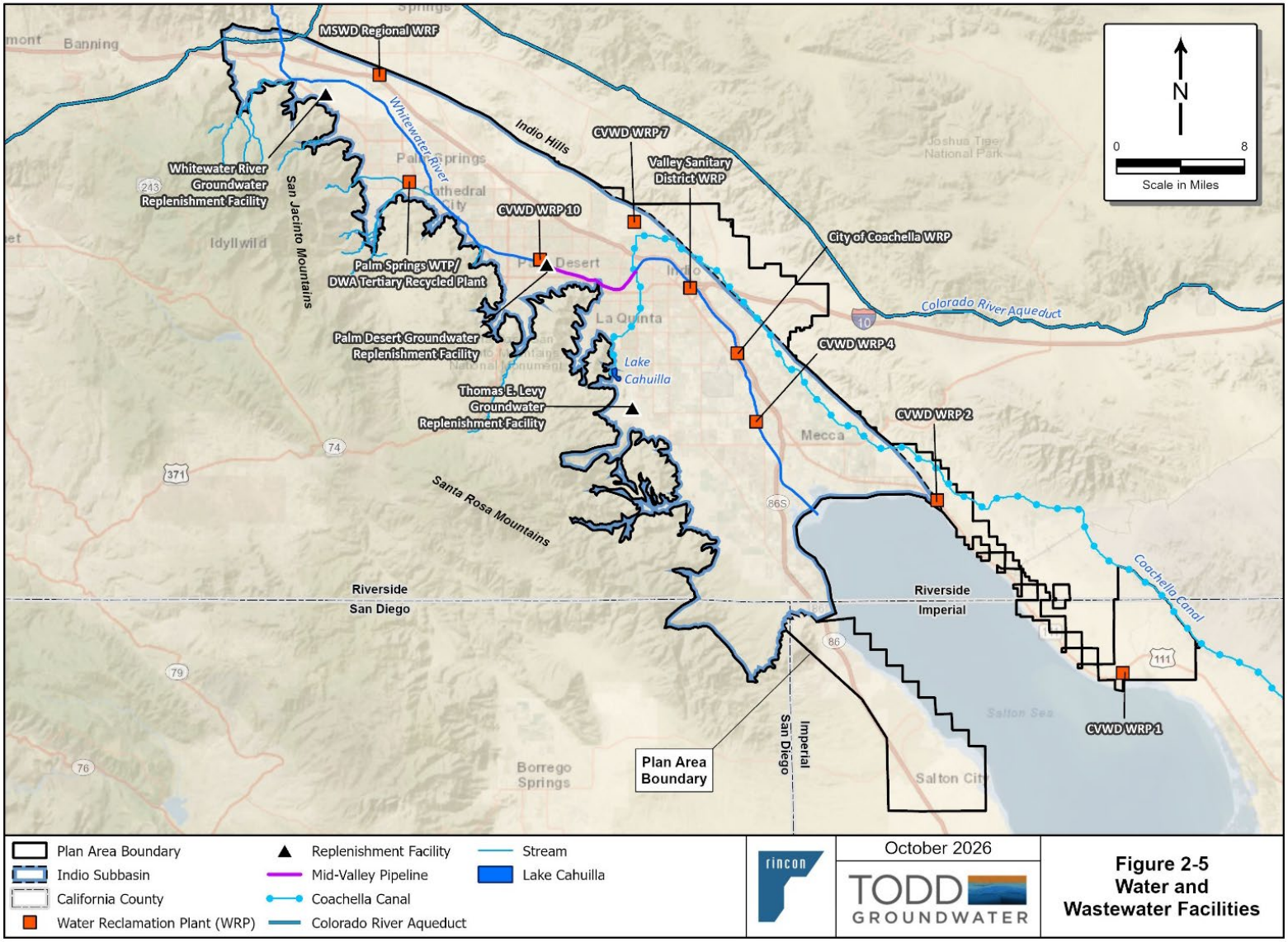
Development of farmland subsequently necessitated construction of agricultural drainage systems in the form of both tile drainage systems, subsurface, and surface drains (from 1930s to 1990s). In addition, stormwater drainage systems have been developed by local agencies over the years, including the Whitewater River/Coachella Valley Stormwater Channel (CVSC).

Major systems and facilities are shown in Figure 2-5 and include the Canal, the CRA, GRFs, water reclamation plants (WRPs), and agricultural drain systems.

Other water resource management programs have included implementation of water conservation, source substitution, and water quality programs.

Groundwater management in the Indio Subbasin has evolved through a series of coordinated regional planning efforts aimed at eliminating overdraft and supporting long-term water supply reliability. These earlier planning efforts have been incorporated into the current Alternative Plan framework, which reflects updated data, modeling, and management approaches and is designed to ensure sustainable groundwater management in compliance with SGMA.

Figure 2-5 Water and Wastewater Facilities



With passage of SGMA, the Indio Subbasin GSAs developed the original Alternative Plan consisting of the *2010 CVWMP Update* (CVWD, 2012) and the *SGMA Alternative Groundwater Sustainability Plan Bridge Document for the Indio Subbasin (Bridge Document)* (Indio Subbasin GSAs, 2016), which was approved by DWR in 2019. Following approval of the original Alternative Plan, the *2022 Indio Alternative Plan Update* was prepared to incorporate current data, update the modeling scenarios, and refine basin management strategies. Subsequently, the Indio Subbasin GSAs have also prepared Annual Reports.[1] These documents together have served as major planning and reporting framework for water resource management. Through regular monitoring and reporting, the Indio Subbasin GSAs can confidentially record groundwater conditions, track progress and determine or evaluate continued compliance with SGMA.

2.4 Water Sources

The Plan Area currently relies on a combination of local groundwater, Colorado River water, SWP exchange water, local surface water, and recycled water to meet water demands. Details about each water source are provided in Chapter 6, *Water Supply*.

2.4.1 Local Groundwater

Local groundwater is pumped from the Indio Subbasin for water supply in the Plan Area. Groundwater has been the principal source of urban water supply in the Plan Area since the early 20th century. Groundwater also supplies water for crop irrigation, fish farms, duck clubs, golf courses, greenhouses, and industrial uses.

The Indio Subbasin is not adjudicated (water rights decided by legal action); rather, groundwater management is implemented by the GSAs through the Alternative Plan in compliance with SGMA. The Subbasin experienced chronic groundwater level declines and storage depletion (i.e., overdraft) until its minimum storage level in 2009. Overdraft was reversed through management including substantial replenishment and source substitution by CVWD and DWA, and significant water conservation by local communities with the support of the GSAs.

The following three replenishment facilities are currently operated in the Indio Subbasin (refer to Figure 2-5):

- Whitewater River Groundwater Replenishment Facility (WWR-GRF)
- Palm Desert Groundwater Replenishment Facility (PD-GRF)
- Thomas E. Levy Groundwater Replenishment Facility (TEL-GRF)

[1] https://sgma.water.ca.gov/portal/alternative/print/23; refer to Section D.



CVWD operates the PD-GRF.

For replenishment, the Subbasin is divided into two management areas, the West Whitewater River Subbasin management area (i.e., West Valley) and the East Whitewater River Subbasin management area (i.e., East Valley). The Subbasin is divided into areas of benefit (AOBs). The West Valley is composed of two AOBs, one managed by CVWD and one by DWA, collectively referred to as the West Whitewater River Subbasin Management Area. The West Whitewater River Subbasin Management Area and the WWR-GRF are jointly managed by CVWD and DWA under the terms of the 1976 Water Management Agreement as revised December 15, 1992, and July 15, 2014. CVWD also operates the PD-GRF which is located in the City of Palm Desert to replenish the Indio Subbasin's mid-valley area, and the TEL-GRF which is located in the City of La Quinta to replenish the East Valley. The East Valley is composed of one AOB (see red dividing line on Figure 2-1); the East Whitewater River Subbasin AOB is managed by CVWD.

In the designated AOBs, groundwater replenishment programs are funded through Replenishment Assessment Charges (RACs) paid by groundwater pumpers (other than minimal pumpers[2]) on a per acre-foot basis; this charge covers applicable costs of importing water and recharging the Subbasin.

2.4.2 Colorado River Water

Colorado River water has been a major source of supply for the Plan Area since 1949 with the completion of the Coachella Canal. The Colorado River is managed and operated in accordance with the Law of the River, which is the collection of interstate compacts, federal and state legislation, various agreements and contracts, an international treaty, a U.S. Supreme Court decree, and federal administrative actions that govern the rights to use of Colorado River water in the seven Colorado River Basin states.



The Coachella Canal was completed in 1949.

The Coachella Canal (refer to Figure 2-5) is a branch of the All-American Canal that brings Colorado River water into the Imperial and Coachella Valleys. Initially, water delivered from the Canal was used exclusively for agricultural irrigation. As urban growth increased, other water users (primarily golf courses and homeowners' associations) began using Colorado River water for large landscape irrigation. Use of Canal water for non-potable purposes helps conserve the Coachella Valley's groundwater supply for domestic use.

[2] CVWD's enabling legislation defines a minimal pumper as any producer who produces 25 or fewer acre-feet (AF) in any year. DWA's legislation defines a minimal pumper as any producer who produces 10 or fewer AF in any year.

Water imported via the Coachella Canal is also used at the TEL-GRF and conveyed through the Mid-Valley Pipeline to the PD-GRF for groundwater replenishment. Colorado River water obtained through transfer agreements with MWD is also used at the WWR-GRF. As documented in the *Indio Subbasin Annual Report for Water Year 2024-2025* (Indio Subbasin GSAs, 2026), approximately 84 percent of delivered Colorado River water conveyed through the Canal was for agricultural use, about 12 percent was delivered for urban and golf course irrigation uses, and about 4 percent was replenished at TEL-GRF and PD-GRF. Replenishment volumes have been reduced in the East Valley since late 2022 due to voluntary curtailment actions related to ongoing Colorado River drought conditions (see Lower Basin Drought Contingency Plan in Chapter 6, Water Supply).

2.4.3 State Water Project

The SWP is managed by DWR and includes 705 miles of aqueduct and conveyance facilities extending from Lake Oroville in northern California to Lake Perris in the south. CVWD and DWA initially contracted for water from the SWP in 1962 and 1963, respectively. CVWD and DWA purchased additional SWP transfers from the Tulare Lake Basin Water Storage District in Kings County and from the Berrenda Mesa Water District in Kern County. Total SWP supplies acquired by CVWD and DWA through its original contracts plus transfers total 194,100 AFY (see Chapter 6, Water supply).

Notably, there are no physical facilities to deliver SWP water to the Plan Area, as the SWP system's southern terminus is located in Perris, CA in western Riverside County. CVWD's and DWA's SWP water is exchanged with MWD for an equal amount of Colorado River water from MWD's CRA.

SWP exchange water (i.e., Colorado River water) is recharged at the WWR-GRF and at the Mission Creek Groundwater Replenishment Facility (MC-GRF) in the Mission Creek Subbasin.

2.4.4 Surface Water

Natural surface water flow in the Plan Area occurs as a result of precipitation and concentrated stream runoff originating from the San Bernardino and San Jacinto Mountains, with lesser amounts originating from the Santa Rosa Mountains. DWA operates stream diversion facilities on Snow, Falls, and Chino Creeks and captures subsurface flow from the Whitewater River Canyon for urban water supply in DWA's service area. The remaining stream flow is replenished via the WWR-GRF. Local surface water is used for municipal and agricultural irrigation near Whitewater River.

2.4.5 Recycled Water



WRP-10 provides recycled water to large irrigation customers in the mid-Valley area.

Recycled water is a reliable, locally produced and managed water supply. Figure 2-5 shows WRP locations and other wastewater treatment facilities in the Indio Subbasin. Currently, three WRPs provide recycled water for irrigation in the Indio Subbasin. Of these, two recycled water facilities are operated by CVWD (WRP-7 and WRP-10). The DWA WRP (which treats secondary effluent from Palm Springs Wastewater Treatment Plant) is operated by DWA in cooperation with the City of Palm Springs. Recycled water from the 5.0 million gallons per day (MGD) WRP-7 (2.5 MGD tertiary capacity) is applied to golf courses in the Sun City area in north Palm Desert and Shadow Hills in north Indio and recycled water from the 18 MGD WRP-10 (15 MGD tertiary capacity) is delivered for golf course irrigation and homeowners' association landscaping in the mid-valley area. The 10 MGD DWA WRP (10 MGD tertiary capacity) provides tertiary treatment for irrigation of golf courses, parks, and other landscaping in the Palm Springs area.

In addition, a new MSWD wastewater treatment plant was completed in September 2024. The Nancy Wright Regional Water Reclamation Facility (Regional WRF), located in the Garnet Hill Subarea, became operational in early 2025. The facility expands regional wastewater treatment capacity and, together with associated conveyance and septic-to-sewer improvements, enables approximately 700 homes and businesses in the MSWD service area to transition from onsite septic systems to centralized sewer service. This transition reduces septic system discharges that may contribute nitrate and other constituents to groundwater, and changes the location and volume of wastewater return flows. The Regional WRF relieves flows previously directed to the Alan L. Horton Wastewater Treatment Plant (WWTP), extending that facility's operational life by about 10 years. The Regional WRF has a design treatment capacity of approximately 4.0 MGD. Current average daily flows are lower and reflect the phased buildout of the service area, with flows expected to increase over time as additional connections and planned development increase. Projected Regional WRF flows are incorporated into the groundwater modeling completed for this *2027 Alternative Plan Update*. The facility is designed to support future recycled water for groundwater replenishment in the Mission Creek Subbasin, which will contribute to groundwater sustainability within that basin (see Chapter 11, Projects and Management Actions).

For other wastewater treatment facilities in the region, treated effluent is discharged either to onsite percolation/evaporation ponds or to the CVSC that runs from Indio to the Salton Sea. However, because recycled water is a reliable source and suitable for landscape irrigation in lieu of groundwater pumping, expansion of water recycling facilities is planned (see Chapter 11, Projects and Management Actions). Additional water recycling in the region could be gained not only through continuing population growth, but also through connecting currently unsewered areas (i.e., some rural portions of the Subbasin and urban areas that use septic tank/leachfield systems to treat and dispose wastewater).

2.5 Land Use Planning

The Indio Subbasin GSAs recognize that land use changes can affect water demand in the Plan Area and affect their ability to achieve and maintain sustainable groundwater management over this *2027 Alternative Plan Update*'s planning and implementation horizon. To address this challenge, Chapter 5, *Demand Projections* includes a description of the population, growth, and demand projections used to forecast demand and Chapter 6, *Water Supply* provides a description of planning assumptions used to develop water supply projections. An update of the numerical groundwater flow model and its water budgets to serve as a reliable tool for simulation of future conditions is described in Chapter 7, *Numerical Model and Plan Scenarios*.

Land use development is guided by land use planning agencies, including those of California cities and counties, which are required to prepare General Plans. General Plans must include elements addressing land use, open space, conservation, and housing, among others. General Plans may include optional elements relating to capital improvements/public facilities, flood management, and water. General Plans are updated through periodic review or are amended with adoption of specific plans that, for example, may provide customized planning for a defined area or a large-scale project.

In addition to cities and counties, other governmental agencies prepare similar general planning documents. Table 2-2 lists the Subbasin's pertinent land use planning agencies and presents information about the latest plan adoptions and coverage of land use planning responsibility.

Table 2-2 Land Use Planning Agencies

Agency	General Plan Adoption	Coverage Area
City of Desert Hot Springs	2020	Entire city
City of Palm Springs	2025; Palm Springs 2040 General Plan	Entire city; city acts as tribe's agent for Agua Caliente Tribal trust lands per land use agreement
City of Cathedral City	2021	Entire city; city acts as tribe's agent for Agua Caliente Tribal trust lands per land use agreement
City of Rancho Mirage	2017	Entire city; city acts as tribe's agent for Agua Caliente Tribal trust lands per land use agreement
City of Palm Desert	2016	Entire city
City of Indian Wells	2025	Entire city
City of Indio	2019	Entire city
City of Coachella	2015	Entire city
City of La Quinta	2013, amended 2022	Entire city
County of Riverside	2015	Unincorporated land; county acts as Tribe's agent for Agua Caliente Tribal trust lands per land use agreement. All other Tribal/Reservation lands excluded
County of Imperial	2015	Unincorporated land; West Shore, Hot Mineral Spa, Bombay Beach
County of San Diego	2011	Unincorporated land; open space in Coachella Valley
Agua Caliente Band of Cahuilla Indians	Land Use Ordinance 2013	Tribal trust lands; other lands covered by land use contracts or agreements with cities and Riverside County
Torres Martinez Desert Cahuilla Indians	Revised 2016	Tribal Reservation lands
Cabazon Band of Cahuilla Indians	1990	Tribal Reservation lands
Augustine Band of Cahuilla Indians	Not available	Tribal Reservation lands
Twenty-Nine Palms Band of Mission Indians	2017	Tribal Reservation lands
Bureau of Land Management (BLM)	2002	California Desert Conservation Area—Coachella Valley Amendment
Bureau of Land Management (BLM)	2004	Santa Rosa and Santa Jacinto National Monument
United States Forest Service (USFS)	2005	San Bernardino National Forest
United States Fish and Wildlife Service (USFWS)	2013	Coachella Valley National Wildlife Refuge
California Department of Parks and Recreation (CDPR)	2005	Anza Borrego Desert State Park
California Department of Parks and Recreation (CDPR)	2002	Mount San Jacinto State Park
California Department of Fish and Wildlife (CDFW)	2025	State wildlife action plan

Local land use planning is governed by the plans listed in Table 2-2; general land use designations are listed below.

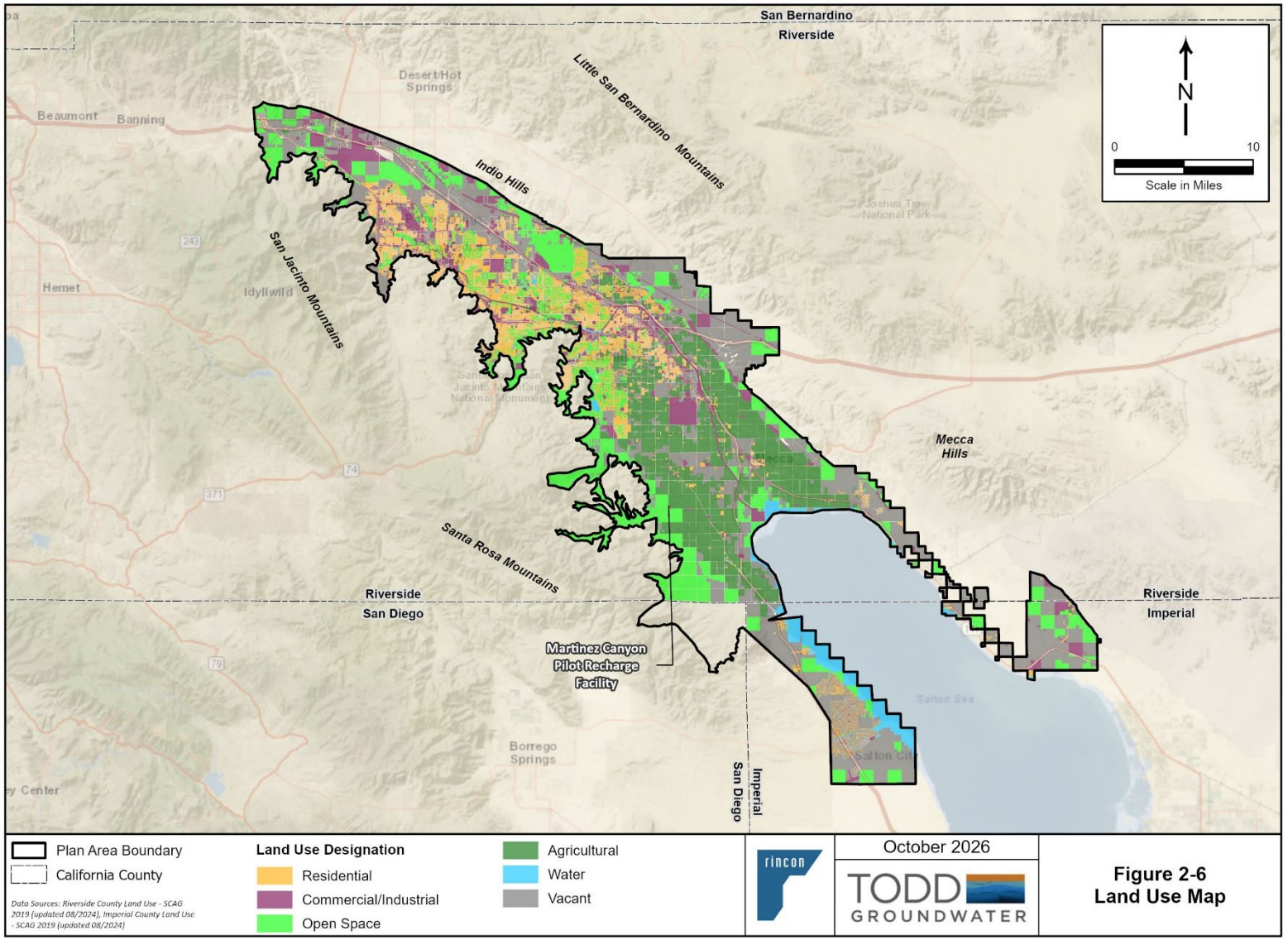
- **Residential**—Includes hillside, very low, low-, medium-, high-density residential, and mobile home parks
- **Commercial**—Includes general, neighborhood, shopping centers, offices, and resort hotels
- **Mixed Use**—Includes combinations of residential, commercial, and public uses
- **Industrial**—Includes business parks, light industrial, and general industrial
- **Institutional and Public Facilities**—Includes governmental offices, cultural facilities, libraries, museums, schools, hospitals, police and fire stations, utility substations as well as other public or quasi-public administrative offices or meeting spaces
- **Open Space**—Includes parks, natural open spaces, and habitat areas; golf courses, pool areas, and landscaped lands defined as private open space; and natural or man-made watercourses
- **Overlay Areas**—Includes special land use designations that provide standards in addition to those of the underlying land use; typically to protect historical areas or limit development in hazard areas
- **Agricultural**—Includes row and truck crops, nurseries, citrus and date palm groves, vineyards, ranches, poultry farms, and other agricultural related uses

Figure 2-6 shows existing land use in the region. Under SGMA, water supply and land use decision-making policy was amended to require closer coordination and consultation among GSAs and land use approval agencies. SGMA aims to improve water supply planning and management and accommodate projects that may result in increased demand or may impact water resource management. In the Coachella Valley, land use plans and growth forecasts are periodically reviewed by water agencies in conjunction with preparing water management plan updates like this *2027 Alternative Plan Update* and urban water management plans (UWMPs). These activities are consistent with SGMA, which states that close coordination between water agencies and land use approval agencies is vital. SGMA requires water agencies to provide a city or county with its current GSP or Alternative Plan and other relevant information (California Government Code Section 65352.5).

Before adopting a General Plan, or any substantial General Plan amendment, planning agencies must review and consider the approved GSP or Alternative Plan and must refer the proposed adoption or substantial amendment to any affected GSA. SGMA also requires that a GSP or Alternative Plan account for the most recent planning assumptions stated in local General Plans.

While nothing specified in SGMA or contained in a GSP can be interpreted as superseding the land use authority of cities or counties, Senate Bill (SB) 610 and SB 221 require that this information should be included in the administrative record that serves as the evidentiary basis for an approval action by a city or county for projects subject to the California Environmental Quality Act (CEQA) that are of a specific size. As a result, local water agencies prepare and adopt water supply assessments and written verifications of water supply availability for large developments as required by SB 610 and SB 221.

Figure 2-6 Land Use Map



2.6 Disadvantaged Communities

Figure 2-7 shows the extent of disadvantaged communities (DACs), severely disadvantaged communities (SDACs), and economically disadvantaged areas (EDAs) as indicated by unemployment percentage and local financial hardship. DWR maintains two mapping tools for DACs and EDAs with periodic updates based on the American Community Survey (DWR, 2023). In the Indio Subbasin, these communities are diverse and include farm workers, urban and rural residents, and low-income seniors. Groundwater is a primary drinking water source for many communities, so ensuring that groundwater remains safe and reliable is a priority. Historically, localized water quality issues have included arsenic, chromium-6, nitrates, uranium, and salinity (see Chapter 8, *Regulatory and Policy Issues*). Figures 2-7a through 2-7c show the intersection of DACs, SDACs, and EDAs with climate vulnerability indicators from the Climate Vulnerability Index (CVI), including extreme heat, flooding, and drought (Lewis et al., 2023). These figures illustrate areas where socioeconomic vulnerability coincides with elevated climate risks, helping to identify communities that may require focused resilience and water resource planning efforts. As the CVI was created with the intent to assist policy makers by identifying areas of socioeconomic vulnerability, the index does not account for regional planning efforts such as groundwater recharge or future projects such as planned small water system consolidations as part of the determination of vulnerability.

Organizations in the Coachella Valley have coordinated with DACs (inclusive of SDACs and EDAs) for many years. In 2007, the DAC Planning Group was formed regionally to track the progress of DAC programs under California's Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006 (Proposition 84).

Since 2009, the Coachella Valley IRWM Program, which is a partnership among CVWD, CWA, DWA, IWA, MSWD, and Valley Sanitary District (VSD), has engaged in targeted outreach to DACs. The DAC Outreach Program was implemented in 2012 to improve DAC participation in the Coachella Valley IRWM process and has continued to evolve to this day, including efforts aligned with SGMA and State Water Resources Control Board (SWRCB) SAFER Program initiatives.

The *2018 Coachella Valley IRWM/SWR Plan* and the *2020 Colorado River Funding Area Water Needs Assessment* (Colorado River Funding Area Partners, 2020) summarize known water and wastewater needs of DACs and include opportunities for future engagement and projects related to system consolidations, education, safe drinking water, and wastewater treatment. These efforts have been supplemented by more recent planning activities, funding programs, and project implementation efforts addressing DAC water supply, water quality, and wastewater infrastructure needs throughout the region. These include the Coachella Valley Regional Water Resilience Plan (CVRWRP), which focuses on vulnerable communities; addresses the technical, regulatory, and ownership challenges related to climate risks; identifies and assesses climate vulnerabilities; and outlines practical and feasible water resilience actions (see Section 8.5.4).

General outreach efforts conducted by the CVRWMG aim to encourage DAC participation in the Coachella Valley IRWM Program and to ensure that DAC needs and concerns are incorporated into current and future planning documents. The Coachella Valley IRWM Program has also provided increased technical, engineering, and grant support for DACs that apply for IRWM grant opportunities. Through Proposition 84 and the California Water Quality, Supply, and Infrastructure Improvement Act of 2014 (Proposition 1), the IRWM Program has provided millions of dollars to support DAC planning and construction projects.

The DAC Infrastructure Task Force, which is a collaboration between CVWD, non-profit organizations, regulatory agencies, and municipalities, meets bimonthly to secure access to safe affordable drinking water, wastewater, and flood control services in historically disadvantaged Coachella Valley regions through strategic planning, funding procurement, needs assessment, and reporting. This continued, consistent level of outreach over the years has allowed for relationship building with the DAC community.

Figure 2-7 Disadvantaged Communities and Economically Disadvantaged Areas

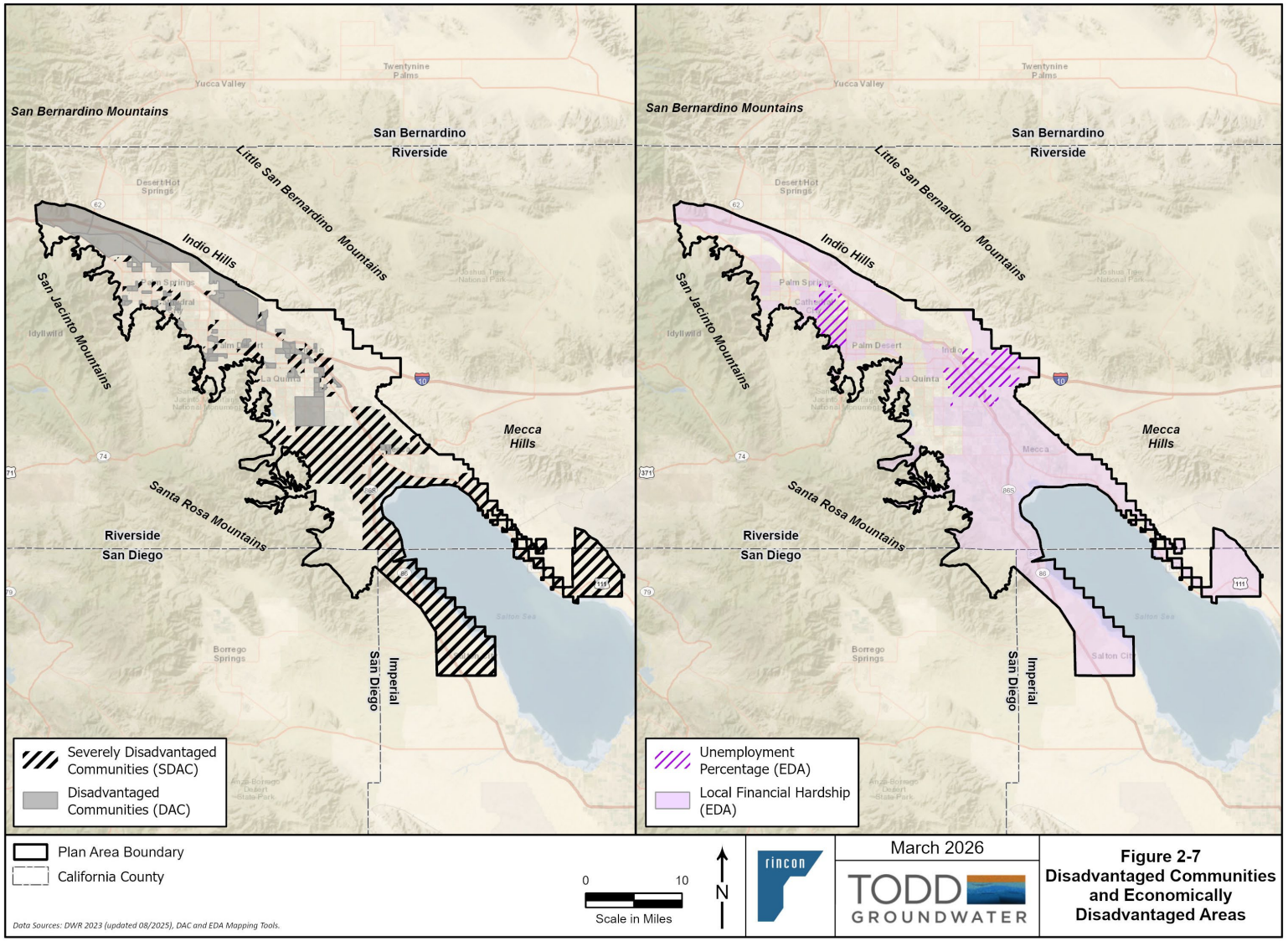


Figure 2-7a Disadvantaged Communities and Economically Disadvantaged Areas (Extreme Heat)

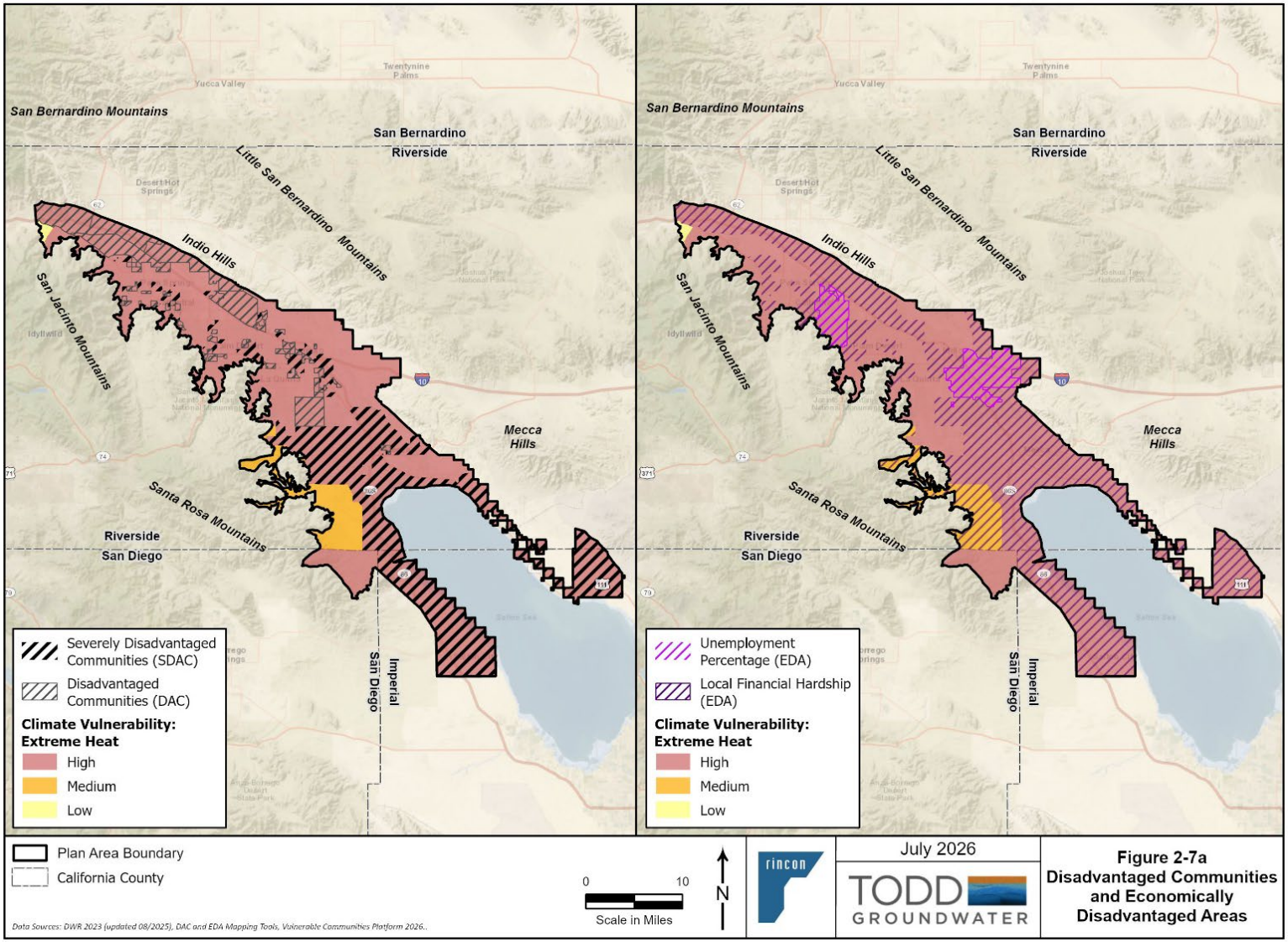


Figure 2-7b Disadvantaged Communities and Economically Disadvantaged Areas (Flood)

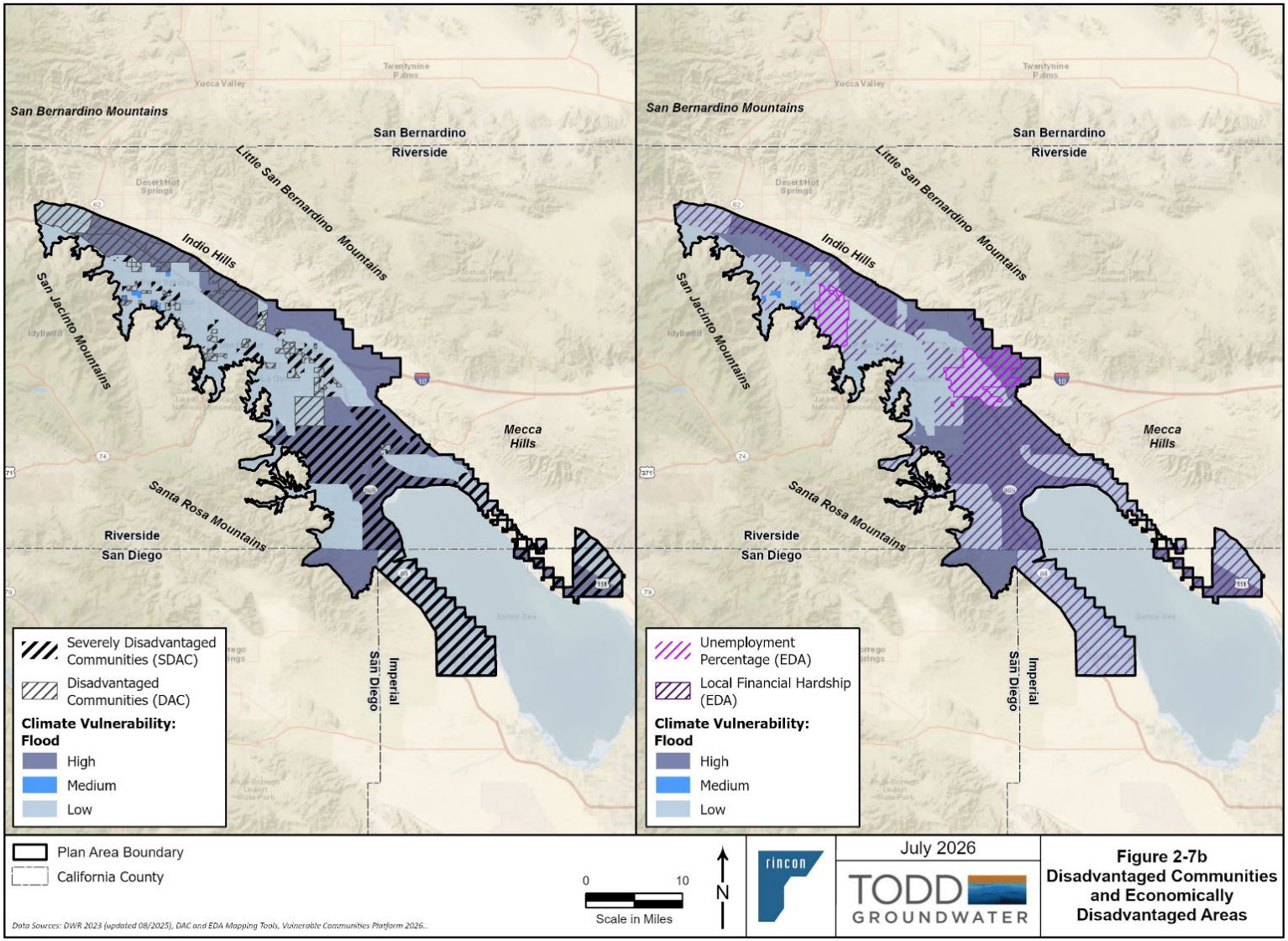
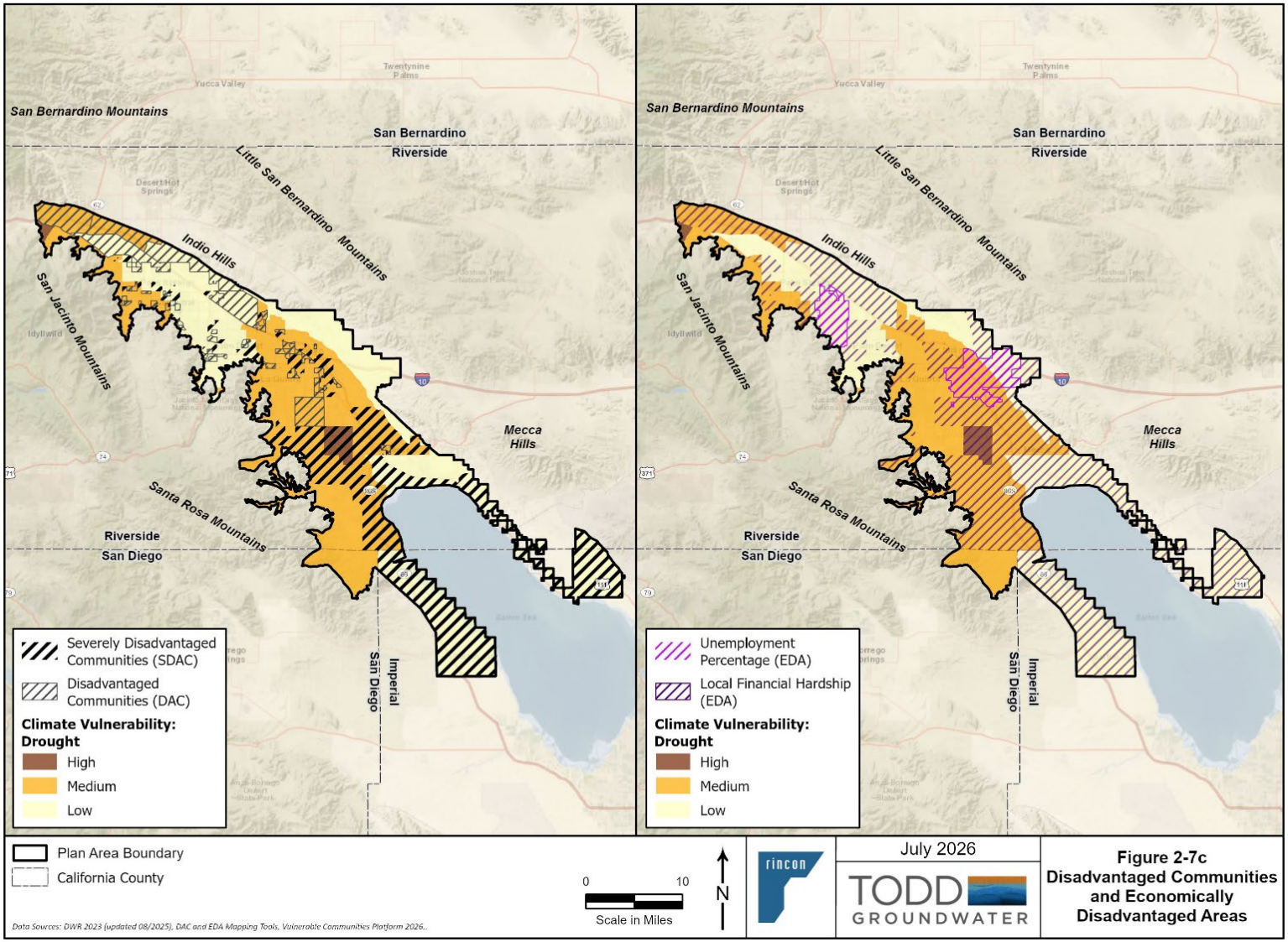


Figure 2-7c Disadvantaged Communities and Economically Disadvantaged Areas (Drought)



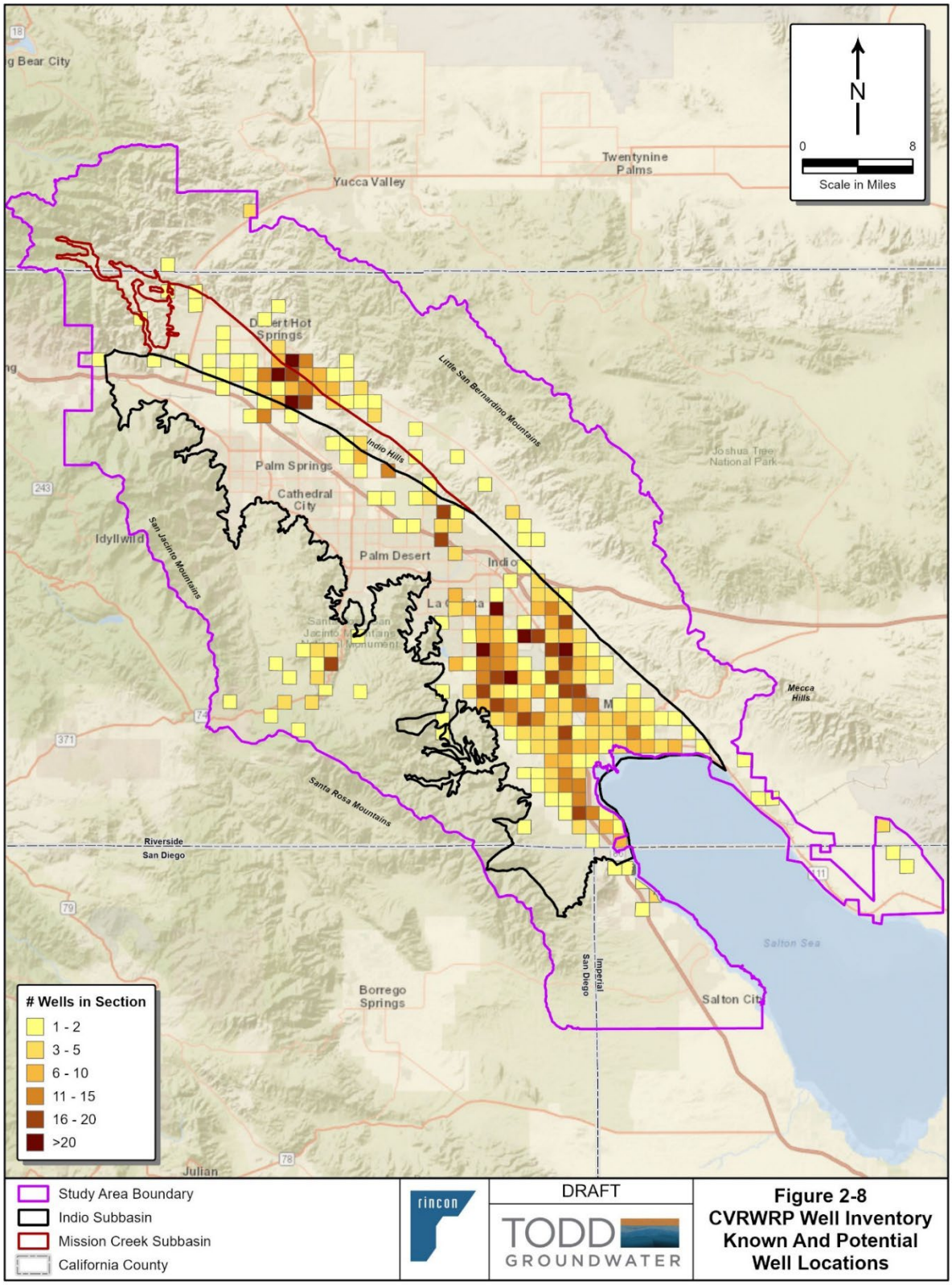
2.7 Water Use Sectors

Water use in the Plan Area includes four predominant water user groups: municipal, agriculture, golf, and other. Water demand in the Plan Area is met through a supply combination of groundwater, surface water, and non-potable water, including recycled water and imported Canal water. Major water use sectors and sources are described below; detailed information is provided in Chapter 5, *Demand Projections*.

- **Municipal**—The municipal group includes all water uses related to urban development, including residential, commercial, industrial, and institutional. Municipal water supplies predominantly consist of groundwater in the Plan Area, with some local surface water in portions of the DWA service area and non-potable water (i.e., recycled water and Canal water) for irrigation in the CVWD and DWA service areas. Supplies are generally served by the local water agencies (i.e., CVWD, CWA, DWA, and IWA). In some areas, small public water systems, private pumpers, and private mutual water companies and purveyors supply water in their services areas, with most using groundwater.
- **Golf**—The golf group consists of water uses related to golf course irrigation and maintenance. Golf courses primarily use groundwater from private wells, Canal water, and/or recycled water. In a few limited areas, golf courses use domestic water supply. Some golf water users also provide water stored in onsite ponds to municipal users (e.g., homeowners' associations) for irrigation. Note that in the Annual Reports, golf water demands are reported under "Urban" category.
- **Agriculture**—The agriculture group consists of water uses related to irrigation of crops and agricultural production. Canal water is the predominant agricultural water supply, with some surface water use in the DWA service area and with groundwater pumped from private wells in CVWD areas where Canal water is not available.
- **Other**—The other group consists of water uses related to recreational lakes, fish farms, and duck clubs. These demands are met using Canal water, potable water, or water pumped from private wells. Note that in the Annual Reports, other water demands are reported under "Agricultural" category.

In the Plan Area, a number of rural communities are not connected to the GSAs' domestic water system(s). Residents in these communities depend on individual domestic wells or private wells connected to independent small water systems to supply their drinking water. The local groundwater supplies of several small water systems have shown elevated concentrations of arsenic, chromium-6, and other constituents. CVWD and CWA are actively pursuing consolidation of small water systems in their domestic service areas. Figure 2-8 shows the density and distribution of domestic and small community water systems using wells within the Plan Area, based on the well inventory developed through the CVRWRP. Individual well locations are not shown, and additional information regarding the well inventory is provided in the CVRWRP and associated well inventory documentation.

Figure 2-8 Small Water System Wells



2.8 Water Resources Monitoring

In general, water resources monitoring addresses climate (i.e., temperature, precipitation, evaporation), streamflow, subsidence, groundwater elevations, surface water and groundwater quality, groundwater pumping, and drain flows. For this *2027 Alternative Plan Update*, water resources monitoring discussions are focused on the Indio Subbasin. Monitoring programs are briefly described below, and Chapter 10, *Monitoring Program*, provides additional information along with recommendations for improvement.

2.8.1 Climate

Climate data are available from DWR's California Irrigation Management Information System (CIMIS) for five CIMIS stations in the Indio Subbasin (Figure 2-9). Two are active as of 2026: Indio 2 Station #200 and Thermal South Station #218. Precipitation data have been collected for the 12 Riverside County Flood Control and Water Conservation District (RCFCWCD) precipitation monitoring stations, which are also shown in Figure 2-9 Data were used to support groundwater conditions characterization and an evaluation of irrigation water demands for agricultural and golf course uses.

2.8.2 Streamflow

USGS measures streamflow at 15 locations in the Indio Subbasin, which are also shown on Figure 2-9. DWA measures surface water diversions from Snow, Falls, Whitewater, and Chino watersheds. Streamflow data are compiled annually to support tracking of Subbasin conditions as part of the Annual Reports.[3]

2.8.3 Subsidence

USGS, in cooperation with CVWD, has been studying land subsidence in the Coachella Valley since 1997. In 2020, they completed a comprehensive report of findings (USGS, 2020) that documents historical subsidence, plus recent cessation of subsidence and uplift. Ongoing cooperative studies between USGS and local agencies are continuing to monitor subsidence conditions, with updated analyses anticipated in future publications. The latest study from the USGS is expected in late 2026. Figure 2-10 shows the USGS land-subsidence monitoring network, which consists of geodetic monuments used as global positioning system (GPS) stations that can be surveyed repeatedly. This monitoring network has grown over time and currently includes 24 stations. In addition to these stations, interferometric synthetic aperture radar (InSAR) data are available that use radar images from satellites to provide broad spatial mapping of land surface vertical displacement. More information on subsidence in the Indio Subbasin can be found in Chapter 4, *Groundwater Conditions*.

2.8.4 Groundwater Elevations

Groundwater level monitoring data are available for selected wells in the Indio Subbasin dating back to 1910. Figure 2-11 illustrates the distribution of monitored wells as of water year (WY) 2024-2025, when levels were measured in 356 wells by the Indio Subbasin GSAs as part of their respective groundwater level monitoring programs. Out of these wells, 57 are classified as "key wells" and are specifically monitored by the Indio Subbasin GSAs for compliance with SGMA.

[3] https://sgma.water.ca.gov/portal/alternative/print/23; refer to Section D.

DWR established the California Statewide Groundwater Elevation Monitoring (CASGEM) Program in 2009 to track seasonal and long-term groundwater elevation trends in California's groundwater basins. Effective July 1, 2026, the CASGEM Online System was fully integrated into DWR's SGMA Portal Monitoring Network Module (MNM), consolidating groundwater elevation data management and reporting into a single statewide platform. The CASGEM Program continues to support SGMA implementation through coordinated groundwater level monitoring and data management. Groundwater elevation monitoring data are used to characterize basin conditions, evaluate pumping and recharge operations, assess progress toward sustainability, and support groundwater modeling and model calibration.

Figure 2-9 Climate and Streamflow Monitoring Stations

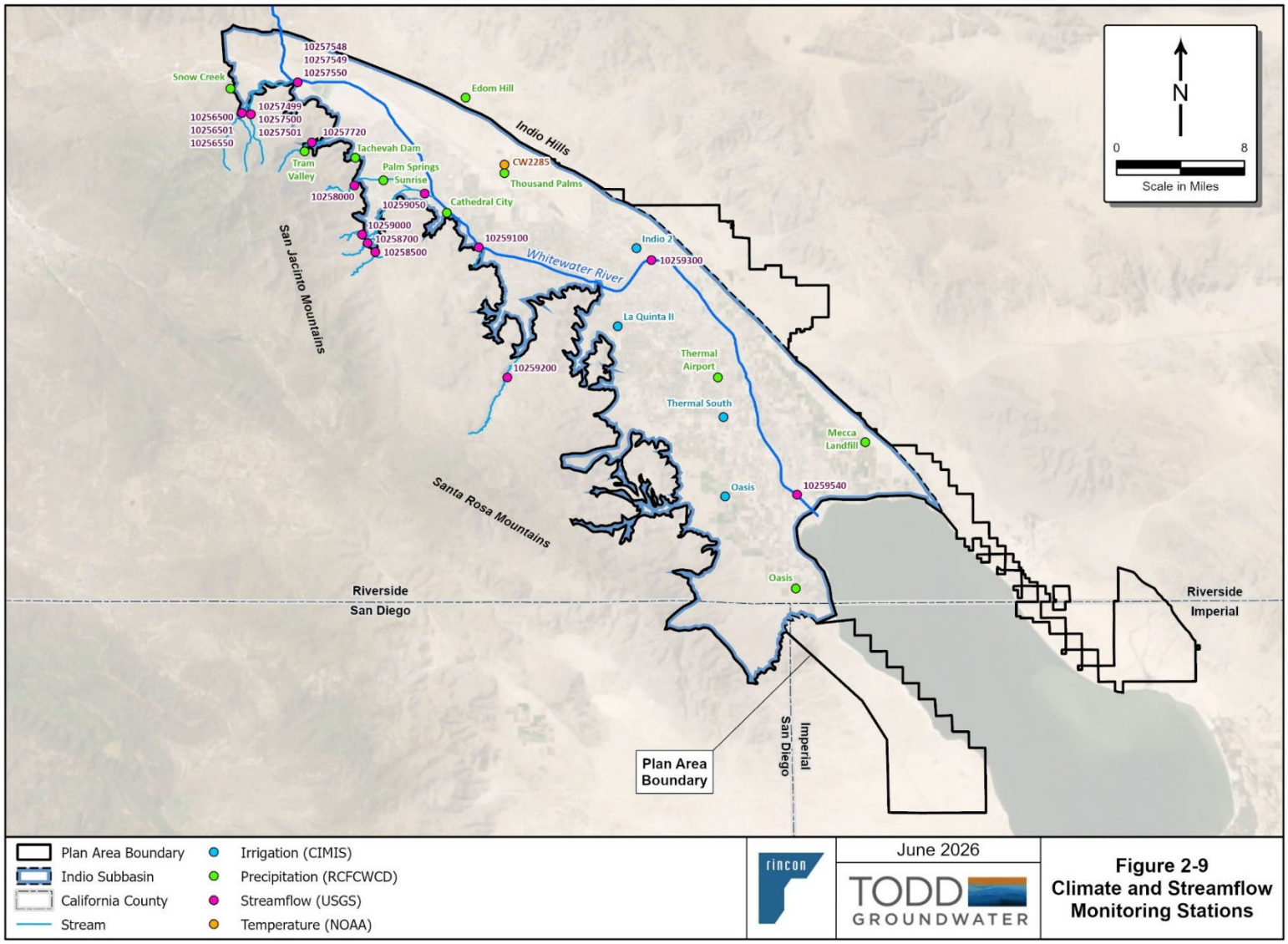


Figure 2-10 USGS GPS Stations and Wells Used for Subsidence Monitoring

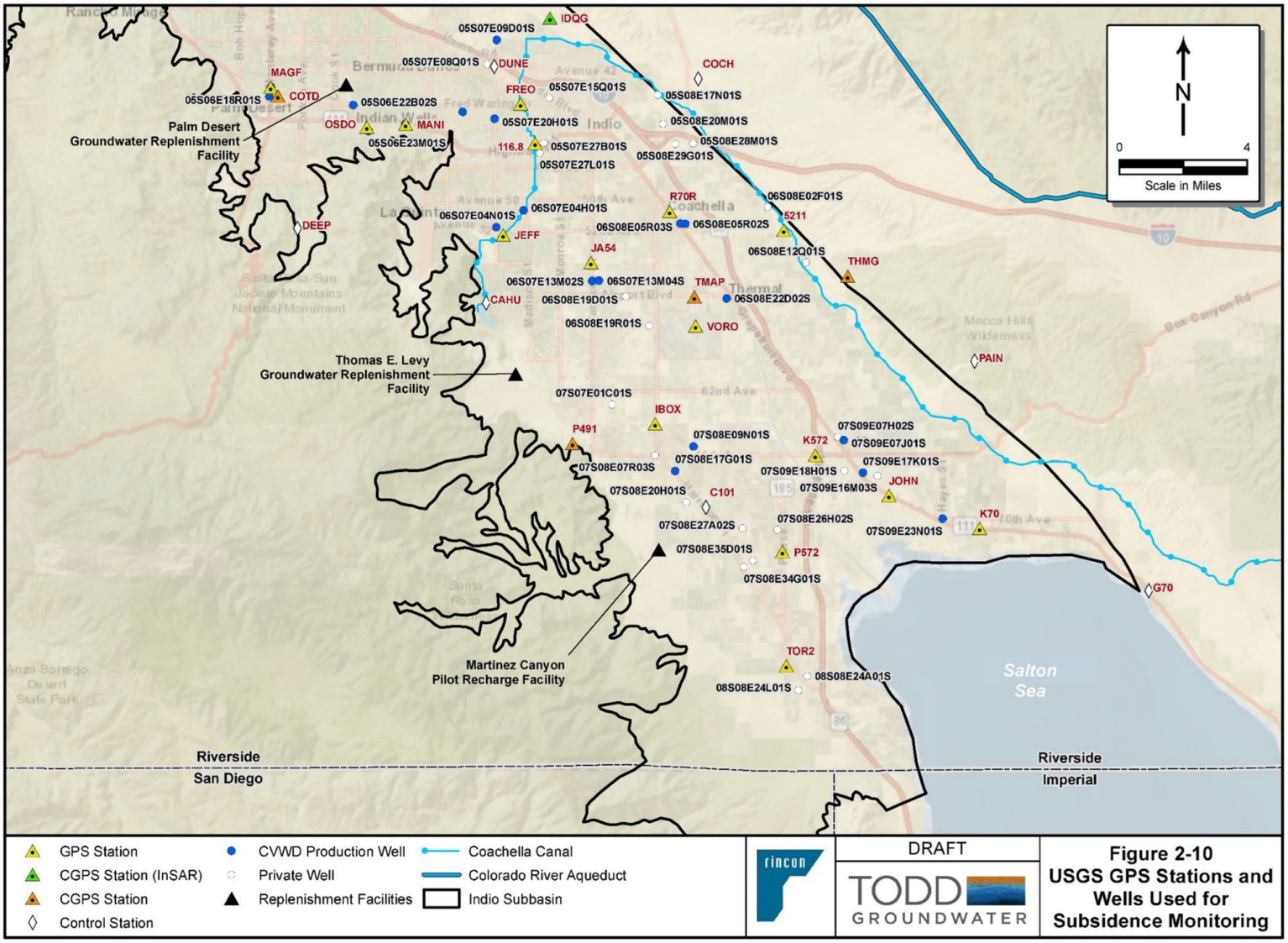
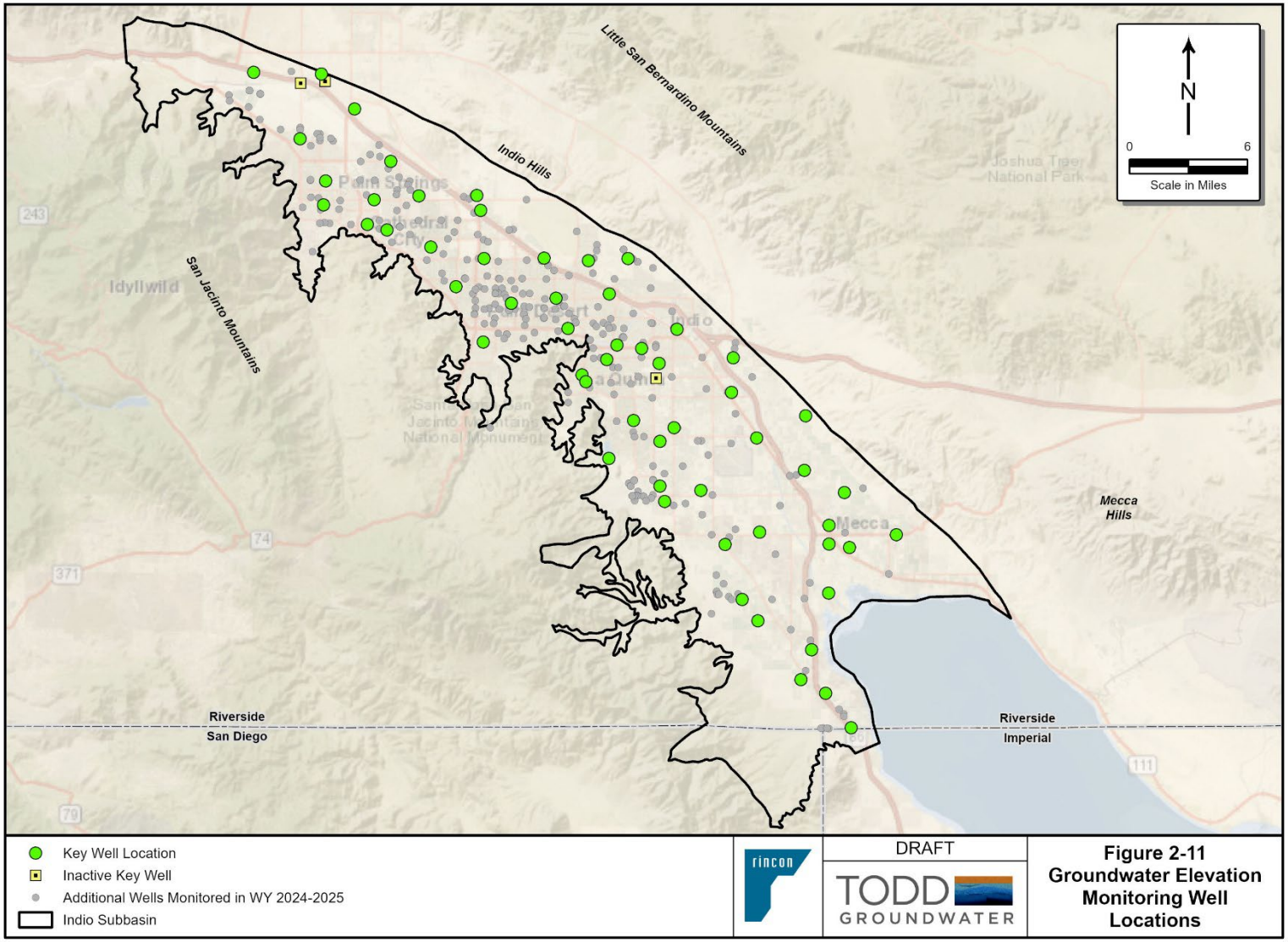


Figure 2-11 Groundwater Elevation Monitoring Well Locations



2.8.5 Surface Water and Groundwater Quality

Surface water and groundwater quality monitoring is performed by multiple agencies in the Plan Area. For example, water purveyors are required by State law to monitor and report on the quality of their water sources, and report to each customer and the SWRCB Division of Drinking Water. These data are publicly available on the SWRCB's GAMA Program website. In addition, Tribes monitor water quality in their wells and maintain records; not all these data are publicly available. Local water agencies conduct water quality monitoring as summarized below.

- **CVWD**—CVWD monitors domestic wells and wells to monitor recharge areas, conduct special studies to address a specific parameter (such as chromium-6) or a specific area, and conducts Coachella Valley Salt and Nutrient Management Plan (CV-SNMP) monitoring
- **CWA**—CWA monitors its domestic wells and conducts CV-SNMP monitoring
- **DWA**—DWA monitors streams and its domestic wells, monitors for State emerging contaminants (e.g., per- and polyfluoroalkyl substances [PFAS]), and conducts CV-SNMP monitoring
- **IWA**—IWA monitors its domestic wells and conducts CV-SNMP monitoring

Figure 2-12 shows the locations of groundwater wells with available water quality data examined for characterization of groundwater quality as part of this *2027 Alternative Plan Update* (i.e., wells reporting recent water quality data). These groundwater wells include supply, irrigation, and monitoring wells. These wells include those installed near GRFs and two nested monitoring wells near the Salton Sea that monitor changes in groundwater levels and quality as potential indications of saline intrusion.



Monitoring wells are sampled by the GSAs for a variety of water quality constituents.

In 2020, the GSAs, in coordination with local water/wastewater agencies, the RWQCB, and other stakeholders, initiated an update to the 2015 CV-SNMP. This effort included development of a Groundwater Monitoring Program Workplan approved in February 2021 and a CV-SNMP Development Workplan approved in October 2021, which also informed preparation of a series of technical memoranda. Supporting materials, including the Workplans and technical memoranda, are available on the CV-SNMP website[4]The update process has since advanced to implementation of monitoring activities, data evaluation, and ongoing coordination with regulatory agencies to support long-term groundwater quality management in the Subbasin.

[4] Coachella Valley Salt and Nutrients Management Plan Website: https://www.cvsnmp.com

2.8.6 Groundwater Pumping

Information about groundwater production is critical to Indio Subbasin management. California Water Code Division 2 Part 5 requires each well owner or operator in the counties of Riverside, San Bernardino, Los Angeles, and Ventura extracting more than 25 AFY of groundwater to file a Notice of Extraction and Diversion of Water with the SWRCB. In addition, the enabling legislation of CVWD and DWA respectively require that all production subject to replenishment assessment must be measured, and replenishment assessment invoices based on quantities produced are billed monthly or quarterly. The reporting threshold for pumpers within CVWD's boundary is 25 AFY, while the threshold for DWA is 10 AFY. All production wells exceeding these thresholds are required to have a measuring device capable of measuring and registering the amount of water produced; 621 wells in these areas subject to the replenishment assessment are metered. Both CVWD and DWA maintain production records for wells in their respective areas. Figure 2-13 illustrates the distribution of groundwater production wells in the Indio Subbasin.

2.8.7 Drain Flows



CVWD measures drain flows at 27 sites on a monthly basis.

The CVSC and associated subsurface and open drains receive intercepted shallow groundwater from agricultural fields and convey flow to the Salton Sea. A USGS gage station continuously measures flow in the lower CVSC near the Salton Sea (Figure 2-9), while CVWD measures drain flows at 27 sites on a monthly basis. Annual drain flow volumes are reported in the Annual Reports. In response to recommendations from DWR and the *2022 Alternative Plan Update*, CVWD completed the *East Coachella Valley Agricultural Drainage System Flow Study* in 2023 (see Section 8.3 and Appendix 2-A). The study documented the drainage system and identified multiple sources of inflow, including agricultural return flows, regulatory water associated with irrigation system operations, treated wastewater, fish farm effluent, stormwater runoff, unauthorized discharges, and shallow groundwater. The study concluded that drain outflow volumes are influenced by multiple sources and are not a reliable indicator of groundwater sustainability conditions. Drain flow data continue to be used to track groundwater outflow and to calibrate the Subbasin's numerical groundwater flow model.

Figure 2-12 Wells with Water Quality Data Used for 2027 Alternative Plan Update

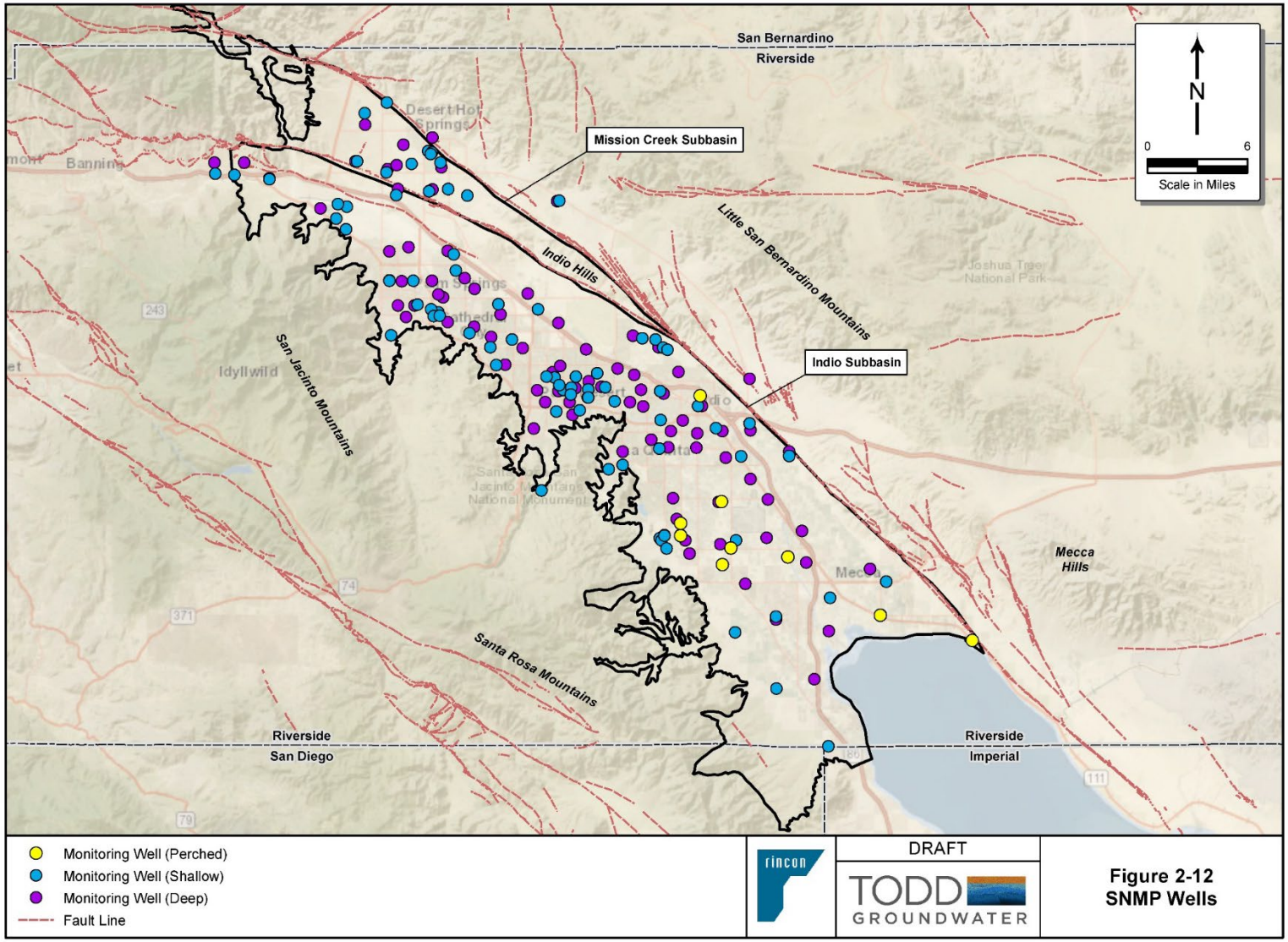
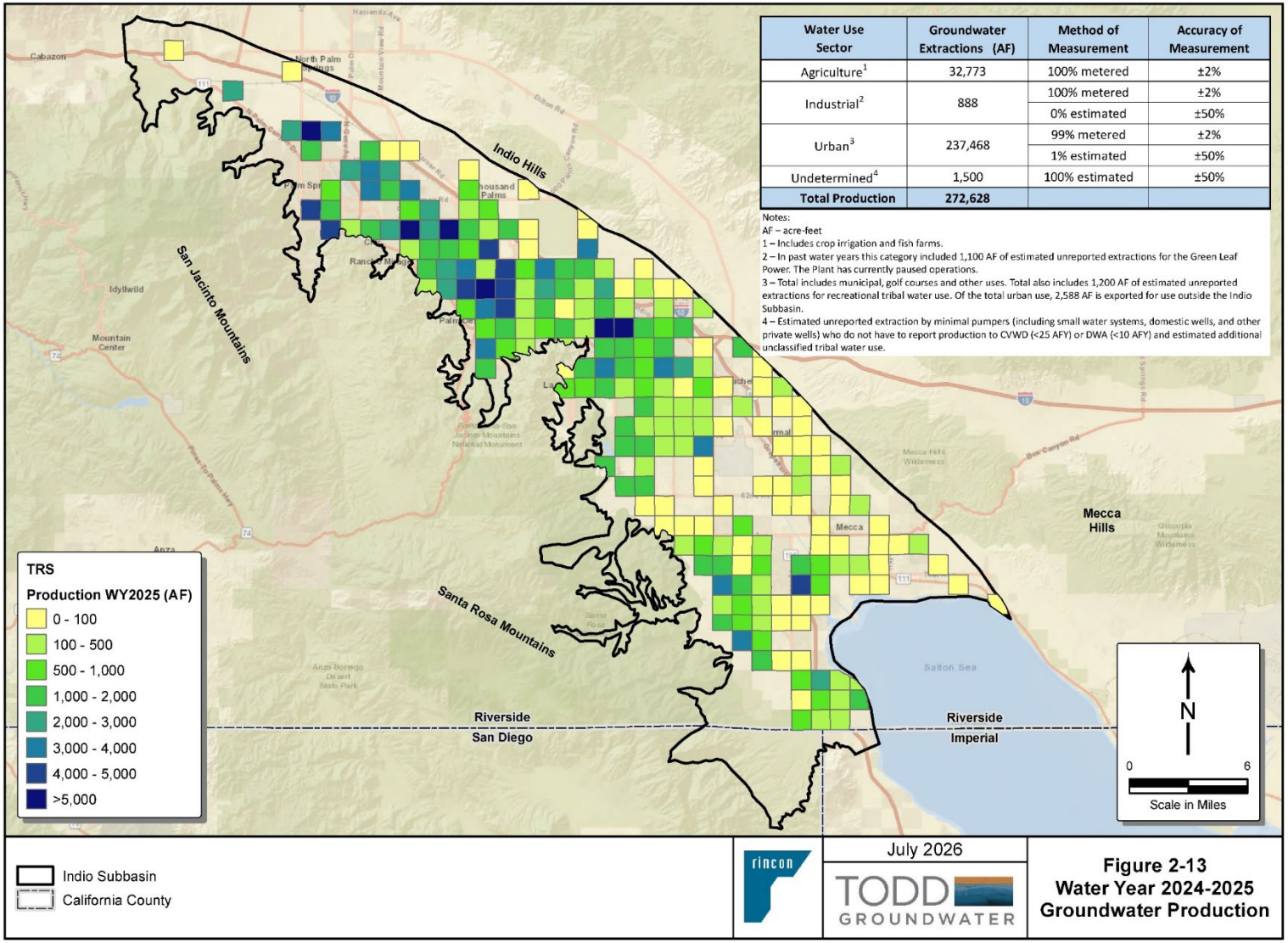


Figure 2-13 Water Year 2024–2025 Groundwater Production



3 Hydrogeologic Conceptual Model

This chapter describes the Indio Subbasin hydrogeologic conceptual model (HCM), and establishes the Plan Area's geologic framework, including hydrogeologic boundaries, geologic formations and structures, and principal aquifer units. This chapter also summarizes groundwater recharge and discharge areas, describing how and where water flows into and out of the Subbasin. An important aspect of this system is artificial recharge of groundwater (i.e., replenishment), which is conducted at groundwater replenishment facilities (GRFs). GRF operation has been critical to halting and reversing groundwater level declines and storage depletion, which are key criteria for sustainability in the Indio Subbasin.

The HCM presented here is a summary of relevant aspects of the Subbasin hydrogeology that influence groundwater sustainability. Chapter 7, *Numerical Model and Plan Scenarios* and Chapter 9, *Sustainable Management*, refer to the technical information summarized here.

3.1 Physical Setting

Figure 3-1 shows the extent of the Coachella Valley Groundwater Basin (Basin), which encompasses more than 800 square miles and extends from the San Gorgonio Pass area in the San Bernardino Mountains to the northern shore of the Salton Sea. The Basin is bordered by the San Bernardino Mountains on the north, the San Jacinto and Santa Rosa Mountains on the west, the Little San Bernardino Mountains on the east and Salton Sea on the south. The San Bernardino, San Jacinto, and Santa Rosa Mountains impede eastward movement of storms and create a rain shadow, which results in an arid climate and greatly reduces the contribution of direct precipitation as a source of natural recharge to the Basin. Figure 3-1 also shows the location of the Whitewater River GRF (WWR-GRF), Palm Desert GRF (PD-GRF), and Thomas E. Levy GRF (TEL-GRF) (denoted as blue triangles).

The Basin is composed of the San Gorgonio Pass, Mission Creek, Desert Hot Springs, and Indio Subbasins (Figure 3-1). The boundary between the San Gorgonio Pass and Indio Subbasins is a bedrock constriction and divide; otherwise, the boundaries between Subbasins within the Basin are generally defined by faults that represent barriers to the lateral movement of groundwater. This discussion focuses on the Indio Subbasin.

The western half of the Indio Subbasin is characterized by an urban resort/recreation-based economy and includes the cities of Palm Springs, Cathedral City, Rancho Mirage, Palm Desert, and Indian Wells, as well as the unincorporated community of Thousand Palms. The eastern half has a predominantly agricultural-based economy and includes the cities of Indio, Coachella, and La Quinta, along with the unincorporated communities of Mecca, Thermal, and Oasis.

As shown in Figure 3-2, the Indio Subbasin has been described in terms of five Subareas: Garnet Hill, Palm Springs, Thermal, Thousand Palms, and Oasis. The semi-water-bearing areas of Indio Hills and Barton Canyon are also shown in Figure 3-2. These areas are distinguished because they are underlain by low-permeability, highly faulted Plio-Pleistocene formations, including the Palm Springs Formation, which generally yield substantially less groundwater than the adjacent subareas (DWR, 1964).

3.2 Geologic Setting



Water from the Colorado River Aqueduct is conveyed through the Whitewater Hydropower Plant and ultimately feeds WWR-GRF.

The Indio Subbasin is bounded on its northern, northwestern, southwestern, and southern margins by uplifted bedrock; Subbasin sedimentary fill consists of thick sand and gravel sedimentary sequences eroded from the surrounding mountains. Sedimentary infill in the Indio Subbasin thickens southward, ranging from several thousand to 12,000 feet thick, depending on location within the Subbasin. The upper approximately 2,000 feet constitute the aquifer system that is the primary source of groundwater supply (DWR, 1979). Figure 3-3 is a geologic map encompassing the Indio Subbasin, showing that most of the basin is composed of Tertiary Alluvium (Q), with areas of Quaternary Dune Sand (Qs). Some minor units are observed such as Miocene to Pleistocene Sandstone and Conglomerate (QPc) in the southwestern most subbasin and Quaternary landslide deposits in the western Santa Rosa Mountains.

From about the City of Indio southeasterly to the Salton Sea, the Indio Subbasin is characterized by increasingly thick layers of silt and clay, especially in the shallower portions of the Indio Subbasin. These silt and clay layers are remnants of ancient lakebed deposits and impede the percolation of water applied for irrigation (DWR, 1964).

Figure 3-1 Coachella Valley Groundwater Basin and Subbasins

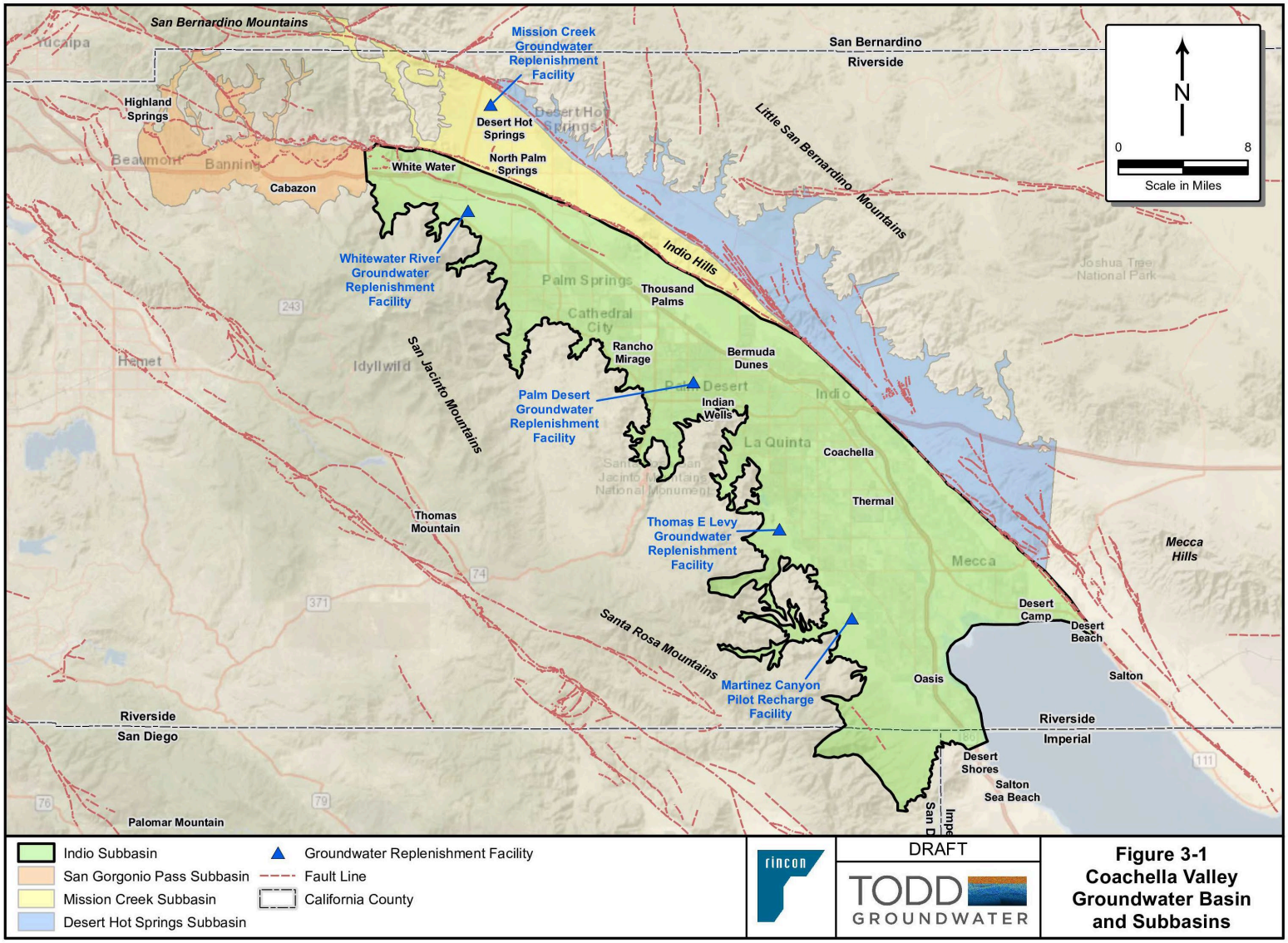
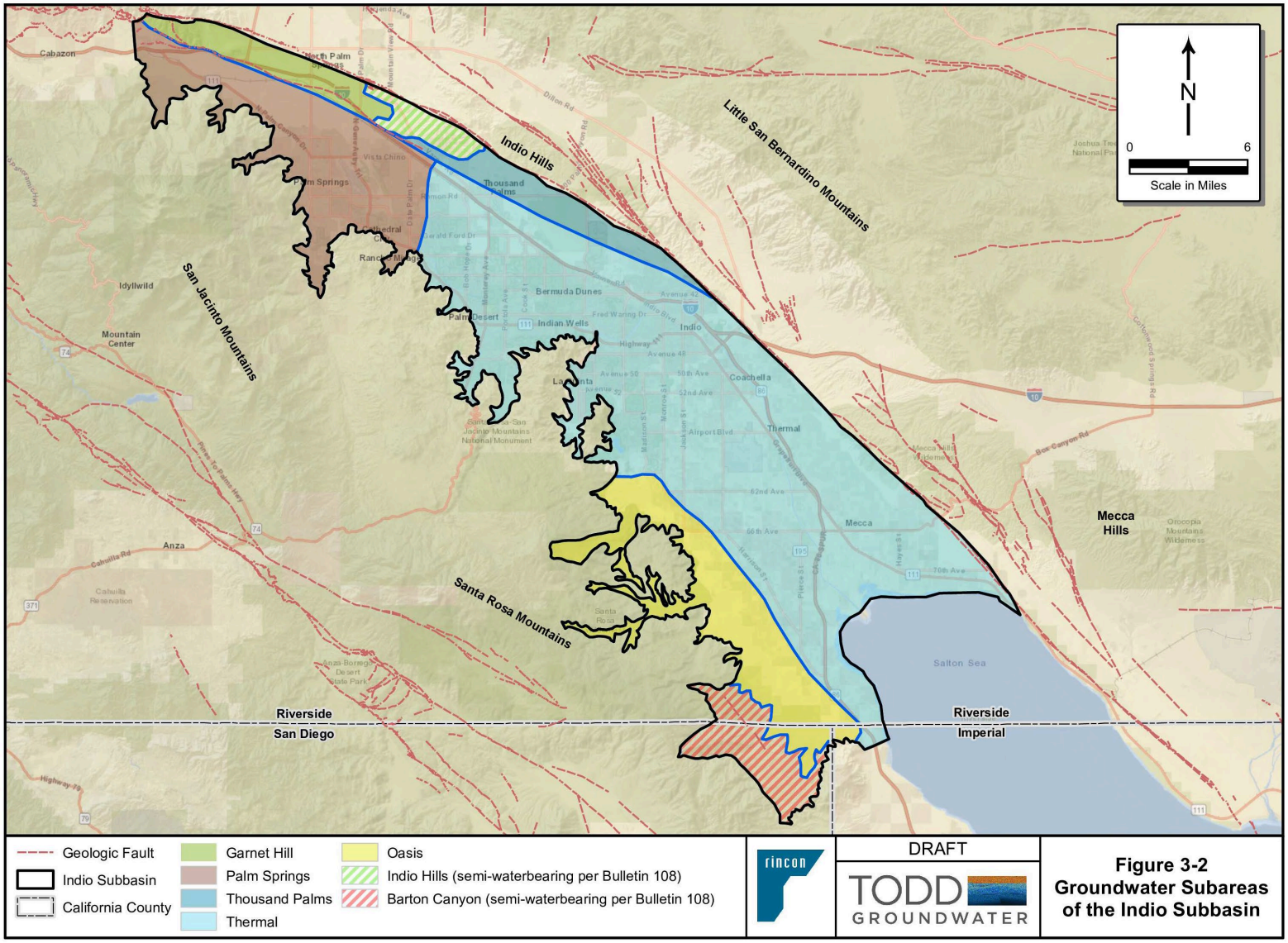


Figure 3-2 Groundwater Subareas of the Indio Subbasin



3.2.1 Garnet Hill Subarea

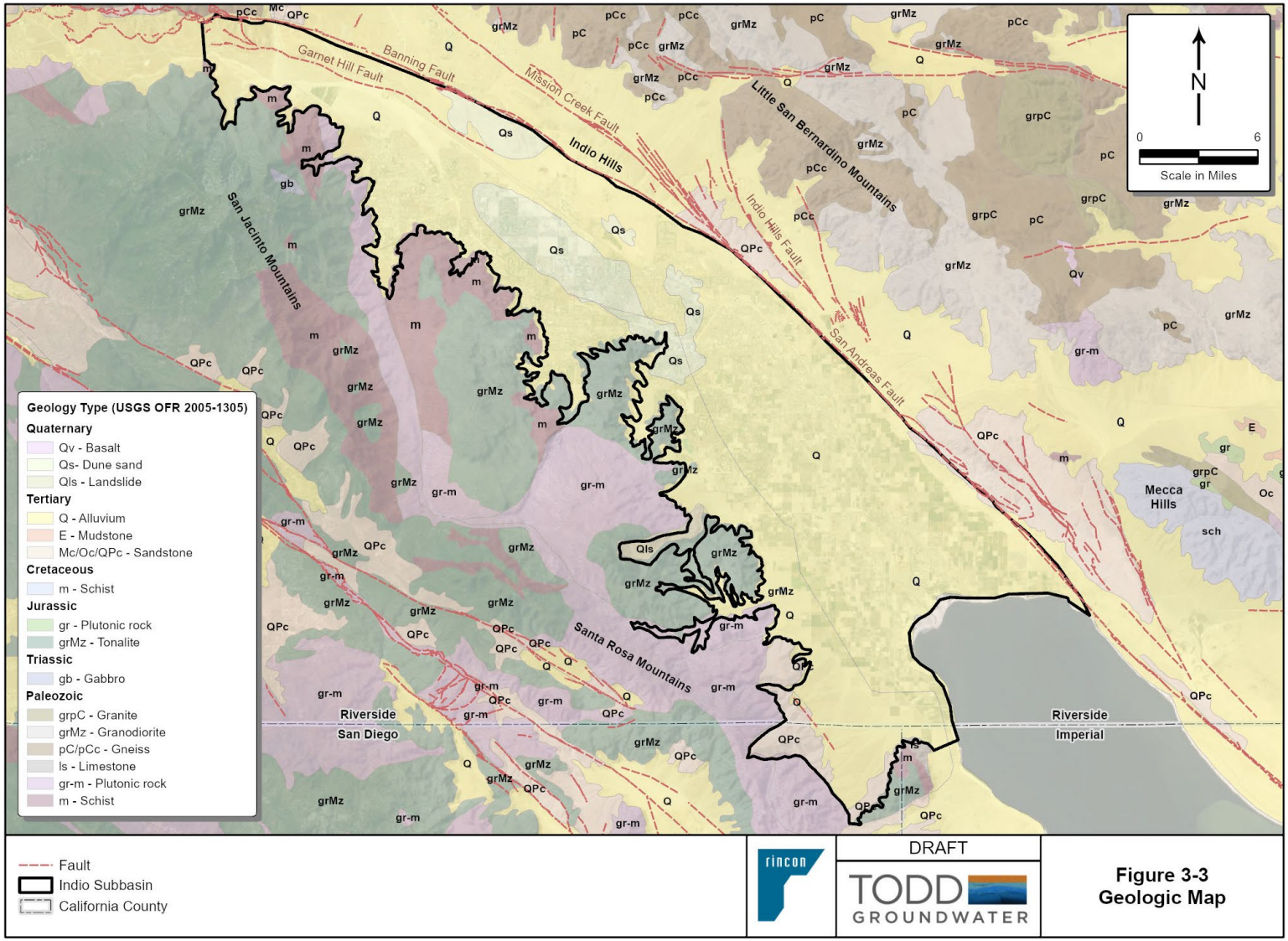
The Garnet Hill Subarea, located between the Garnet Hill Fault and the Banning Fault, is considered part of the Indio Subbasin as defined in DWR's *California's Groundwater: Bulletin 118—Update 2025* (Bulletin 118) (DWR, 2025) and as shown in Figure 3-2. The relative scarcity of wells in the Garnet Hill Subarea limits available geologic information and understanding of groundwater interactions between this Subarea and the adjoining Mission Creek and Indio Subbasins. The 2013 *Mission Creek/Garnet Hill Subbasins Water Management Plan* (CVWD, DWA, and MSWD, 2013) states that groundwater production is low in the Garnet Hill Subarea and is not expected to increase significantly in the future due to relatively low well yields compared to those in the Mission Creek Subbasin. Groundwater levels in the western and central portions of the Subarea show response to large replenishment quantities from the WWR-GRF, while levels are relatively flat in the eastern portion of the Subarea.

While the Garnet Hill Subarea receives subsurface inflow from Mission Creek Subbasin and some natural recharge from occasional high flows of Mission Creek and other streams, the chemical character of the groundwater and its direction of movement indicate that the main source of inflow to the Subarea comes from percolation associated with the Whitewater River (CVWD, DWA, and MSWD, 2013).

3.2.2 Palm Springs Subarea

Located in the northwestern portion of the Indio Subbasin, the Palm Springs Subarea is bounded by the Garnet Hill Fault to the north and the eastern slopes of the San Jacinto Mountains to the south and extends southeast to Cathedral City. Alluvial fan deposits consist of heterogeneous, coarse-grained sediments with a total thickness exceeding 1,000 feet. Although there is no lithologic distinction apparent based on water well driller's logs, the total thickness of recent deposits suggests that Ocotillo Conglomerate underlies recent Fanglomerate deposits at depths ranging from 300 to 400 feet (DWR, 1964). Substantial natural and artificial recharge (i.e., replenishment) occurs through the thick sequence of coarse sediments in this Subarea.

Figure 3-3 Geologic Map



3.2.3 Thermal Subarea

Groundwater in the Palm Springs Subarea moves southeastward into the Thermal Subarea. As shown in Figure 3-2, the division between the Palm Springs Subarea and the Thermal Subarea is near the City of Cathedral City.

Figure 3-4 presents a generalized stratigraphic column of the Thermal Subarea showing local geologic units and groundwater zones. As illustrated, the hydrostratigraphy, or the arrangement and hydraulic characteristics of geologic units, is characterized by the following:

- A shallow semi-perched and confining zone consisting of recent silts, clays, and fine sands
- An upper aquifer with unconfined (water table) conditions
- A semi-confining aquitard of fine-grained materials
- A lower aquifer with confined and artesian conditions

As shown on Figure 3-4, fine-grained clay deposits of the upper Ocotillo Conglomerate Formation separate the upper and lower aquifers. The clay deposits are not regionally extensive or sufficiently thick enough to completely restrict vertical groundwater flow between the upper and lower aquifer zones and are thus referred to as an aquitard.

The aquitard is absent, and no distinction between the upper and lower aquifer zones occurs, along the southwestern margins of the Thermal Subarea at the base of the Santa Rosa Mountains, such as the alluvial fans at the mouth of Deep Canyon and near the City of La Quinta.

The lower aquifer, composed of Ocotillo Conglomerate Formation, consists of silty sands and gravels with interbeds of silt and clay. The lower aquifer contains the greatest quantity of stored groundwater in the Indio Subbasin. The top of the lower aquifer occurs at a depth ranging from 300 to 600 feet below ground surface (bgs). The thickness of the zone is undetermined, as the deepest wells in the Coachella Valley do not fully penetrate the formation. Available data indicate that the zone is at least 500 feet thick and can be in excess of 1,000 feet thick. The thickness of the aquitard overlying the lower aquifer zone ranges from 100 to 200 feet, although in some areas near the Salton Sea it may be in excess of 500 feet.

Capping the upper aquifer zone in the Thermal Subarea is a shallow fine-grained zone in which semi-perched groundwater occurs (Figure 3-5). This zone consists of recent silts, clays, and fine sands and is relatively persistent southeast of the City of Indio. It ranges from 0 to 100 feet thick and is an effective barrier to deep percolation. The low permeability of the materials southeast of the City of Indio has contributed to agricultural drainage challenges in the area. Semi-perched groundwater has been maintained by irrigation water applied to agricultural lands, necessitating construction of an extensive subsurface tile drain system (DWR, 1964). North and west of the City of Indio, the zone is composed mainly of clayey sands and silts, and its effect in retarding deep percolation is limited.

Figure 3-4 Generalized Stratigraphic Column Thermal Subarea

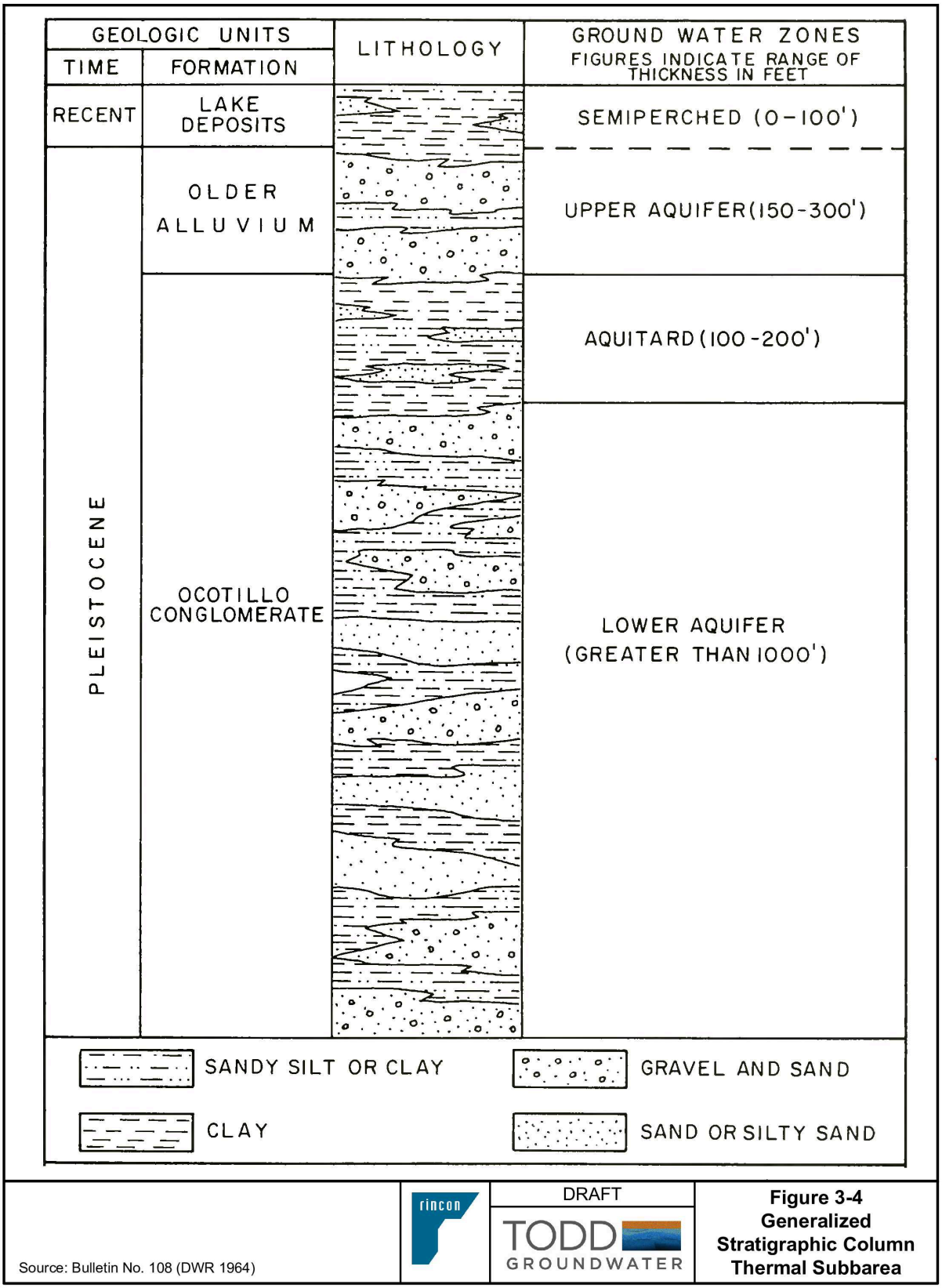
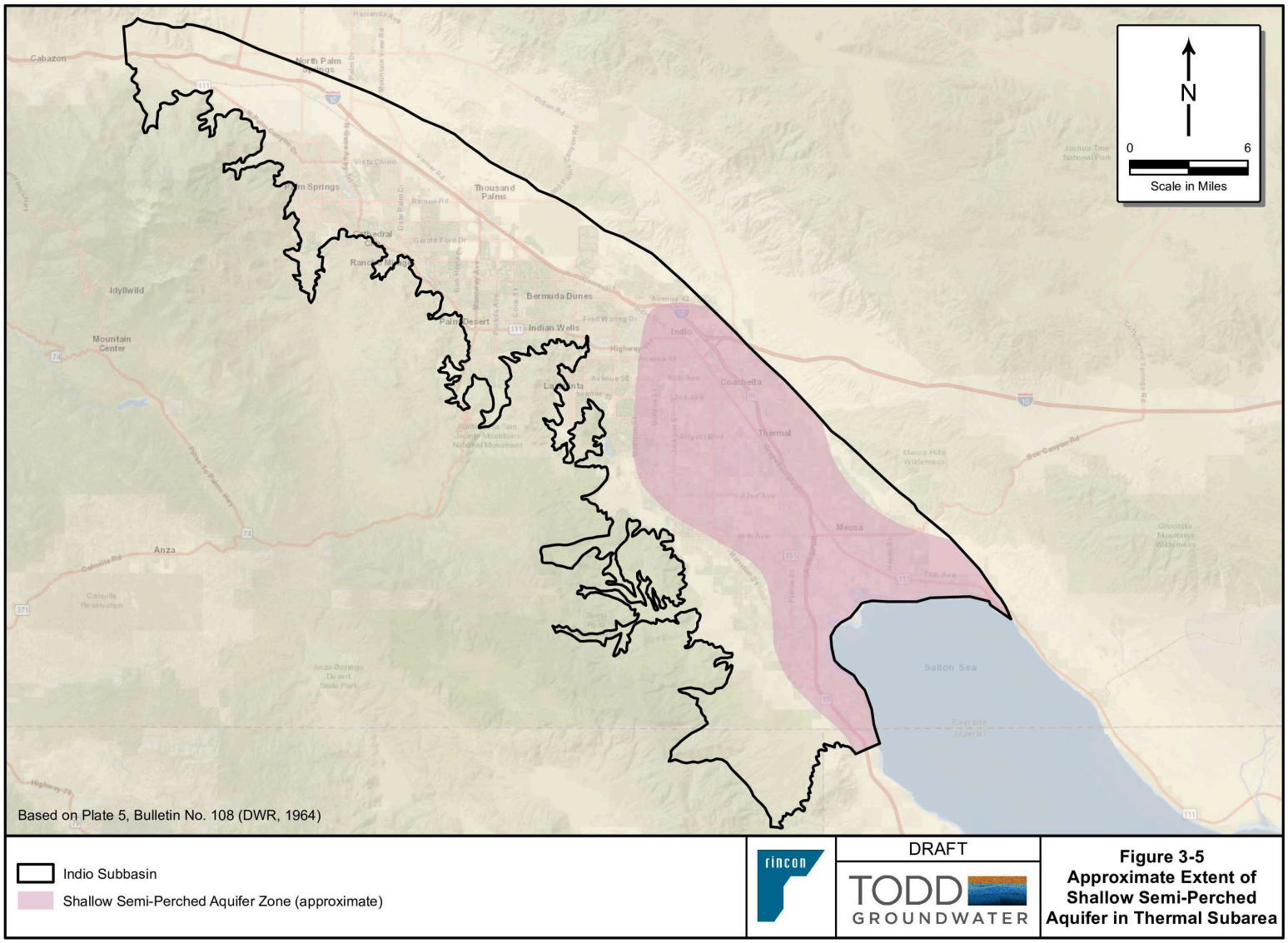


Figure 3-5 Approximate Extent of Shallow Semi-Perched Aquifer in the Thermal Subarea



3.2.4 Thousand Palms Subarea

The Thousand Palms Subarea (Figure 3-2) is located along the southwest flank of the Indio Hills and is differentiated from the Thermal Subarea by groundwater quality differences (DWR, 1964). In brief, groundwater in the Thousand Palms Subarea is characterized by sodium sulfate chemistry that is distinct from the calcium bicarbonate water of the Thermal Subarea. The differences in water quality indicate that replenishment to the Thousand Palms Subarea comes primarily from the Indio Hills and is limited in supply. The relatively sharp boundary between chemical characteristics of water derived from the Indio Hills in the Thousand Palms Subarea and groundwater in the Thermal Subarea suggests there is little intermixing between the two Subareas.

The configuration of the water table north of the community of Thousand Palms is such that the generally uniform, southeasterly gradient in the Palm Springs Subarea diverges and steepens to the east along the base of Edom Hill. This steepened gradient suggests the presence of a barrier to groundwater flow in the form of a reduction in sediment permeability or a southeast extension of the Garnet Hill Fault. Gravity surveys by DWR (1964) do not indicate a subsurface fault. Accordingly, the sharp increase in gradient is attributed to lower sediment permeability to the east.

3.2.5 Oasis Subarea

Another peripheral zone of unconfined groundwater, with different chemical characteristics from water in the major Indio Subbasin areas, is found underlying the Oasis Subarea that extends along the base of the Santa Rosa Mountains. Water-bearing materials underlying the Subarea consist of highly permeable alluvial fan deposits. Although groundwater data suggest that the boundary between the Oasis and Thermal Subareas may be a buried fault extending from Travertine Rock to the community of Oasis, the remainder of the boundary is a lithologic change from the coarse fan deposits of the Oasis Subarea to the interbedded sands, gravel, and silts of the Thermal Subarea. Little information is available as to the thickness of the water-bearing materials, but it is estimated to be in excess of 1,000 feet.

3.3 Faults

The Indio Subbasin is bordered on the southwest by the Santa Rosa and San Jacinto Mountains. The boundaries between Subbasins within the Basin are generally defined by faults that serve as effective barriers to the lateral movement of groundwater. The Indio Subbasin is separated from the Mission Creek Subbasin by the Banning Fault, and from the Desert Hot Springs Subbasin by the San Andreas Fault (Figure 3-3). Both faults represent effective barriers to groundwater flow.

The Garnet Hill Subarea lies between the Garnet Hill and Banning Faults, which act as partially effective barriers to lateral groundwater movement. The Garnet Hill Fault partially impedes groundwater flow from the Garnet Hill Subarea toward the south. This effect is revealed by close inspection of groundwater level information on either side of the Garnet Hill Fault; for example, the groundwater level contour map in the *Indio Subbasin Annual Report for Water Year 2024-2025* (see Figure 3-2; Indio Subbasin GSAs, 2026) shows differences of as much as 300 feet across the Garnet Hill Fault; such elevation differences also are illustrated on the hydrogeologic cross section B-B' (Figure 3-10). The Garnet Hill Fault does not reach the surface and is probably effective as a barrier to lateral groundwater movement only below a depth of about 100 feet (CVWD, DWA, and MSWD, 2013). A comparison of Figure 3-2 and Figure 3-3 indicates that the Palm Springs Subarea is bounded by the Garnet Hill Fault to the north.

3.4 Recharge and Discharge Areas

This section identifies groundwater inflows and outflows and describes the respective recharge and discharge areas of the Indio Subbasin. Quantification of the inflows and outflows will be described in more detail in Chapter 4, *Current and Historical Groundwater Conditions* and Chapter 7, *Numerical Model and Plan Scenarios*.

3.4.1 Groundwater Inflows

Sources of inflow (i.e., recharge) to the Indio Subbasin include the following:

- Infiltration of natural inflows through mountain-front and stream channel recharge
- Subsurface inflows
- Artificial recharge of imported water (i.e., replenishment)
- Wastewater percolation
- Return flows from municipal/domestic use, agriculture, golf courses, and other sources

From 2000 to 2025, combined return flows have represented the largest source of recharge in the Subbasin, followed by imported water recharge and natural mountain front and stream channel recharge. However, in recent years between 2022 to 2025, groundwater replenishment has been the largest source of recharge in the Subbasin.

3.4.1.1 Infiltration of Natural Inflows

Precipitation that falls in the San Jacinto, Santa Rosa, and Little San Bernardino Mountains is the primary source of natural recharge in the Indio Subbasin with only minor recharge from precipitation in the Little San Bernardino Mountains. Mountain-front recharge includes subsurface inflow from canyons and surface runoff from minor tributaries along the mountain fronts. The Whitewater River is the major stream channel contributing recharge with additional infiltration along other channels such as Snow and Falls Creeks in the upper valley and several smaller streams in the lower portion of the valley that only flow during wet years. The annual volume of natural recharge varies significantly as the annual volume of precipitation varies widely. During normal and wet years, mountain front recharge from these streams and smaller watersheds percolates into the Subbasin as additional subsurface flow.

3.4.1.2 Subsurface Inflows

Natural inflow to the Indio Subbasin includes subsurface inflow from the San Gorgonio Pass Subbasin through the bedrock constriction, subsurface inflow from the Mission Creek Subbasin across the Banning Fault, and subsurface inflow from Desert Hot Springs Subbasin across the Banning and San Andreas Faults. In addition, subsurface inflow occurs from beneath the Salton Sea to deep zones in the Indio Subbasin.

3.4.1.3 Artificial Recharge (Replenishment)

Artificial recharge is accomplished as follows:

- In the western portion of the Indio Subbasin at the WWR-GRF
- In the mid-valley at the PD-GRF

- In the eastern portion of the Indio Subbasin at the TEL-GRF (formerly the Dike 4 Recharge Facility)

The source of replenishment water for the WWR-GRF is State Water Project (SWP) exchange water (i.e., water exchanged for Colorado River water via the Colorado River Aqueduct), while the source of replenishment water for PD-GRF and TEL-GRF is Colorado River water via the Coachella Canal (Canal).

3.4.1.4 Wastewater Percolation

The urban portions of the Indio Subbasin are served primarily by municipal sewer systems that convey wastewater to municipal wastewater treatment plants. A portion of the treated wastewater that is not recycled and reused or discharged to the Coachella Valley Stormwater Channel (CVSC) is disposed into percolation/evaporation ponds.

3.4.1.5 Return Flows from Use

Deep percolation of water applied to agricultural fields, golf courses, and urban landscapes represents a major inflow to the groundwater system and is referred to as irrigation return flow. In addition to the wastewater percolation that occurs at wastewater treatment ponds, some inflow occurs from septic tank/leachfield systems that are used to treat and percolate wastewater. These are grouped with return flows because they are individually small and distributed across rural portions of the Indio Subbasin and a few urban areas without access to sewer systems. There are also some septic systems in areas with access to sewer services that are not connected.

3.4.2 Groundwater Outflows

Indio Subbasin groundwater outflows consist of the following:

- Groundwater pumping
- Subsurface and drain flows to Salton Sea
- Evapotranspiration (ET)

3.4.2.1 Groundwater Pumping

Groundwater pumping is the largest component of outflow from the Indio Subbasin. Groundwater is pumped for agricultural, municipal, golf course, and other beneficial uses within the Indio Subbasin; additional groundwater is pumped from the Indio Subbasin and exported for use within the Plan Area in adjacent Subbasins.

3.4.2.2 Subsurface and Drain Flows to the Salton Sea

In the eastern Indio Subbasin, the confining unit of the upper aquifer impedes deep percolation of applied water, resulting in saturated soil conditions that reduce agricultural productivity. In the 1930s, a network of open drainage ditches was constructed to alleviate this condition. Subsurface (i.e., tile) drainage systems were installed to control high water table conditions and to intercept shallow groundwater with elevated salinity. The CVSC and associated drains receive intercepted shallow groundwater from agricultural fields and convey flows to the Salton Sea. The CVSC and drain system also receive flows of Canal water that exceed requested deliveries (i.e., regulatory water), treated wastewater, and fish farm effluent.

Historically, with relatively high groundwater levels, groundwater naturally flowed toward the Salton Sea. With groundwater level declines in the southeastern Indio Subbasin, the rate of outflow to the Salton Sea decreased. Since about 2015, groundwater level increases have resulted in restoration of net outflow of groundwater to the Salton Sea (see Section 7.2.5).

3.4.2.3 Evapotranspiration

Prior to development, water outflow through ET was significant above the semi-perched aquifer in the southeastern portion of the Coachella Valley. As native landscapes were converted to agriculture, groundwater outflow to ET decreased. Additionally, a portion of the imported water used for groundwater replenishment and/or disposed as wastewater is lost to evaporation.

3.5 Hydrogeologic Cross Sections

Seven hydrogeologic cross sections were developed to illustrate hydrogeologic conditions across the Indio Subbasin. Figure 3-6 shows the locations of the cross sections along with the GRF locations. Cross sections A-A', A'-A'', and A''-A''' (Figures 3-7 through 3-9) form a contiguous 50-mile cross section oriented along the central longitudinal axis of the Indio Subbasin, starting in the San Gorgonio Pass Subbasin in the northwest and ending at the northern shore of the Salton Sea in the southeast.

3.5.1 Longitudinal Cross Sections

Cross Section A-A' (Figure 3-7) runs along the axis of the Indio Subbasin from the San Gorgonio Pass Subbasin to just southeast of Date Palm Drive in Cathedral City in the Palm Springs Subarea. Permeable sands and gravels comprise most of the Subbasin deposits with smaller lenses of fine sand and clay, which increase in frequency to the southeast. Depth to bedrock (bottom of Subbasin) is about 1,400 feet at the northwest edge and increases to the southeast, where depths to bedrock are greater but known only to the extent that depth to bedrock exceeds the maximum depth of local wells.

The Figure 3-7 legend indicates use of two different groundwater elevation sources. The solid triangle indicates the water year (WY) 2024-2025 groundwater elevation, which was derived from contours shown in *Indio Subbasin Annual Report for Water Year 2024-2025* (Indio Subbasin GSAs, 2026). Subsequently, the United States Geological Survey (USGS) has installed three new wells in the area at the northwest end of the cross section where groundwater monitoring points had been sparse. To provide a more accurate depiction of groundwater elevations in this area, groundwater elevations measured in 2025 in the three new wells were used; these are denoted in the legend as "measured 2025 groundwater elevation data from wells projected onto the section," and are shown as open triangles. This new information provides a more accurate depiction of groundwater levels in an area characterized by substantial changes over short distances in ground surface elevation, groundwater levels, and depth to bedrock.

Groundwater flow is from northwest to southeast and groundwater elevations, where data are available, range from greater than 380 feet above mean sea level (msl) near WWR-GRF to about 300 feet above msl near the southeast end of the section. Groundwater elevations are anticipated to exceed 1,100 feet above mean sea level near the San Gorgonio Pass Subbasin; however, data for this specific location were not available for the current analysis, and further discussion of the San Gorgonio Pass area is detailed in Section 3.6. Groundwater elevations and gradients are strongly influenced by groundwater replenishment activities at WWR-GRF.

Cross Section A'-A'' (Figure 3-8) runs along the axis of the Subbasin continuing the A-A' cross section through the northwest portion of the Thermal Subarea. Increasing fine sands and clay lenses are noted when compared with cross section A-A'. The approximate boundary between the upper and lower aquifer is illustrated on the cross section. As illustrated, depths to bedrock are greater than 1,300 feet based on maximum well depths.

Cross section A''-A''' (Figure 3-9) runs along the axis of the Subbasin continuing the A'-A'' cross section through the northwest portion of the Thermal Subarea to the Salton Sea. Increasing fine sands and clay lenses are noted when compared with cross section A'-A''. The approximate boundary between the upper and lower aquifer is illustrated in the cross section. Depths to bedrock are greater than 1,500 feet based on maximum well depths.

Groundwater flow is from northwest to southeast and groundwater elevations range from nearly 830 feet above msl at the northwest end of the Subbasin to at or above the ground surface (at about 220 feet below msl) at the southeast end of the Subbasin. The extent of artesian conditions is shown on Figure 3-9.

Overall, these longitudinal cross sections document a down-valley progression of alluvial sediment from predominantly sand and gravel to increasing fine sands with limited clay lenses and then to the clay-dominated sediments at the Salton Sea. Highlights of this evaluation are summarized below.

- With the significant thickness of coarse sediments and depth to groundwater, the northwestern portion is the primary forebay area for substantial groundwater replenishment, including artificial recharge at WWR-GRF.
- The middle portion is transitional, with increasing fine sand and silt and more clay lenses, recognition of upper and lower aquifers, and decreasing depth to groundwater.
- The distal portion shows a progression to predominant clay, the clear definition of upper and lower aquifers, and shallow groundwater and artesian conditions that would indicate Subbasin discharge under natural conditions.

Figure 3-6 Cross Section Locations

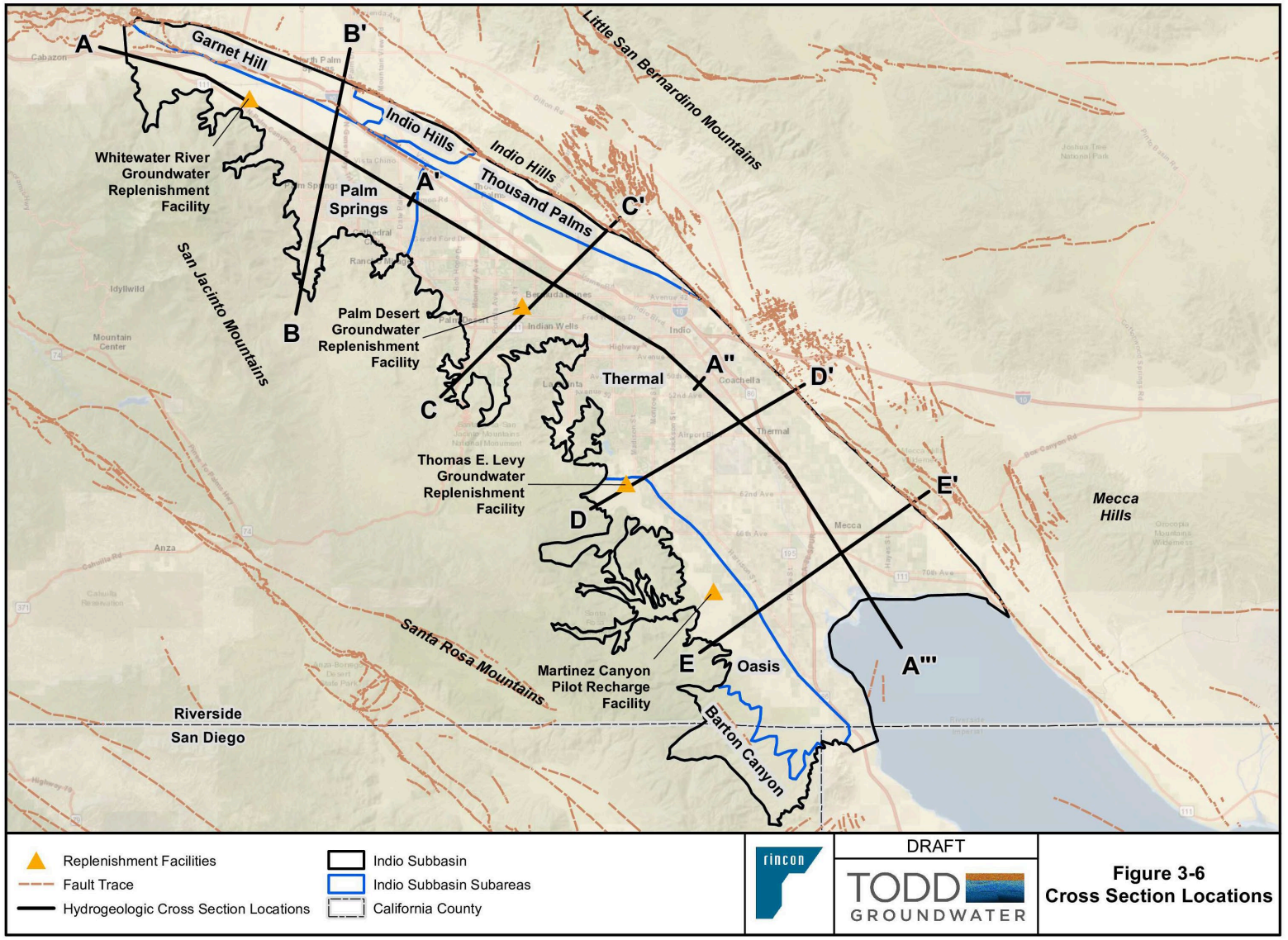


Figure 3-7 Cross Section A to A'

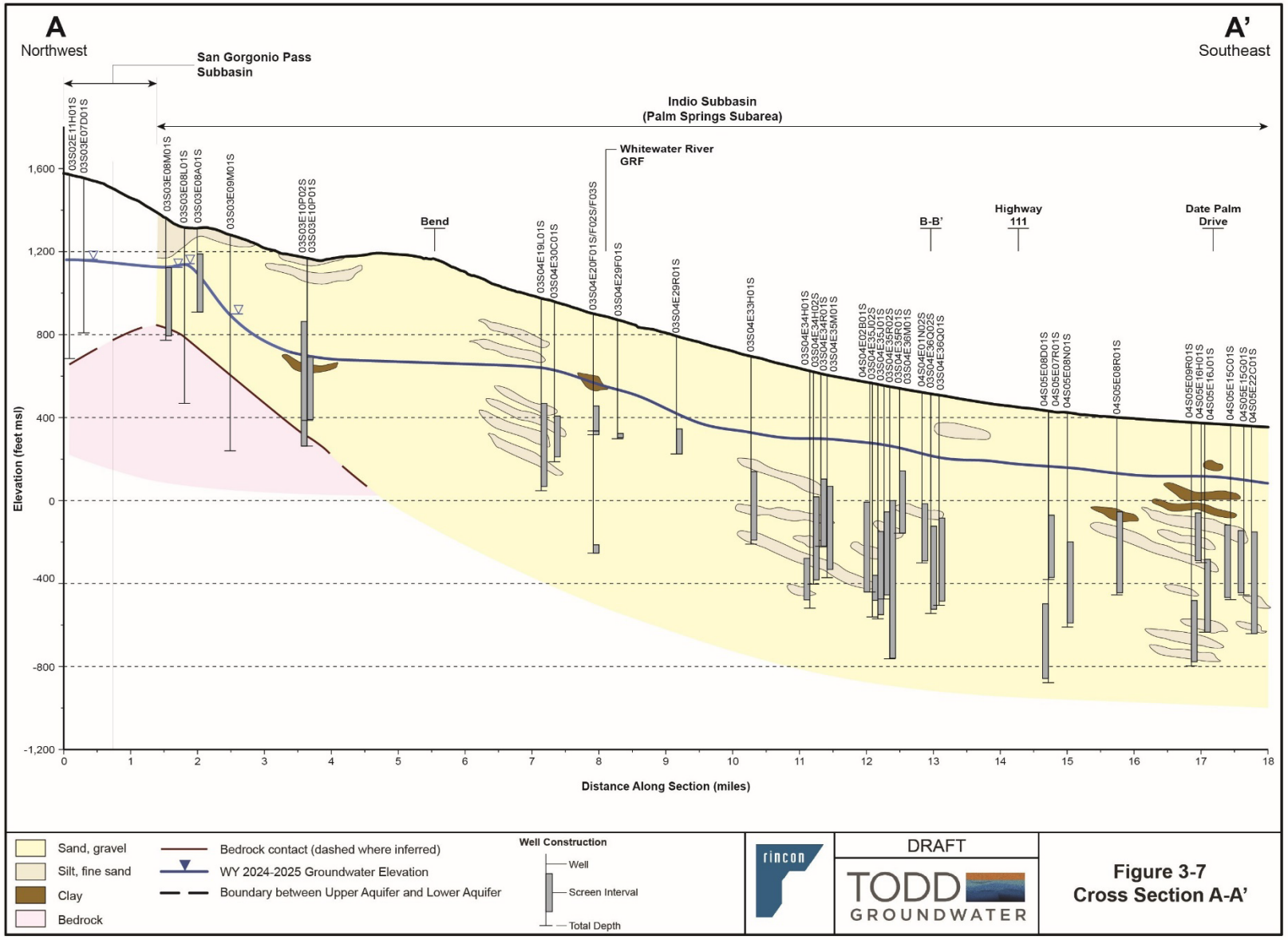


Figure 3-8 Cross Section A' to A''

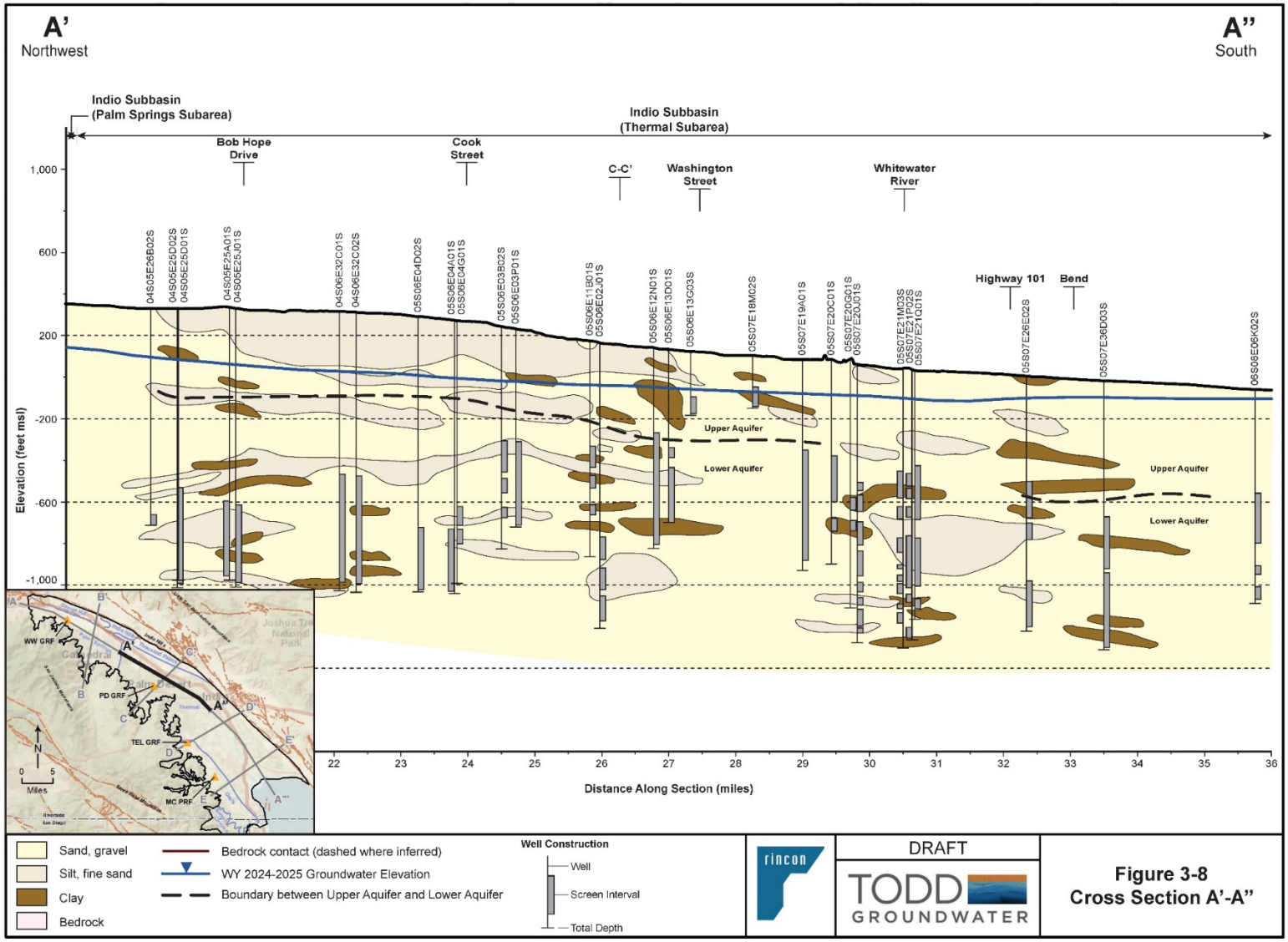
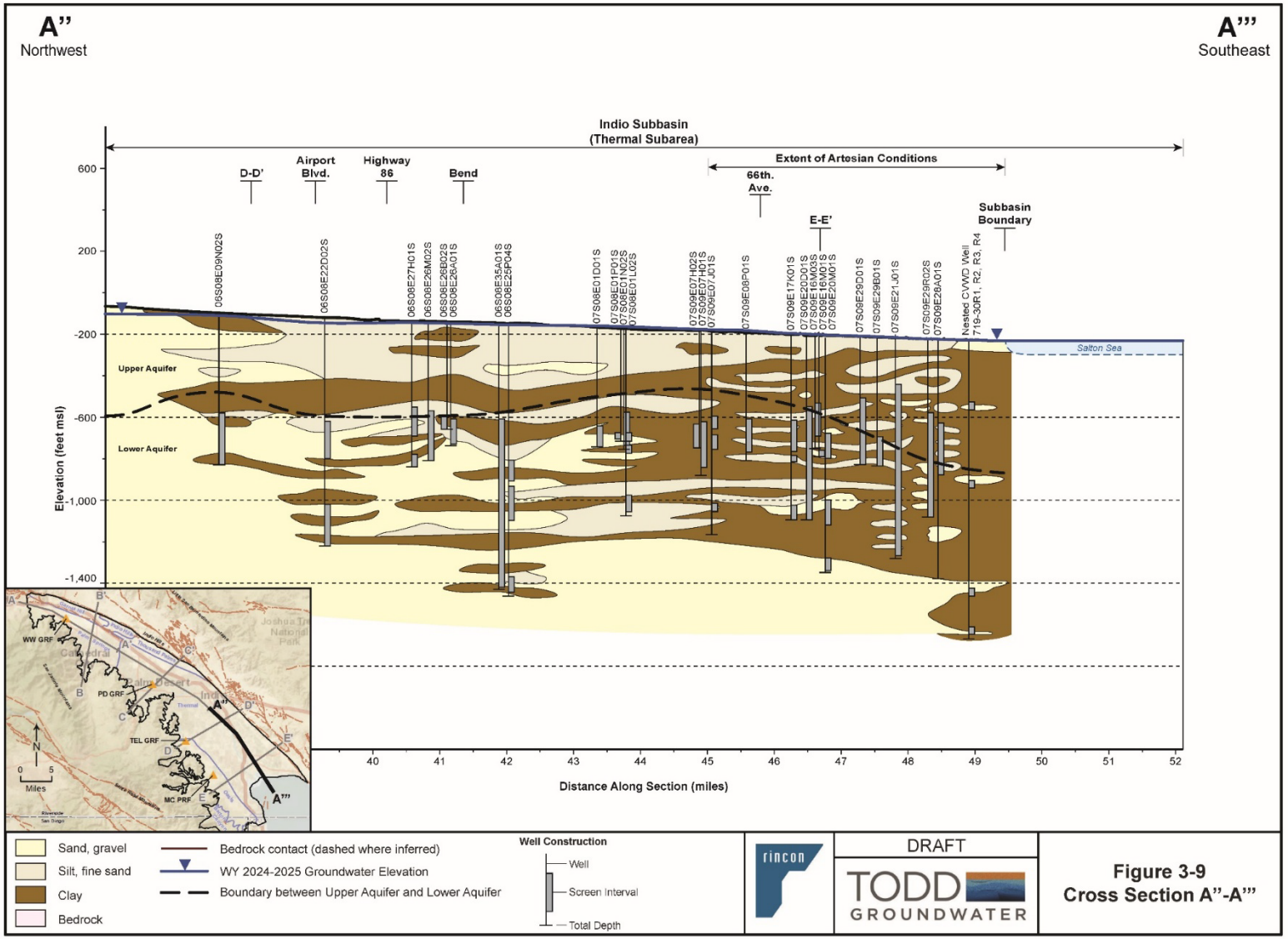


Figure 3-9 Cross Section A'' to A'''



3.5.2 Perpendicular Cross Sections

Cross sections B-B', C-C', D-D', and E-E' (Figures 3-10 through 3-13) were constructed perpendicular to the main axis of the Indio Subbasin. Collectively, these cross sections incorporate hydrogeologic information from the five main Subareas of the Indio Subbasin except the Indio Hills and Barton Canyon Subareas, which are semi-water bearing and generally lack subsurface information. The Subbasin bottom is not well defined but extends beyond the maximum depth of groundwater wells drilled in the Indio Subbasin (i.e., 1,500 feet).

Cross section B-B' (Figure 3-10) runs roughly north-south intersecting cross section A-A'. Cross section B-B' crosses the Palm Springs Subarea in the south and the Garnet Hill Subarea and the Mission Creek Subbasin in the north. Cross section B-B' shows sands and gravels with fine sand and clay lenses, with deposits thickening toward the center of the Indio Subbasin. Displacements of geologic materials along the Garnet Hill and Banning Faults are shown in Figure 3-10. These faults provide the boundaries between the Palm Springs and Garnet Hill Subareas of the Indio Subbasin and between the Indio and Mission Creek Subbasins. Cross section B-B' is roughly perpendicular to the northwest to southeast flow direction in the Indio Subbasin. Significant change in groundwater elevations is shown across the two faults confirming that the faults act as partial barriers to groundwater flow.

Cross section C-C' (Figure 3-11) runs perpendicular to cross section A'-A''. Cross section C-C' crosses the Thermal and Thousand Palms Subareas of the Indio Subbasin in the southwest and the Mission Creek and Desert Hot Springs Subbasins in the northeast. Cross section C-C' shows sands and gravels with increasing frequency of fine sand and clay lenses compared with cross section B-B'. Subbasin sediments thicken toward the center of the Indio Subbasin. Displacement of the Banning Fault provides the boundary between the Indio and Mission Creek Subbasins. Cross section C-C' shows the boundary between the upper and lower aquifers. This cross section is roughly perpendicular to the northwest to southeast flow direction in the Indio Subbasin with depths to water of about 100 feet in the central portion of cross section C-C'.

Cross section D-D' Figure 3-12) runs perpendicular to Cross Section A''-A'''. Cross section D-D' crosses the Oasis and Thousand Palms Subareas of the Indio Subbasin in the southwest and the Desert Hot Springs Subbasins in the northeast. Cross section D-D' shows sands and gravels with increasing frequency of fine sand and clay lenses compared with Cross Section C-C'. Basin sediments thicken toward the center of the Indio Subbasin. The San Andreas Fault provides the boundary between the Indio and Desert Hot Springs Subbasins. Cross section D-D' shows the boundary between the upper and lower aquifers. Cross section D-D' is roughly perpendicular to the northwest to southeast flow direction in the Indio Subbasin with shallow depths to water, typically less than 40 feet in the central portion of the cross section.

Cross section E-E' (Figure 3-13) runs perpendicular to Cross Section A''-A'''. Cross section E-E' crosses the Oasis and Thousand Palms Subareas of the Indio Subbasin in the southwest and the Desert Hot Springs Subbasins in the northeast. Cross section E-E' shows sands and gravels with increasing frequency of fine sand and clay lenses compared with cross section D-D'. Basin sediments thicken toward the center of the Indio Subbasin. The San Andreas Fault is the boundary between the Indio and Desert Hot Springs Subbasins.

Cross section E-E' shows the boundary between the upper and lower aquifers. The cross section is roughly perpendicular to the northwest to southeast flow direction in the Indio Subbasin with shallow depths to water. The extent of artesian conditions is shown in Figure 3-13.

Cross section E-E' shows the boundary between the upper and lower aquifers. The cross section is roughly perpendicular to the northwest to southeast flow direction in the Indio Subbasin with shallow depths to water. The extent of artesian conditions is shown in Figure 3-13.



TEL-GRF utilizes a narrow mountain-front forebay for artificial recharge.

The perpendicular cross sections provide additional insights into the hydrogeology of the Indio Subbasin as listed below.

- The relatively narrow, bedrock or fault-bounded character of the Indio Subbasin in the northwest
- The substantial thickness of the Subbasin that occurs along the eastern margin of the Indio Subbasin or along the Subbasin axis
- The greater proportion of coarse-grained sediments along the western mountain front and limit of regional clay to the west, indicating a narrow mountain-front forebay for natural recharge and for artificial recharge (e.g., TEL-GRF on Section D-D', Figure 3-12).

Figure 3-10 Cross Section B to B'

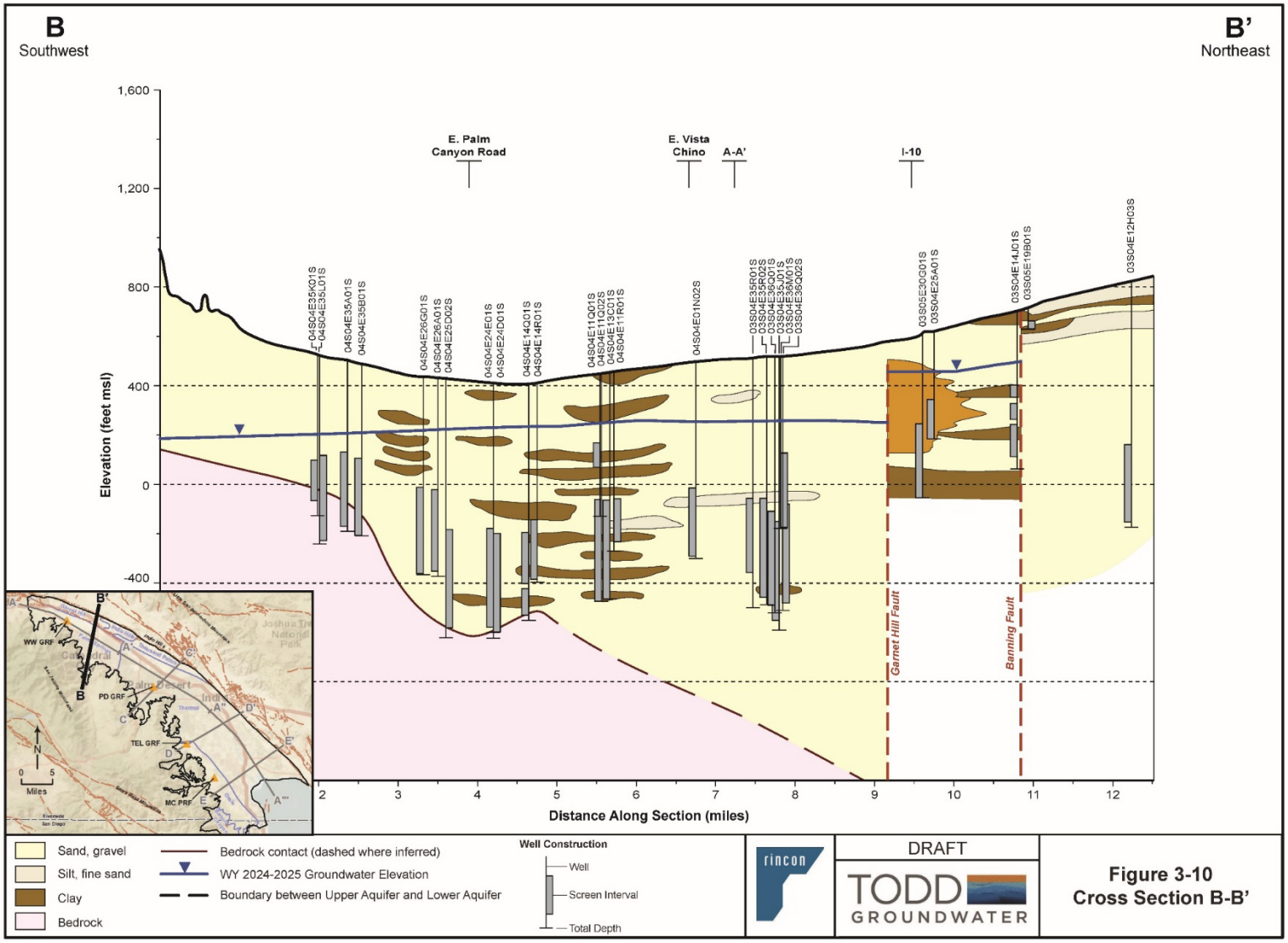


Figure 3-11 Cross Section C to C'

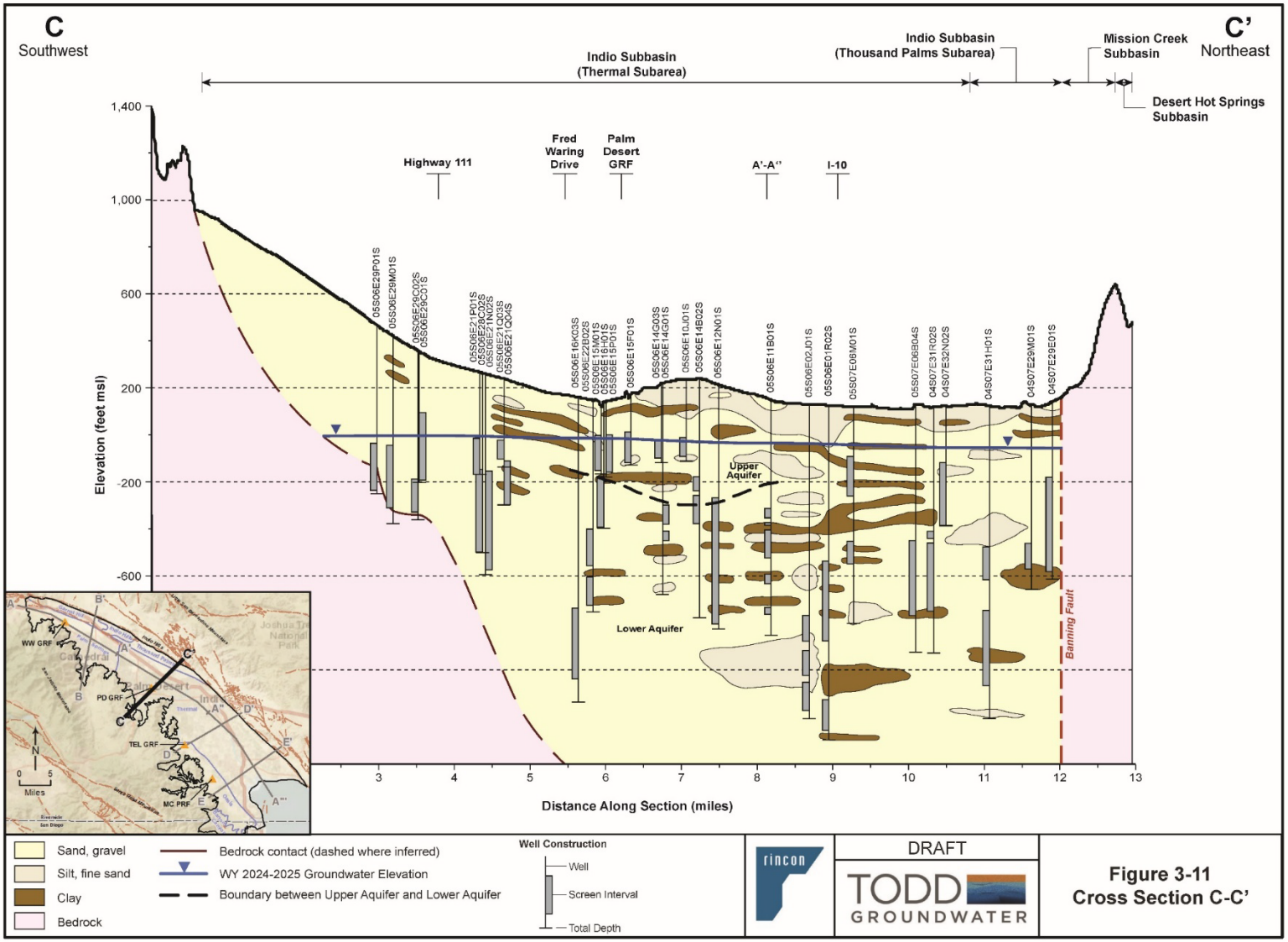


Figure 3-12 Cross Section D to D'

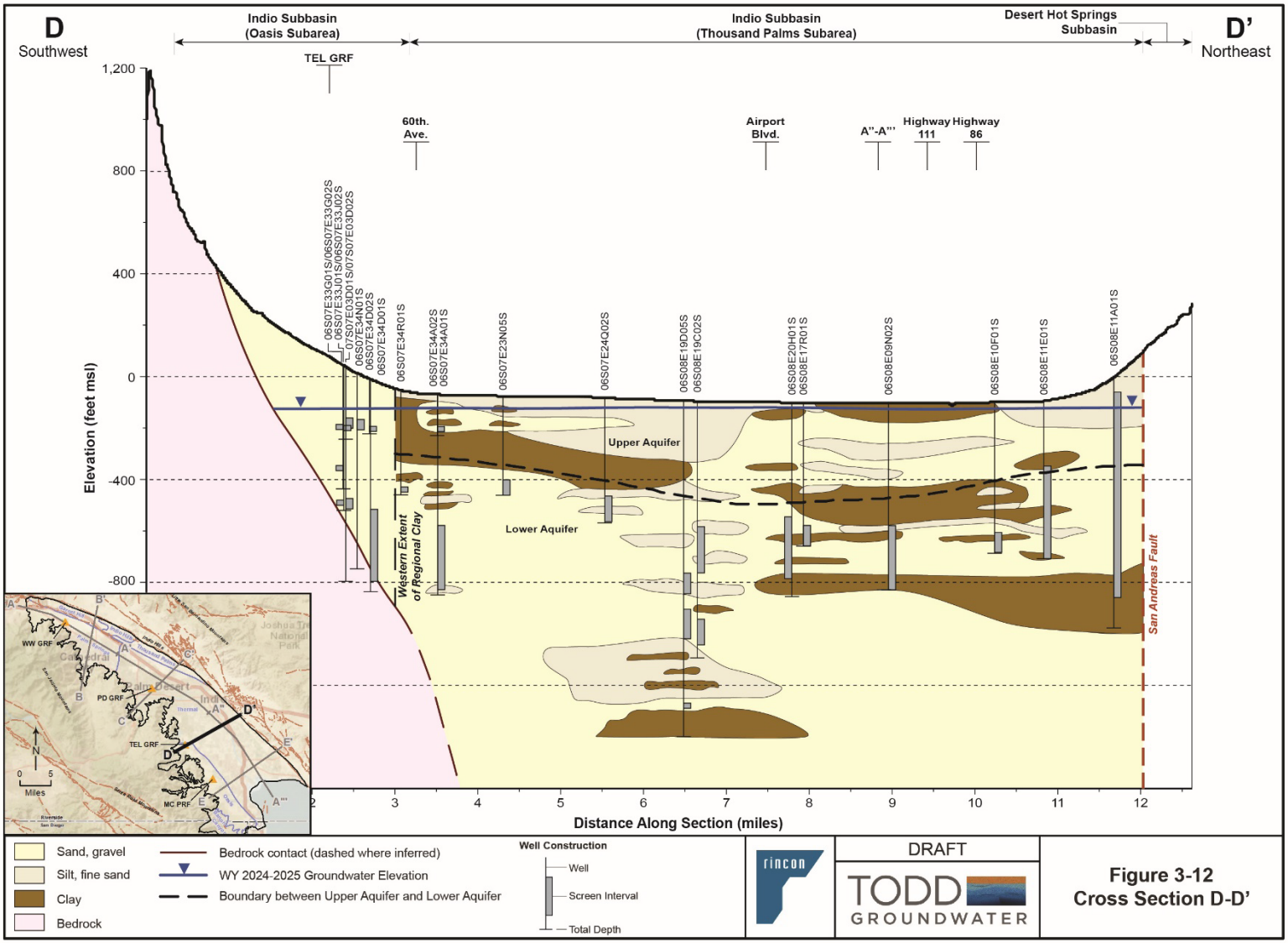
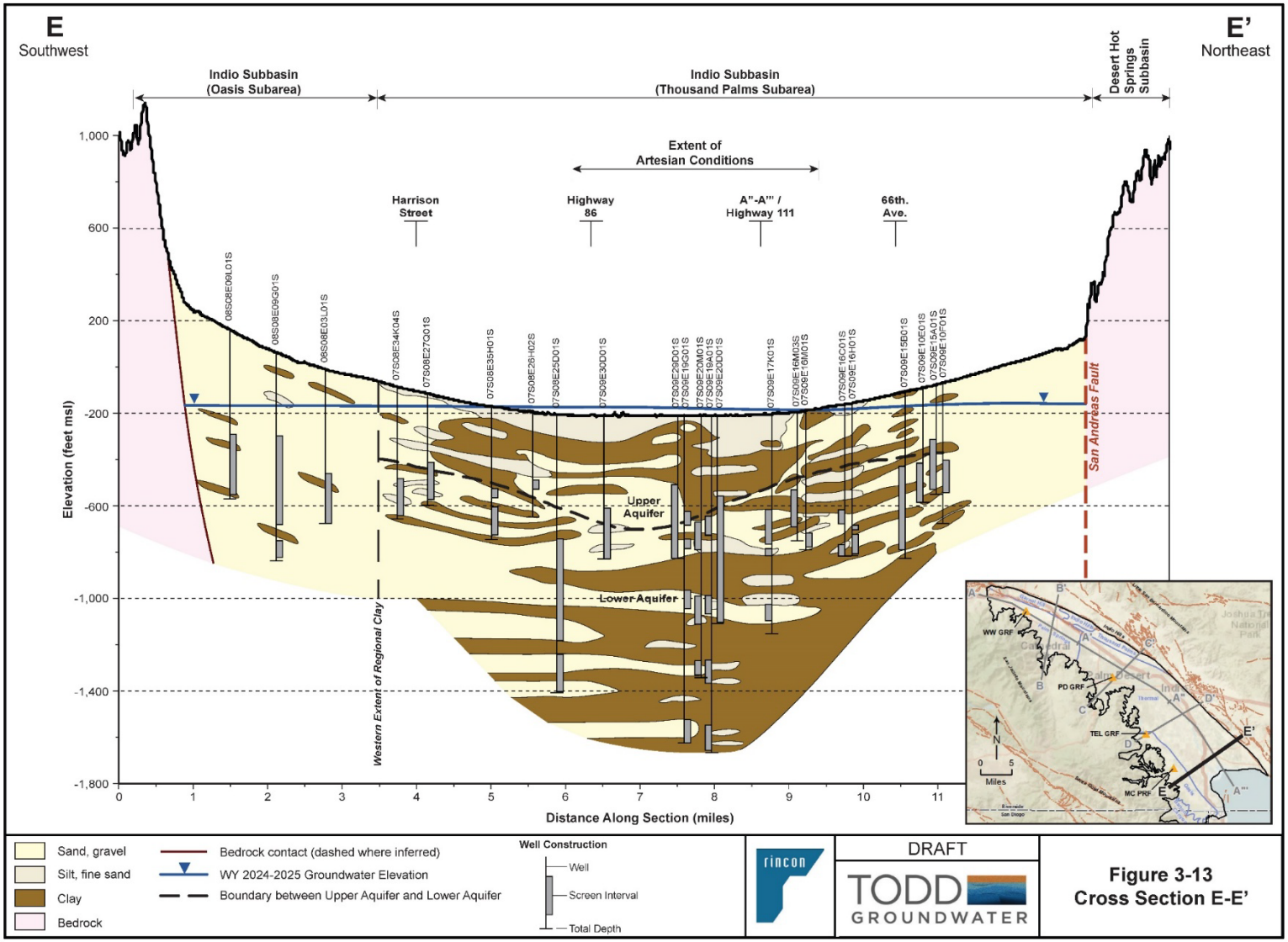


Figure 3-13 Cross Section E to E'



3.6 Indio and San Gorgonio Pass Subbasin Boundary Flow Reconciliation

To understand the hydrogeologic setting of the Indio and San Gorgonio Pass (SGP) Subbasin boundary, Indio and SGP Subbasin teams worked together to establish a shared hydrogeologic understanding, perform independent analytical flow estimates, and support alignment of future numerical groundwater flow models. A technical memorandum was prepared by Todd Groundwater in November 2025 to detail a collaborative effort between the Subbasins, and is included as Appendix 3-A. The primary purpose of this evaluation was to reconcile discrepancies in groundwater flow calculations along their shared hydrogeologic boundary and outline improvements for future modeling.

Groundwater naturally flows from northwest to southeast—from the higher-elevation SGP Subbasin into the lower-elevation Indio Subbasin—although local, temporary flow reversals can occur due to intense artificial replenishment at the WWR-GRF situated just southeast of the boundary. The boundary area behaves as a narrow pass roughly one mile wide, and recent data from USGS monitoring wells indicate that the maximum thickness of the unconsolidated alluvial aquifer at the center of the pass is roughly 900 feet before encountering crystalline bedrock. The complex San Andreas Fault system, including the Banning, Garnet Hill, and San Gorgonio Pass Thrust faults, acts as a partial lateral barrier to flow. Data from nested wells show a massive groundwater cascade with steep vertical and horizontal gradients caused by a buried bedrock ridge near the subbasin boundary. Regional gravity surveys and Airborne Electromagnetic (AEM) resistivity data indicate how the sediment basin fill thins near the pass and confirm the presence of high-resistivity, coarse-grained materials like sands, gravels, and cobbles in the subbasin transition area.

To independently evaluate the potential flow outside numerical modelling, Darcy's Law was used to calculate boundary fluxes using newly available field data gathered between 2019 and 2025. These calculations combined a saturated cross-sectional area modeled realistically as an inverted triangle based on bedrock slopes, an average hydraulic gradient of 0.09 ft/ft, and a range of realistic hydraulic conductivity values. The analytical calculations yielded an average estimated boundary discharge of 22,420 AFY when applying the SGP model's hydraulic conductivity, and a variability analysis confirmed that the SGP model's higher flow estimates are well-supported by observed field data.

Based on the technical consensus established in the 2025 memorandum, this *2027 Alternative Plan Update* implements several critical modeling improvements to better align the two subbasin frameworks, described in Chapter 7, *Numerical Model and Plan Scenarios*.

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4 Current and Historical Groundwater Conditions

This chapter describes the current and historical groundwater conditions in the Indio Subbasin. The Indio Subbasin is the primary source of groundwater supply for the Plan Area (see Figure 2-1 in Chapter 2, *Plan Area*) and is a California Department of Water Resources (DWR)-designated Subbasin (No. 7-021.01) of the Coachella Valley Groundwater Basin. Adjoining groundwater basins and subbasins are shown in Figure 1-1 in Chapter 1, *Introduction*. While the Plan Area overlies portions of the Desert Hot Springs Subbasin and the Orocopia Valley, Chocolate Valley, and West Salton Sea basins, these are not major sources of regional groundwater supply.

Groundwater conditions are described with reference to the six sustainability indicators identified in the Sustainable Groundwater Management Act (SGMA). These include:

1. Groundwater elevations
2. Groundwater storage
3. Land subsidence
4. Groundwater quality
5. Seawater intrusion
6. Interconnected surface water and groundwater dependent ecosystems

Descriptions of groundwater conditions focus on the period 1990 through 2025. While historical data also are provided (for example, historical change in groundwater storage from 1970), this 35-year period encompasses varying climatic conditions (including statewide drought) and represents current operations relative to water importation, groundwater replenishment, water recycling, and water conservation, among other management actions. This period is also consistent with the update of the numerical groundwater flow model. The original numerical model was calibrated from 1936 to 1996 and was updated through 2025 as part of this *2027 Alternative Plan Update*.

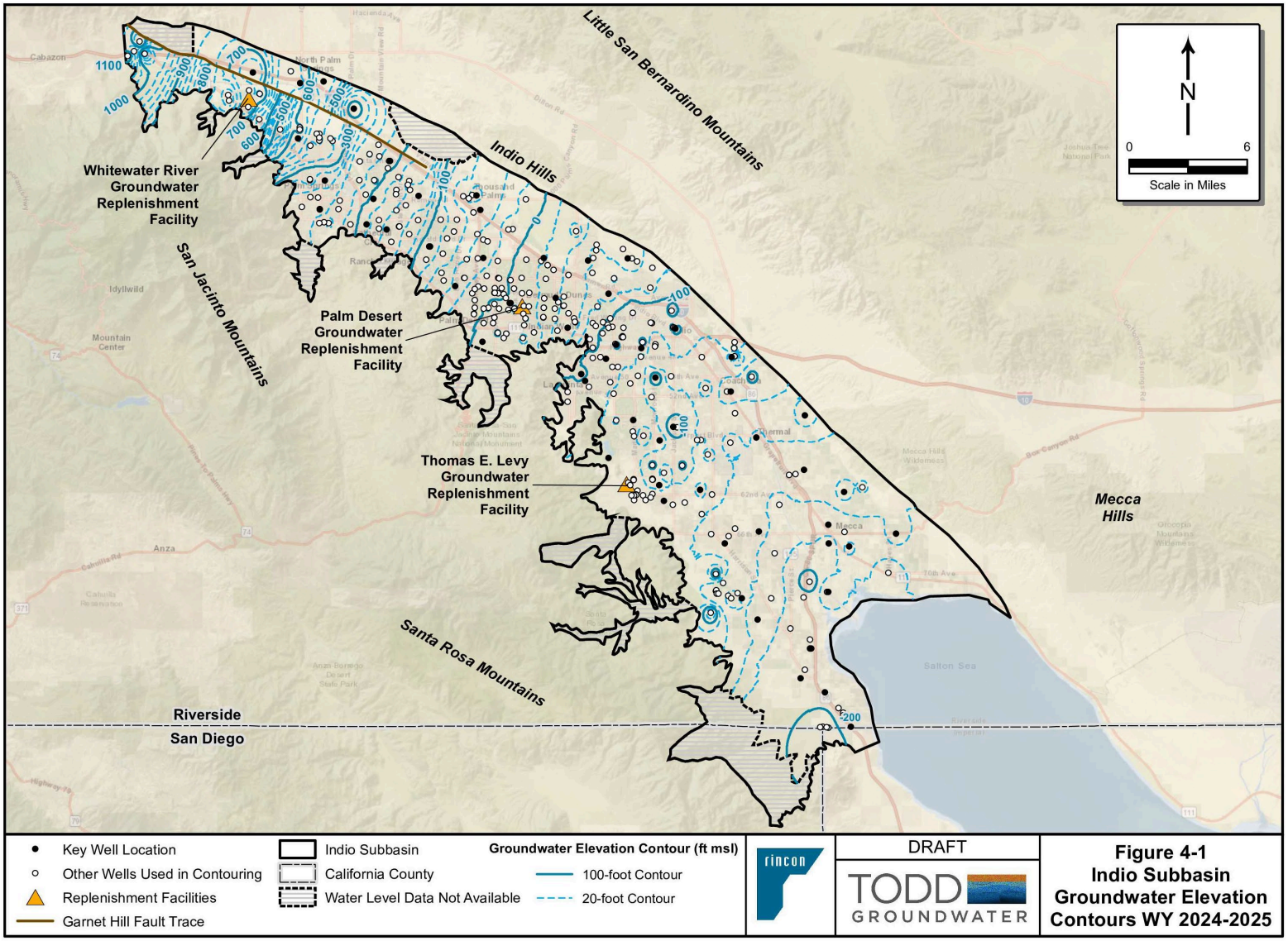
4.1 Groundwater Elevations

This section summarizes groundwater conditions in terms of elevations, flows, trends over time, vertical groundwater gradients and depth to groundwater, as well as regional groundwater level changes. The groundwater elevation monitoring program is described briefly in Chapter 2, *Plan Area*.

4.1.1 Groundwater Elevations, Flow, and Trends

Figure 4-1 shows the Water Year (WY) 2024-2025 groundwater elevation contour map for the Indio Subbasin. Groundwater elevations of the principal aquifer are averaged over the water year; this is most representative, as local groundwater levels do not exhibit strong seasonal trends. As shown on the figure, regional groundwater flows are in a northwest-to-southeast direction through the Indio Subbasin.

Figure 4-1 Indio Subbasin Groundwater Elevation Contours WY 2024-2025





Recharge at TEL-GRF commenced in 2009.

Groundwater elevations range from greater than 1,200 feet mean sea level (msl) east of the San Gorgonio Pass Subbasin in the northwest to approximately -200 feet msl in the southeast along the northern shoreline of the Salton Sea. The hydraulic gradients across the Indio Subbasin in WY 2024-2025 were typically steeper in the northwest, flattening downgradient to the southeast. Groundwater elevations and gradients are influenced by groundwater replenishment activities near the Whitewater River Groundwater Replenishment Facility (WWR-GRF) and Thomas E. Levy Groundwater Replenishment Facility (TEL-GRF). Water level contours around the TEL-GRF form a broad, gently sloping groundwater mound, as indicated by the wider contour spacing relative to areas to the north and south. This pattern is consistent with sustained recharge operations and indicates lower hydraulic gradients in the immediate vicinity of the facility compared to adjacent areas (Figure 4-1). Since initiation of Phase 1 operations of the Palm Desert Groundwater Replenishment Facility (PD-GRF) in 2019, groundwater levels in the vicinity of the PD-GRF have generally stabilized and recovered from the historical lows observed during the mid-2010s. Although a distinct recharge-induced groundwater mound is not evident in the water level contours, hydrographs from nearby monitoring wells (Figure 4-2 and Figure 4-3) indicate sustained groundwater level increases consistent with the effects of recharge operations that began in 2019 . Geological faults, constrictions, and pumping also affect localized hydraulic gradients, which can be observed in the north along the Garnet Hill Fault Trace (Figure 4-1). Measured groundwater elevations are significantly higher on the northern side of the fault, 500 to 700 feet, than the southern side, 200 to 340 feet.

Figure 4-2 shows locations of wells with long-term hydrographs. Long-term water level hydrographs for selected wells distributed across the Indio Subbasin are presented on Figure 4-3 to Figure 4-5 to illustrate groundwater elevation trends over time in the West Valley, East Valley, and confined area. Full-sized hydrographs are provided in Appendix 4-A. The surface elevation of each well is shown in the hydrographs as a horizontal line color-coded to match the respective hydrograph. The hydrographs depict the groundwater level response to historical pumping and water management activities identified and implemented since preparation of the *2002 Coachella Valley Water Management Plan* (*2002 CVWMP*) (CVWD, 2002).

Figure 4-3 shows hydrographs for wells in the West Valley area. The hydrographs show that groundwater levels have responded directly and positively to historical replenishment activities at the WWR-GRF, with groundwater levels rising by as much as 150 feet since 2000. Groundwater elevations in the Palm Springs/Cathedral City area have remained relatively stable over time with more moderate positive responses to upgradient WWR-GRF replenishment activities. Groundwater levels in the Palm Desert area have stabilized since 2005 and increased slightly since 2010. A common trend in the West Valley area is the occurrence of groundwater level lows between 2010 and 2015. After 2015, a general, gradual rise of water levels are observed in nearly all wells.

Figure 4-4 shows hydrographs for the East Valley, where groundwater elevations in Indio, Coachella, Bermuda Dunes, and La Quinta have stabilized since 2005 and increased slightly in the La Quinta area since 2010. The largest groundwater elevation increases since 2015 are observed in wells closer to the Salton Sea. Groundwater elevations near Thermal and Mecca have responded positively to replenishment activities at the TEL-GRF, source substitution programs, water conservation programs, and other projects and management actions (PMAs).

Figure 4-2 Wells with Long-Term Hydrographs

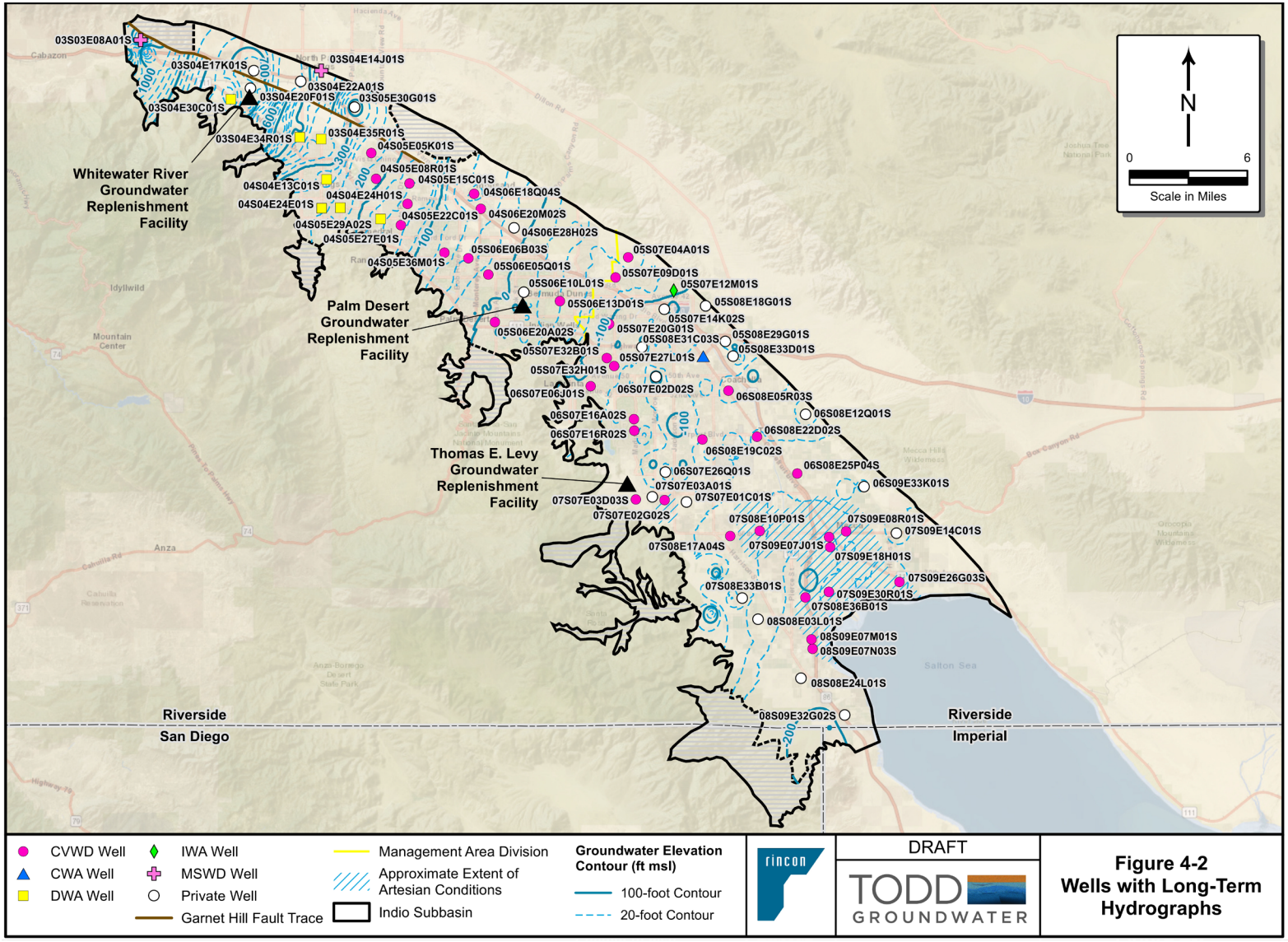


Figure 4-3 Water Level Hydrographs West Valley

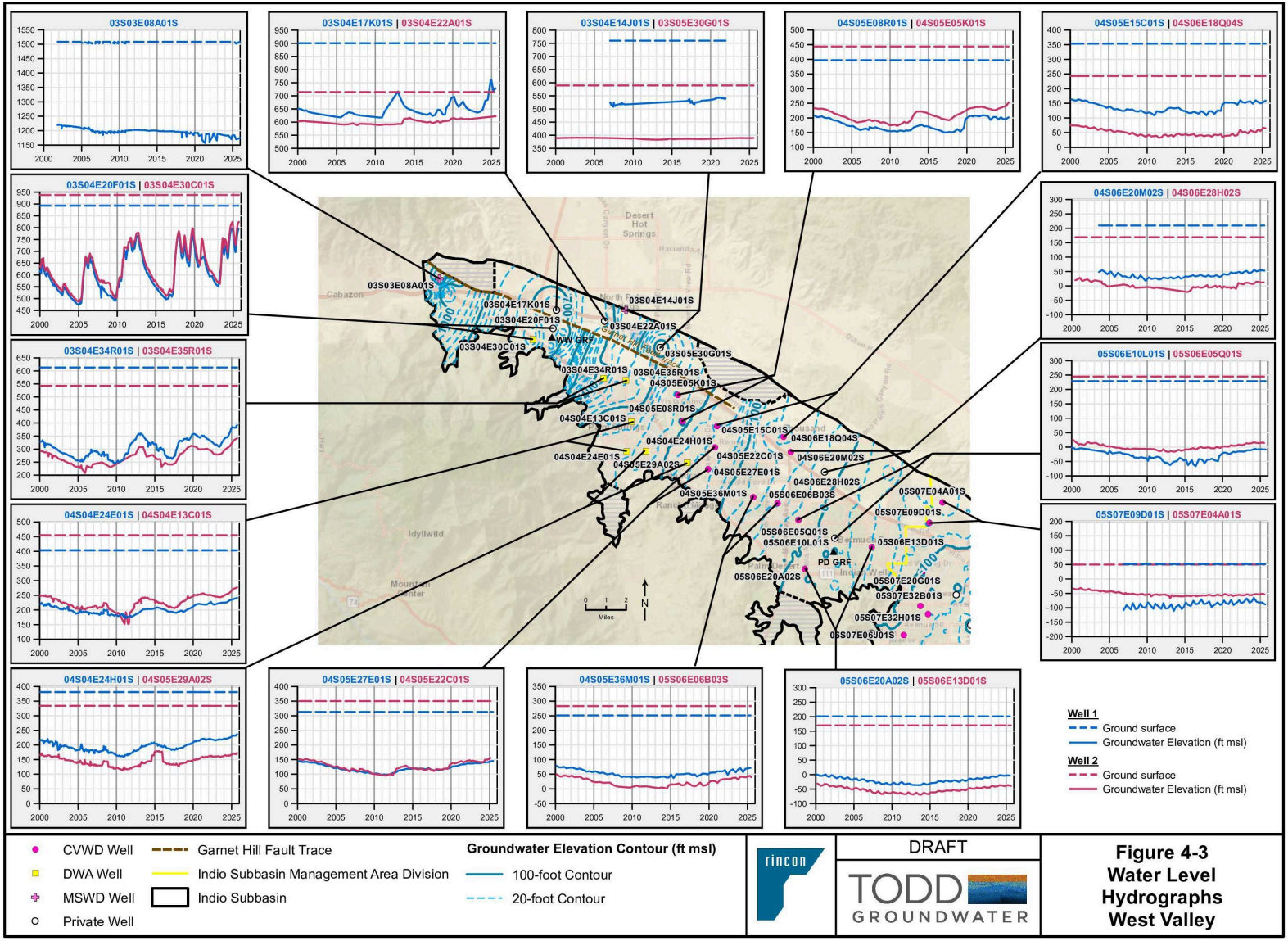
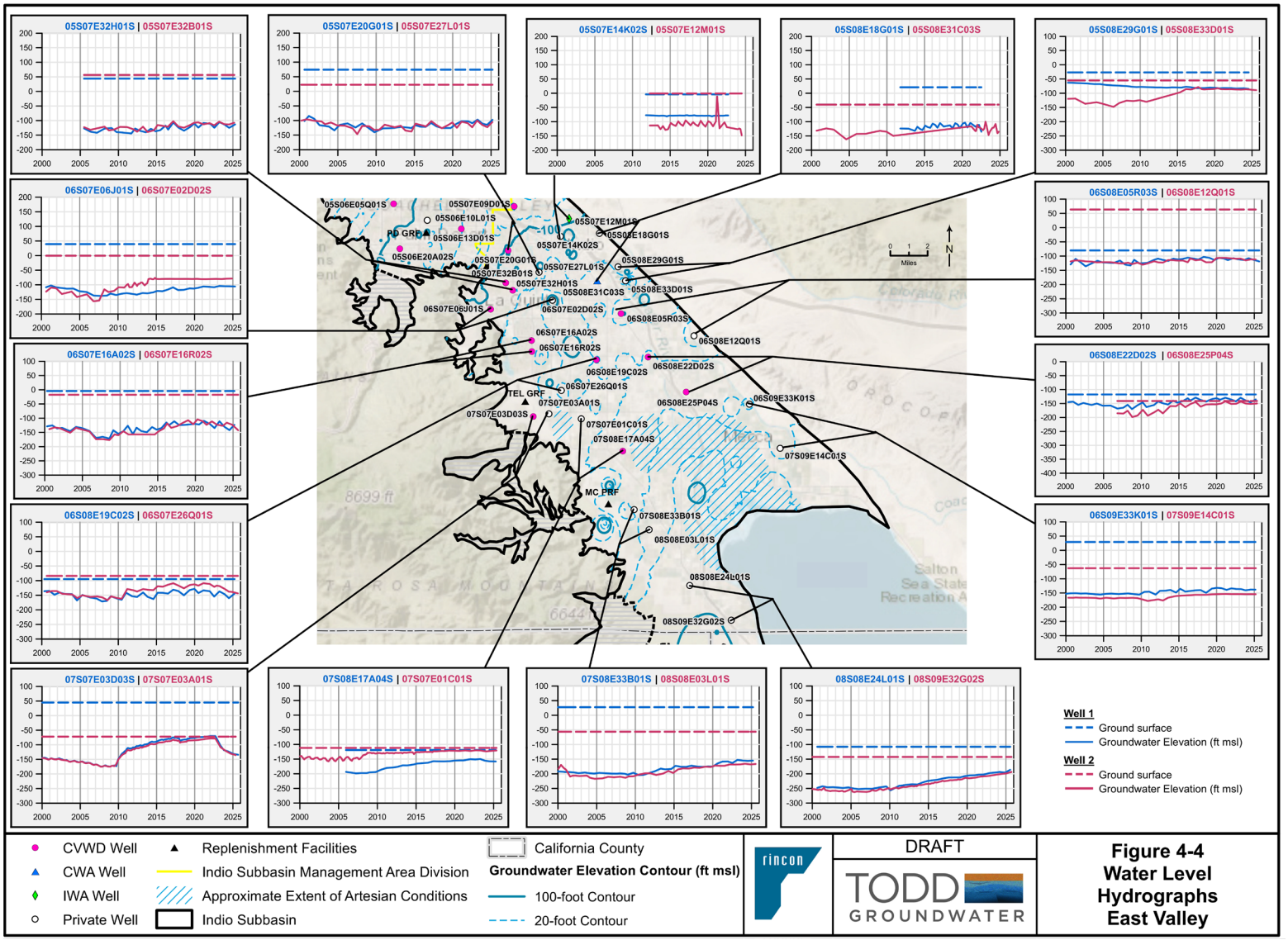


Figure 4-4 Water Level Hydrographs East Valley



4.1.2 Vertical Groundwater Gradients (Artesian Conditions)

Historically, eastern portions of the Indio Subbasin experienced artesian conditions with sufficient pressure to cause groundwater levels in wells to rise above the ground surface; such artesian-flowing wells attracted early settlers to farm in this area. Artesian conditions declined in the late 1930s as a result of increased local groundwater pumping. The completion of the Coachella Canal by the United States Bureau of Reclamation (USBR) in 1949 brought Colorado River water to the eastern Coachella Valley for agricultural irrigation purposes. Artesian conditions returned in the early 1960s through the 1980s, as imported Colorado River water was substituted for groundwater production. Beginning in the late 1980s, groundwater use increased again, resulting in declining water levels and loss of artesian conditions. Groundwater management programs (including groundwater replenishment, source substitution, and water conservation) are restoring local groundwater levels, and artesian conditions have recurred in the eastern Indio Subbasin. Benefits associated with artesian conditions include reduced groundwater pumping costs and water quality protection of the deeper, confined production zone aquifers.

Figure 4-5 shows the location of ten artesian well hydrographs through WY 2024-2025. Wells closest to and downgradient of the TEL-GRF have responded to replenishment activities since they began in 2009 and have remained relatively stable since 2015. From 2015 onwards, groundwater levels have been near or at ground surface.

4.1.3 Groundwater Occurrence (Depth to Water)

Figure 4-6 shows averaged depth to water contours for the Indio Subbasin for WY 2024-25. Greatest depths to water are observed in the western margins of the basin (250 to 300 feet). The effect of the Garnet Hill Fault is indicated by a change in depth to groundwater across the fault. Depth to groundwater ranges from 100 to 160 feet on the northern side of the fault and from 120 to 220 feet on the southern side of the fault, respectively. Depths to groundwater generally decrease to about 100 to 250 feet in the mid-Subbasin area and then to zero or above the ground surface in artesian wells near the Salton Sea (see Figure 4-5 for approximate extent of artesian conditions). In addition to relatively shallow or artesian conditions in the principal aquifer, the East Valley (Thermal Subarea) is characterized by a shallow semi-perched aquifer (see extent in Figure 3-5 in Chapter 3, *Hydrogeologic Conceptual Model*). The occurrence of shallow groundwater in the East Valley led to construction of an agricultural drain system, shown in Figure 2-5 of Chapter 2, *Plan Area*. As described in the *2010 CVWMP Update*, the shallow groundwater is associated with a risk of liquefaction, a process by which sediments below the water table lose strength and deform (typically due to seismic shaking) and can cause damage to infrastructure. The *Riverside County General Plan* has recognized liquefaction, mapped areas of risk, and defined protective land use policies (County of Riverside, 2020).

4.1.4 Groundwater Elevation Change

Figure 4-7 shows a 16-year groundwater elevation change map for the Indio Subbasin, including two zoomed-in maps to show water level changes for the numerous wells in the mid-valley area and TEL-GRF vicinity. The change in groundwater elevation is based on the difference between the average groundwater elevations for wells monitored by Coachella Valley Water District (CVWD), Coachella Water Authority (CWA), Desert Water Agency (DWA), and Indio Water Authority (IWA) between WY 2008-2009 and WY 2024-2025 (16 years).

Figure 4-5 Water Level Hydrographs Artesian Wells

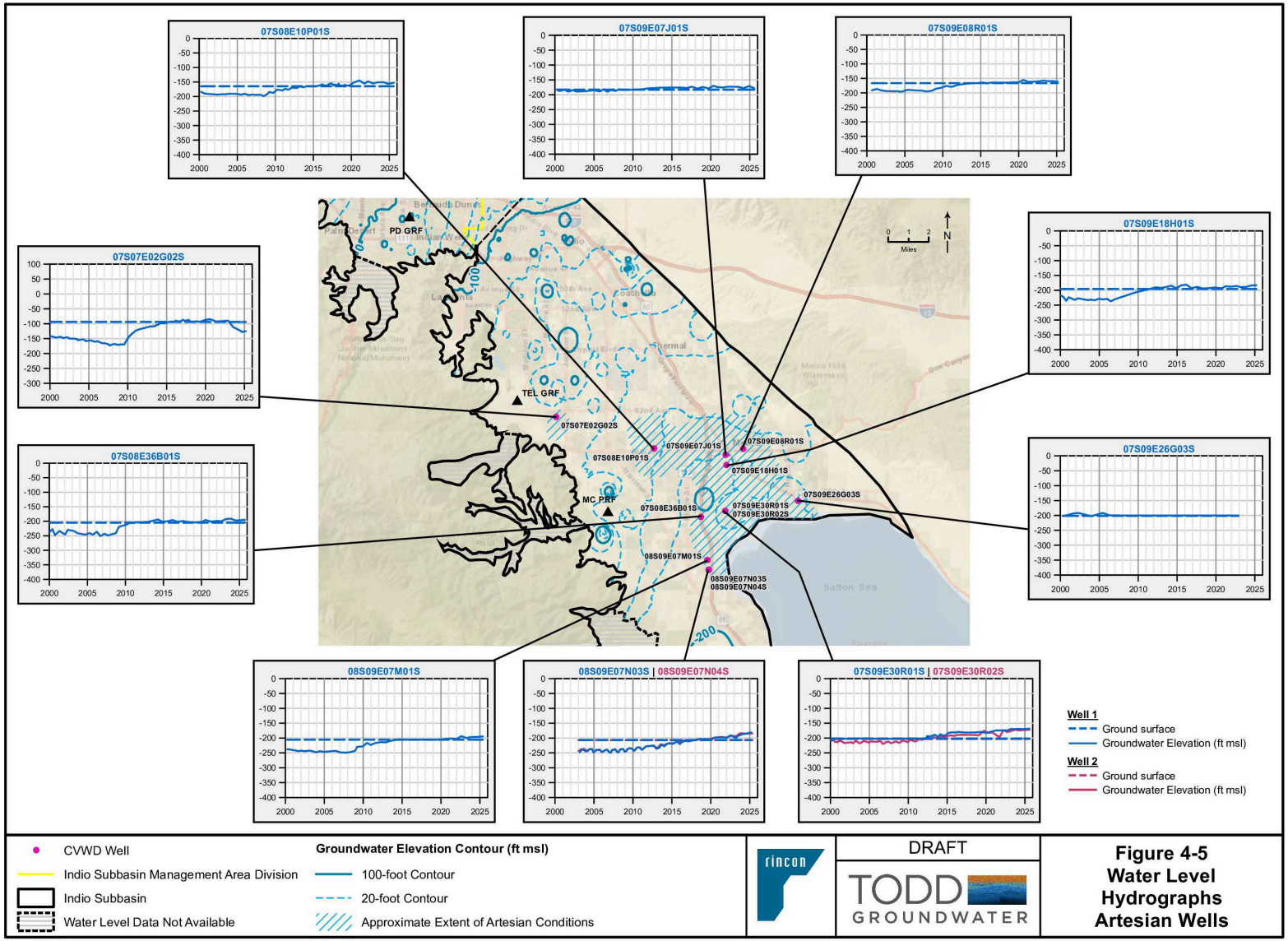


Figure 4-6 Depth to Water Contours

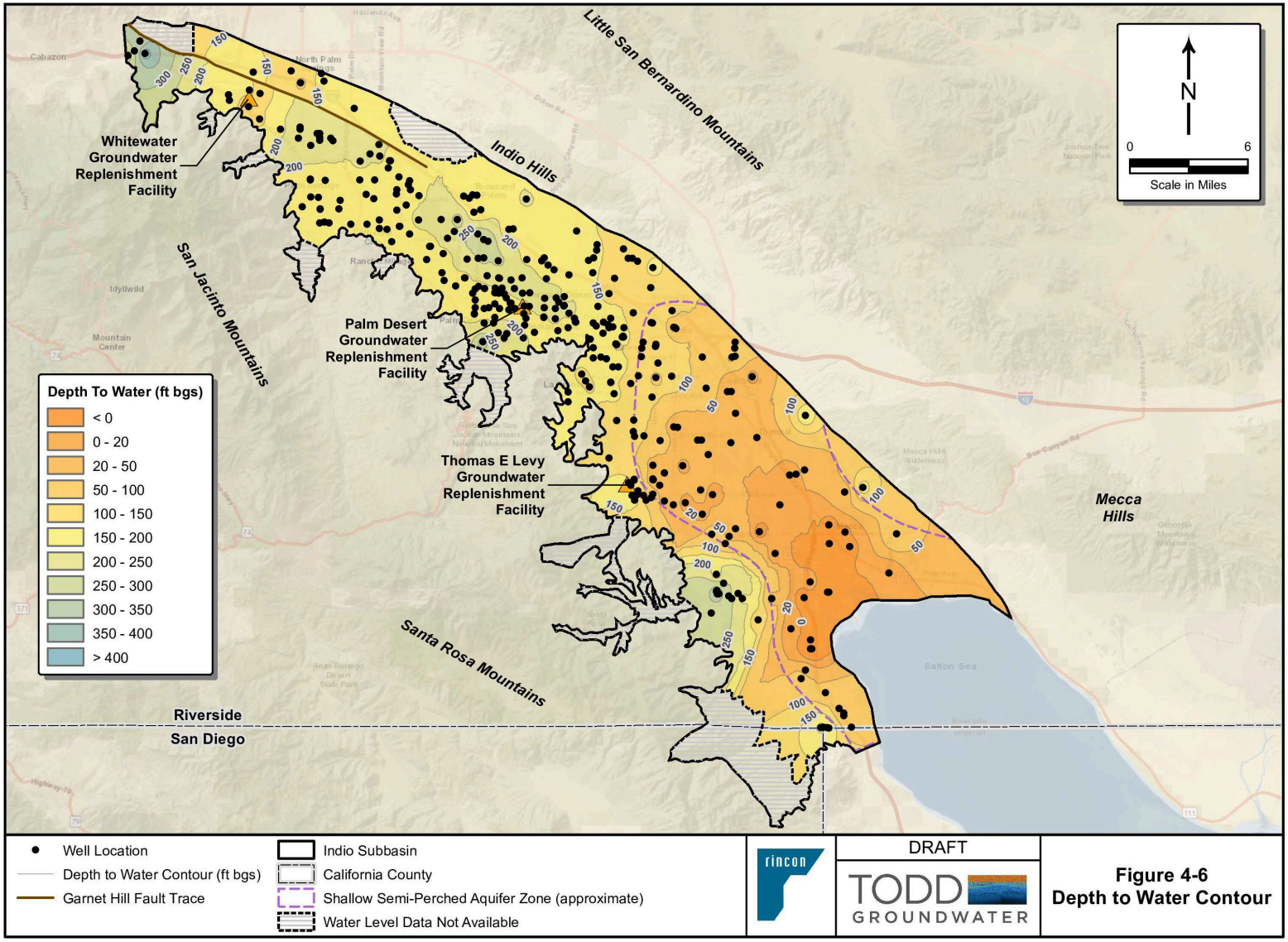
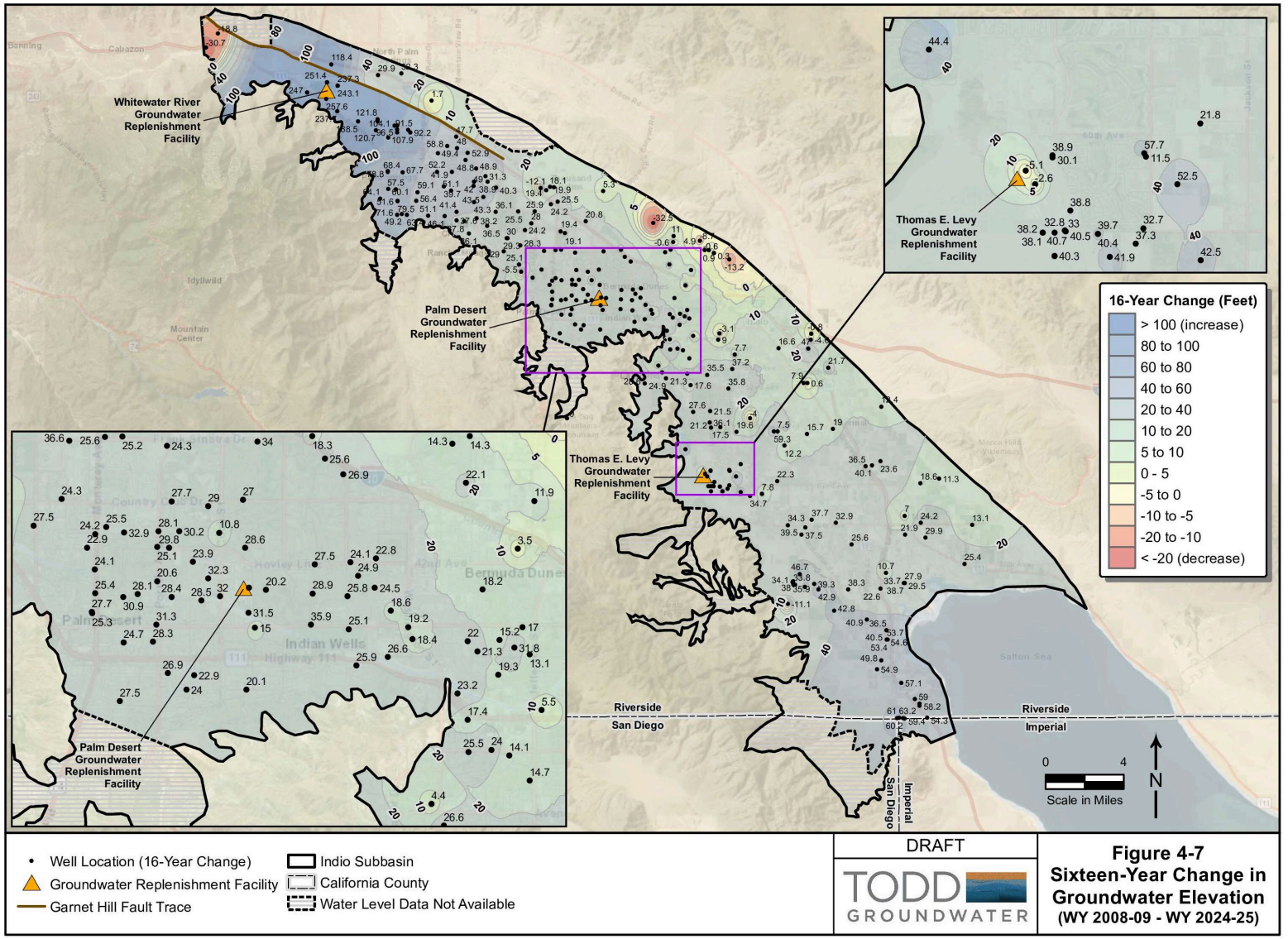


Figure 4-7 Sixteen-Year Change in Groundwater Elevation (WY 2008-2009 to WY 2024-2025)



Groundwater levels in the Indio Subbasin have increased significantly over the 16 years from WY 2008-2009 to WY 2024-2025. The largest groundwater increases are observed in the vicinity of the WWR-GRF and TEL-GRF, with water level increases as much as 200 feet and 50 feet in the immediate vicinity of the two facilities, respectively. In the mid-valley area near Palm Desert, Indian Wells, and La Quinta, groundwater level increases have ranged from 20 to 30 feet, reflecting the benefits of source substitution and conservation programs. Some localized groundwater level declines as much as 30 feet are observed in the Palm Desert area to the northeast of Bermuda Dunes. Replenishment at the PD-GRF began in February 2019 and has raised groundwater levels in the mid-valley region by 23.1 feet in nearby wells, shown in the inset map in Figure 4-7. Groundwater levels in the southeastern portion of the Indio Subbasin have increased between 10 and 60 feet, reflecting storage benefits from replenishment operations at the TEL-GRF and decreased pumping, with higher increases observed in the southernmost portion of the Subbasin.

4.2 Changes in Groundwater Storage

The Indio Subbasin Annual Reports and Engineer's Reports on Water Supply and Replenishment Assessment have previously assessed annual changes in groundwater storage. These assessments are intended to detect and track overdraft, if present, as a basis for sustainability planning. This section briefly summarizes Subbasin changes in groundwater storage; a more detailed numerical description is in Chapter 7, *Numerical Model and Plan Scenarios*.

Long-term sustainability is typically assessed based on changes in groundwater storage over a historical period on the order of 10 to 20 years including wet and dry periods. Figure 4-8 shows the annual change in groundwater storage from 1970 through WY 2024-2025 (gray columns). The starting year of 1970 was selected because it is 3 years before imported water replenishment commenced in the Indio Subbasin.

Figure 4-8 also shows the annual inflows, outflows, groundwater production, and 10- and 20-year running-average changes in groundwater storage. As shown on the chart, annual inflows to the Indio Subbasin (dark blue line) are highly variable with years of high inflows generally corresponding to wet years when State Water Project (SWP) delivery volumes were greater. Higher inflows in the mid-1980s occurred when Metropolitan Water District of Southern California (MWD) commenced large-scale advance water deliveries to the Indio Subbasin. After about 1989, the chart shows an extended period of decline until about 2009. Since 2009, both the 10- and 20-year running average changes in storage have shown general upward trends, while noting that the 10-year average showed a short-term decline between 2019 and 2023, with subsequent recovery to near-2019 levels by Spring 2025.

Figure 4-9 shows the cumulative change in storage since 1970. The goal of the *Indio Subbasin Alternative Plan* is to eliminate groundwater overdraft, not to restore the Subbasin to historical conditions. Since 2009, the Indio Subbasin has recovered approximately 1.2 million acre-feet (AF) of groundwater in storage, or about 65 percent of the cumulative depletion observed from 1970 to 2009.

Figure 4-8 Historical Change in Groundwater Storage in Indio Subbasin

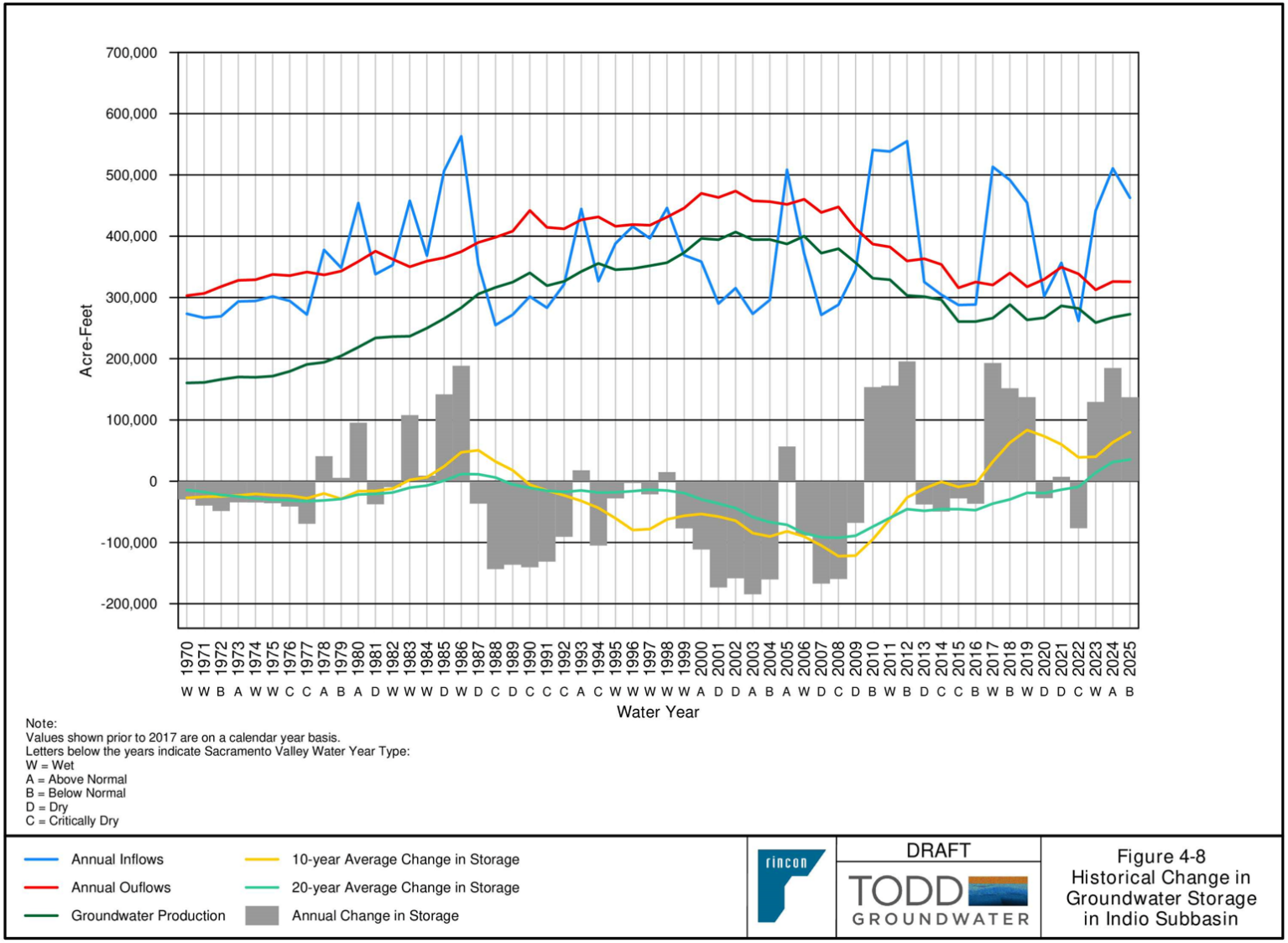
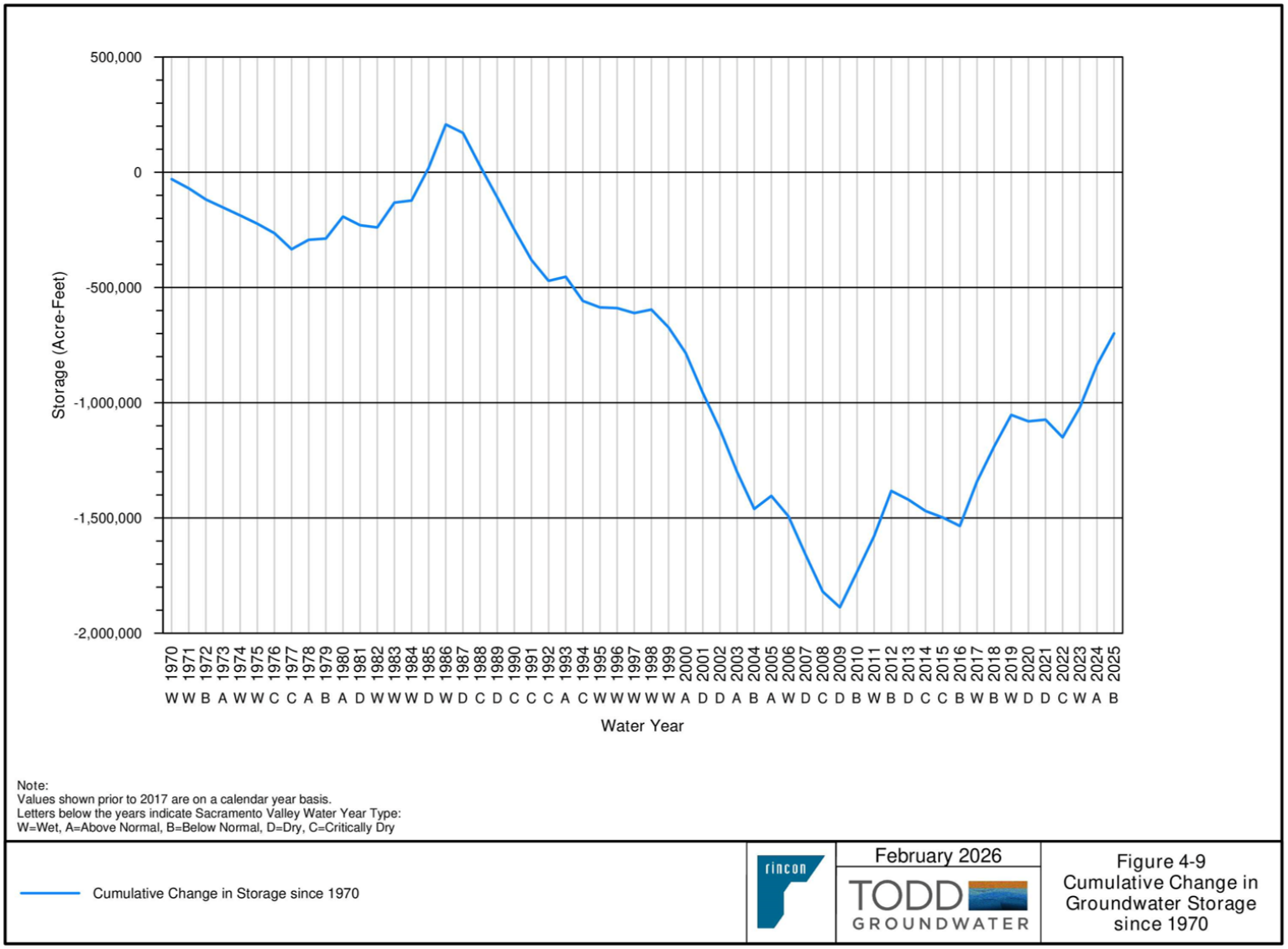


Figure 4-9 Cumulative Change in Groundwater Storage since 1970



4.3 Land Subsidence

Land subsidence is the differential lowering of the ground surface, which can damage structures and facilities. This may be caused by regional tectonism or by declines in groundwater elevations due to pumping. The latter process is relevant to Subbasin management and the *2027 Alternative Plan Update*. As groundwater elevations decline in the subsurface, dewatering and compaction of predominantly fine-grained deposits (such as clay and silt) can cause the overlying ground surface to subside.

Land subsidence due to groundwater withdrawals can be temporary (elastic) or permanent (inelastic). Elastic deformation occurs when sediments compress as pore pressures decrease but expand by an equal amount as pore pressures increase. A decrease in groundwater elevations from groundwater pumping causes a small elastic compaction in both coarse- and fine-grained sediments; however, when compaction is small, conditions can return to normal once water levels recover. An increase of groundwater elevations, through reduced pumping or managed groundwater recharge, can increase pore pressures within fine-grained deposits, allowing elastic deformation to recover and reduce the potential for additional subsidence (Galloway, Jones and Ingebritsen, 1999; Galloway and Burbey, 2011). Because elastic deformation is relatively minor and generally recoverable, it is not considered an impact.

Land subsidence, resulting from aquifer system compaction and groundwater level declines, has been a concern in the Coachella Valley since the mid-1990s and has been investigated since 1996 through an on-going cooperative program between CVWD and the United States Geological Survey (USGS) (Sneed and Brandt, 2020). Global Positioning System (GPS) surveying, using Global Navigation Satellite Systems (GNSS)-Inferred Positioning System and Orbit Analysis Simulation Software (GipsyX, formerly GIPSY-OASIS), and interferometric synthetic aperture radar (InSAR) methods have been used to determine the location, extent, and magnitude of the vertical land-surface changes in the Coachella Valley.

The network of GPS stations in the Subbasin is shown in Figure 2-9 in Chapter 2, *Plan Area*. The GPS measurements have been used to determine elevation changes at specific locations, while InSAR measurements have documented the geographic extent of elevation changes for the Indio Subbasin.

4.3.1 Observed Subsidence

4.3.1.1 USGS Studies

Land subsidence in the Coachella Valley has been investigated since 1995 through an on-going cooperative program between CVWD and the United States Geological Survey (USGS). Analysis of Interferometric Synthetic Aperture Radar (InSAR) data collected from 1995 to 2017 by the USGS indicates that as much as 2.0 feet of subsidence occurred in the Indio Subbasin from 1995 to 2010 near Palm Desert, Indian Wells, and La Quinta (Sneed and Brandt, 2020). From 2010 to 2020, groundwater levels stabilized or partially recovered in that area in response to the implementation of source substitution, conservation, and groundwater replenishment programs included in the *2010 CVWMP* resulting in much smaller subsidence magnitudes. Elsewhere, up to 1 inch of uplift has been measured from 2011 to 2020 in the Palm Springs area, corresponding to higher groundwater levels in response to WWR-GRF recharge.

The GSAs and the USGS have established a partnership and a continuing subsidence monitoring program to collect and evaluate data between 2015 and 2023 with a report to be published by the USGS by late 2026.

Figure 4-10 shows mapped subsidence and uplift from December 28, 2014, to June 27, 2017, as reported in the USGS study by Sneed and Brandt (2020). Since 2010, groundwater levels have stabilized or have been partially recovered in response to the implementation of source substitution, conservation, and groundwater replenishment programs included in the *2010 CVWMP Update*. Up to 0.08 feet of uplift has been measured since 2011 in the Palm Springs area, corresponding to higher groundwater levels in response to upgradient WWR-GRF recharge. In the Thermal area, the ground surface has also rebounded about 0.16 feet over the past 10 years, returning to elevations observed in 2001. This rebound roughly coincides with commencement of recharge operations at the TEL-GRF in 2009. While the cooperative program between CVWD and the USGS has historically provided vital assessments of vertical land-surface changes in the Subbasin, the publication timeline for the next phase of the USGS subsidence study does not align with the preparation schedule for this *2027 Alternative Plan Update.*[1] This *2027 Alternative Plan Update* utilizes alternative, high-resolution datasets to ensure the analysis remains both current and internally consistent.

In the *2027 Alternative Plan Update*, the assessment of groundwater conditions and Sustainable Management Criteria (SMC) relies on the extensive, state-supported TRE Altamira InSAR dataset provided by DWR. This approach ensures a rigorous, spatially continuous evaluation of recent land-surface displacement across the Indio Subbasin without delaying SGMA compliance timelines.

Water levels in wells near the subsidence geodetic monuments2, in and near the three subsiding areas shown by InSAR, and throughout the Subbasin, generally indicate longer-term stability or rising groundwater levels since about 2010. These results reflect the reversal in trends of groundwater level declines since 2009.

While many areas have ceased subsiding (and a few have even uplifted) some areas did subside during 2010–2017, although at a slower rate, partly reflecting the character of sediments in the basin. Subsidence when groundwater levels are stable or recovering indicates that residual compaction may have occurred and that coarse-grained zones and thin aquitards may have expanded as groundwater levels recovered.

[1] Advance copies of the data were unavailable at time of completion for the draft *2027 Alternative Plan Update*.
[2] Most geodetic monuments consist of flat metal disks that are anchored in the ground or to a structure and can be surveyed repeatedly.

Figure 4-10 Subsidence Map USGS, 2014-2017

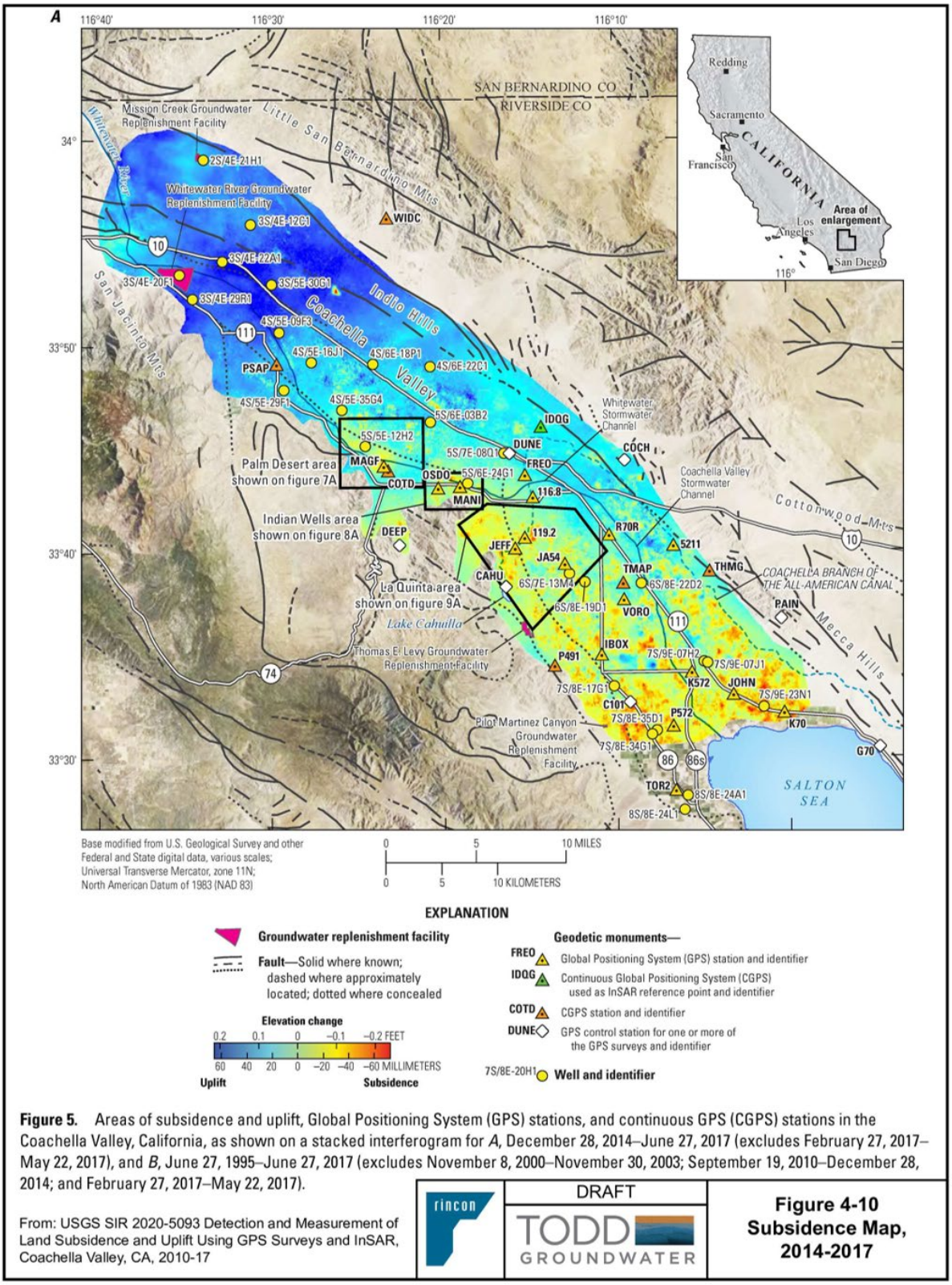


Figure 5. Areas of subsidence and uplift, Global Positioning System (GPS) stations, and continuous GPS (CGPS) stations in the Coachella Valley, California, as shown on a stacked interferogram for *A*, December 28, 2014–June 27, 2017 (excludes February 27, 2017–May 22, 2017), and *B*, June 27, 1995–June 27, 2017 (excludes November 8, 2000–November 30, 2003; September 19, 2010–December 28, 2014; and February 27, 2017–May 22, 2017).

From: USGS SIR 2020-5093 Detection and Measurement of Land Subsidence and Uplift Using GPS Surveys and InSAR, Coachella Valley, CA, 2010-17

rincon | DRAFT TODD GROUNDWATER | **Figure 4-10 Subsidence Map, 2014-2017**

4.3.2 DWR InSAR Data

Since 2015, land subsidence within the Indio Subbasin continues to be monitored using satellite-based InSAR techniques. InSAR provides high-resolution measurements of vertical land-surface displacement over large geographic areas and has become an important tool for evaluating the extent and magnitude of land subsidence associated with groundwater level changes. DWR maintains a statewide InSAR monitoring program and publishes processed subsidence datasets derived from multiple satellite platforms.

4-11Figure 4-11 shows the vertical land-surface displacement data obtained from DWR's TRE Altamira InSAR dataset, which measures cumulative vertical displacement between June 13, 2015, and April 1, 2025. The dataset is referenced to a stable point outside the area of deformation and provides a spatially continuous record of land-surface elevation changes throughout the Subbasin. Negative displacement values indicate land subsidence, whereas positive values indicate uplift.

Based on the spatial patterns displayed in Figure 4-11, the localized vertical land-surface displacement trends vary across the Subbasin, reflecting distinct structural controls and proximity to managed recharge basins.

Uplift is predominant in the northern section of the Subbasin, between Whitewater and the Palm Springs International Airport, where land-surface elevations increased by up to 0.19 feet (approximately 2.3 inches). As shown in Figure 4-11, this regional rebound encompasses the area surrounding the Whitewater Groundwater Replenishment Facility. This uplift zone is structurally bound to the north by the Garnet Hill Fault Trace, demonstrating how local faulting acts as a structural control on pressure distribution and resulting elastic expansion within the aquifer matrix.

Figure 4-11 Subsidence Map, 2015-2025

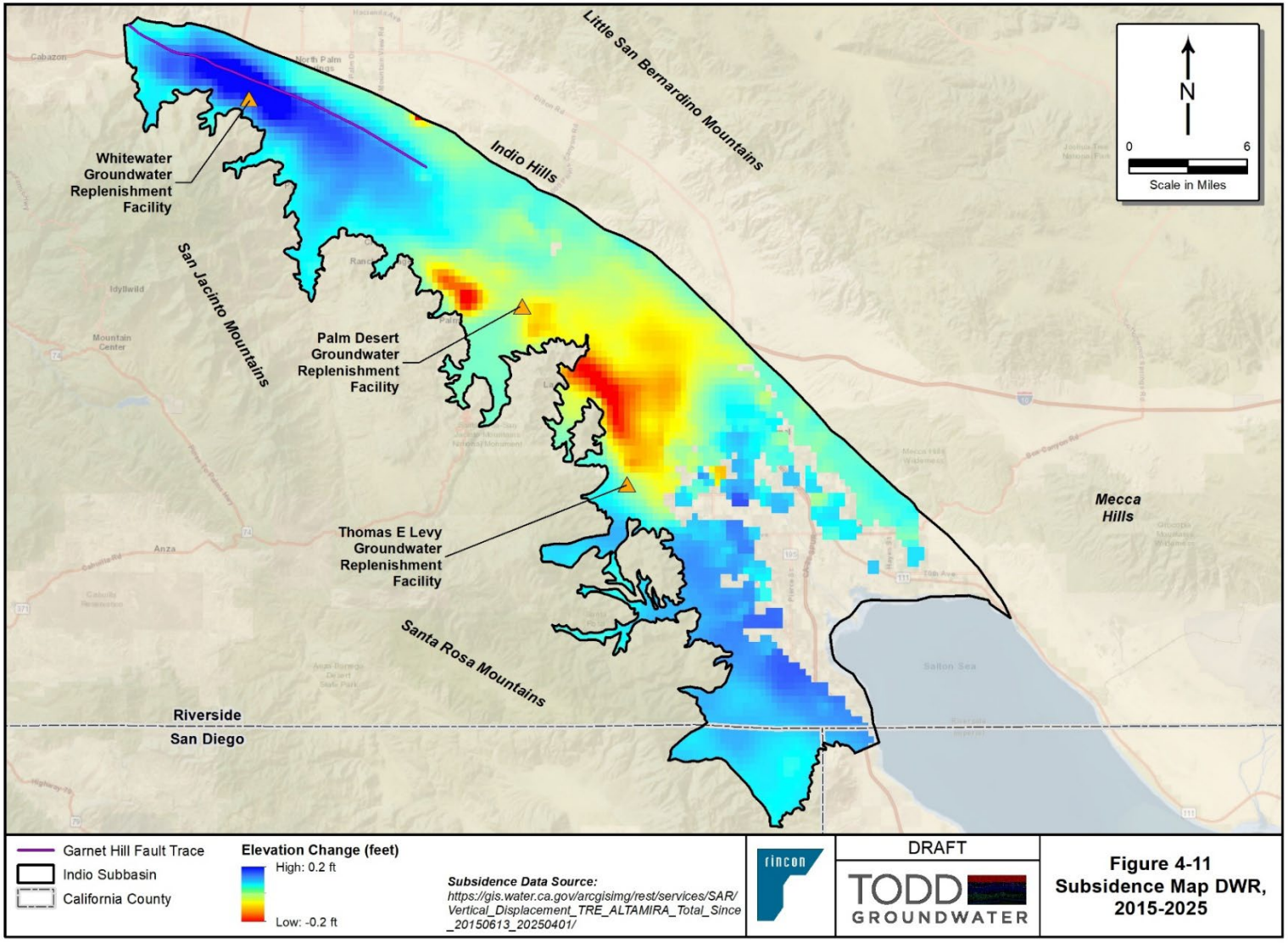


Figure 4-12 Areas of Observed Subsidence

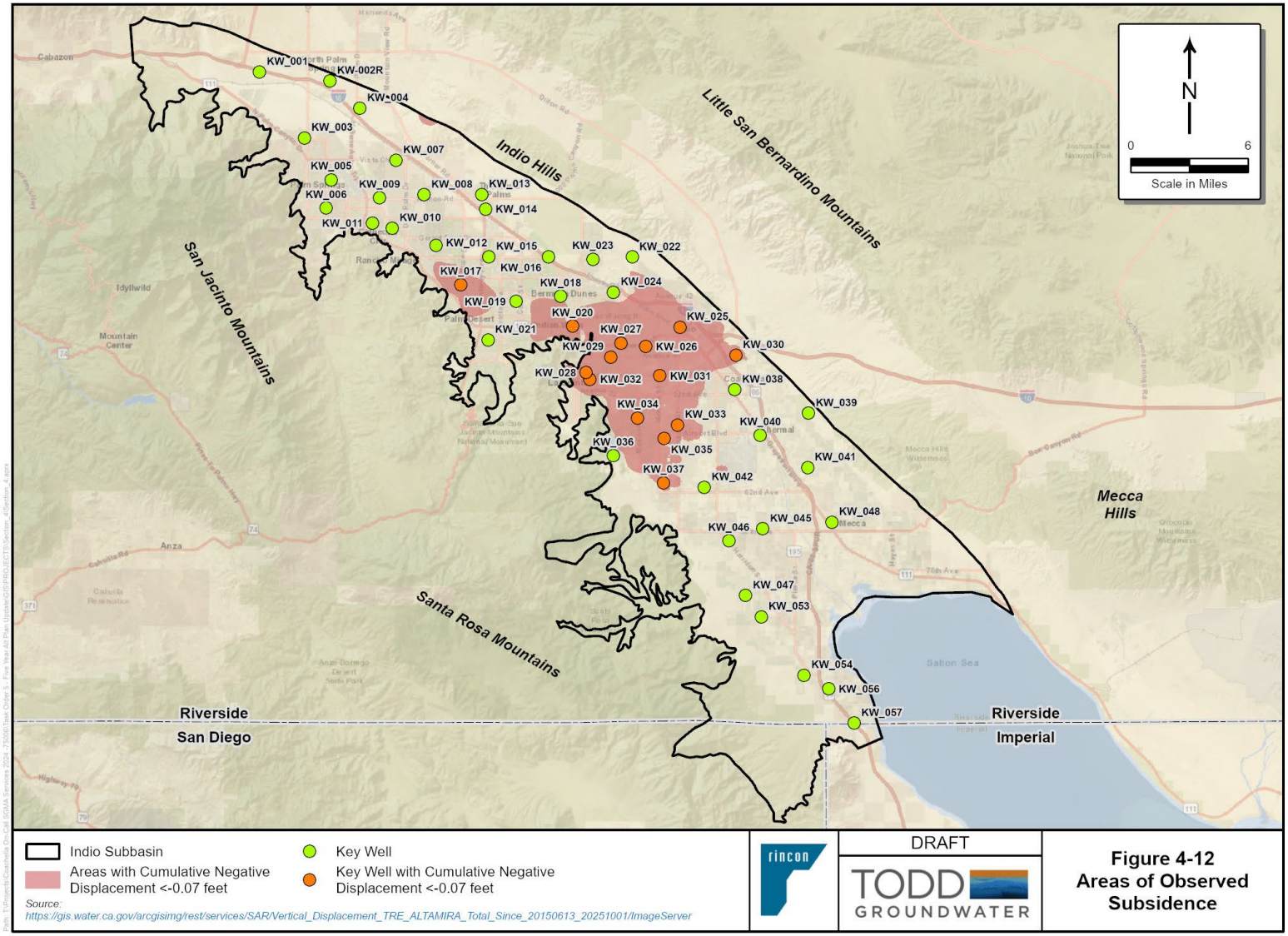
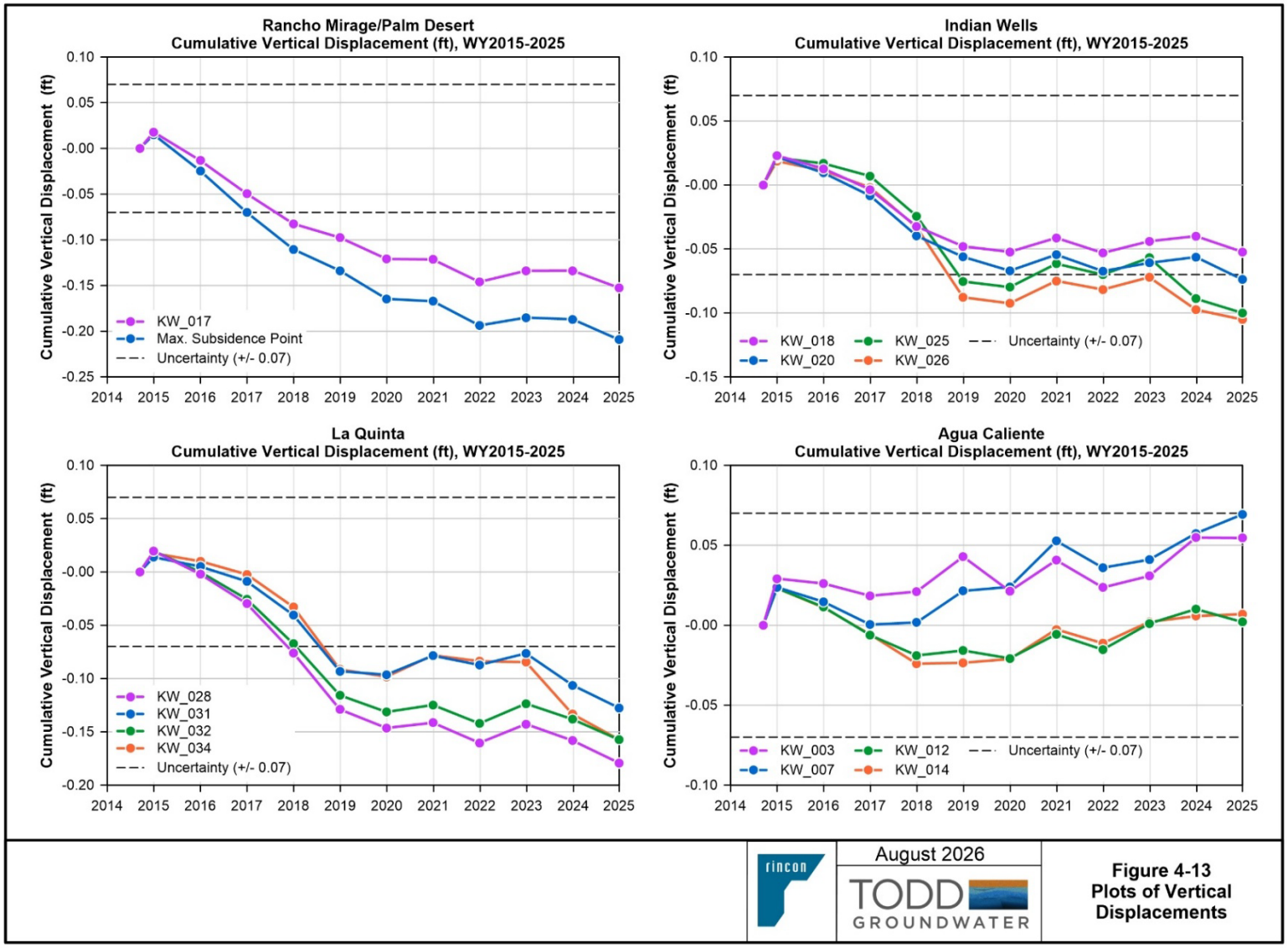


Figure 4-13 Plots of Vertical Displacement Over Time



4.3.3 Areas with Potential for Subsidence

Figure 4-13 shows the focused InSAR data showing areas of the Subbasin that have experienced negative displacement outside of the error range of the method. Figure 4-13 shows the vertical displacement from the available InSAR data at specific key wells in the areas of the Subbasin that have observable subsidence, with the time series presented in water years. Within each area, the cumulative vertical displacement exhibit consistent temporal patterns across annual to decadal time periods, although with differing magnitudes (Figure 4-13). These temporal consistencies likely reflect regional similarities in the geologic/hydrogeologic setting, groundwater elevation changes, and resultant land displacement magnitudes and dynamics within each area. Prominent land subsidence remains evident along the central-western margins of the Subbasin, specifically within the Rancho Mirage/Palm Desert, Indian Wells, and La Quinta areas. In these areas, cumulative downward displacement reached up to 0.20 feet (approximately 2.4 inches). A localized area of pronounced subsidence is located west of the PD-GRF, while a larger, continuous linear belt of subsidence extends north and west of the TEL-GRF.

Rancho Mirage/Palm Desert

In the Rancho Mirage/Palm Desert area (Figure 4-13, upper right), both KW017 and the Max Subsidence Point experienced negative cumulative displacements from WY2015 to WY2025, although with a notable reduction in the downward displacement rate starting in approximately WY2019. The displacements at these two sites mirror each other in pattern, while differing slightly in magnitude.

Indian Wells

In the Indian Wells area (Figure 4-13, upper left), all four sites exhibited negative cumulative displacements from WY2015 to WY2019, followed by negligible or slightly negative changes in displacement from WY2020 thereafter. From WY2020 through WY2025, all four sites display higher frequency oscillations in displacement that are relatively similar and likely indicate compaction and rebound on inter-annual timescales. In contrast, the localized subsidence along the central-western margin appears to have intensified over time. While Figure 4-10 captured the early stages of this trend with smaller, fragmented patches near Palm Desert, Indian Wells, and La Quinta. Figure 4-11 shows these areas expanding into a much larger, continuous linear belt along the western margin of the Subbasin. This apparent increase in cumulative subsidence may indicate localized seasonal pumping stresses or the delayed, residual compaction of thick, slow-draining fine-grained aquitards. Both factors may reflect the time needed for fine-grained materials to fully drain or equilibrate, even as local recharge management efforts continue along these specific western margins.

La Quinta

In La Quinta (Figure 4-13, lower right), all four sites exhibited negative cumulative displacements from WY2015 to WY2019, followed by negligible changes in displacement from WY2020 through WY2023 and slightly negative displacement from WY2024 thereafter. From WY2020 through WY2023, all four sites display higher frequency oscillations in displacement that are relatively similar and likely indicate compaction and rebound on inter-annual timescales. South and east of the TEL-GRF, the InSAR mapping shows a broad extent of minor uplift (less than 0.08 feet, or 1 inch) and stabilization. While a full assessment along the furthest southeastern boundary is constrained by a lack of continuous satellite data coverage directly adjacent to the shoreline of the Salton Sea, the regional data indicate a significant temporal shift. Most notably, this southern portion of the

Subbasin has transitioned from a historical trend of active subsidence (Figure 4-10) to one of net uplift (4-11).Figure 4-11). This reversal may reflect progressive, long-term water level recovery and pore-pressure restoration following sustained artificial recharge operations at the TEL-GRF, coupled with other source substitution, conservation, or groundwater replenishment programs.

Whitewater/Agua Caliente

In the Whitewater/Agua Caliente area (Figure 4-13, lower right) two of the four sites, KW003 and KW007, exhibited net increases in displacement, while the remaining two sites, KW012 and KW014, exhibited negligible changes in displacement from WY2015 to WY2025. For all four sites, the land displacement trend is concave up, i.e., the rate of positive land displacement increases with time, transitioning from relatively static to a more positive/upward displacement rate. All four sites show similar higher frequency displacement oscillations correlating with elastic compaction and subsequent, complete rebound occurring on interannual timescales. The northern section of the Subbasin, near the WWR-GRF, remains a consistent zone of uplift across both periods. This pattern is consistent with sustained groundwater recovery and recharge related aquifer response, suggesting that WWR-GRF recharge may be contributing to reduced susceptibility to aquifer compaction and subsidence.

4.4 Groundwater Quality

The *2010 CVWMP Update* considered groundwater quality issues including salinity, nitrate, arsenic, hexavalent chromium (chromium-6), uranium, and perchlorate. In its Alternative Assessment Staff Report, DWR provided recommendations that were incorporated into the *2022 Alternative Plan Update*, including additional maps and discussions of fluoride, arsenic, chromium-6, and dibromochloropropane (DBCP) distributions. A water quality database was developed for the Alternative Plan Update and has been maintained since. The areal extent, vertical distribution, and time trends for these selected constituents were all evaluated.

The Coachella Valley Salt and Nutrient Management Plan (CV-SNMP) *Development Workplan* was developed in 2021 and approved by the RWQCB in October 2021. The workplan focuses on the sustainable management of salts/total dissolved solids (TDS) and nutrients, including nitrate, in the Coachella Valley Groundwater Basin. The *Final CV-SNMP* is scheduled for completion in 2027 as part of the ongoing multi-year update process. While separate regulatory processes, the Alternative Plan Update and the CV-SNMP work together to support basin-wide sustainable groundwater management and groundwater quality protection strategies in the Indio Subbasin (and the larger Coachella Valley Groundwater Basin). Additional discussion details of water quality policy and planning are in Chapter 8**,** *Regulatory and Policy Issues***.** The completed CV-SNMP technical memorandums are available at: https://www.cvsnmp.com/resources/.

4.4.1 Constituents of Concern

Constituents of concern (COCs) are water quality constituents selected for evaluation because they are known or suspected to affect drinking water quality, beneficial uses, regulatory compliance or basin sustainability. COCs may include naturally occurring constituents, anthropogenic contaminants, or emerging contaminants that have demonstrated exceedances of applicable standards, increasing concentration trends, known sources within the basin, or other characteristics warranting monitoring and management. COCs for the Indio Subbasin include TDS, nitrate, arsenic, chromium-6, uranium, fluoride, perchlorate, and 1,2-dibromo-3-chloropropoane (DBCP). Per- and

polyfluoroalkyl substances (PFAS) have been identified in portions of the Indio Subbasin, but are currently being treated as an emerging groundwater quality issue rather than a COC. Elevated TDS and nitrate concentrations are linked to current and historic water and wastewater management, agricultural activity, urban land use, septic systems, and natural conditions. In the Indio Subbasin, arsenic, chromium-6, uranium, and fluoride are naturally occurring and geologically derived. DBCP is a soil fumigant historically used in agriculture. Perchlorate can be found in some fertilizers and was first detected in Colorado River water in 1997. Atmospheric deposition of perchlorate can also occur naturally, with potential concentration in groundwater in desert regions (USGS, 2014).

4.4.2 Data Sources for Water Quality Mapping

Groundwater quality data have been collected from CVWD, CWA, DWA, IWA, the USGS National Water Information System, and the California State Water Resources Control Board (SWRCB) Safe Drinking Water Information System (SDWIS) website. Data included samples from monitoring wells, public supply wells, and private agricultural and domestic wells. Monitoring wells and relatively deep public supply wells have been the source of the most frequent and recent measurements. This evaluation included only data from raw (untreated) groundwater samples collected from wells with verified locations and sampled in 1990 or later.

4.4.3 Plan View Concentration Maps

Water quality maps (Figure 4-14 to Figure 4-21) show the spatial distribution of the constituents. For each well with water quality data during the period 1990-2025, the most recent water quality measurement is shown on the plan-view maps. The most recent measurement at each well was used, as opposed to the median or mean of a given period, because COCs may show increasing or decreasing trends over time in some wells. Such trends are depicted on the time-concentration plots for TDS and nitrate.

The water quality measurements were interpolated across the Subbasin for each constituent as indicated by the color-ramping in each map legend. Some areas of the Subbasin that lack monitoring wells and data were excluded from the analysis.

Constituent concentrations typically vary with depth. However, depth-specific data are limited and insufficient for mapping water quality of different depth zones. The mapping presented here is intended to depict water quality in vertical zones that generally provide groundwater supply to production wells. These wells are typically greater than 300 feet deep; accordingly, monitoring wells with screened intervals less than 300 feet deep were not included. Information on screened intervals is lacking for some wells, but these were included because most Subbasin wells are screened at depths greater than 300 feet. Shallow monitoring wells were excluded from the analysis. For nested wells (groups of monitoring wells at one location with a range of screened interval depths), water quality data are shown for the nested well with depth commensurate with nearby public supply wells.

Figure 4-14 TDS Concentration Map

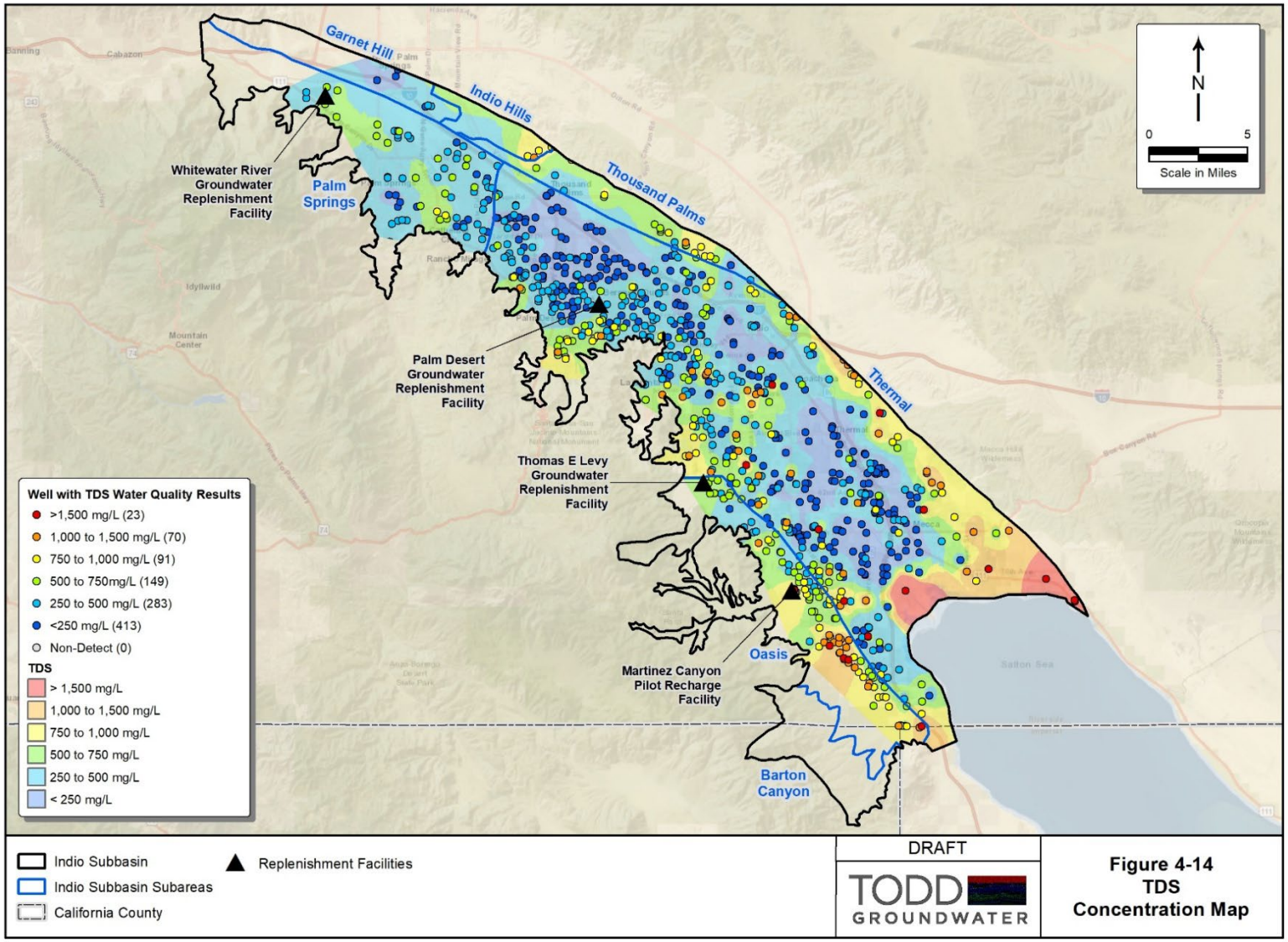


Figure 4-15 Nitrate as NO_3 Concentration Map

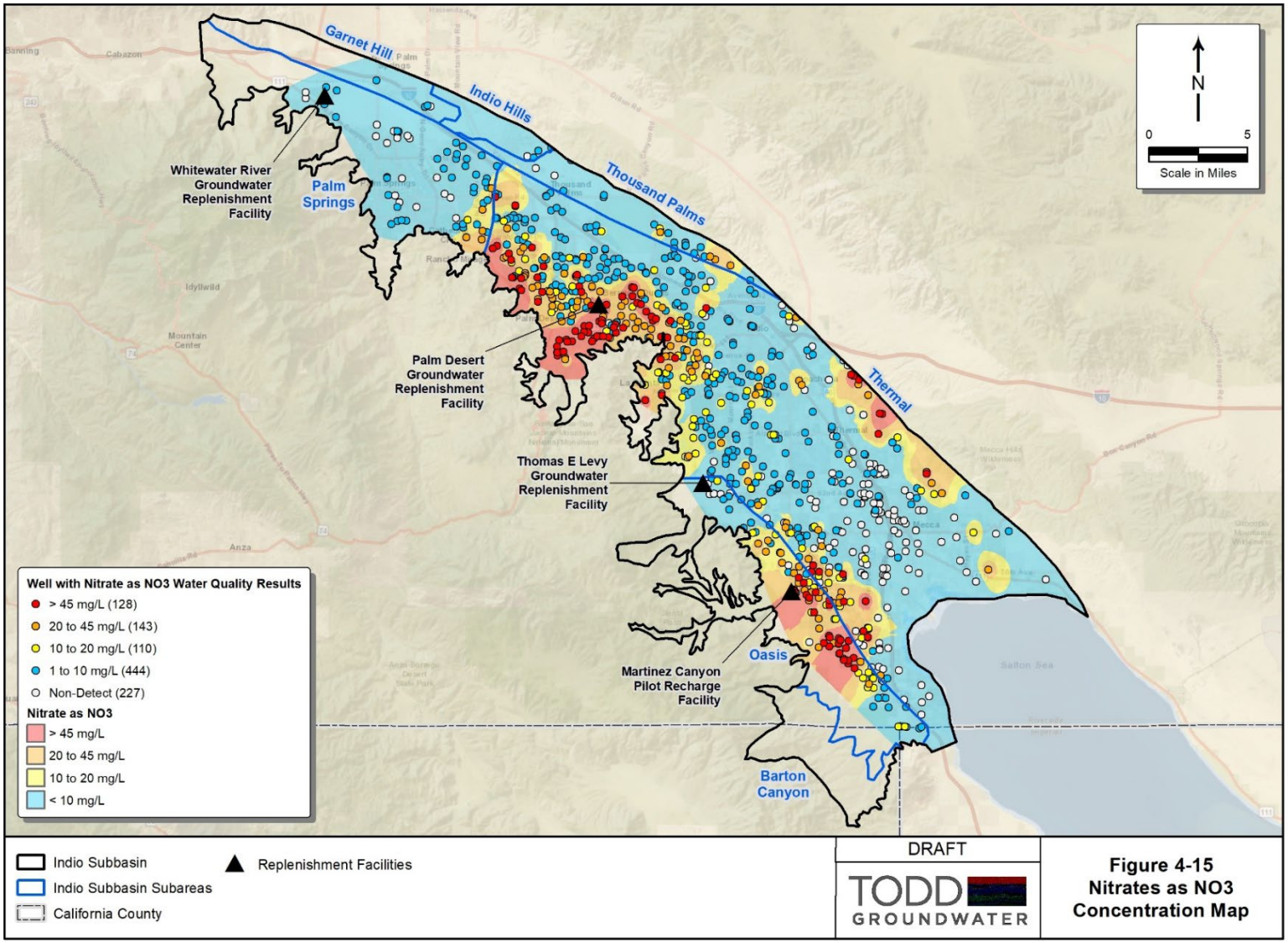


Figure 4-16 Arsenic Concentration Map

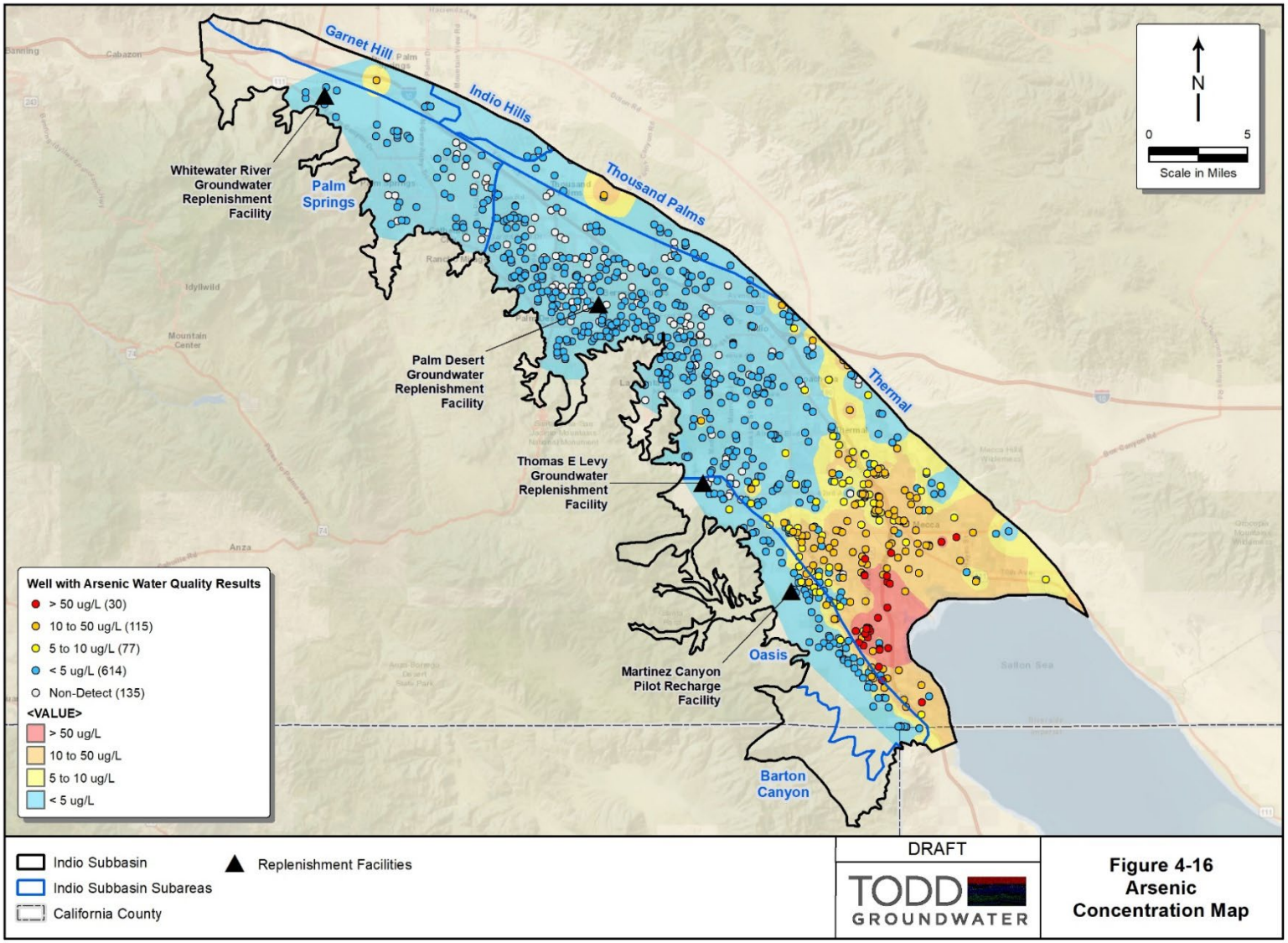


Figure 4-17 Chromium-6 Concentration Map

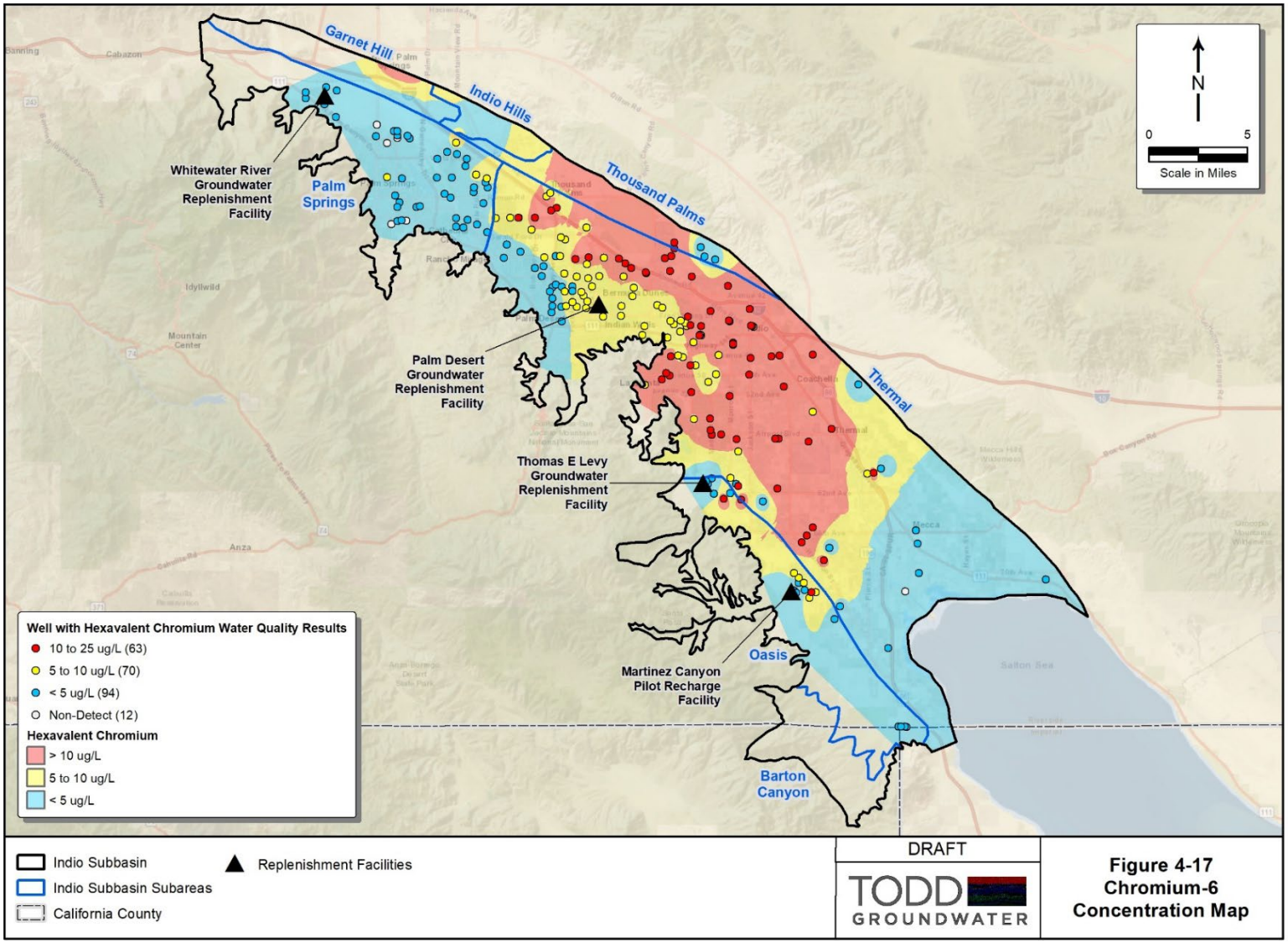


Figure 4-18 Uranium Concentration Map

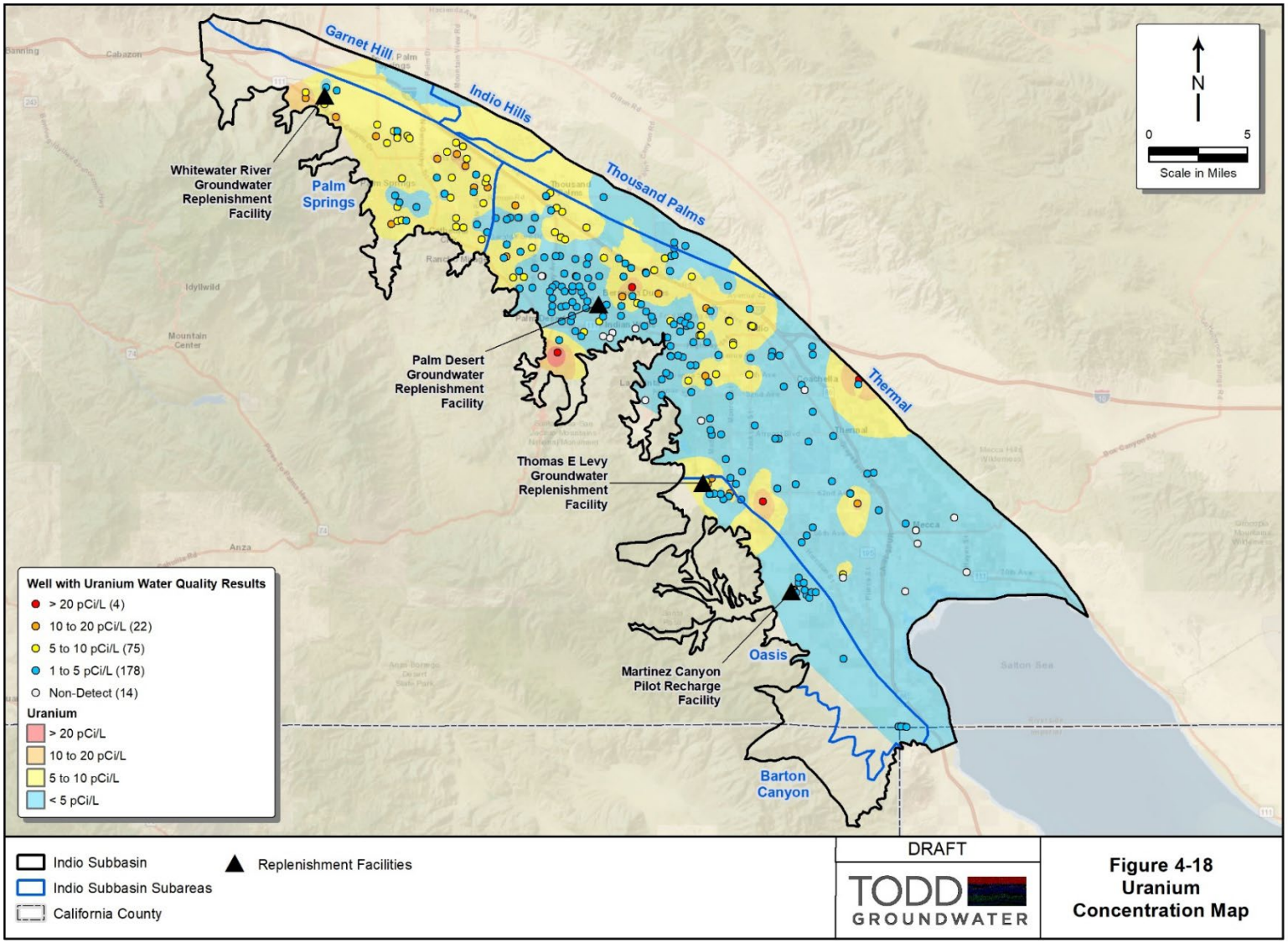


Figure 4-19 Fluoride Concentration Map

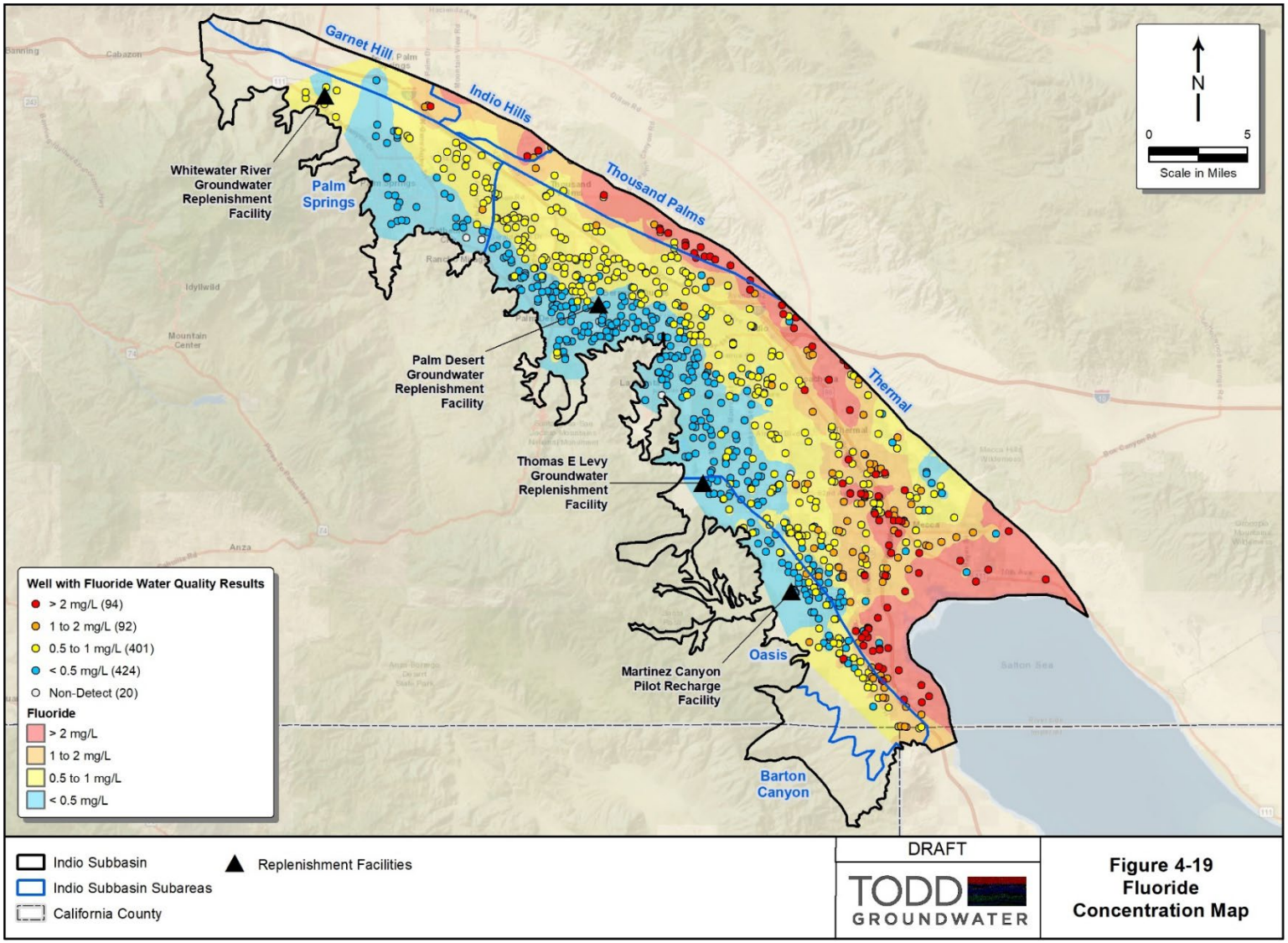


Figure 4-20 Perchlorate Concentration Map

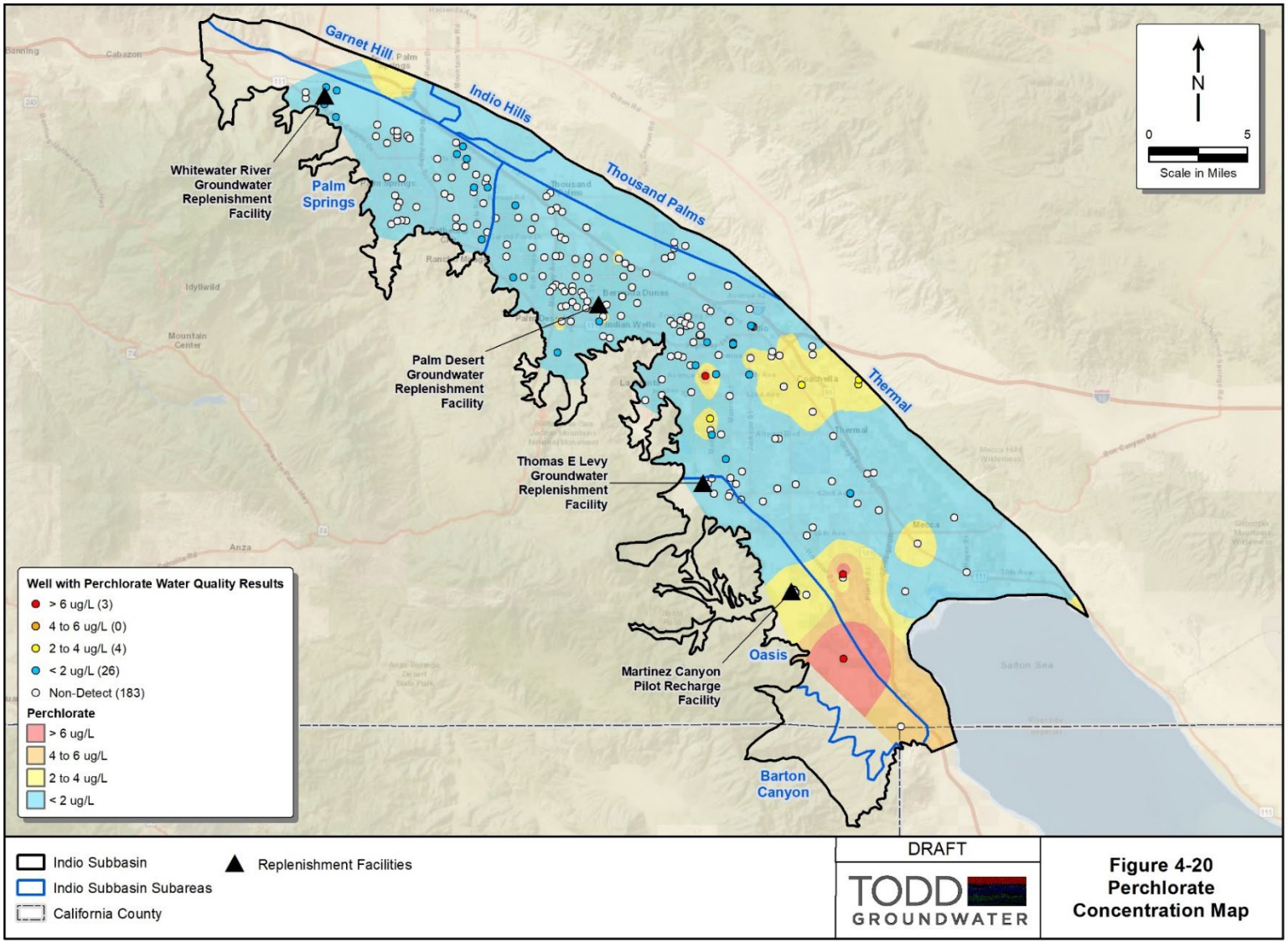
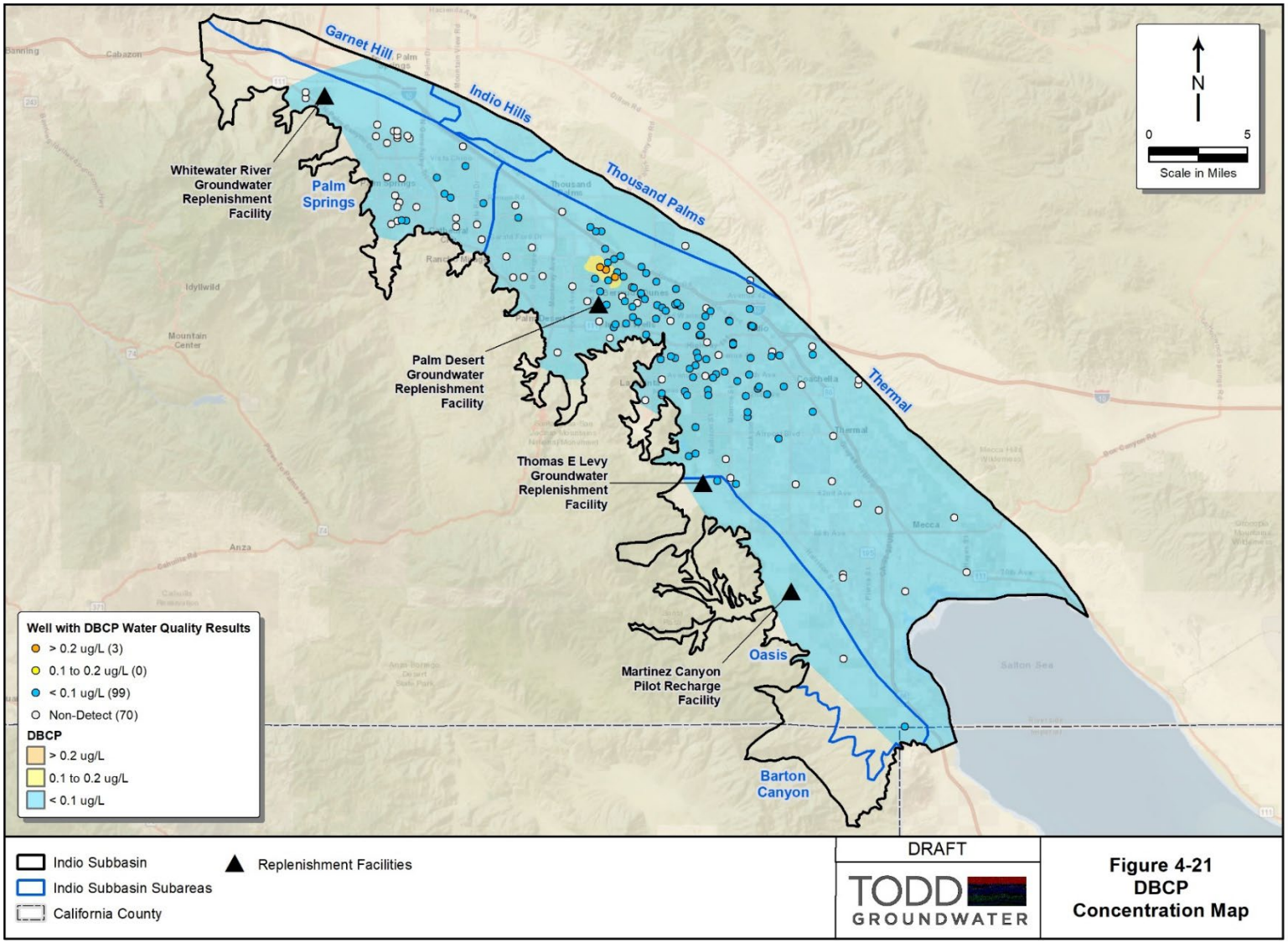


Figure 4-21 DBCP Concentration Map



4.4.4 Water Quality Cross Sections

In the *2022 Alternative Plan Update*, to evaluate vertical variations in groundwater quality, 14 vertical cross sections (A-A' through N-N') were prepared. These cross sections were not updated for the *2027 Alternative Plan Update* as they still illustrate the relevant vertical variations in groundwater quality. The cross-section locations are shown in Appendix 4-B, each of which documents the most recent concentrations reported from 1990 to 2019 for TDS, nitrate, arsenic, and chromium-6. Because the cross sections are intended to show vertical variations, shallow monitoring wells are included. The well screens on each cross section are color-coded according to the most recent concentration, which is shown at the bottom of the well profile. Vertical scales may vary between figures.

4.4.5 Time-Concentration Plots for TDS and Nitrate

Figure 4-22 and Figure 4-23 present selected time-concentration plots that represent temporal trends in TDS and nitrate, respectively. Time-concentration plots were created for all wells with at least five TDS or nitrate measurements. These plots were then evaluated within the context of the water quality maps, water quality cross sections, and hydrogeologic cross sections to represent groundwater quality trends in various Subareas. The wells shown in the time-concentration plots were selected based on the following criteria:

- **Location** – Wells were selected to provide a broad distribution across the Subbasin.
- **Ongoing and/or recent monitoring** – Wells were prioritized with recent and frequent measurements over the 1990-2025 period.
- **Trends** – Wells that best represent groundwater quality trends in each Subarea were selected.
- **Well construction** – Wells with known screened depths were prioritized. Groups of wells with different screened intervals were selected to illustrate relationships between temporal water quality trends and depth.

In some cases, multiple wells are plotted on one chart and differentiated by different color lines. On the map, the wells are circled with the corresponding chart color. Where wells are nested or are in essentially the same location, only one color is provided around the well symbol.

Figure 4-22 TDS Time-Concentration Plots

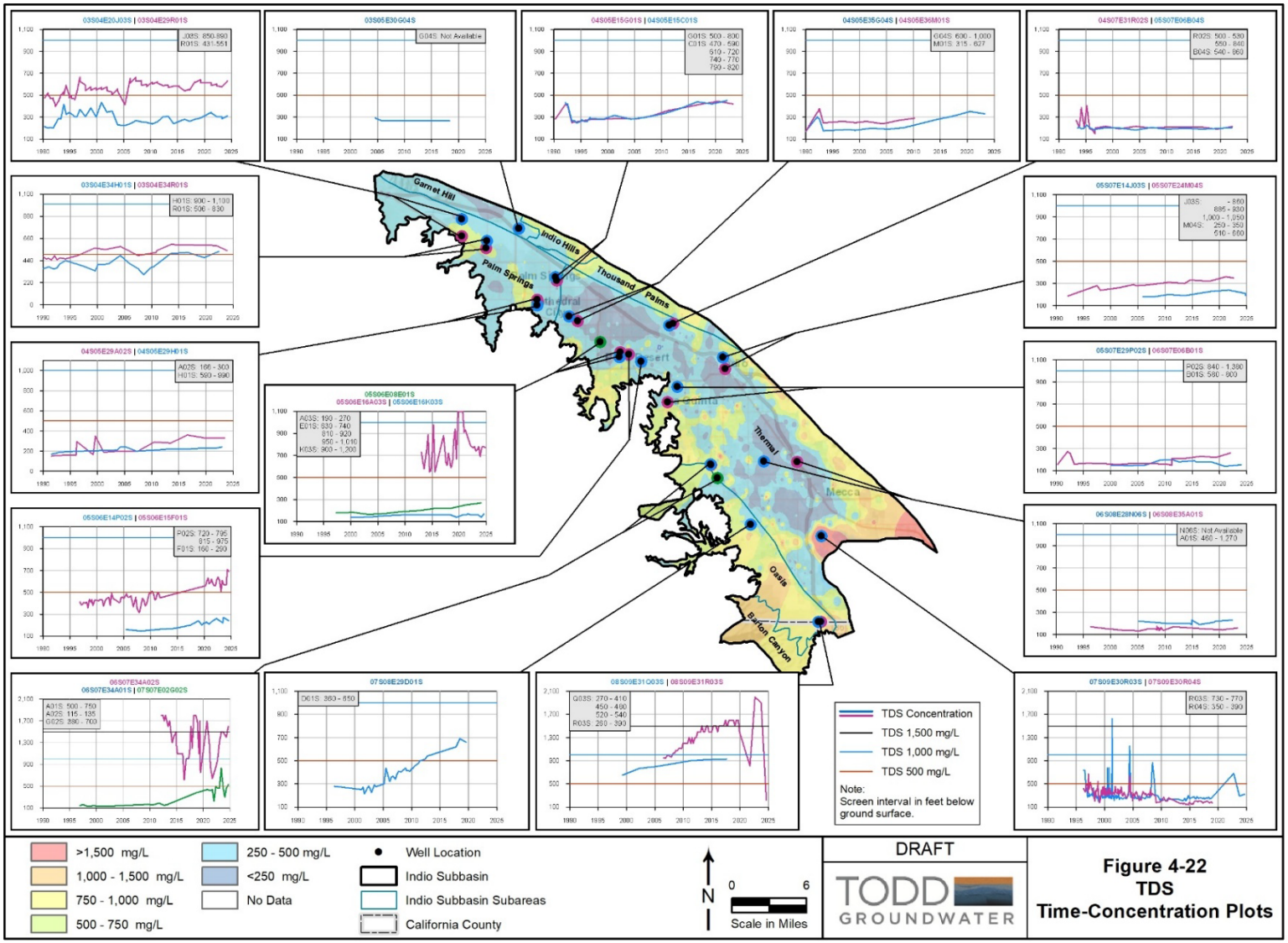
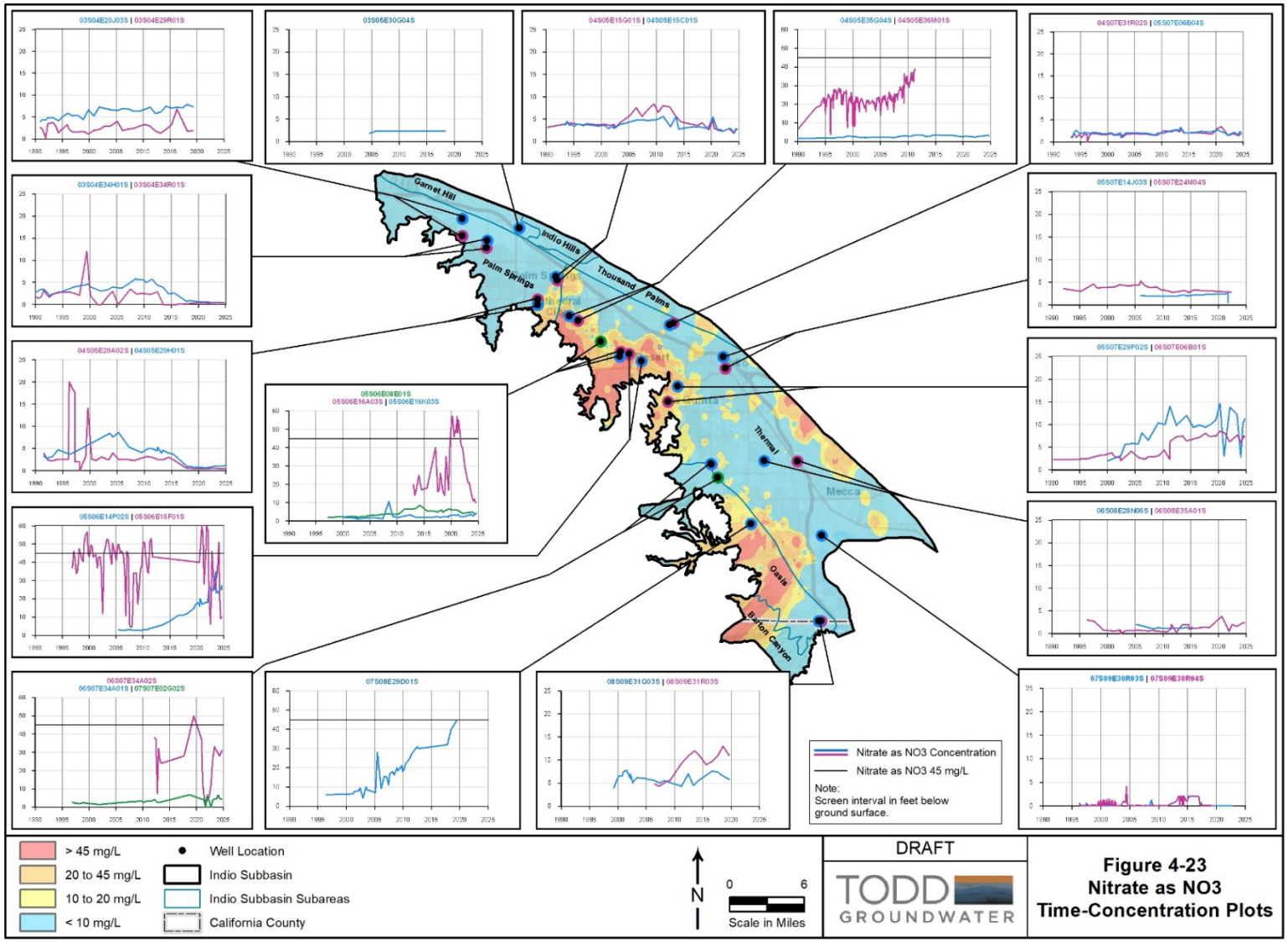


Figure 4-23 Nitrate as NO_3 Time-Concentration Plots



4.4.6 Total Dissolved Solids

Groundwater in the Indio Subbasin shows a wide range of salinity, measured in terms of TDS concentrations. No fixed Consumer Acceptance Contaminant Level has been established for TDS. Instead, TDS is regulated by Secondary Maximum Contaminant Levels (SMCLs), or Consumer Acceptance Contaminant Level Ranges, set by the SWRCB: a recommended 500 milligrams per liter (mg/L) level, an upper 1,000 mg/L level, and a short-term 1,500 mg/L limit. While primary maximum contaminant levels (MCLs) are health-based standards, SMCLs, such as those for TDS, are based on aesthetic concerns such as taste, color, and odor. Salinity management policies, progress, and related issues are described in Section 8.1.

4.4.6.1 Sources

Natural elevated TDS concentrations occur in the upper aquifer, typically along the Coachella Valley margins. Potential saltwater intrusion from the Salton Sea is addressed in Section 4.5. These sources have been reviewed and documented as part of CV-SNMP Task 1 – Characterize TDS/N Mass Loading.[3] TDS in the Subbasin is derived from:

- Natural sources,
- Return flows from agricultural and landscape irrigation,
- Recharge of imported Colorado River water,
- Wastewater discharge (municipal and septic tanks), and
- Subsurface inflows from adjacent Subbasins, such as the Desert Hot Springs Subbasin, which is characterized by poor water quality (DWR, 1964).

Completion of the Coachella Canal in 1949 allowed use of Colorado River water for agricultural irrigation, with subsequent use for golf course and large landscape irrigation. As shown in the land use map (Figure 2-6 in Chapter 2, *Plan Area*) agriculture is most extensive in the East Valley. Irrigation results in evaporative concentration of TDS in shallow groundwater; the agricultural drain system helps alleviate such salt loading locally (see Figure 2-5 in Chapter 2, *Plan Area*).

Colorado River water has been used to replenish the Indio Subbasin and reverse overdraft. Deliveries have occurred from the Coachella Canal to Dike 4 (1994-2008), TEL-GRF (since 2009) and PD-GRF (since 2019), as well as from the Colorado River Aqueduct (CRA) to the WWR-GRF since 1973. The CRA supply has lower TDS concentration than the Coachella Canal supply, because it is diverted higher along the Colorado River. The CV-SNMP takes into account Colorado River water quality as it assesses salt loading and forecasts TDS in the Basin, specifically in Task 1 – Characterize TDS/N Mass Loading and Task 4 – Technical Approach for Forecasting TDS/N Concentrations.

Water use for domestic purposes results in salt loading to wastewater. Locations of water reclamation plants (WRPs) and other wastewater treatment facilities are shown in Figure 2-5 in Chapter 2, *Plan Area*. As described in Chapter 2, *Plan Area*, three WRPs currently provide recycled water for irrigation. For the other WRPs, treated effluent is discharged either to onsite percolation/evaporation ponds or to the Coachella Valley Stormwater Channel (CVSC) that conveys water to the Salton Sea. Some portions of the Subbasin (mostly rural) use septic tank/leachfield systems to treat and dispose wastewater.

[3] CV-SNMP Technical Memorandums are available at: https://www.cvsnmp.com/resources/.

4.4.6.2 Distribution and Trends

TDS concentrations in the Indio Subbasin reflect multiple factors affecting geographic and vertical distribution as well as trends. These factors have changed over time as a result of changing land uses and water and wastewater management activities.

Figure 4-13 shows the spatial distribution of the most recent TDS concentration results from wells included in this analysis. As noted in Section 4.4.3, the map shows the most recent value for each well with water quality data between 1990 and 2025, and shallow monitoring wells were excluded.

Figure 4-14 shows that groundwater over large portions of the Indio Subbasin has TDS concentrations less than 500 mg/L. While TDS concentrations are depth-dependent in many portions of the Indio Subbasin, a few spatial patterns are observed on the map. Groundwater in the center of the Subbasin has low TDS concentrations, often less than 250 mg/L. The highest TDS concentrations (>1,500 mg/L) are observed near the Salton Sea. TDS concentrations along the perimeter of the Subbasin are frequently greater than 500 mg/L. The median TDS concentration for all wells included in the analysis is 321 mg/L, considering the most recent measurement at each well. Of the 1,195 total wells sampled (shallow wells were excluded from the analysis), 10 percent indicate most-recent TDS values greater than 1,000 mg/L, 34 percent indicate most-recent concentrations greater than 500 mg/L, and most wells show concentrations below 500 mg/L.

TDS trends are shown as selected time-concentration plots in Figure 4-22; note that the vertical scales mostly are 100 to 1,100 mg/L with three exceptions having scales up to 2,100 mg/L to accommodate higher concentrations. The time-concentration plots include some groupings of wells that are near one another but with screens in different vertical zones. The plots indicate that TDS concentrations in shallow zones typically are higher and more variable than in deeper zones. Increases in TDS concentrations are observed at wells in the areas around Whitewater, Palm Springs, Palm Desert, and Coachella, along with the shallow aquifer in the East Valley area. In general, TDS concentrations are stable or show lower rates of increasing concentrations in deeper zones and in the central and eastern Thermal Subarea.

The various factors contributing to salt loading are being evaluated through the current CV-SNMP process, including technical work on TDS/N loading, and current groundwater quality, management zones and beneficial use protection metrics, and forecasting future TDS/N concentrations. Chapter 8, *Regulatory and Policy Issues*, provides additional discussion on salinity management, regulatory context, and other salinity-related issues.

4.4.7 Nitrate

Groundwater in the Indio Subbasin shows a range of nitrate concentrations from very low background levels (less than 1 mg/L) to concentrations exceeding the drinking water standard. The drinking water standard or primary MCL for nitrate is 45 mg/L when measured as nitrate.[4]

Nitrate concentrations were reported from 1,175 wells between 1990 and 2025. The most recent measurements from each well show a median nitrate concentration of 3.7 mg/L. For 136 wells, or 12 percent of all wells sampled, the most recent nitrate concentrations were greater than 45 mg/L. Shallow monitoring wells (associated with local monitoring around facilities such as WRPs) are not included in this accounting because the mapping is intended to depict water quality in vertical zones

[4] The MCL is 10 mg/L for nitrate when measured as nitrogen. All nitrate as nitrogen concentrations were converted to nitrate as nitrate for this groundwater quality assessment.

that generally provide groundwater supply to production wells. In general, wells with high nitrate concentrations are relatively shallow wells.

Elevated nitrate was identified as an emerging issue in the *2010 CVWMP Update* and remains a focus of groundwater quality evaluation. In Chapter 8, *Regulatory and Policy Issues*, an updated focus is on small water systems. Between 2010 and 2025, nitrate as nitrogen was measured from 85 wells serving small water systems. Of these, nitrate concentrations exceeded the primary MCL in 5 wells.

Quantification of nitrate loading to the groundwater system is being addressed through the CV-SNMP process, discussed in more detail in Chapter 8, *Regulatory and Policy Issues*.

4.4.7.1 Sources

Historical land uses have contributed to nitrate currently detected in groundwater. Such legacy nitrate loading has occurred from historical agriculture and agricultural development of mesquite lands as well as rural septic systems (prior to development of centralized wastewater collection, treatment, and disposal systems). Historically, portions of the now-urban Indian Wells were characterized by extensive mesquite forests (Huberty, et al., 1948). Under natural conditions, moisture was insufficient to decompose leaves and twigs and consequently, large amounts of nitrogen-containing litter accumulated under the trees. When the lands were cleared, leveled, and irrigated for agriculture, the organic matter was decomposed and nitrate was leached by irrigation return flow and migrated to the underlying water table. In addition, irrigated agriculture historically extended farther northwestward into now-urban areas (DWR, 1964, see Plate 13); assuming fertilizer use, such agriculture represents legacy loading of nitrate.

Ongoing activities that currently contribute nitrate loading include use of nitrogen-based fertilizers for agriculture, golf courses, and landscaping; septic tank percolation; and wastewater disposal through percolation.

4.4.7.2 Distribution and Trends

Nitrate concentrations in Indio Subbasin groundwater vary spatially, with depth, and temporally, as summarized in the following paragraphs.

Figure 4-15 shows the spatial distribution of most recent nitrate concentrations in groundwater. As discussed in Section 4.4.3, the map shows the most recent value for each well with water quality data between 1990 and 2024, and shallow monitoring wells were excluded.

As shown, the highest nitrate concentrations occur mostly along the western margins of the Indio Subbasin. Some of these areas, such as the northwestern portions of the Thermal Subarea, have a long history of agricultural and urban development, as well as nitrate loading from multiple sources associated with native vegetation, agricultural processes, and wastewater percolation. A study was conducted in 2019 (Todd Groundwater, 2019) of shallow groundwater near the WRP-10 in Palm Desert. Analysis of the groundwater using nitrate and oxygen isotopes indicated that the primary source of nitrate in groundwater near WRP-10 is soil nitrate; in other words, the nitrate derived from mesquite tree debris stored in soils. The study also revealed the isotopic signatures of nitrate from fertilizer, manure, and wastewater. As part of the CV-SNMP, current groundwater quality concentrations and trends were characterized. High nitrate concentrations were observed in the Palm Desert area, primarily near WRP-10and PD-GRF. Increasing nitrate trends were observed in these areas as well (West Yost, 2024).

While deeper groundwater tends to be higher quality, the occurrence of nitrate loading, pumping, and the vertical transport of water through screened well intervals can cause nitrate-rich water to migrate downward. The CV-SNMP workplan also observed higher nitrate concentrations in the shallow aquifer than in the deep aquifer.

Nitrate trends are documented in the time-concentration plots on Figure 4-23. Review of the plots shows significant variability in shallow nitrate concentrations and local increases in nitrate concentrations, mostly in the western areas where concentrations are already elevated in shallow wells. The occurrence of high nitrate concentrations in shallow zones and increasing nitrate concentrations in nearby deeper wells is also revealed in Figure 4-23 (for example, see lower left plots), which suggests local downward migration.

4.4.8 Arsenic

Arsenic was identified in the *2010 CVWMP Update* as an emerging issue. An update is provided in Chapter 8, *Regulatory and Policy Issues*. Arsenic is found to have carcinogenic and non-carcinogenic effects on health if ingested at high levels over a long period of time. Both the federal and California state governments have established a primary drinking water MCL for arsenic of 10 µg/L.

Both the areal and vertical distributions of arsenic were examined. Arsenic naturally occurs in groundwater, generally derived from basin sediments, and often dissolved in groundwater with anoxic or high-pH conditions. As shown on Figure 4-16, arsenic concentrations are highest in the southern portion of the Indio Subbasin, directly northwest of the Salton Sea.

Of the most recently measured arsenic concentrations in all wells, arsenic levels were below the detection limit (ranging from 0.06 to 3.95 µg/L) in 49 percent of wells. While most arsenic concentrations are low, 170 wells, or 15.7 percent of all wells, had the most recent arsenic measurements greater than the 10 µg/L MCL. As shown in Figure 4-16, elevated arsenic concentrations occur in the eastern portion of the Indio Subbasin, near the Salton Sea. The maximum arsenic measurement observed was 136 µg/L, in 2008.

Arsenic is primarily a concern for small water systems and private domestic wells. As described in Chapter 8, *Regulatory and Policy Issues*, arsenic in small water systems is being addressed by Riverside County, the United States Environmental Protection Agency (EPA), and by CVWD's Disadvantaged Communities Infrastructure Task Force. Large public water systems are able to selectively drill wells in areas or to depths with low arsenic concentrations, decommission affected wells, or provide water treatment to remove arsenic prior to delivery. These activities are less accessible to small water systems or private domestic well owners. Only eight out of 296 CVWD, DWA, CWA, or IWA public supply wells show arsenic concentrations greater than 10 µg/L in their most recent measurement; four of these wells have not been sampled in the past 15 years. All four wells are CVWD wells, inactive, and no longer permitted under the SWRCB's Division of Drinking Water (DDW) program for municipal use. CVWD has installed three treatment plants between 2004 and 2006 to reduce arsenic levels in wells serving groundwater to communities located along the eastern and northern shores of the Salton Sea including Mecca, North Shore, Bombay Beach, Hot Mineral Spa, Thermal, Oasis, and Valerie Jean.

4.4.9 Chromium-6

Chromium-6 is the oxidized form of the metal chromium and occurs in oxygen-rich groundwater near chromium-bearing rocks. It was identified in the *2010 CVWMP Update* as an emerging issue (see update in Chapter 8, *Regulatory and Policy Issues*) because of the State assessment occurring at

the time to establish a lower public health goal and MCL. In 2014, California adopted a 10 µg/L MCL for chromium-6. The MCL was rescinded in 2017 and then re-instated in October 2024 (see Section 8.2.4).

Both the geographic and vertical distributions of chromium-6 were examined. Figure 4-17 shows the geographic extent of elevated chromium-6 concentrations in the Indio Subbasin. While chromium-6 can be due to anthropogenic (human-caused) pollution, its extent in the Indio Subbasin and its geologic occurrence in surrounding formations clearly signals that chromium is naturally occurring. Groundwater in the mid-to-southeastern portion of the Indio Subbasin often contains chromium-6 concentrations greater than 10 µg/L.

Chromium-6 is stable in aquifers with oxidizing groundwater conditions. In some portions of California, elevated chromium-6 conditions have been linked to nitrate-rich irrigation return flow from agriculture (Hausladen et al., 2018; McClain et al., 2019). Agriculture does not appear to increase chromium concentrations in Indio Subbasin because chromium does not co-occur with high nitrate concentrations and chromium-6 concentrations are lower in shallow groundwater.

Chromium-6 concentrations are stable in most wells and have decreased in areas where Colorado River water is used to replenish natural groundwater. Chromium-6 concentrations in Colorado River water are far below the total chromium MCL and the previously rescinded, now reinstated chromium-6 MCL. In 2024, chromium-6 concentrations in the Coachella Canal were below the 1 ug/L detection limit. Within the Colorado River, chromium-6 concentrations during 2020 through 2025 have ranged from below the 0.02 ug/L detection limit to 0.15 ug/L, with a 2020 to 2024 5-year average of 0.04 ug/L (Central Arizona Project 2026) at Lake Havasu (above the Colorado River Aqueduct and All-American Canal intakes). For example, the chromium-6 map (Figure 4-17) indicates an area of relatively low concentrations in the vicinity of the TEL-GRF where groundwater quality changes have been observed.

Of the most recent measurements in wells, the maximum chromium-6 concentration is 26 µg/L, and the median concentration is 6.3 µg/L. In total, 70 wells (27 percent of all wells with chromium-6 measurements) have their most-recent samples showing chromium-6 concentrations over 10 µg/L. Total chromium concentrations appear to be fully represented by chromium-6 occurrence and show a similar distribution of concentrations. For most recent measurements of total chromium, 102 wells (25.4 percent of total wells) have concentrations greater than 10 µg/L, and the median concentration is 7.6 µg/L.

Out of 216 CVWD, DWA, CWA, or IWA public supply wells tested for chromium, 60 had concentrations greater than 10 µg/L. As discussed in Chapter 8, *Regulatory and Policy Issues*, the GSAs have investigated chromium-6 treatment options and applied for funding.

4.4.10 Uranium

Uranium has an MCL of 20 picocuries per liter (pCi/L), or 30 µg/L. At this concentration, the effect of radiation is negligible, but the chemical properties of uranium can cause kidney damage over time.

As shown in Figure 4-18, uranium concentrations are higher in the northwestern portion of the Indio Subbasin. The *2010 CVWMP Update* discussed Colorado River water as a potential source of uranium. Uranium sampling at Lake Havasu, the diversion point for the CRA, has indicated the presence of uranium at levels less than 5 µg/L (Central Arizona Project, 2015, 2017, 2019). Available data indicate that the likely source of uranium in the Subbasin is from local geologic sources. Uranium is often derived from eroded granite (Jurgens et al., 2010), such as the granites to the west

of the northern Indio Subbasin or the bedrock northeast of the Subbasin. Uranium often occurs in shallow, oxygen-rich groundwater and in iron oxides on the surfaces of aquifer sediment. Soluble uranium often occurs in association with calcium and bicarbonate (Jurgens et al., 2010), and groundwater in the Palm Springs Subarea has been characterized as a calcium-bicarbonate water type (DWR, 1964).

In the Indio Subbasin, uranium concentrations greater than the 20 pCi/L MCL were only detected in six wells, 1.9 percent of all wells monitored. The median uranium concentration in the Subbasin is 3.6 pCi/L.

4.4.11 Fluoride

Fluoride is a naturally occurring element found in concentrations exceeding the California primary MCL (2 mg/L) in portions of the Indio Subbasin. While fluoride is a necessary component of a healthy diet to prevent dental cavities, fluoride at concentrations greater than 4 mg/L (the federal EPA MCL) can cause mottled teeth and bone disease.

As shown on Figure 4-19, elevated fluoride concentrations are observed along the eastern side of the Indio Subbasin and northern boundary of the Salton Sea. Of the most-recent fluoride measurements from wells, the median concentration is 0.6 mg/L, and the maximum concentration is 13.0 mg/L. In total, 118 wells, or 10.3 percent of all wells sampled, have their most recent fluoride measurement greater than the 2 mg/L MCL. These higher concentrations are likely due to proximity to the San Andreas Fault and geothermally active areas near the Salton Sea. Other parts of the United States also see higher concentrations occurring near faults and geothermically active areas (McMahon et al., 2020).

Fluoride is primarily a concern for small water systems and private domestic wells. Review of available data indicates that 54 small water systems have reported fluoride data since 2010. Thirteen small water systems reported fluoride concentrations greater than 2 mg/L and six detected fluoride at concentrations greater than 4 mg/L. As summarized in Chapter 8, *Regulatory and Policy Issues*, CVWD has an active program to assist small water systems in disadvantaged areas that have water supply problems including water quality issues. Large water systems are able to selectively drill wells in areas with low fluoride concentrations or provide treatment to meet the MCL, while these activities are less accessible to small water systems or private domestic well owners. Only 4 out of 257 CVWD, DWA, CWA, or IWA public supply wells had the most recent measurement show fluoride concentrations greater than 2 mg/L in their most recent measurement. Only one of these wells has been sampled in the past 15 years and is known to be inactive.

4.4.12 Perchlorate

Perchlorate was identified in the *2010 CVWMP Update* as an emerging issue (see Chapter 8, *Regulatory and Policy Issues*), because of historical contamination in the Colorado River that originated from two manufacturing facilities. Perchlorate may also occur naturally in arid basin settings. Cleanup activities have since mitigated perchlorate levels in Colorado River water. Perchlorate loading into Las Vegas Wash has decreased more than 90 percent from 1998 to 2009, and levels remained below 2 µg/L from 2009 to 2020 at MWD's Lake Havasu intake (MWD, 2020). CVWD monitors the Coachella Canal at Avenue 52. Other than one perchlorate detection in 2020 (1.1 ug/L), all other Canal water samples have been below the detection limit for perchlorate. The

California MCL is set at 6 µg/L. As documented in Figure 4-20, detections of perchlorate in the Indio Subbasin have been highly localized with concentrations less than 2 µg/L.

4.4.13 Dibromochloropropane

DBCP is a pesticide banned in the United States since 1979 because it is hazardous to gastrointestinal and pulmonary health. California has an MCL of 0.2 µg/L for DBCP. While it is broken down in sunlight, it can remain in groundwater for decades; because it is denser than groundwater, it tends to sink to the bottom of aquifers. DBCP has been detected in public supply and private irrigation wells but has not been detected in public supply wells above the MCL. Three private irrigation wells have most-recent DBCP concentrations greater than 0.2 µg/L. These three wells have not been monitored in over ten years. The maximum concentration observed was 0.4 µg/L. As shown in Figure 4-21, the wells with high DBCP measurements are relatively localized in the central Thermal Subarea. The DBCP occurrence is limited to unconfined portions of the Subbasin where specific historical irrigated agricultural practices occurred.

4.5 Seawater Intrusion

The Indio Subbasin is located over 60 miles from the Pacific Ocean and is not vulnerable to seawater intrusion in the traditional sense. However, it is potentially vulnerable to saltwater intrusion from the Salton Sea. Percolation of high TDS groundwater from the shallow aquifer may also be a source of degradation to the deep aquifer. High rates of production in the lower aquifer near the Salton Sea could pull in dense, saline water, and thus degrade groundwater quality in deep portions of the aquifer. Potential saltwater intrusion along the Salton Sea northwestern boundary is monitored through two sets of nested monitoring wells, installed and managed by CVWD. Results from these monitoring wells do not suggest current groundwater degradation due to saltwater intrusion.

The Salton Sea is about 30 feet deep, 35 miles long, and 15 miles wide. Its primary source of water is agricultural drainage, transported through the Alamo River, New River, CVSC, and agricultural drains. The Salton Sea has no outflowing streams, but the rate of evaporation is higher than the rate of inflows, causing a decline in the surface elevation, decrease in surface area and volume, and salinization. Salton Sea levels measured by the USGS have dropped approximately 12 feet from January 2000 to January 2025, and the shoreline has retreated (California Natural Resources Agency, 2026). TDS levels in the Salton Sea during 2019 were greater than 69,000 mg/L (Salton Sea Authority, 2020) and have steadily increased since, ranging from 83,000 to 90,000 mg/L in 2025 (California Natural Resources Agency, 2026).

While increasing salinization of the Salton Sea suggests an increased potential for saltwater intrusion, the dropping Salton Sea levels and retreating shoreline suggest a groundwater gradient from the Subbasin toward the sea and therefore less potential for intrusion from the sea. However, local groundwater gradients can change based on changes in groundwater pumping, recharge, and density differences between groundwater and Salton Sea water.

To detect and track potential saltwater intrusion, two sets of dedicated nested monitoring wells have been installed. The northernmost set of nested monitoring wells, about 2.1 miles north of the Salton Sea, was installed in 1996 with perforation depths at 300-390, 730-770, 1220-1260, and 1,430-1,470 feet below ground surface (bgs) (see Figure 4-22 and Figure 4-23). All wells but the deepest well have shown stable or decreasing TDS concentrations, indicating that saltwater intrusion from the Salton Sea is not currently occurring in this region. The shallowest well (labelled

07S09E30R04S on Figure 4-22), shows a decreasing TDS trend during 1996-2019, from about 500 mg/L to under 200 mg/L, with the exclusion of the data spike in 2024. Well 07S09E30R03S, with the 730-770 feet bgs screen, has maintained TDS concentrations under 300 mg/L, excepting occasional data spikes (Figure 4-22).

4.6 Interconnected Surface Water and Groundwater Dependent Ecosystems

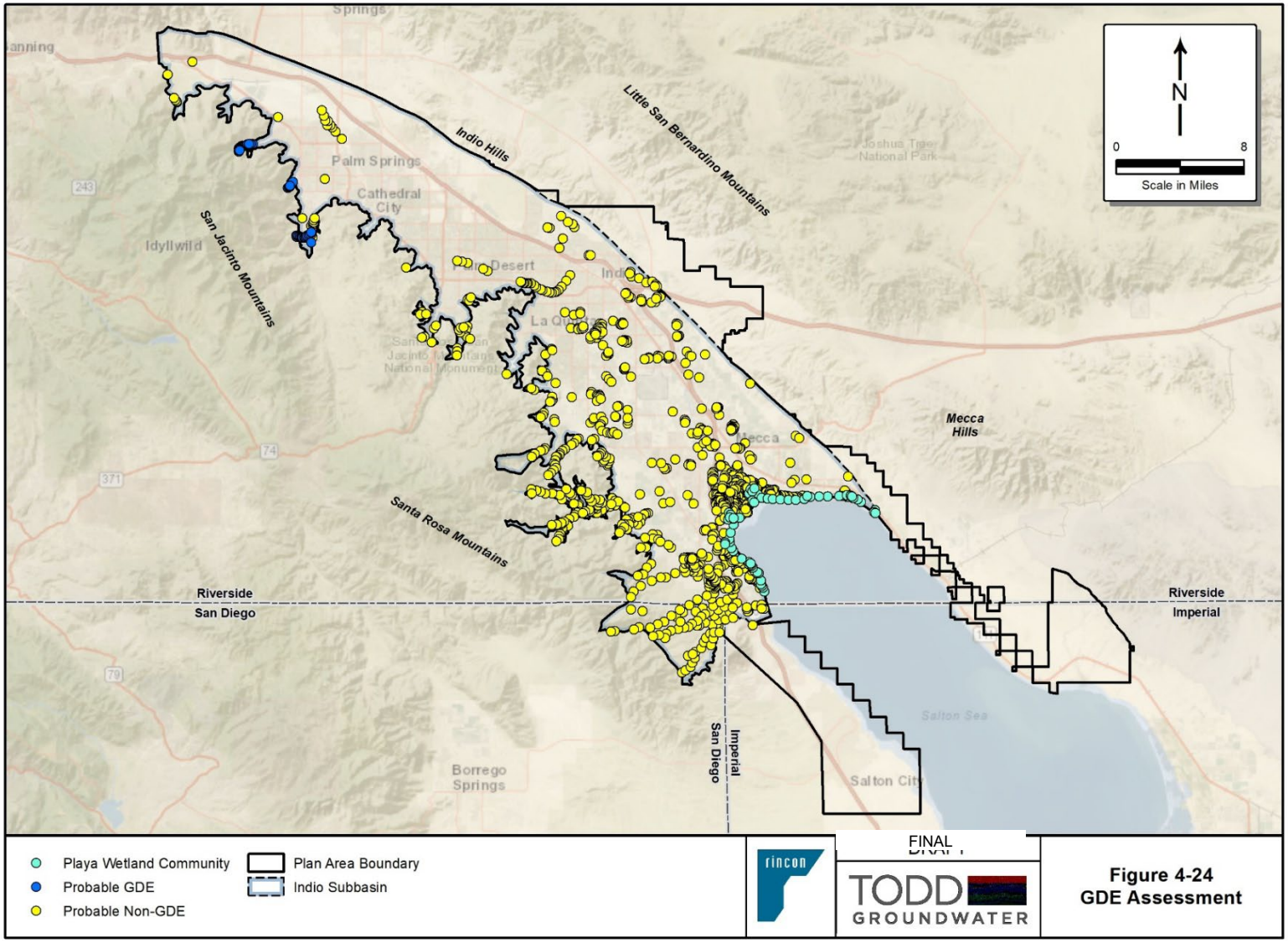
An interconnected surface water is hydrologically connected by a continuous saturated zone to the underlying aquifer. A "gaining" stream occurs when groundwater elevation is higher than surface water elevation and groundwater flows into the surface water. A "losing" stream occurs when surface water elevation is higher than groundwater elevation and surface water flows into the groundwater. A groundwater dependent ecosystem (GDE) is defined in the GSP Regulations as "ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface." When interconnected surface water is depleted, GDEs that depend on perennial or seasonal flows may be degraded. The *2022 Alternative Plan Update* identified GDEs in the Indio Subbasin using best available information (including data available from DWR) and by applying the expertise of a professional wetland scientist.

DWR provides the Natural Communities Commonly Associated with Groundwater (NCCAG) dataset through the online SGMA data portal. This NCCAG dataset was used for initial identification of potential GDEs in the Subbasin. Once downloaded, the data were compiled using a set of six pre-existing dataset sources; this process is explained in detail on DWR's Natural Communities Dataset Viewer. Because DWR's NCCAG dataset was not verified prior to public distribution, DWR recommends evaluation of NCCAG-identified locations by a licensed biologist.

For the *2022 Alternative Plan Update*, the NCCAG dataset locations were assessed by a licensed wetlands biologist, as documented in the *Indio Subbasin Groundwater Dependent Ecosystems Study* (Woodard & Curran, 2021), which is provided in Appendix 4-C. The study includes a review of the EPA ecoregions and a preliminary review of special-status (threatened and endangered) species within the Indio Subbasin. The desktop assessment used publicly available statewide and regional data layers and involved visual review of 1,045 individual locations to determine potential GDE status. The biologist then selected 15 locations for GDE field assessment. The field study was conducted from January 11-14, 2021, at 13 sites. Two sites were not accessible at the time of field deployment and were therefore eliminated from the field assessment. Upon completion of the in-person field verification, the preliminary desktop GDE assessment was refined.

As shown on Figure 4-24, 50 (five percent) of the 1,045 sites were determined to be Probable GDEs, 932 sites (89 percent) were determined to be Probable non-GDEs, and 63 sites (6 percent) were determined to be Playa Wetland Communities.

Figure 4-24 GDE Assessment



Probable GDEs consist of areas with apparent dense riparian and wetland vegetative communities along mapped drainage systems with potential for deep-rooted phreatophytes and/or visible, natural surface water flow. These Probable GDE clusters comprise hot or cold springs, seeps, and stream channels that convey snowmelt from the surrounding San Jacinto mountain front. Due to their location in upper canyons where groundwater extraction is generally not occurring, the specific areas in the Indio Subbasin where Probable GDEs were identified do not have existing groundwater data available for review (see Figure 4-5). Probable GDEs identified along the mountain-front may be associated with surface runoff, snowmelt, or springs and seeps from up-gradient sources.



Representative photo of a Probable GDE, a spring in Chino Canyon

Probable Non-GDEs are areas that appeared incorrectly mapped based on current land development and land-use or that otherwise appeared to be dry upland areas, cultivated and/or flooded agricultural land, obvious humanmade ponds, lakes, and other features, channelized drains, and areas with no other indicators of groundwater presence near the surface. It should be noted that dry washes, arroyos, bajadas, and other ephemeral conveyances where water only flows in response to heavy precipitation events were classified as Probable Non-GDEs for this study.



Representative photo of a Probable Non-GDE, a bajada in the southeast portion of the Subbasin

Playa Wetland Community includes areas of wetland habitat along the Salton Sea exposed seabed (playa) generally downstream of stream, agricultural drain, or stormwater channel outlets. The receding of the Salton Sea is exposing thousands of acres of playa each year and water from irrigation ditches and other drainages that previously flowed directly into waters of the Sea now spreads out on the exposed playa of the Sea where new vegetation and wetlands currently exist as a result. As discussed in the *Indio Subbasin Groundwater Dependent Ecosystems Study,* the *Coachella Valley Multiple Species Habitat Conservation Plan* (*CVMSHCP*) (Coachella Valley Association of Governments, 2007) identifies some of these playa wetlands as part of the CVSC/Delta Conservation Area, which includes the CVSC, agricultural drains emptying into the Salton Sea that may contain



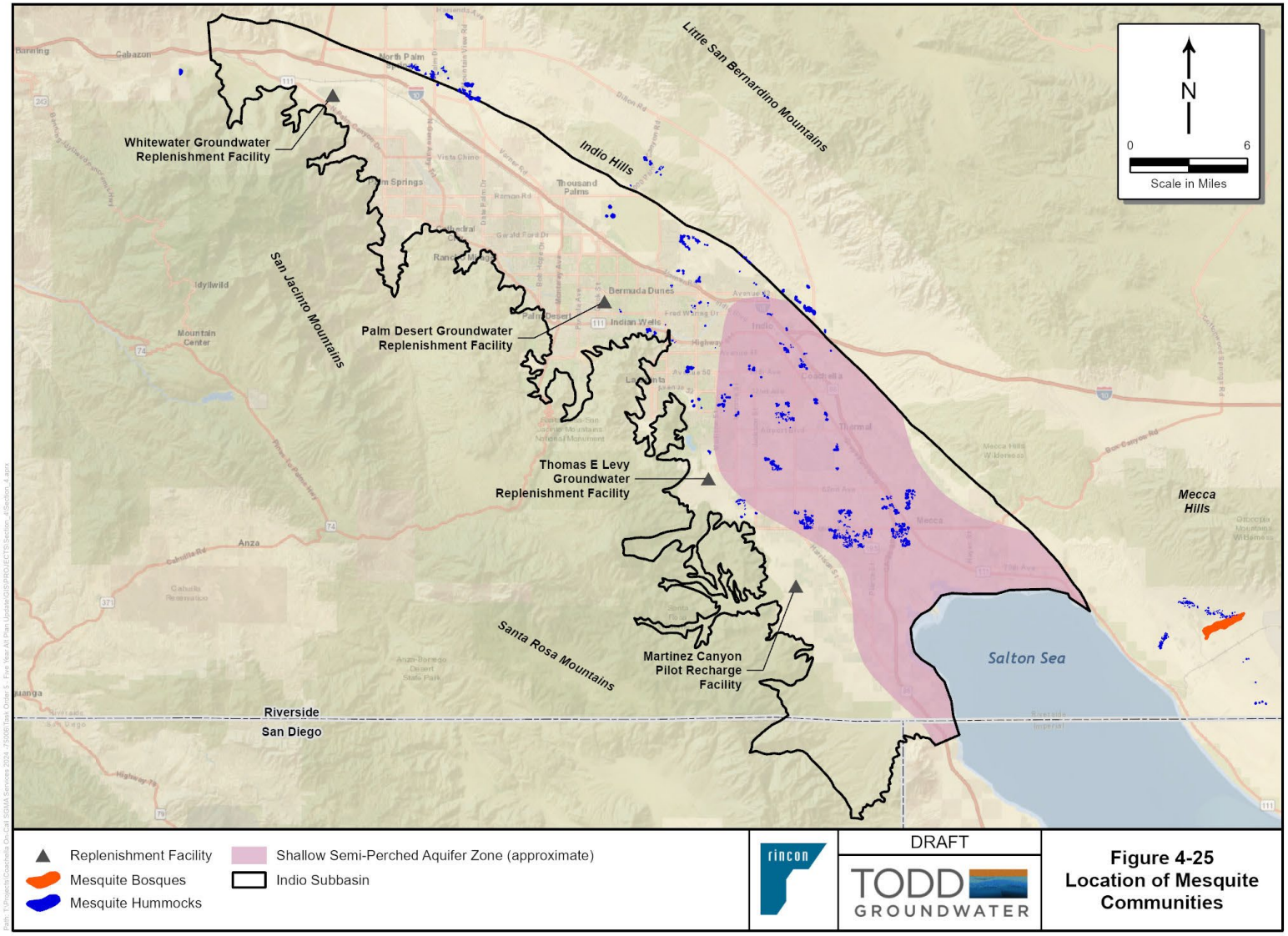
Representative photo of a Playa Wetland Community along the Salton Sea exposed seabed

desert pupfish habitat, and areas along the seashore that contain sensitive natural communities. The *CVMSHCP* acknowledges that this habitat is sustained largely by agricultural runoff and outflow in the CVSC, but that maintenance of the drains and the flood control channel periodically modifies the habitat.

The *Indio Subbasin Groundwater Dependent Ecosystems Study* in Appendix 4-C provides additional documentation, including a table of the state and federal threatened and endangered species listed for the Indio Subbasin, field assessment notes, maps, and photographs of the GDE field assessment sites. Current groundwater conditions indicate that groundwater management in the Indio Subbasin has no significant or undesirable impacts on GDEs.

In addition to the GDEs identified in the GDEs Study, the California Department of Fish and Wildlife (CDFW) submitted a comment letter to the *2022 Alternative Plan Update* asking the GSAs to consider mesquite hummock and mesquite bosque as GDEs. The *CVMSHCP* lists these communities as found in seasonally wet, high salinity, shallow groundwater, indicating perched seasonal locations. Figure 4-25 shows the area these communities may be located. Most of the communities are located in or around the perched aquifer area. Given their location and dependence on high salinity shallow groundwater, it is unlikely they are connected to the saturated groundwater of the principal aquifer.

Figure 4-25 Location of Mesquite Communities



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5 Demand Projections

5.1 Introduction

Water resources planning requires reliable estimates of future water demands. Many factors can affect the amount of water used in the future, including local climate, existing water use patterns, population growth, seasonality, employment, economic trends, environmental needs, and water conservation efforts. As demographic changes occur within a region over time, future demand projections may also change. For example, population projections were much higher in the *2010 Coachella Valley Water Management Plan Update* (*2010 CVWMP Update*) (Coachella Valley Water District [CVWD], 2012) and have been reduced to reflect more tempered growth over the last few decades (refer to Chapter 1, *Introduction*). Revising the demand forecast with updated demographic projections is important for anticipating future water use more accurately when compared to projected supplies identified in Chapter 6, *Water Supply*.

To provide an adequate long-range forecast of future water demands, this *2027 Alternative Plan Update* uses a 25-year planning period from 2025 through 2050. Projected water demands are broken into four major categories: municipal, agricultural, golf, and other. Projections for each of these four categories were developed separately and then summed in the final section of this chapter.

5.2 Factors Affecting Future Water Demands

There are a number of uncertainties and changes in the region and state that could affect future water demands in the Plan Area. These uncertainties include the following:

- **Revised Growth Forecast.** The Southern California Association of Governments (SCAG) released new socioeconomic growth forecasts in early 2024 (*Connect SoCal 2024*)[1] that updated previous projections for population, housing, and employment. The SCAG forecast was developed in coordination with City and County municipal planners and was based on the land use designations in their respective adopted General Plans. *Connect SoCal 2024* reduced projected growth in the Plan Area to levels substantially lower than those published in the *2002 Coachella Valley Water Management Plan* (*2002 CVWMP*) (CVWD, 2002).
- **Agricultural Land Conversions.** *Connect SoCal 2024* identified specific parcels that are currently vacant or used for agriculture but are planned for conversion to urban uses. *Connect SoCal 2024* relied on those developable parcels, coupled with the housing and employment growth projections, to estimate increases in municipal demand and associated decreases in agricultural demand.
- **Development on Tribal/Reservation Lands.** There are over 50,000 acres of Tribal/Reservation lands in the Plan Area. While much of the Tribal/Reservation lands in the West Valley has been developed to varying degrees, a substantial amount of Tribal/Reservation land in the East Valley is largely undeveloped. All five Tribal governments in the Plan Area were engaged by the Groundwater Sustainability Agencies (GSAs) with requests for land use and water demand projections for their Tribal/Reservation lands. Several of the Tribes indicated that projected Tribal/Reservation land uses were already included in municipal General Plans; therefore,

[1] https://scag.ca.gov/connect-SoCal-2024

Connect SoCal 2024 adequately captures Tribal/Reservation growth. Others did not respond; for the purposes of analysis, all Tribal/Reservation lands were assumed to grow in accordance with *Connect SoCal 2024*.

- **Long-Term Conservation Regulations.** Following the 2012–2016 drought, California passed two major pieces of conservation legislation: Assembly Bill (AB) 1668 (Friedman) and Senate Bill (SB) 606 (Hertzberg). As outlined in *Making Conservation A California Way of Life* (California Department of Water Resources [DWR] and California State Water Resources Control Board [SWRCB], 2018), the legislation requires the establishment, implementation, reporting, and enforcement of urban water use objectives, along with agricultural water use efficiency requirements. These objectives and standards are currently in the early stages of implementation and reporting, as described in Section 5.3 below.

5.3 Municipal Demands

This section summarizes the process used to develop the municipal water demand projections for the Plan Area, which includes the cities of Cathedral City, Coachella, Indian Wells, Indio, La Quinta, Palm Desert, Palm Springs, and Rancho Mirage, and unincorporated areas in Riverside and Imperial Counties. A small portion of the Plan Area extends into San Diego County. However, this area is not included in this analysis, which uses SCAG's population, housing, and employment forecasts that do not address San Diego County. This small area is mostly rugged uplands, contains minimal development, and is not likely to be developed further.

As described in Chapter 1, *Introduction*, the water agencies serving as GSAs for this *2027 Alternative Plan Update* include the following:

- CVWD, serving parts of Cathedral City, Indian Wells, Indio, La Quinta, Palm Desert, Palm Springs, Rancho Mirage, and unincorporated Riverside and Imperial counties.
- Coachella Water Authority (CWA), serving the City of Coachella.
- Desert Water Agency (DWA), serving parts of Cathedral City and Palm Springs, and portions of unincorporated Riverside County in the West Valley.
- Indio Water Authority (IWA), serving the City of Indio's sphere of influence.

This section documents the datasets, methodologies, and assumptions used to develop water demand projections for all municipal uses within the Plan Area boundary.

5.3.1 Municipal Demand Methodology

The municipal demand forecast used water use and adjustment factors customized to each of the GSAs and their service areas, based on a variety of information including customer billing data and a geographic information system (GIS) database with parcel-level land use information. The base projection year was established as 2025 using interpolated data from the 2019 baseline year from SCAG via *Connect SoCal 2024*. Future water demand projections were based on SCAG growth projections for 2025,[2] 2035, and 2050. Future water demands with linear interpolation between these years are reported in five-year increments. The methodology used to develop municipal water demand projections was as follows:

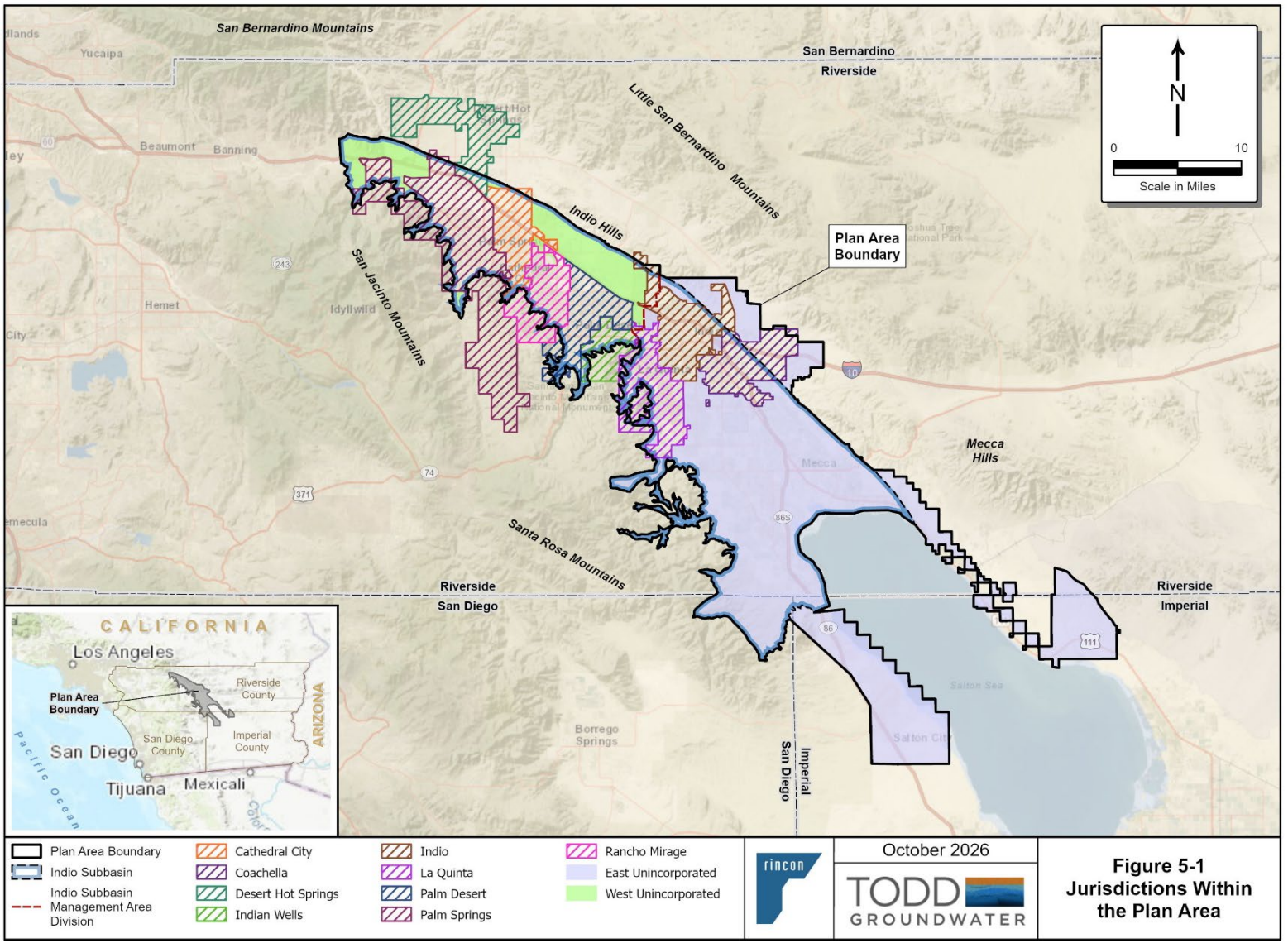
[2] 2025 forecast is a projection based on SCAG demographic data and does not reflect actual 2025 water use.

1. **SCAG Regional Growth Forecast.** SCAG provided socioeconomic forecasts for population, households, and employment based on geographic units called traffic analysis zones (TAZs) that were correlated to each municipality and GSA service area. These SCAG data served as the starting point for analysis. Additional information was required to estimate total housing units for the region.
2. **Housing Unit Analysis.** Additional information about vacancy rates was used to estimate baseline and projected housing units for the Plan Area, including housing units used by seasonal residents and other part-time users. Recent development data and land use information were used to allocate future housing units into the single-family and multiple-family sectors.
3. **Employment Analysis.** SCAG employment forecasts were used to allocate future commercial, industrial, and institutional (CII) employees to comparable water billing categories to project demands.
4. **Unit Demand Factors.** Customer billing data provided by the GSAs from October 2019 to September 2024 were evaluated to determine baseline water use factors by billing category for each GSA. The multiple-year average was used to capture annual weather variations. Water demand projections were calculated using *gallons per household* for residential and landscape uses, and *gallons per employee* for CII uses.
5. **Water Loss.** Water loss estimates were based on validated Water Loss Audit reports provided by the GSAs. An average of five years of available water loss audits (for 2020 through 2024) were used to develop a water loss estimate. Water loss was assumed to decrease with the implementation of Advanced Metering Infrastructure (AMI).
6. **Adjustment Factors.** Future demands were adjusted for indoor and outdoor conservation based on savings from the natural replacement of indoor devices, as well as installation of smart irrigation controllers, turf replacement rebates, non-functional turf bans, and from implementation of DWR's *2015 Model Water Efficiency Landscape Ordinance* (MWELO) (DWR, 2015) for future developments.

The basic units of municipal demand projections are jurisdictions (i.e., cities and unincorporated county areas) in the Plan Area, as shown in Figure 5-1. Within each jurisdiction, demographic factors were considered homogeneous. For example, the average vacancy rate for a city was considered the same in instances where a city was split between multiple water agencies or when a city was both inside and outside the Plan Area boundary. Unincorporated areas were separated into distinct estimates for the West Valley and the East Valley. The East Unincorporated geographic area (see Section 5.3.2 below) includes both Riverside and Imperial Counties.

For each of the GSAs, socioeconomic data and demand projections were totaled by each *GSA Area*, which is defined as being limited to the portion of the GSA's jurisdictional area in the Plan Area. For example, the *CVWD Area* includes all of CVWD's jurisdictional area in the Plan Area, whether or not those demands are currently served by their domestic water system. For customers that are not connected to the CVWD domestic water system but are in the CVWD Area, demands met by private wells or small water systems are allocated to CVWD as the overlying GSA.

Figure 5-1 Jurisdictions within Plan Area



5.3.2 SCAG Regional Growth Forecast

Socioeconomic projections of population, households, and employment were provided by SCAG, which is a joint powers authority that encompasses six counties (Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties). These data were originally prepared for the *2024-2050 Regional Transportation Plan/Sustainable Communities Strategy*, also known as *Connect SoCal 2024*. Household and employment estimates developed for *Connect SoCal 2024* include base year estimates for 2019 and projections for 2035 and 2050. Forecasts for 2025, 2030, 2040, and 2045 were based on linear interpolation. The final socioeconomic growth projections were released with the final version of *Connect SoCal 2024*, which was adopted by SCAG on April 4, 2024.

Connect SoCal 2024's regional growth forecast comprises the most recent and detailed data available for the Plan Area. This regional growth forecast is based on jurisdictional General Plans and is intended to represent the most likely growth scenario considering a combination of recent and past trends and regional growth policies. To assess growth at the regional and county level, SCAG reviewed preliminary data with local jurisdictions as part of the Local Data Exchange (LDX) process. Jurisdictions provided feedback on growth forecasts, along with data elements such as GIS maps and surveys. Input from local municipal planners generally revised growth forecasts upwards based on regional housing allocations.[3]. While *Connect SoCal 2024's* overall growth projections for Coachella Valley have increased from the previous forecast, the annual rate of increase has slightly decreased from the previous forecast.

The major data sources used to develop SCAG's growth forecast at the county level are:

- California Department of Finance (DOF) population and household estimates
- California Employment Development Department (EDD) jobs report by industry
- 2019 existing land use and General Plans from local jurisdictions
- 2020 Decennial Census P.L.-94 171 Redistricting Data
- American Community Survey (2015-2019 5-Year Estimates)
- County assessor parcel databases
- 2019 business establishment data from InfoGroup
- Latest available entitlement agreements as articulated by local jurisdictions
- 6th cycle housing element update data, if available
- Adopted Connect SoCal 2020 policies and growth vision
- Jurisdictional review through the Local Data Exchange (LDX) process

Connect SoCal 2024 projects that the population of Riverside County will increase by approximately 50 percent through 2050. The 2024 update also notes the region's population decline between 2019 and 2023 and attributes this decrease to COVID-19 pandemic impacts. Traffic and visitation declined during the pandemic but has recovered to or exceeded pre-pandemic levels in most communities. SCAG notes that the median age is increasing and unpredictable events like the COVID-19 pandemic may cause significant deviations from projected long-term trends.

Despite fluctuations in projections, current Plan Area growth is consistent with long-term growth trends (i.e., the growth rate effectively averages boom and bust periods) in the Coachella Valley over the last 25 years.

[3] https://scag.ca.gov/rhna

5.3.2.1 Seasonal Population

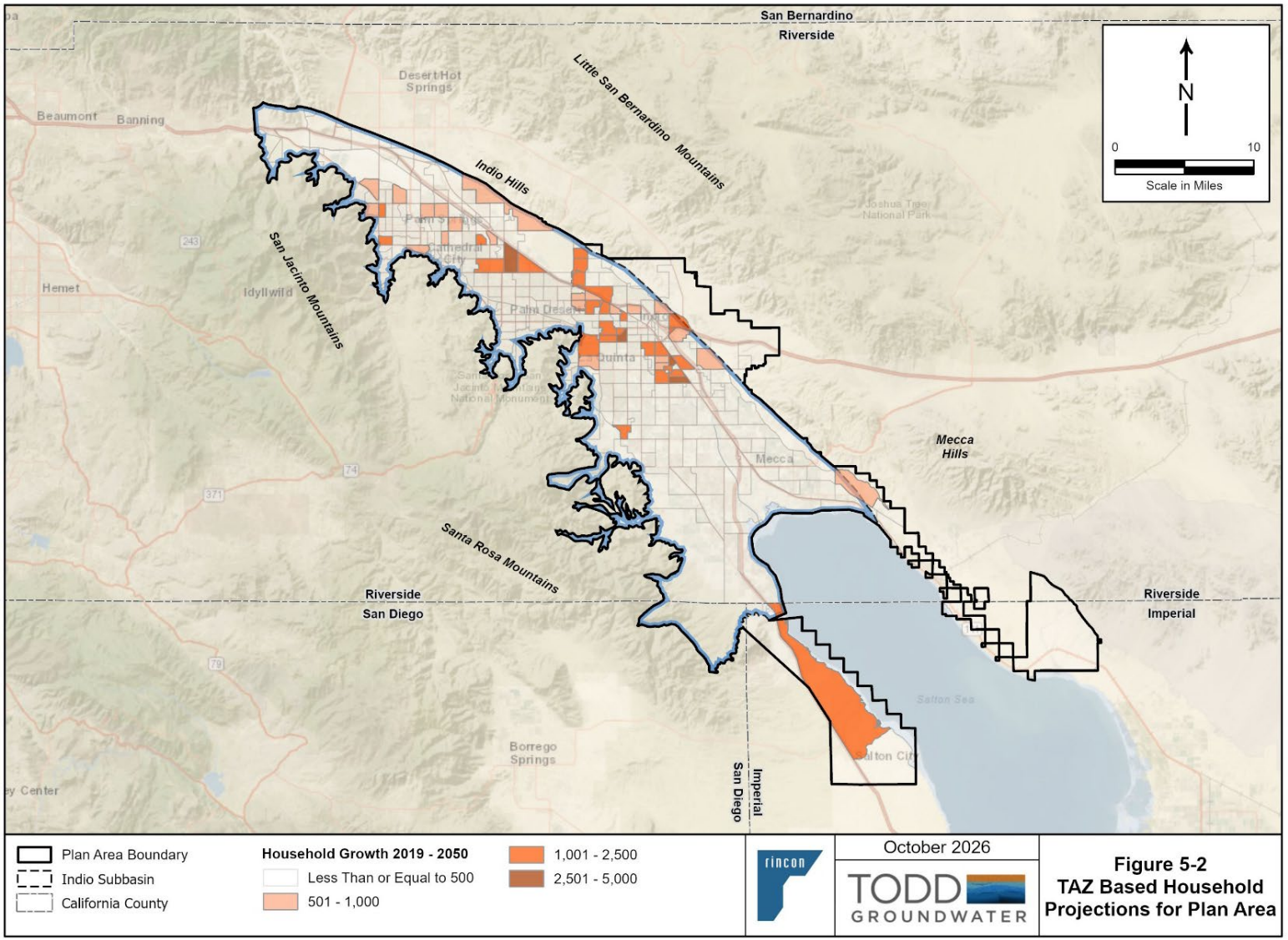
The Coachella Valley is unique in that it includes a high number of homes identified as vacant for "seasonal, recreational, or occasional uses" as defined by the Census Bureau. These homes are not the primary residence of owners or renters based on where they spend most of their time. In the Coachella Valley, these include part-time retirement homes for people who live in one primary location but also have a second home in a warmer location to spend winters and/or weekends. Tourism is also an important part of the region's economy, and many homes are used as short-term rentals. The emergence of the sharing economy and internet-based platforms for short-term rentals has more recently resulted in changes to the short-term rental market. The region's seasonal population is not counted under the Census Bureau's definitions of households and population used by SCAG.

For the purposes of this *2027 Alternative Plan Update*, growth in residential water demand is a function of current and projected housing units, which include all vacant and seasonal units. Seasonal and short-term rental homes are not assumed to deviate significantly as a percentage of total housing units, and future demands associated with these housing types are assumed to correlate with projected household increases. Vacant housing units and other amenities such as municipal parks and common areas that serve the seasonal population have year-round water uses, particularly for outdoor irrigation. Due to the seasonality of the tourism industry and outdoor irrigation requirements in the summer, these homes often use the most water when they are vacant. SCAG's population forecast was expanded for this *2027 Alternative Plan Update* to reflect seasonal population in the Plan Area.

5.3.2.2 Growth Forecast for the Plan Area

SCAG provided socioeconomic forecasts at various levels of geographic units, including 11,267 transportation analysis zones (TAZs), which were developed independently by SCAG and resemble the Census Bureau's block groups. These TAZs were used to split forecasts of households and employment by water agency and by Plan Area. To split individual TAZs, data were clipped along jurisdictional boundaries and further analyzed using aerial imagery. The aerial imagery provided greater precision in locating population centers. Figure 5-2 is a map of the Plan Area showing the largest household growth by TAZ.

Figure 5-2 TAZ Based Household Projections for Plan Area



Socioeconomic Forecast for the Plan Area

Table 5-1 lists the socioeconomic population, household, and employment forecasts for the GSAs in the Plan Area as developed by SCAG. Household and employment forecasts were taken by partitioning SCAG growth estimates spatially by each water district's service area. Population estimates were developed by multiplying household estimates by persons per household data from the 2020 U.S. Census. In the Plan Area, the cities with the largest projected net increases in population are Coachella, with an increase of 109,000 persons (i.e., a 249-percent increase), and Indio, with an increase of 56,000 persons (i.e., a 64-percent increase). As a result, CWA and IWA have the fastest-growing populations among the GSAs.

Table 5-1 Socioeconomic Growth Forecast for GSAs Within Plan Area

	Permanent Population		Households		Employment	
Water Provider	**2019**	**2050**	**2019**	**2050**	**2019**	**2050**
Coachella Valley Water District	216,710	316,454	88,081	126,814	119,150	147,926
Coachella Water Authority	42,522	152,287	10,147	36,341	9,843	24,981
Desert Water Agency	48,158	62,329	25,825	33,398	39,419	49,535
Indio Water Authority	75,249	125,627	25,106	41,913	26,250	35,267
Plan Area Total	**402,392**	**656,697**	**149,159**	**238,466**	**194,662**	**257,710**

Note: SCAG population estimates do not include seasonal population.

Source: *Connect SoCal 2024*



The Coachella Canal runs adjacent to agriculture fields in the East Valley.

Forecast Population with Seasonal Residents

For the purposes of analysis, SCAG's socioeconomic forecast was used to project the region's total population, including seasonal residents. The projection used vacancy rates and persons per household estimates from State of California Department of Finance (DOF) for cities and unincorporated areas (see Section 5.3.4). By definition, seasonal residents would spend less than half the year in seasonal housing units. However, vacant housing units and other amenities that

serve seasonal residents would have year-round water uses, primarily associated with outdoor irrigation.

To estimate total service area population, both permanent residents and seasonal residents were estimated as described below. Permanent and seasonal population was estimated using SCAG housing estimates, Census data, housing density, and water meter connections.

- Step 1: The jurisdictional areas shown in Figure 5-1 were intersected with each GSA's water service area and 2019 housing totals from SCAG's *Connect SoCal 2024* growth projection (SCAG, 2024). Household totals for 2025 were estimated by multiplying the 2019 totals by the growth in residential meter connections for each agency from 2019 to 2025.
- Step 2: The permanent population was estimated by multiplying the 2025 household totals by the number of persons per household for each jurisdiction within the Plan Area using Census data.
- Step 3: The seasonal population was then estimated by dividing the permanent population totals by the occupancy rate from the Census for each jurisdiction to determine the number of housing units, and multiplying the total number of housing units by the difference between the average vacancy rate for California and the vacancy rate of each jurisdiction in the Plan Area.

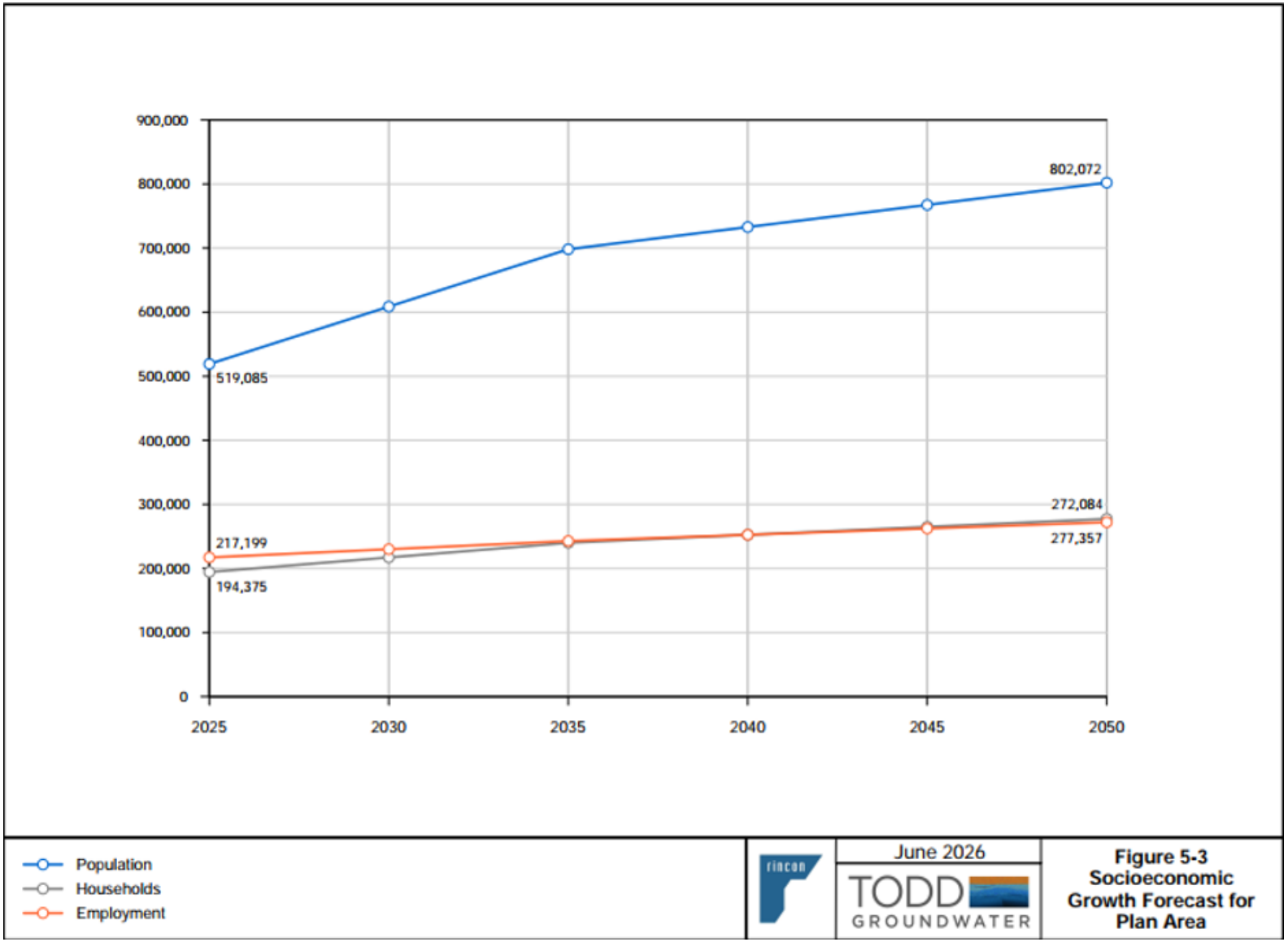
Table 5-2 provides a forecast of Plan Area population with seasonal residents.

Table 5-2 Total Plan Area Population with Seasonal Residents

Water Provider	2025	2030	2035	2040	2045	2050
Coachella Valley Water District	307,889	350,895	393,901	402,140	410,378	418,617
Coachella Water Authority	49,166	73,617	98,069	116,159	134,249	152,339
Desert Water Agency	65,526	72,190	78,854	80,969	83,084	85,199
Indio Water Authority	96,503	111,927	127,351	133,539	139,728	145,917
Plan Area Total	**519,084**	**608,629**	**698,175**	**732,807**	**767,439**	**802,072**

Table 5-2 shows that by 2050, the overall Plan Area population is projected to grow by 282,987 (55 percent) and households are expected to grow by 82,982(43 percent). Overall household growth is expected to increase by approximately two percent annually. This growth is generally consistent with the average three percent annual growth across jurisdictions in the Plan Area from 2000 to 2024 per DOF housing estimates, which are impacted by a higher growth period in the early 2000s (DOF, 2026). Employment is anticipated to grow slower than population or households, with 54,885 new employees (25percent) by 2050. This is a result of net travel out of the region for work, as well as a large number of retirees in the Plan Area.

Figure 5-3 Socioeconomic Growth Forecast for Plan Area

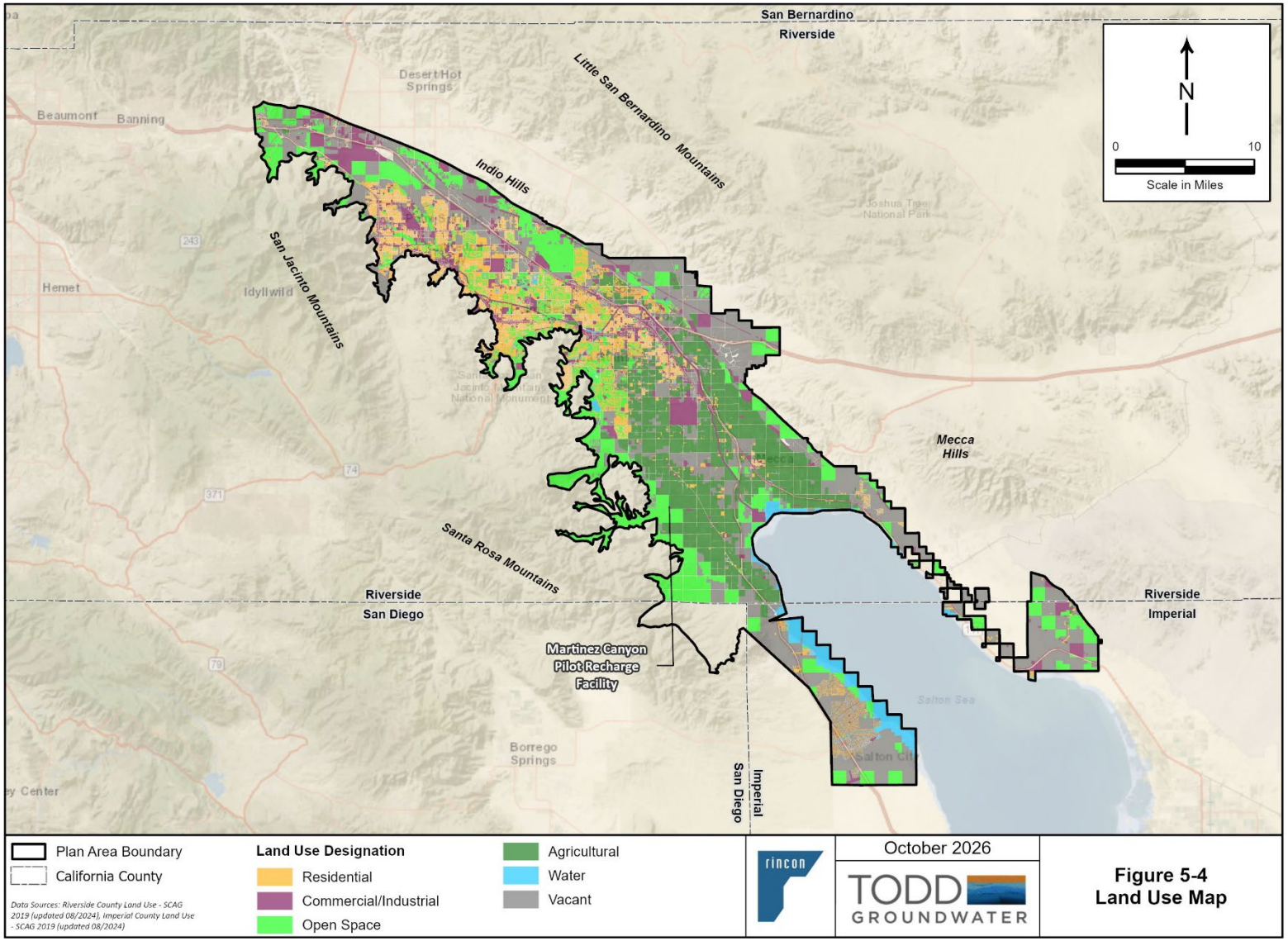


5.3.3 SCAG Land Use

Land use information derived from both General and Specific Plans compiled as part of SCAG's *Connect SoCal 2024* was used during analysis to spatially allocate residential growth and quantify future development of agricultural land. Land use data were retrieved from SCAG's *2019 Annual Land Use*.[4] These data are available in various formats, including SCAG's GIS Open Data Portal.[5] SCAG's land use data include existing land uses, adopted General Plan land use, Specific Plan land use, and adopted zoning codes for each jurisdiction. Because each jurisdiction in the region has their own approach to categorizing land uses, SCAG aggregated these categories into their own land use definitions. These land use data were then reviewed by local jurisdictions as part of SCAG's LDX process, and SCAG's final dataset reflects each jurisdiction's local input. Figure 5-4 shows the 2019 Land Use categories within the Plan Area. Agricultural land is about 12 percent of land use within the Plan Area and is located primarily in the East Valley. Residential land use comprises approximately 24 percent of land use within the Plan Area, while Commercial, Industrial, and Institutional Land Use comprises approximately 13 percent of land use within the Plan Area.

[4]https://hub.scag.ca.gov/datasets/ea9fda878c1947d2afac5142fd5cb658_0/about
[5] http://gisdata-scag.opendata.arcgis.com/

Figure 5-4 Land Use Within the Plan Area



5.3.4 Housing Unit Projections

The growth forecast for residential and landscape water uses used in this *2027 Alternative Plan Update* is based on a forecast of total housing units. SCAG's *Connect SoCal 2024* provides socioeconomic projections of households, or occupied housing units, which exclude all vacant units. Additional information about vacancy rates and housing types from the California DOF (DOF, 2026) was used to transform SCAG projections into estimates of total housing units and to separate housing units into the categories of single-family and multiple-family residences.

5.3.4.1 Vacancy Rates

SCAG's *Connect SoCal 2024* counts are limited to occupied households and had to be increased to account for vacant housing units. Vacancy rates were applied to SCAG household projections for each jurisdiction to develop estimates of total housing units.

Vacancy rates were used instead of a vacant unit count to account for jurisdictions that were split between water agencies or that were both inside and outside of the Plan Area. As the unincorporated areas in the Plan Area are primarily within Riverside County, unincorporated Riverside County vacancy rates were used to determine housing units in those areas. It was assumed that vacancy rates would remain constant for each jurisdiction across future projections. Although vacancy rates have been generally decreasing across the Plan Area, decreasing by an average of about 2 percent from 2010 to 2024, it is unlikely this decrease will remain constant through 2050. Reduced vacancy rates signifies reduced housing units in proportion to household numbers, so assuming constant vacancy rates leads to a high bias and more conservative estimate for demand. Average estimates from the DOF for 2020 to 2024 were used for vacancy rates (DOF, 2026).

Table 5-3 provides recent estimates of households and housing units from the DOF used to calculate vacancy rates for each jurisdiction (DOF, 2026). Jurisdictions with higher vacancy rates were assumed to have higher rates of seasonal households. The cities of Indian Wells and Palm Springs have the highest vacancy rates within the Plan Area and were thus assumed to have the highest occupancy of seasonal residents.

Table 5-3 Vacancy Rates for Plan Area Jurisdictions (2020-2024)

Jurisdiction	Households	Housing Units	Vacancy Rate
Cathedral City	18,524	23,097	20%
Coachella	10,391	10,679	3%
Indian Wells	2,729	5,335	49%
Indio	30,178	36,374	17%
La Quinta	16,520	24,679	33%
Palm Desert	25,291	36,898	31%
Palm Springs	24,622	35,827	38%
Rancho Mirage	9,244	14,985	11%
Unincorporated Riverside County	129,613	145,883	20%

Source: DOF, 2025; Table E-5

5.3.4.2 Baseline Housing Units by Type

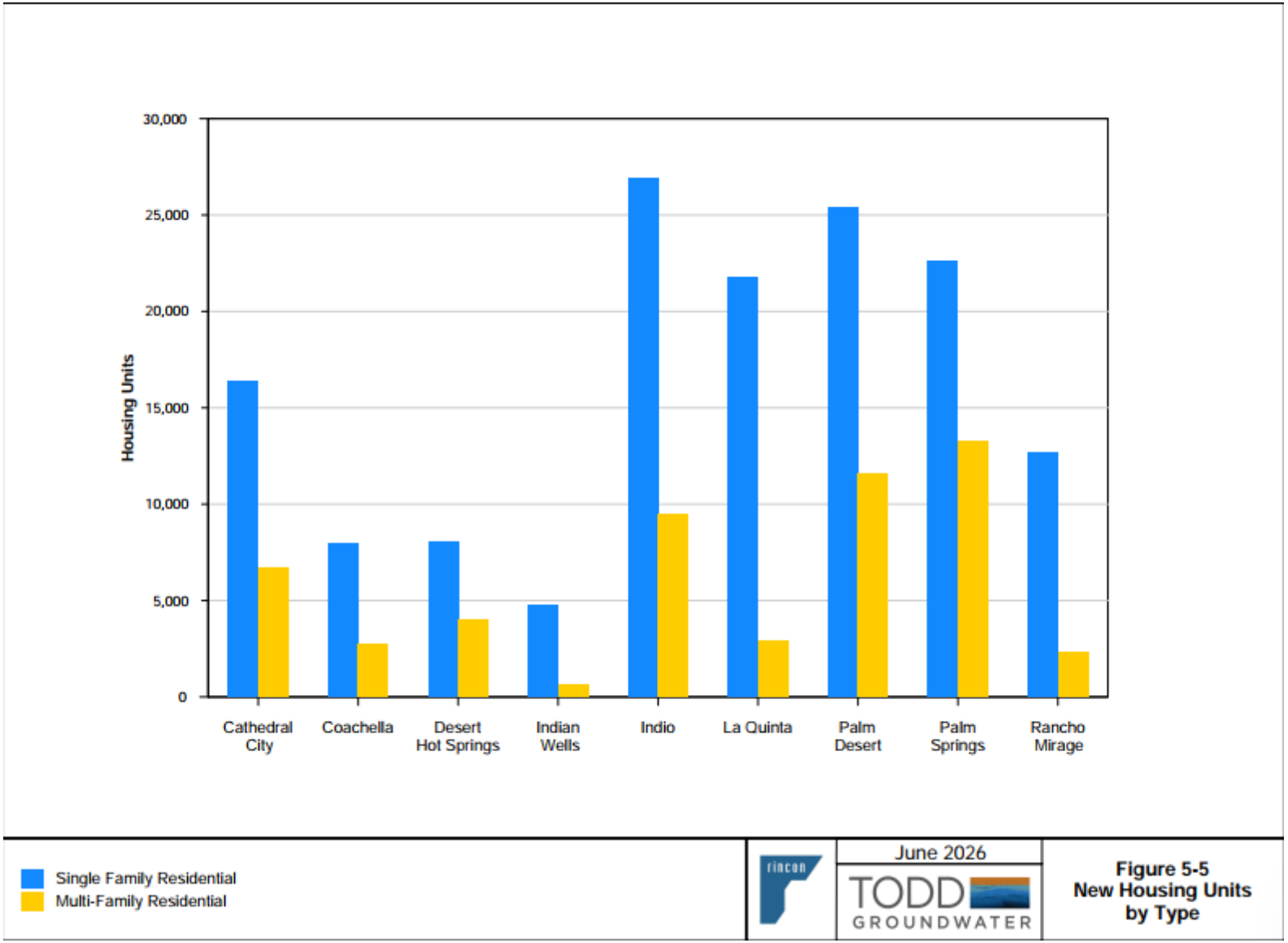
For the baseline housing unit estimate, additional housing data were used to split housing units into categories of single- and multiple-family units to align with customer billing data. This information was derived from DOF estimates for 2024, as shown in Table 5-4 and Figure 5-5.

Table 5-4 Housing Unit Type for Plan Area (2024)

Jurisdiction	Single-Family	Multiple-Family
Cathedral City	71%	29%
Coachella	75%	25%
Indian Wells	89%	11%
Indio	74%	26%
La Quinta	88%	12%
Palm Desert	69%	31%
Palm Springs	63%	37%
Rancho Mirage	85%	15%
Unincorporated Riverside County	74%	26%

Source: DOF, 2025; Table E-5

Figure 5-5 Housing Units by Type for Jurisdictions within Plan Area (2024)



5.3.4.3 Future Housing Units by Type

Development plans submitted within the Plan Area were used as additional data for projecting future development. Residential development projects were reviewed for each city within the Plan Area. The number of planned multiple-family and single-family units were totaled for each city, and the ratio for each housing type to total number of units was applied to additional projected housing units. For the unincorporated areas within the Plan Area, 2024 ratios for Unincorporated Riverside County were used to determine ratios for future development.

Table 5-5 lists the final projected allocation of new housing units into housing types. With the exception of Coachella and Palm Springs, the anticipated percentage of new multiple-family housing units is greater than the DOF percentages for 2020-2024. Historically, new housing units in the Plan Area have been dominated by single-family units (as shown in Figure 5-6). While estimates for new multiple-family units may be high-biased, the California Department of Housing and Community Development has passed several laws and incentives designed to increase housing construction, including AB 725 and SB 684, and multiple-family units are anticipated to increase faster than single family units in California.

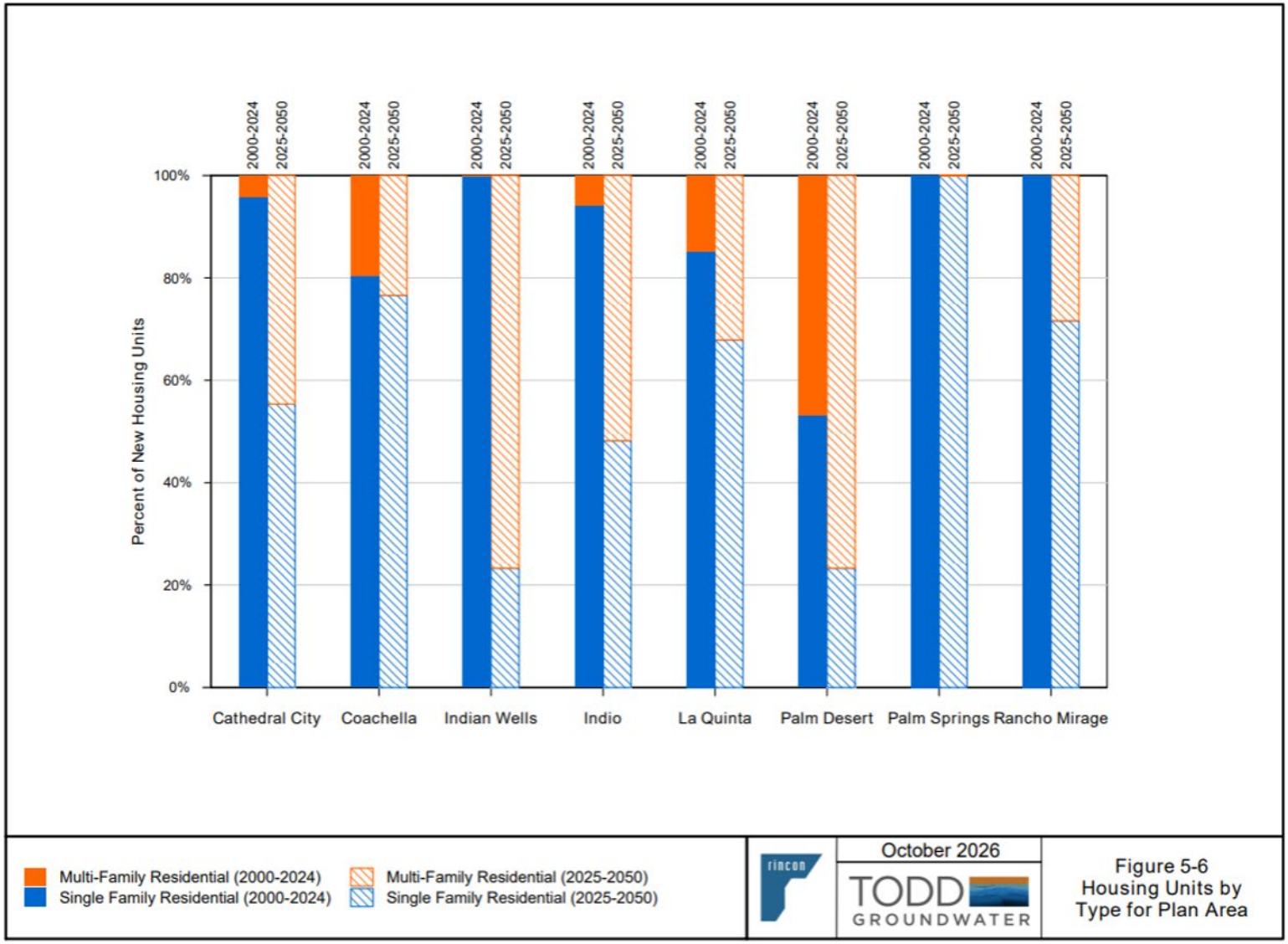
Table 5-5 New Units in Plan Area by Housing Type

Jurisdiction	Single-Family	Multiple-Family
Cathedral City	55%	45%
Coachella	77%	23%
Indian Wells	23%	77%
Indio[1]	55%	45%
La Quinta	68%	32%
Palm Desert[2]	23%	77%
Palm Springs	100%	0%
Rancho Mirage	72%	28%
Unincorporated Riverside County	74%	26%

[1] Based on GSA input, Cathedral City percentages were used to estimate Indio proportions for new housing units.

[2] Based on GSA input, Indian Wells percentages were used to estimate Palm Desert proportions for new housing units.

Figure 5-6 New Housing Units by Type (2015–2024 and 2025-2050)



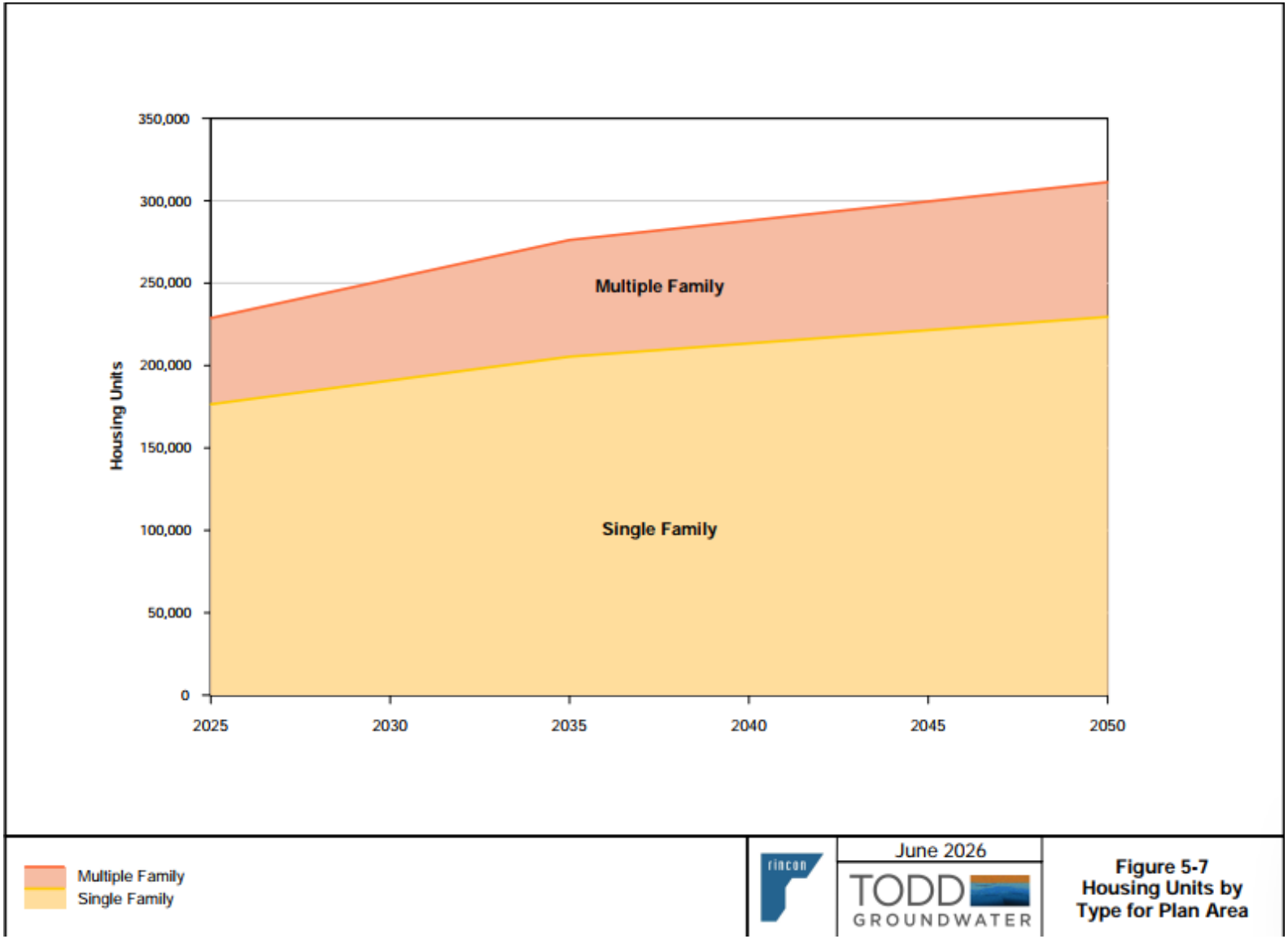
5.3.4.4 Final Housing Unit Projection

Table 5-6 and Figure 5-7 provide the total number of projected housing units by type for the Plan Area. These were used as the basis for developing demand factors and other projections. Overall, the Plan Area is projected to grow by 110,904 housing units (i.e., 55 percent) by 2050. Multiple-family housing units are anticipated to proportionally increase as California incentives drive development towards higher density housing.

Table 5-6 Housing Units by Type for the Plan Area

Housing Type	2025	2030	2035	2040	2045	2050
Coachella Valley Water District						
Single-Family	104,112	111,026	117,940	119,933	121,927	123,920
Multiple-Family	34,345	40,603	46,862	48,438	50,014	51,590
Subtotal	**138,457**	**151,629**	**164,802**	**168,371**	**171,941**	**175,510**
Coachella Water Authority						
Single-Family	11,571	14,813	18,055	21,471	24,888	28,304
Multiple-Family	3,937	4,927	5,917	6,960	8,003	9,046
Subtotal	**15,508**	**19,740**	**23,972**	**28,431**	**32,891**	**37,350**
Desert Water Agency						
Single-Family	34,711	36,670	38,629	40,026	41,424	42,821
Multiple-Family	4,825	4,935	5,045	5,061	5,078	5,094
Subtotal	**39,536**	**41,605**	**43,674**	**45,087**	**46,502**	**47,915**
Indio Water Authority						
Single-Family	26,087	28,419	30,752	32,002	33,253	34,503
Multiple-Family	9,232	11,113	12,994	14,003	15,011	16,020
Subtotal	**35,319**	**39,532**	**43,746**	**46,005**	**48,264**	**50,523**
Plan Area						
Single-Family	176,480	190,928	205,375	213,433	221,491	229,549
Multiple-Family	52,339	61,578	70,818	74,462	78,106	81,750
Plan Area Total	**228,819**	**252,506**	**276,193**	**287,895**	**299,597**	**311,299**

Figure 5-7 Housing Units by Type for Plan Area



5.3.5 Employment Projection

Connect SoCal 2024 employment estimates were used to project future CII water use. SCAG projects regional employment across 20 broad industry sectors as established by the North American Industry Classification System (NAICS). These sectors are based on a set of national employment forecasts and a region's share of the nation's employment. For the Coachella Valley, employment is projected to grow at a slower rate than the overall population. This is a result of net travel out of the region for work, as well as the large number of retirees in the Plan Area. Table 5-7 provides employment projections for the GSAs in the Plan Area. Employment trends were impacted by the COVID-19 pandemic as remote work increased and demographic shifts occurred.

Table 5-7 Baseline and Forecast Employees by GSAs

Water Provider	2025	2030	2035	2040	2045	2050
Coachella Valley Water District	125,016	129,905	134,794	139,171	143,548	147,926
Coachella Water Authority	13,108	15,829	18,550	20,694	22,838	24,981
Desert Water Agency	41,832	43,842	45,853	47,081	48,308	49,535
Indio Water Authority	28,517	30,406	32,296	33,286	34,277	35,267
Plan Area Total	**208,473**	**219,982**	**231,493**	**240,232**	**248,971**	**257,709**

5.3.6 Unit Demand Factors

Municipal water demand in the growth projection was calculated using a per-housing unit demand factor (*gallons per housing unit per day*) for residential and landscape uses and a per-employee demand factor (*gallons per employee per day*) for non-residential uses. A benefit of this approach over typical per-capita unit water use approaches was the ability to better estimate water uses associated with land use features, such as lot sizes and building footprints not directly associated with population. In addition, SCAG population estimates were not calculated at the county level, so population estimates for the Plan Area are directly tied to household numbers. In addition to households, there are water demands associated with vacant housing and seasonal population. Demands are directly correlated to household growth, but the increase is a function of housing unit growth, which includes usage from seasonal residents and outdoor landscaping of vacant lots. Residential uses were divided into single- and multiple-family housing unit types to align with customer billing categories. Demand factors were calculated using a 5-year average of water demand from customer billing data provided by Plan Area water providers.

5.3.6.1 Historical Billing Data

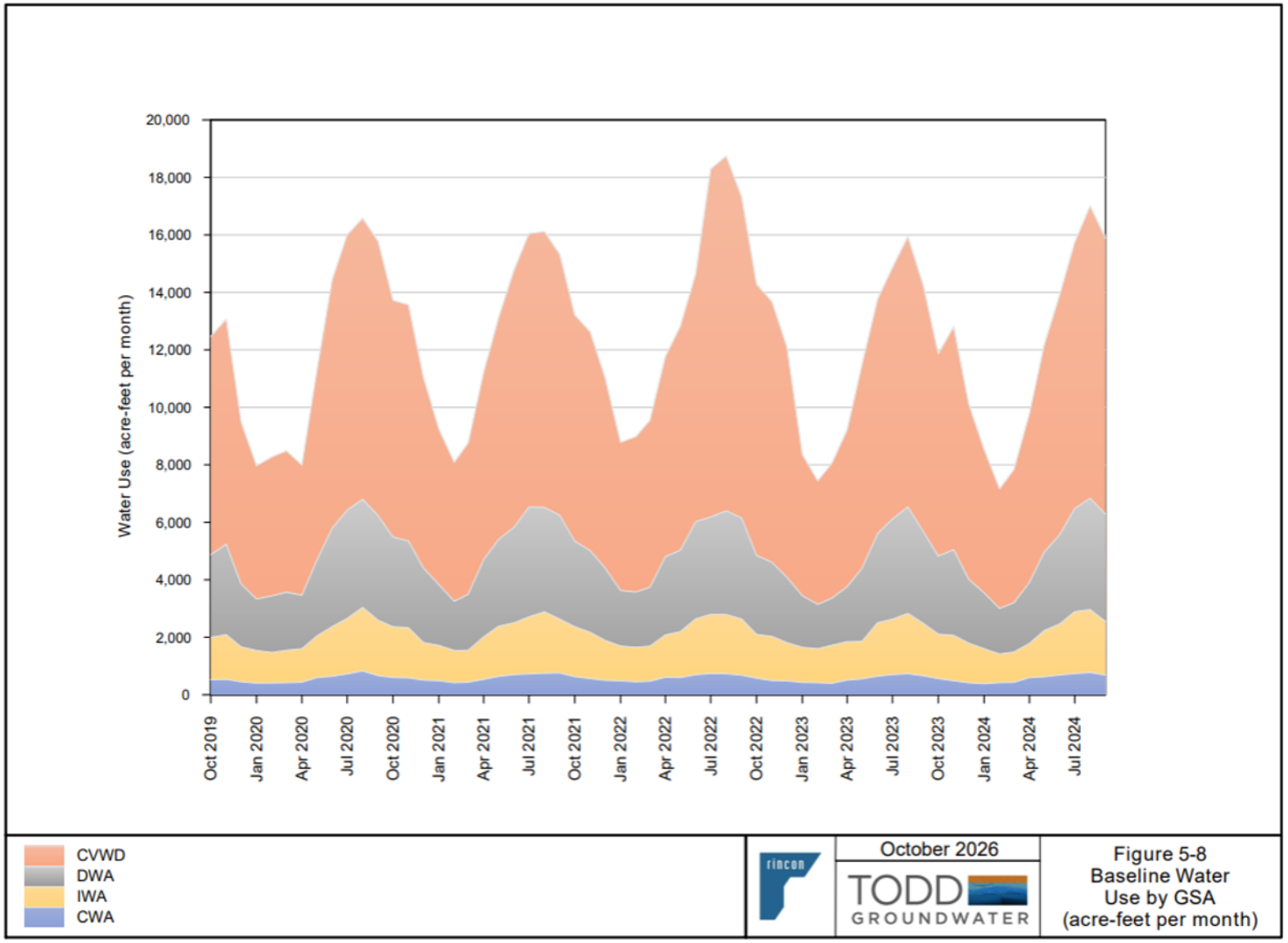
Table 5-8 lists the total annual domestic water use for each GSA in acre-feet per year (AFY). Baseline water use was based on a 5-year average measured from October 2019 to September 2024. The 5-year average was selected to account for annual variations in water use from weather, as well as other irregularities that can occur over shorter time periods. California's water year (WY) of October through September was chosen for the annual reporting period to better align with the region's weather patterns and SGMA reporting.

Table 5-8 Baseline Domestic Water Use for Plan Area GSAs (AFY)

GSA	WY 2020	WY 2021	WY 2022	WY 2023	WY 2024	5-Year Average
Coachella Valley Water District	87,655	93,613	92,889	85,172	88,639	89,594
Coachella Water Authority	6,656	5,650	6,067	6,140	6,063	6,115
Desert Water Agency	31,215	25,499	28,024	30,357	28,729	28,765
Indio Water Authority	17,948	17,299	15,943	17,546	17,855	17,318
Plan Area Total	**143,474**	**142,061**	**142,923**	**139,215**	**141,286**	**141,792**

Figure 5-8 shows a graph of the monthly baseline water use for each GSA. The baseline period includes the COVID-19 pandemic, which impacted travel, employment, and population for several years beginning in March 2020. As indicated in Table 5-8, the highest water use was in WY 2020 and the lowest water use was in WY 2023. Over the five-year period, there is little variation in annual water use and the lowest and highest annual water usage differ by less than 3,000 AFY. Given the effects of climate change, drought periods, and new conservation legislation that will be implemented during the planning horizon, downward pressure on water demand is expected. Demand impacts from passive and active conservation are discussed further in Section 5.3.9.

Figure 5-8 Baseline Water Use by GSA (Acre-Feet per Month)



Other Water Suppliers in the Plan Area

CVWD and DWA have populations that are both within their service area boundaries and outside their domestic water service areas. Residents outside of the domestic service area are served by private wells or other water systems, such as mutual water companies and small water systems. For CVWD, this includes Myoma Dunes Mutual Water Company (MDMWC) and several small water systems. For DWA, this population includes a portion of the DWA jurisdictional area overlapping with Mission Springs Water District (MSWD) and several small water systems. MSWD provides municipal water service to these customers, which include a small number of customers in the northwest of the Indio Subbasin (i.e., the Garnet Hill Subarea). IWA and CWA serve all customers in their service areas.

Additional Water Supplies in the Municipal Demand Projection

Baseline water use includes urban water demands met by a water source other than GSA domestic production, including small water systems, private wells, recycled water, and Coachella Canal water. Although these demands are not currently met by the GSAs' domestic water supplies, they are still considered municipal demands and are accounted for in the municipal demand forecast. MDMWC is large enough that it was separated out for the demand forecast and baseline demand factors were calculated separately for it. Other small water systems and municipal demand met by recycled water and private wells were estimated using production data. This water is used primarily for turf and landscape irrigation. The demands shown in Table 5-9 are based on 2020 to 2024 average water use. For IWA, this water was supplied by CVWD for use in IWA's service area. DWA recycled water and surface water deliveries were included in historical billing data are accounted for in DWA's average baseline domestic water use.

Table 5-9 Other Municipal Water Supply (AFY)

Jurisdiction	Use Category	Source(s)	Demand (AFY)
Palm Springs	Landscape	Recycled Water	95
Palm Desert	Landscape	Recycled Water	465
Indio	Landscape	Recycled Water	129
East Unincorporated	CII	Private Well Production	13,760
West Unincorporated	CII	Private Well Production	5,919
West Unincorporated	Single-Family Residential	Private Well Production	124
East Unincorporated	Multiple-Family Residential	Private Well Production	67
West Unincorporated	Multiple-Family Residential	Private Well Production	401
Total		**Private Well Production**	**20,961**

Water demand for populations in the Plan Area outside of CVWD and DWA service areas supplied by private wells was calculated using CVWD and DWA billing data for unincorporated areas in Riverside County. The difference between single-family housing units and single-family residential meter counts was used to estimate the number of unmetered households in the unincorporated areas, and water demands per meter count were applied to estimated unmetered households. A 5 percent contingency was added to produce a more conservative metric. The estimated demand is provided in Table 5-10 below.

Table 5-10 Unmetered Household Demand (AFY)

Agency	Jurisdiction	Unmetered Households	Demand (AFY)
Coachella Valley Water District	East Unincorporated	3,049	1,339
Coachella Valley Water District	West Unincorporated	1,375	585
Desert Water Agency	West Unincorporated	497	246
Total		**4,921**	**2,170**

5.3.6.2 Baseline Demand Factors

For analysis, billing data from each GSA were aggregated into five generic customer sectors, as shown in Table 5-11. Each of these customer sectors was associated with an output from the regional growth forecast to develop a unit factor. For the single- and multiple-family sectors, future water demand was based on single- and multiple-family housing units, respectively. For the landscape sector, future water demand was based on total housing units using the assumption that future landscape uses, such as common areas and parks, are driven by future residential development. For the CII sector, future water demand was based on the total number of employees, using the assumption that CII growth is tied to employee growth. The other sector, which includes water uses such as temporary construction meters, was assumed to stay constant and was based on the five-year average.

Table 5-11 Variables Used in Unit Factors Calculation

Customer Sector	Output from Growth Forecast
Single-Family Residential	Single-Family Housing Units
Multiple-Family Residential	Multiple-Family Housing Units
Landscape	Total Housing Units
Commercial, Industrial, and Institutional	Employees
Other	Baseline Average

These unit factors were applied to the growth forecast to develop a baseline municipal demand projection before conservation or water loss. CWA and IWA have a higher number of persons per housing unit and fewer seasonally vacant units compared to CVWD and DWA. This results in higher water use as measured in gallons per housing unit per day (gphud) when compared to traditional measurement of gallons per capita per day (gpcd).

Demand Factors by GSA and Jurisdiction

Demand factors for single-family, multiple-family, landscape and CII were projected by jurisdiction, as demands and growth rates in each GSA's service area differ regionally. Table 5-12, Table 5-13, Table 5-14, and Table 5-15 list the single-family, multiple-family, landscape, and CII demand factors for cities in each GSA's service area. These totals were calculated by matching customer-level database information with SCAG housing and employment information. Water use patterns vary regionally due to a variety of factors, such as lawn size, household demographics, and commercial business type.

Table 5-12 Single-Family Demand Factors by GSA and Jurisdiction

Jurisdiction	Single-Family Water Use (millions of gallons)	Single-Family Housing Units	Single-Family Unit Factor (gphud)
Coachella Valley Water District			
Cathedral City	2,044	15,218	368
Indian Wells	1,366	4,815	777
Indio	523	3,308	433
La Quinta	4,029	21,524	512
Palm Desert	4,423	26,292	461
Rancho Mirage	2,858	14,943	524
East Unincorporated	809	7,087	313
West Unincorporated	463	7,981	159
Total	**16,515**	**101,168**	**447**
Coachella Water Authority			
Coachella	1,570	11,571	372
Desert Water Agency			
Cathedral City	300	2,080	395
Palm Springs	5,224	32,185	445
Total	**5,524**	**34,265**	**442**
Indio Water Authority			
Indio	3,905	26,087	410
Myoma Dunes Mutual Water Company			
West Unincorporated	787	3,280	657
Plan Area Total	**28,301**	**176,371**	**439**

[1] Baseline housing units used to calculate unit factors were based on 2025 estimates of housing.

Table 5-13 Multiple-Family Demand Factors by GSA and Jurisdiction

Jurisdiction	Multiple-Family Water Use (millions of gallons)	Multiple-Family Housing Units	Multiple-Family Unit Factor (gphud)
Coachella Valley Water District			
Cathedral City	605	6,214	267
Indian Wells	16	600	73
Indio	78	1,171	181
La Quinta	122	2,914	115
Palm Desert	656	11,965	150
Rancho Mirage	206	2,684	210
East Unincorporated	183	5,224	96
West Unincorporated	8	2,827	7
Total	**1,874**	**33,599**	**153**
Coachella Water Authority			
Coachella	232	3,937	161
Desert Water Agency			
Cathedral City	17	283	165
Palm Springs	239	4,384	149
Total	**256**	**4,667**	**150**
Indio Water Authority			
Indio	596	9,232	177
Myoma Dunes Mutual Water Company			
West Unincorporated	172	444	1,061
Plan Area Total	**3,130**	**51,879**	**165**

[1] Baseline housing units used to calculate unit factors were based on 2025 estimates of housing.

Table 5-14 Landscape Demand Factors by GSA and Jurisdiction

Jurisdiction	Landscape Water Use (millions of gallons)	Housing Units	Landscape Unit Factor (gphud)
Coachella Valley Water District			
Cathedral City	738	21,433	94
Indian Wells	676	5,415	342
Indio	210	4,479	128
La Quinta	1,816	24,438	203
Palm Desert	2,308	38,256	165
Rancho Mirage	1,540	17,627	239
East Unincorporated	192	12,311	43
West Unincorporated	73	10,808	19
Total	**7,553**	**134,767**	**154**
Coachella Water Authority			
Coachella	339	15,508	60
Desert Water Agency			
Cathedral City	41	2,363	47
Palm Springs	1,461	36,569	109
Total	**1,502**	**38,932**	**106**
Indio Water Authority			
Indio	762	35,319	59
Myoma Dunes Mutual Water Company			
West Unincorporated	80	3,724	59
Plan Area Total	**10,236**	**228,250**	**123**

[1] Baseline housing units used to calculate unit factors were based on 2025 estimates of housing.

Table 5-15 CII Demand Factors by GSA and Jurisdiction

Jurisdiction	CII Water Use (millions of gallons)	Employees	CII Unit Factor (gallons per employee per day)
Coachella Valley Water District			
Cathedral City	183	8,956	56
Indian Wells	134	5,180	71
Indio	76	2,039	101
La Quinta	265	18,234	40
Palm Desert	781	47,580	45
Rancho Mirage	342	18,928	49
East Unincorporated	126	8,309	42
West Unincorporated	76	7,599	28
Total	**1,983**	**116,825**	**46**
Coachella Water Authority			
Coachella	292	9,843	81
Desert Water Agency			
Cathedral City	149	4,379	93
Palm Springs	2,681	34,888	210
Total	**2,830**	**39,267**	**197**
Indio Water Authority			
Indio	936	26,250	98
Myoma Dunes Mutual Water Company			
West Unincorporated	65	2,323	77
Plan Area Total	**6,106**	**194,508**	**86**

[1] Employee numbers used to calculate unit factors were based on 2025 estimates.

5.3.6.3 Indoor and Outdoor Water Use Estimates

Outdoor water use was estimated to distinguish landscape water savings in new developments. For some customers, water used for landscaping is not directly metered. An industry standard approach to measuring outdoor use, referred to as the minimum month method, is to assume all winter use is categorized as indoor consumption. This method underestimates outdoor use because of winter irrigation in dry climates such as the Coachella Valley.

The method used for this forecast documented the pattern of seasonal variation from dedicated irrigation meters and applied it to other sectors with mixed meters. With dedicated irrigation meters, winter irrigation is directly measured, and seasonal irrigation patterns could be applied to other sectors.

Figure 5-9 is an example plot comparing baseline landscape irrigation and single-family residential water use for CWA. As shown, the seasonal variation of dedicated landscape meters correlates to single-family water use. Seasonal variation patterns were applied to water use for each jurisdiction within GSA service areas. For jurisdictions where water demand was poorly correlated with the seasonal variability of dedicated landscape usage, percentages from nearby jurisdictions were assumed for outdoor usage.

Figure 5-9 CWA Average Monthly Single-Family Water Use and Landscape Irrigation Correlation, 2020-2024

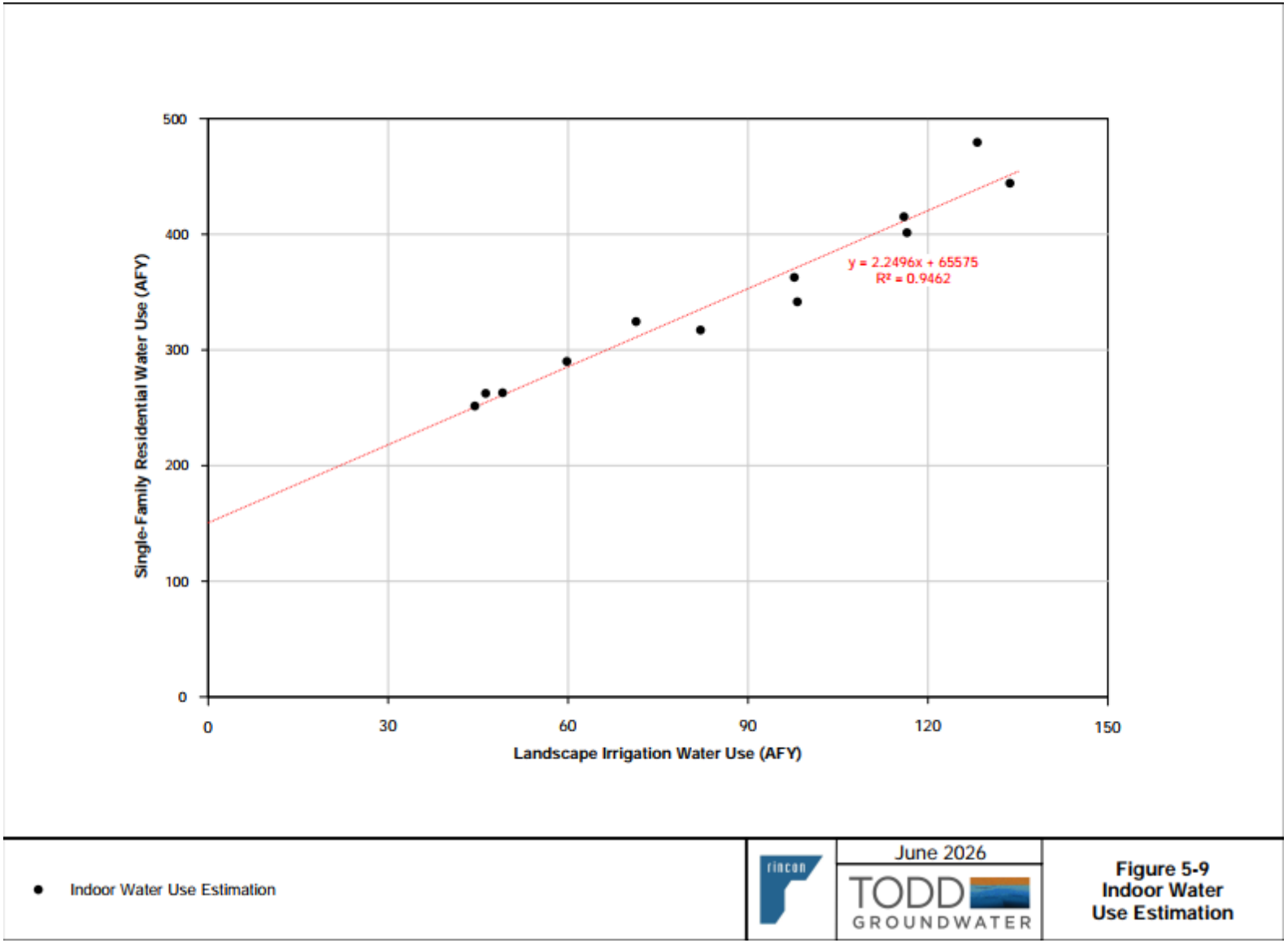


Table 5-16 lists the resulting outdoor water factors developed through analysis of each GSA's data. These values are an average based on the five-year billing data used for each jurisdiction within the Plan Area. All use from dedicated landscape meters is assumed to be outdoor use. CII outdoor use is varied, ranging from zero to 73 percent. Single-family outdoor use is greater than multiple-family outdoor use across all agencies and jurisdictions, as single-family homes generally have larger areas associated with irrigation, such as lawns and gardens.

Table 5-16 Outdoor Water Use Percentages for GSAs

Jurisdiction	Single- Family	Multiple- Family	CII	Landscape
Coachella Water Authority				
Coachella	57%	8%	34%	100%
Coachella Valley Water District				
Cathedral City	60%	30%	29%	100%
Indian Wells	78%	0%	36%	100%
Indio	60%	9%	58%	100%
La Quinta	69%	8%	22%	100%
Palm Desert	67%	43%	0%[1]	100%
Palm Springs	51%	13%	n/a[2]	100%
Rancho Mirage	77%	51%	39%	100%
East Unincorporated	56%	21%	39%	100%
West Unincorporated	90%	22%	63%	100%
Desert Water Agency				
Cathedral City	60%[3]	30%[3]	73%	100%
Palm Springs	63%	36%	57%	100%
West Unincorporated	69%[3]	n/a[4]	n/a[4]	100%
Indio Water Authority				
Indio	58%	15%	44%	100%

[1] Negative percentages were assumed to have zero percent outdoor use

[2] CVWD has no CII use in Palm Springs

[3] DWA outdoor percentages for single-family and multiple-family use for Cathedral City and single-family use for unincorporated areas used CVWD percentages for use type and jurisdiction due to a lack of correlation to irrigated landscape use

[4] DWA has no multiple-family or CII use in unincorporated areas

5.3.7 Baseline Forecast

Table 5-17 shows the baseline municipal demand forecast for the Indio Subbasin. This is projected municipal water use before considering conservation savings and system water loss.

Table 5-17 Municipal Demand Forecast for the Plan Area (acre-feet)

Category	2025	2030	2035	2040	2045	2050
Baseline Forecast	168,629	182,406	196,183	204,816	213,449	222,082
Private Wells and Small Water Systems	2,170	2,170	2,170	2,170	2,170	2,170
Total	**170,799**	**184,576**	**198,353**	**206,986**	**215,619**	**224,252**

5.3.8 Water Loss

Water loss includes real loss, which is physical water lost from a utility's storage tanks and pressurized distribution system up to the point of customer consumption (e.g., at the water meter) and apparent loss, which includes customer metering inaccuracies and data handling errors. As of 2015, SB 555 requires California urban water suppliers to submit an annual water loss audit to DWR. This audit attempts to quantify all inputs and outputs of a supplier's potable distribution system along with many other factors related to quantifying water losses. SB 555 also directed the SWRCB to develop customized performance standards for volumetric water loss for individual urban retail water suppliers, which were adopted in 2022. The performance standards are quantified by volume of real and apparent loss, either in gallons per connection per day or gallons per mile of pipe per day. This value is a performance indicator that is automatically calculated as an output of the American Water Works Association Water Loss Audit prepared annually by urban water suppliers, which is also submitted to DWR.

Five years of available validated Water Loss Audit reports were retrieved from DWR's Water Use Efficiency (WUE) Data Portal.[6] Water Loss Audits calculate water loss based on the difference between production and consumption. For this analysis, water loss was projected as a percentage of baseline annual demands from 2020-2024, averaging approximately 8 percent across the Plan Area. Table 5-18 lists baseline annual demands by GSA for 2020-2024, average annual water loss for 2020-2024, and water loss as a percentage of baseline demand totals. Water losses for CVWD include losses reported for MDMWC. Generally, water loss percentages are higher for agencies with larger service areas, and thus more miles of conveyance and distribution piping and higher density of service connections. CVWD and DWA have the highest water loss percentages and lowest density of service connections, with 56 and 60 connections per mile of water main, respectively. CWA and IWA have lower water loss percentages and higher density of service connections, with 74 and 75 connections per mile of water main, respectively.

Table 5-18 Water Loss Reporting by Water Provider (5-Year Average)

Water Provider	Baseline Annual Demand	Average Water Loss 2020-2024	Water Loss Percent
Coachella Valley Water District	112,964	9,727	8.61%
Coachella Water Authority	6,889	364	5.29%
Desert Water Agency	30,967	2,078	6.71%
Indio Water Authority[1]	18,719	1,082	5.78%
Total Plan Area	**169,539**	**13,251**	**7.82%**

[1] IWA reports losses on a fiscal year basis. Fiscal Year 2020 through 2024 reports were used to calculate average annual water loss.

Table 5-19 shows the water loss projection for the Plan Area. While water loss volume will increase over time due to increased water use, the regional water loss percentage was assumed to decrease over time due to water loss reduction measures implemented by the GSAs, such as improved leak detection, advanced metering infrastructure, and updates to supply infrastructure.

[6] https://wuedata.water.ca.gov/

Table 5-19 Water Loss Projection for Plan Area (AFY)

	2025	2030	2035	2040	2045	2050
Municipal Demand Baseline Totals	168,629	182,406	196,183	204,816	213,449	222,082
Water Loss	12,853	13,457	14,011	14,571	15,131	15,692
Percent of Base Municipal Demands	7.6%	7.4%	7.1%	7.1%	7.1%	7.1%

5.3.9 Conservation Savings

The municipal water demand projection used an inventory growth and replacement model and historical and projected housing units for cities in the Plan Area to estimate water savings rates for single-family residential, multi-family residential, and non-residential plumbing fixtures and appliance inventories. Separate models were developed for outdoor water use, toilets, clothes washers, faucets, and urinals. Future outdoor water uses were reduced based on an adjusted outdoor use estimate for new developments and additional active conservation programs initiated by the GSAs.

5.3.9.1 Indoor Passive Water Savings

The municipal water demand forecast estimates conservation that occurs as a result of changes in state and federal water efficiency requirements for plumbing fixtures, sometimes referred to as passive conservation. These standards have resulted in a significant reduction of indoor water use over time. Going forward, codes and standards for fixtures and appliances will continue to reduce indoor water demand through the replacement of existing fixtures, and more efficient technologies used in new developments.

Passive conservation savings are based on a demographically driven growth and replacement model that accounts for fixtures from new construction and natural replacement using the same demographic data used in *Connect SoCal 2024*. Savings estimates are provided for the single-family residential, multi-family residential, and non-residential sectors. The passive conservation model estimates water savings for toilets, showerheads, clothes washers, dishwashers, and urinals. The model estimates the stock of different types of water fixtures annually from 1990 to 2050.

Table 5-20 shows the assumptions used to estimate indoor passive conservation savings. Water fixtures installed in new construction were assumed to comply with current plumbing codes. Natural replacement rates vary by device and are linked to the expected life of the device. When devices fail and are replaced, when spaces are remodeled, or for other reasons, new devices were assumed to comply with current plumbing codes. Estimates from a study by the Pacific Institute were used for assumptions of the frequency of use for each device. Water savings in gallons per person per year (for residential devices) and gallons per employee per year (for commercial devices) were calculated from these assumptions.

Table 5-20 Water Savings Assumptions for Appliance Replacement

Fixture/Appliance	Average Water Use	Assumed Replacement Water Use	Replacement Rate (% per year)	Frequency of Use	Water Savings (gallons per person/employee per year)
Residential Toilets Installed Pre 1992	3.5 gpf[1]	1.28 gpf[2]	2[3]	4.8 flushes per person per day[4]	3,892
Residential Toilets Installed Post 1992	1.6 gpf[1]	1.28 gpf[2]	2[3]	4.8 flushes per person per day[4]	561
Residential Showerheads	2.5 gpm[5]	2 gpm[4]	10[6]	8.7 minutes per use 4.7 uses per person per week[4]	1,067
Residential Clothes Washers	23 gpc[7]	17.5 gpc[6]	1[3]	2.3 cycles per person per week[4]	9,643
Residential Faucets	2.2 gpm[7]	1.8 gpm[7]	7[6]	10.1 minutes per person per day[4]	1,476
Residential Dishwashers	6 gpc[7]	3.5 gpc[7]	7[6]	0.85 cycles per person per week[4]	111
Non-Residential Toilets Installed Pre 1992	3.5 gpf[1]	1.28 gpf[2]	2[3]	2.4 flushes per employee per day[4]	1,946
Non-Residential Toilets Installed Post 1992	1.6 gpf[2]	1.28 gpf[2]	2[3]	2.4 flushes per employee per day[4]	281
Non-Residential Urinals	1 gpf[8]	0.5 gpf[2]	4[6]	1,160 gallons per employee per year[9]	580

Definitions:

Gpf: gallons per flush, Gpm: gallons per minute, Gpc: gallons per cycle

Sources:

[1] California Statute

[2] California (AB715) 2007

[3] Porse et al. (2025) JAWRA, Quantifying Replacement Rates from Indoor and Outdoor Urban Water Conservation Incentives in California

[4] Urban Water Conservation and Efficiency Potential in California, Pacific Institute (2014)

[5] Metropolitan Water District, Urban Water Management Plan (2020)

[6] EPA Water Sense. Water Efficiency Management Guide Residential Kitchen and Laundry (2017)

[7] Federal Standard (DOE) 2012

[8] Energy Policy Act of 1992

[9] Estimated using assumptions for businesses with 25 male employees from Waterless Co, Inc. 2023. A Closer Look at Urinals, Water Consumption, and the Environment

Table 5-21 lists the projected residential indoor passive conservation savings (in AF) for new and existing developments in the Plan Area by GSA. These savings are calculated from the per capita water savings assumptions in the previous table for current and new housing. Savings from device replacement were capped by the savings estimated from complete device turnover (when all devices have been replaced).

Table 5-21 Indoor Water Savings in the Plan Area (Acre-Feet)

Water Provider	2025	2030	2035	2040	2045	2050
Coachella Valley Water District	418	2,133	3,838	4,732	5,373	6,010
Coachella Water Authority	62	347	631	920	1,193	1,465
Desert Water Agency	73	353	630	840	990	1,140
Indio Water Authority	151	783	1,411	1,812	2,154	2,495
Plan Area Total	**704**	**3,616**	**6,510**	**8,304**	**9,710**	**11,110**

5.3.9.2 Outdoor Water Savings

Outdoor water conservation savings include both active and passive conservation assumptions. Passive savings were calculated based on implementation of MWELO and California's non-functional turf requirements (DWR, 2015; AB 1572). Active savings were calculated with estimated savings from smart irrigation controllers and turf conversions. Table 5-22 lists the projected outdoor conservation savings (in AF) for new and existing developments in the Plan Area by GSA. Methodology for estimating outdoor savings is described below.

Model Water Efficient Landscape Ordinance (Passive Water Savings)

MWELO sets a minimum standard for outdoor water conservation in California and applies to new construction projects with landscape areas of 500 square feet or more. The size threshold for existing landscapes that are being rehabilitated is 2,500 square feet. MWELO also allows for special landscape areas (SLAs) that allow for extra water in non-residential areas for specific landscape functions such as recreation or for areas irrigated with recycled water.

Passive water savings resulting from implementation of MWELO were based on an evapotranspiration adjustment factor (ETAF), which when applied to reference evapotranspiration, adjusts for plant water requirements and irrigation efficiency. The current ETAF for new residential landscapes is 0.55 and the ETAF for non-residential landscapes is 0.45. Existing landscapes were assumed to have an ETAF of 0.7, meaning that new residential landscapes were assumed to use 21 percent less water, and new non-residential landscapes were assumed to use 36 percent less water. It was also assumed that 25 percent of dedicated landscape meters were categorized as



The demand forecast assumes desert landscaping in new residential developments, in accordance with GSA policies.

SLAs such as sports fields, and therefore no savings were assumed to come via MWELO requirements. No savings were assumed from existing landscapes, as these projections typically receive incentives under conservation programs, and are not considered passive savings. Chapter 11, *Projects and Management Actions* describes active conservation programs that incentivize outdoor water use efficiency.

Non-Functional Turf Ban (Passive Water Savings)

California legislation passed in 2023 prohibits the use of potable water for irrigation of non-functional turf (decorative grass with no other function, such as recreation) on commercial, industrial, and institutional properties (AB 1572). The ban will go into effect in 2027 through 2031 for Institutional (2027), Commercial and Industrial (2028), Homeowner's Associations (2029), and properties owned by local governments in disadvantaged communities (2031). An assumed reduction of 30 percent in existing dedicated landscape irrigation demands for 2030 through 2050 was used to estimate conservation due to this ban. This reduction estimate was based on aerial imagery review of areas of functional versus non-functional turf. Water savings from this ban may be higher or lower than estimated due to changes in recycled water use, delays in compliance, and decrease in new turf for future developments.

Smart Irrigation Controllers (Active Water Savings)

All four GSAs have programs in place offering rebates for the installation of smart irrigation controllers, which conserve water by improving outdoor irrigation efficiency. Water Savings from the installation of smart irrigation controllers was estimated using installation rates from a 2025 study published in the Journal of the American Water Resources Association (JAWRA) and water savings estimates from a 2017 water conservation study by the Los Angeles Department of Water and Power (LADWP) (Porse et al., 2025; LADWP, 2017). An installation rate of 0.62 percent was applied to housing units by jurisdiction. Each installed unit was assumed to save 13,636 gallons per household annually.

Turf Conversion (Active Water Savings)

The Indio Subbasin GSAs have been actively encouraging conservation in the Coachella Valley through various programs, including rebates for turf conversion, i.e., replacing existing high water use turf with drought tolerant landscaping. Water savings from these conversion programs were estimated using a 2024 regional study by the Coachella Valley Regional Water Management Group (CVRWMG).This study used water savings data from turf rebate programs conducted between 2014 and 2023 by each GSA to estimate water savings in each GSA's service area per acre of turf converted (CVRWMG, 2024). A replacement rate of 0.08 percent per year was used based on estimates from the 2025 JAWRA water conservation study (Porse et al., 2025). Water savings assumptions of 17, 55, and 19 gallons per square foot per year were used for CVWD, DWA, and IWA respectively based on the 2024 CVRWMG study. The 19 gallons per square foot per year savings estimation was used for CWA based on its proximity to Indio's service area.

Table 5-22 Outdoor Water Savings Within the Plan Area (Acre-Feet)

Water Provider	2025	2030	2035	2040	2045	2050
Coachella Valley Water District						
MWELO	300	1,612	2,923	3,603	4,282	4,962
Non-Functional Turf Ban	0	5,319	7,092	7,092	7,092	7,092
Smart Irrigation Controllers	99	594	1,088	1,328	1,568	1,808
Turf Conversion	9	55	101	149	200	252
Total	**408**	**7,580**	**11,204**	**12,172**	**13,142**	**14,114**
Coachella Water Authority						
MWELO	15	91	167	245	323	401
Non-Functional Turf Ban	0	78	104	104	104	104
Smart Irrigation Controllers	11	67	123	182	241	300
Turf Conversion	0	2	3	5	7	8
Total	**26**	**238**	**397**	**536**	**675**	**813**
Desert Water Agency						
MWELO	52	320	588	771	953	1,135
Non-Functional Turf Ban	0	1,034	1,379	1,379	1,379	1,379
Smart Irrigation Controllers	20	123	225	310	395	480
Turf Conversion	8	47	87	126	166	205
Total	**80**	**1,524**	**2,279**	**2,586**	**2,893**	**3,199**
Indio Water Authority						
MWELO	57	288	520	644	767	891
Non-Functional Turf Ban	0	511	682	682	682	682
Smart Irrigation Controllers	33	196	359	462	565	668
Turf Conversion	2	12	22	32	42	53
Total	**92**	**1,007**	**1,583**	**1,820**	**2,056**	**2,294**
Plan Area Total	**606**	**10,349**	**15,463**	**17,114**	**18,766**	**20,420**

5.3.10 Water Demands on Tribal/Reservation Lands

In the Plan Area, much of the Tribal/Reservation lands in the West Valley has been developed to varying degrees while a substantial amount of Tribal/Reservation lands in the East Valley is largely undeveloped. To accurately project water demand on Tribal/Reservation lands, Tribal/Reservation outreach has been conducted by the GSAs throughout the 2022 and 2027 update processes consistent with DWR's *Draft Guidance Document for the Sustainable Management of Groundwater: Engagement with Tribal Governments* (DWR, 2017). The GSAs have established coordination with Tribes in the Plan Area via the SGMA Tribal Workgroup, which meets quarterly, and Tribal/Reservation email lists. Tribal/Reservation data were requested from the Workgroup, including information about land use, population and housing, water demand, and water conservation. During preparation of the *2022 Alternative Plan Update*, the Tribes indicated that projected Tribal/Reservation land uses are generally included in municipal General Plans. Therefore, this forecast assumes that *Connect SoCal 2024* adequately captures Tribal/Reservation growth and Tribal/Reservation water demands were not included here in a separate category for analysis; rather, they are included in this municipal demand forecast.

5.3.11 Final Municipal Demand Forecast

Table 5-23 and Figure 5-10 show the municipal demand forecast with future indoor and outdoor conservation for the Plan Area. Indoor water conservation adjustments for new and existing developments include toilets, clothes washers, and urinals. The outdoor water conservation adjustments include implementation of MWELO for new developments. The total conservation adjustment came to 11,110 AFY by 2050 for indoor uses and 20,420 AFY by 2050 for outdoor uses. The total demand estimate for municipal uses in the Plan Area is 208,415 AF in 2050, which is an increase of 26,072 AF (14 percent) from 2025 demand (182,342 AFY). This 14 percent increase in municipal water demand compares to a projected 55 percent increase in Plan Area population.

Table 5-23 Municipal Demand Forecast for the Plan Area (Acre-Feet)

Category	2025	2030	2035	2040	2045	2050
Baseline Forecast	168,629	182,406	196,183	204,816	213,449	222,082
Private Wells and Small Water Systems	2,170	2,170	2,170	2,170	2,170	2,170
Indoor Conservation	-703	-3,615	-6,510	-8,304	-9,710	-11,110
Outdoor Conservation	-607	-10,350	-15,464	-17,114	-18,766	-20,420
Consumption in Plan Area	170,689	171,811	177,579	182,768	188,343	193,922
Water Loss	12,853	13,457	14,011	14,571	15,131	15,692
Municipal Demand Totals	**182,342**	**184,069**	**190,390**	**196,139**	**202,275**	**208,415**

Note: Passive conservation savings and outdoor adjustment are compared against baseline period.

Figure 5-10 Municipal Demand Forecast for Plan Area

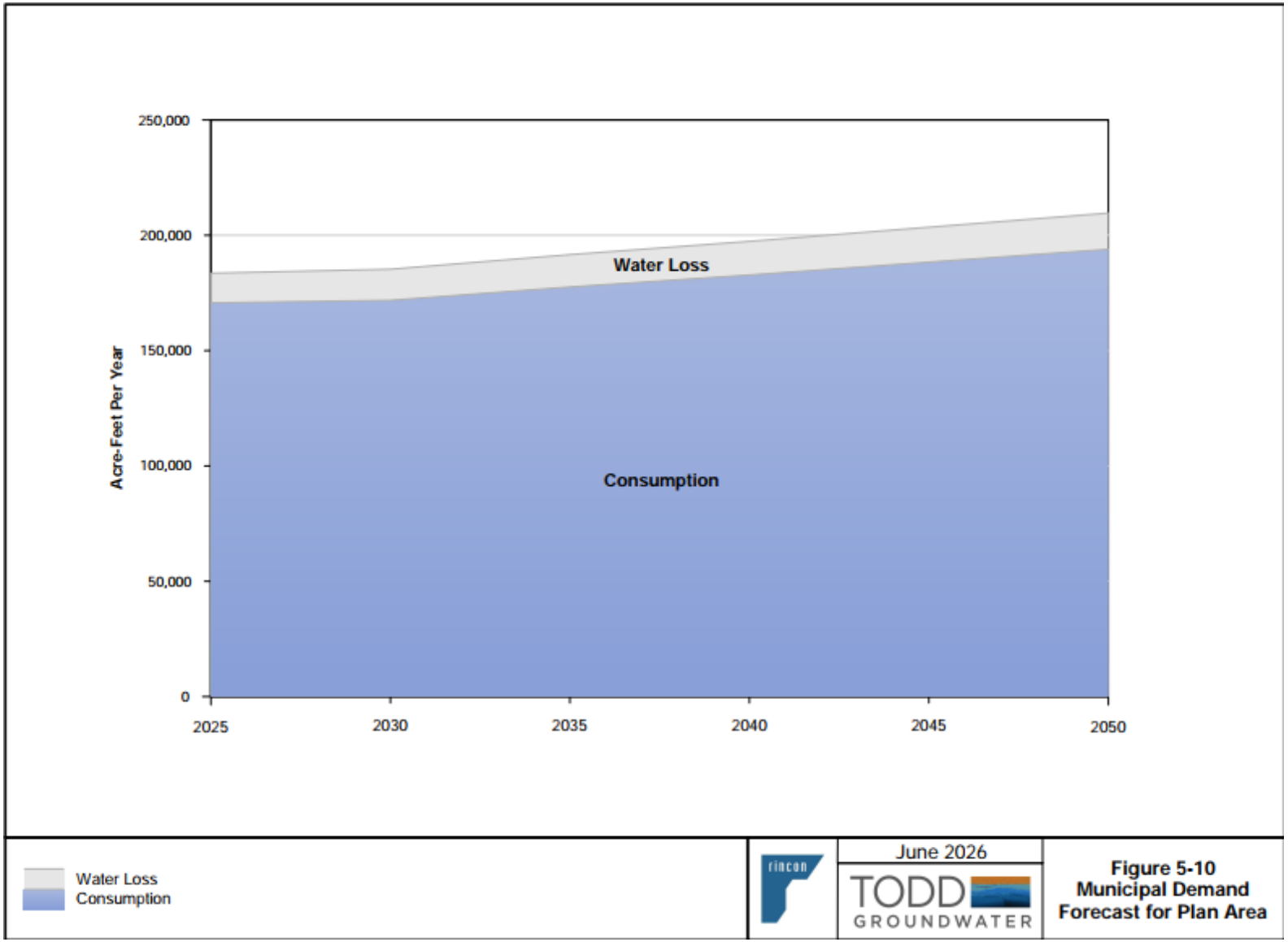


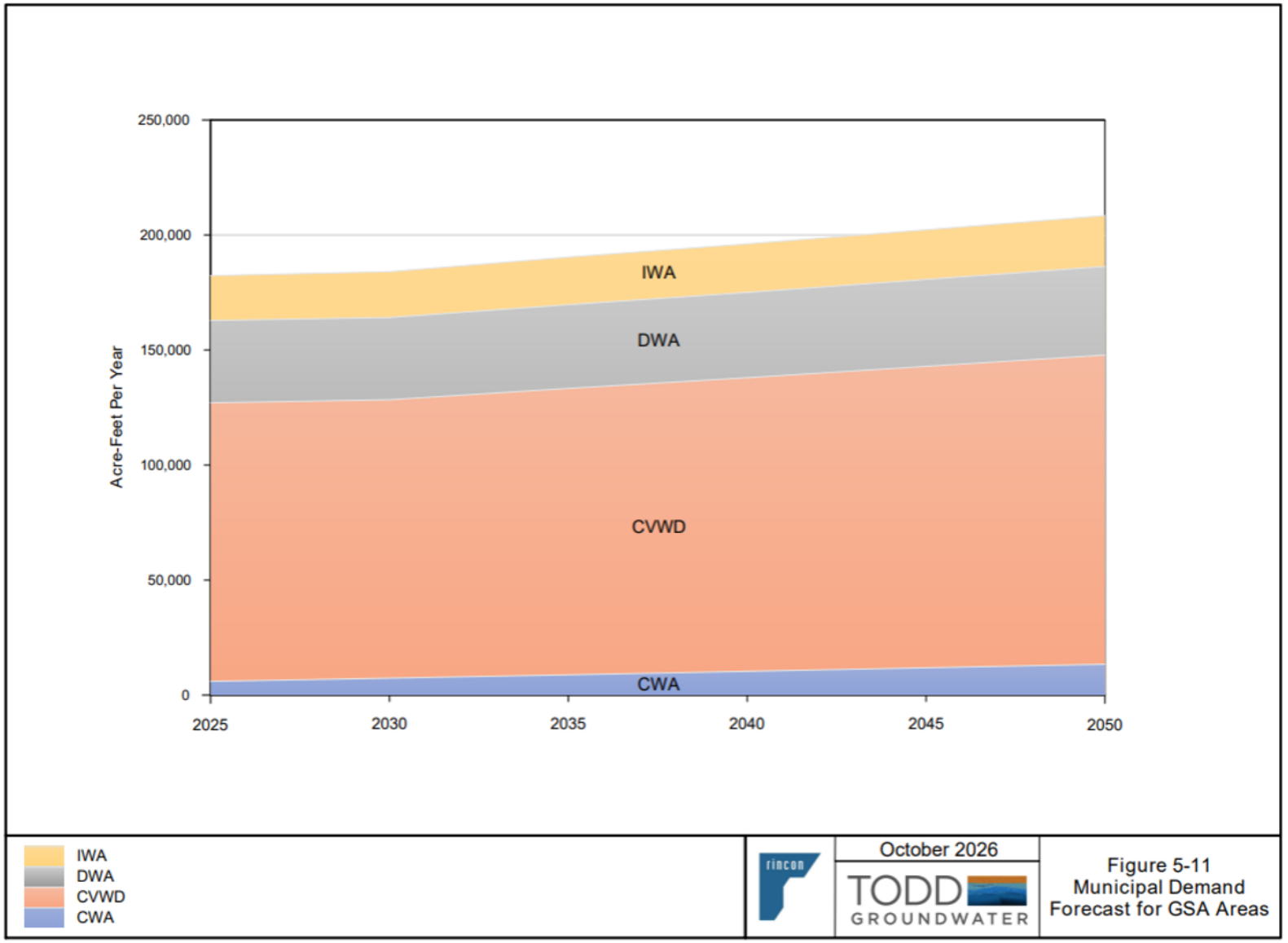
Table 5-24 and Figure 5-11 show a water demand forecast by GSA area in the Plan Area.

Table 5-24 Total Municipal Demand Forecast for GSA Areas (Acre-Feet)

Category	2025	2030	2035	2040	2045	2050
Coachella Valley Water District						
Consumption	111,653	111,209	114,322	117,109	120,147	123,188
Water Loss	9,435	9,830	10,190	10,537	10,885	11,232
Total Demand	**121,088**	**121,039**	**124,512**	**127,646**	**131,032**	**134,420**
Coachella Water Authority						
Consumption	5,600	6,917	8,287	9,721	11,171	12,621
Water Loss	353	435	512	602	693	783
Total Demand	5,953	7,352	8,798	10,323	11,863	13,404
Desert Water Agency						
Consumption	33,760	33,673	34,278	34,877	35,534	36,193
Water Loss	2,015	2,067	2,113	2,182	2,251	2,320
Total Demand	**35,775**	**35,740**	**36,391**	**37,059**	**37,785**	**38,513**
Indio Water Authority						
Consumption	18,476	18,812	19,492	19,862	20,291	20,721
Water Loss	1,049	1,125	1,196	1,249	1,303	1,356
Total Demand	**19,525**	**19,937**	**20,688**	**21,111**	**21,594**	**22,077**
Plan Area Total						
Consumption	168,989	170,112	175,879	181,068	186,644	192,223
Water Loss	12,853	13,457	14,011	14,571	15,131	15,692
Total Demand	**182,342**	**184,069**	**190,390**	**196,139**	**202,275**	**208,415**

Consumption is calculated as the baseline forecast minus passive indoor and outdoor conservation. GSA area totals may not sum to Plan Area totals due to rounding error.

Figure 5-11 Municipal Demand Forecast for GSA Areas



5.4 Agricultural Demands

Agriculture is an essential part of the Coachella Valley economy, with a gross production value of more than $1.7 billion in 2024 (County of Riverside Agricultural Commissioner, 2024). Agricultural water demand is met via Colorado River (Coachella Canal) water, groundwater, and surface water. Agricultural demand varies by farmed parcel, depending on crop type and sequencing (e.g., many farmers use trimester cropping). Figure 5-12 shows agricultural water use from 2010 to 2024.

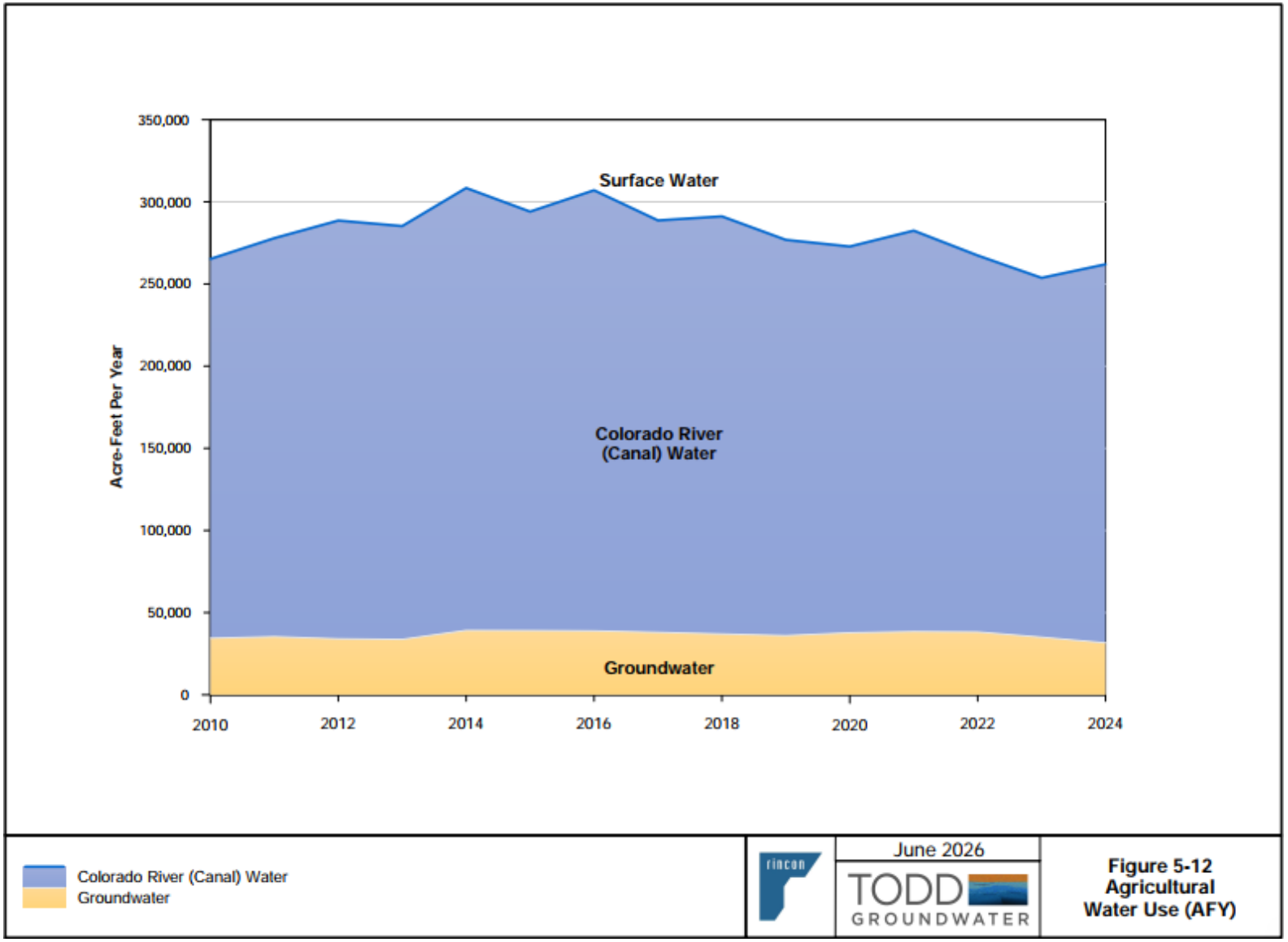


Agricultural fields in the Coachella Valley are irrigated with non-potable Colorado River water and groundwater.

Average agricultural demand between 2020 and 2024 was 267,655 AFY, which was approximately 51 percent of total demand in the Plan Area during that period.

The *2010 CVWMP Update* assumed agricultural demand decreased in proportion to the increase in urban demand. This *2027 Alternative Plan Update* instead accounts for reduced agricultural water use associated with the conversion of specific parcels from agricultural to urban land uses, while the municipal demand forecast accounts for new urban demands associated with parcel buildout. Land use data from SCAG's *Connect SoCal 2024* were used to estimate this parcel conversion through 2050.

Figure 5-12 Agricultural Water Use, 2010–2024 (AFY)



5.4.1 Agricultural Land Conversion

SCAG land use data were used to determine the reduction in agricultural parcels over time as they are developed for urban uses. To evaluate projected land conversion, potentially developable agricultural lands from the SCAG *Connect SoCal 2024* dataset were overlaid with data from the United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS) 2024 Cropland Data Layer showing cropped lands (USDA 2025). Table 5-25 lists available agricultural lands in the Plan Area and the proportion that were cropped in 2024.

Table 5-25 Agricultural Acres by Geographic Unit (Acres)

Geographic Units	2024 Agricultural Acres	2024 Cropped Acres	Agricultural Lands that are Cropped
Cathedral City	22	19	86%
Coachella	3,134	1,580	50%
Indian Wells	149	145	97%
Indio	790	524	66%
La Quinta	440	391	89%
Palm Desert	86	84	98%
Palm Springs	53	51	97%
Rancho Mirage	101	100	99%
Unincorporated East	42,181	31,519	75%
Unincorporated West	82	62	75%
Plan Area Total	**16,573**	**4,093**	**25%**

Figure 5-13 shows the change in anticipated agricultural land use per SCAG from 2019 to 2050. This anticipated change in agricultural acreage was used to calculate changes in agricultural water use by geographic unit. It is assumed that increase in agricultural land is primarily due to a difference in granularity between the 2019 and 2050 classifications of land use, as fewer types of land use classifications are used in the 2050 projection.

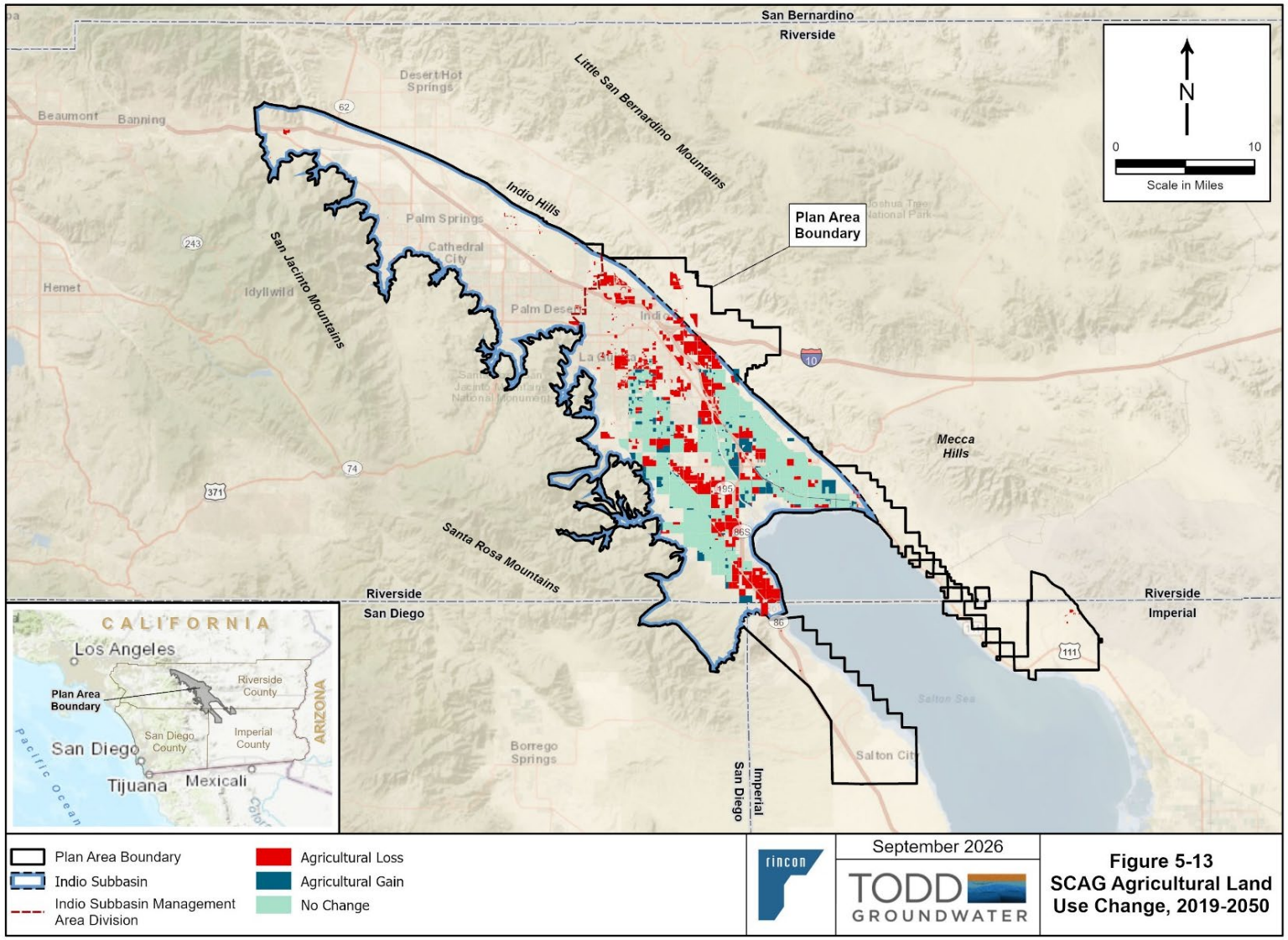
To receive local input on the agricultural demand forecast, the GSAs conducted outreach to Coachella Valley Irrigated Lands Coalition, a membership-based organization of local farmers. The agricultural demand methodology and projection was presented at a membership meeting in January 2026. No comments were received during the outreach process.

Table 5-26 shows projected net acres of agricultural parcels assumed to be converted to urban uses in 5-year increments through 2050 based on SCAG land use estimations for 2019 and 2050. A GIS analysis was performed of NASS's crop data in conjunction with these assumed conversions to determine total acres of cropped land.

Table 5-26 Conversion of Agricultural to Urban by Geographic Unit (Acres)

Geographic Units	2025	2030	2035	2040	2045	2050
Cathedral City	52	41	31	21	10	0
Coachella	3,948	3,580	3,211	2,843	2,475	2,106
Indian Wells	0	0	0	0	0	0
Indio	2,207	1,766	1,324	883	441	0
La Quinta	573	458	344	229	115	0
Palm Desert	20	16	12	8	4	0
Palm Springs	13	10	8	5	3	0
Rancho Mirage	56	56	56	56	56	56
Unincorporated East	56,207	55,994	55,781	55,568	55,355	55,142
Unincorporated West	110	110	110	110	110	110
Plan Area Total	**63,186**	**62,031**	**60,877**	**59,723**	**58,569**	**57,414**

Figure 5-13 SCAG Agricultural Land Use Change, 2019 to 2050



5.4.2 Agricultural Demand Factors

The agricultural demand factor used for projecting agricultural demands, in acre-feet per acre of cropped land, is based on crop acreage from the USDA NASS 2024 Cropland Data Layer, estimated applied water use for the Coachella Valley from the California Natural Resources Agency (CNRA) Statewide Agricultural Water Use Data 2016-2020, and average agricultural water usage from 2020 to 2024 (USDA, 2025; CNRA, 2023).

The assumed applied water use for each crop in the Coachella Valley was taken from CNRA agricultural water use data for Coachella Valley, estimated using evapotranspiration, crop information, soil characteristics, and precipitation data. Total crop acreage for each of the nine jurisdictions described in Section 5.3, *Municipal Demands* was estimated using the NASS 2024 Cropland Data Layer, overlaid with each jurisdiction boundary. An average applied water use estimate for each jurisdiction was established by weighting the estimated applied water use for each crop in acre-feet per acre by the total crop acreage. Once an estimated weighted average of applied water use for each jurisdiction was calculated, water use was estimated by multiplying this weighted average by the estimated 2019 SCAG land use. This water use total was calibrated to the 5-year average (i.e., 2020–2024) agricultural water use total, and a crop demand factor was estimated from the calibrated water use per SCAG 2019 acreage. Agricultural water supply was calculated based on the 5-year average for groundwater pumping and Canal deliveries. Table 5-27 lists the agricultural demand factor for each geographic unit.

Table 5-27 Agricultural Demand Factors (Based on 2020–2024 Average)

Geographic Units	Agricultural Lands (Acres)[a]	Average Applied Water Use (AF/Acre)	Estimated Agricultural Water Demand (AFY)	Adjusted Agricultural Water Demand (AFY)	Demand Factor (AF/Acre)
Cathedral City	52	3.75	195	188	3.63
Coachella	3,948	3.49	13,779	13,384	3.39
Indian Wells	0	3.82	0	0	3.70
Indio	2,207	3.40	7,504	7,283	3.30
La Quinta	573	3.76	2,154	2,086	3.64
Palm Desert	20	3.87	78	75	3.75
Palm Springs	13	3.83	49	48	3.71
Rancho Mirage	56	4.06	228	221	3.94
Unincorporated East	56,207	4.48	251,806	243,909	4.34
Unincorporated West	110	4.48	491	476	4.34
Plan Area Totals	**63,186**	**–**	**276,284**	**267,670**	**–**

a Acreage includes the physical size of agricultural parcels but does not include multiple harvests for non-permanent crops.

5.4.3 Agricultural Conservation

In 2014, U.S. Department of the Interior Bureau of Reclamation (USBR) initiated a Pilot System Conservation Program to fund voluntary water conservation projects to benefit the Colorado River system. As part of that program, CVWD continued to offer rebates to agricultural customers to convert farmed land from a flood/furrow system to drip irrigation through 2019. However, efforts to convert from flood irrigation to drip irrigation have flattened, as users with the financial ability to undertake the conversion have already done so. The remaining users still using a flood/furrow system are mostly small farmers who do not have the necessary infrastructure to implement a conversion. As such, most passive water conservation savings associated with increased irrigation efficiency have already been realized, and the region has experienced demand hardening in agricultural water conservation. For example, Figure 5-12 (above) shows that agricultural water demands from 2010 to 2024 have been decreasing, but at a slower rate in recent years indicating demand hardening, in which a level of water use efficiency is reached such that the potential for increased water use efficiencies becomes limited. Additional passive conservation is anticipated to be negligible moving forward and none was assumed for the agricultural demand forecast. Instead, participation in active agricultural conservation, such as CVWD's Agricultural Irrigation Efficiency Program, was considered (refer to Chapter 11, *Projects and Management Actions*).

5.4.4 Final Agricultural Demand Projections

The agricultural demand factors presented above were applied to agricultural acreage anticipated to remain in production over time. Total agricultural demands were calculated based on 2019 cropped acreage, and then water demands associated with lands anticipated for agriculture to urban conversion (totaling 1,982 acres) were subtracted out in 5-year increments.

Agricultural demand increase was estimated using anticipated water usage from a list of approved Water Supply Assessments (WSAs) provided by CVWD staff (dated June 18, 2025) for upcoming development approvals. Approximately 584 AFY was added to the forecast in 2028 for the addition of a date farm anticipated to come online by 2028. The 584 AFY was based on a conservative estimate of the maximum anticipated annual water use in the WSA.

Total agricultural demand in the Plan Area is projected to decline from 267,653 AFY in the baseline (i.e., a 5-year average) to 247,703 AFY in 2050, which is a seven percent decrease. The SCAG forecast projected no agricultural parcels within Coachella or Indio by 2050. Table 5-28 lists projected agricultural demand through 2050. For the West Unincorporated Area, which contains negligible agricultural lands in comparison to its total area, this analysis assumed other vacant lands would be urbanized, and no agricultural lands would be affected.

Table 5-28 Projected Agricultural Water Demand (AFY)

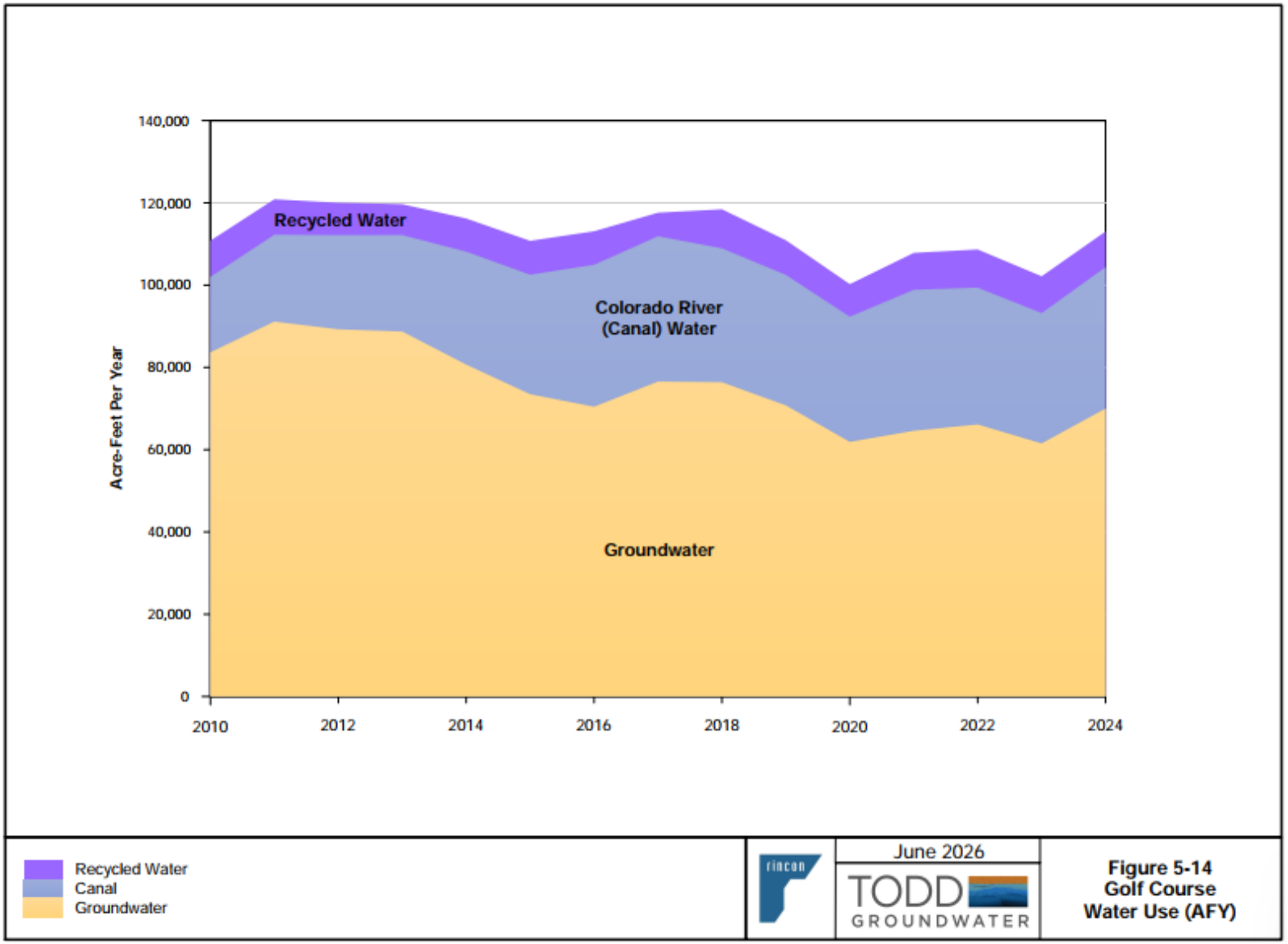
Jurisdiction	5-Year Average (2020–2024)	2025	2030	2035	2040	2045	2050
Cathedral City	**187**	187	150	112	75	37	0
Coachella	**13,372**	13,372	12,125	10,877	9,629	8,382	7,134
Indian Wells	**1**	1	1	1	0	0	0
Indio	**7,280**	7,280	5,824	4,368	2,912	1,456	0
La Quinta	**2,085**	2,085	1,668	1,251	834	417	0
Palm Desert	**75**	75	60	45	30	15	0
Palm Springs	**47**	47	38	28	19	9	0
Rancho Mirage	**221**	221	221	221	221	221	221
Unincorporated East	243,909	243,909	243,569	242,645	241,720	240,796	239,872
Unincorporated West	476	476	476	476	476	476	476
Plan Area Total	**267,653**	**267,653**	**264,132**	**260,024**	**255,917**	**251,808**	**247,703**

5.5 Golf Demand

The golf industry represents a significant water demand sector in the Plan Area, comprising over 18 percent or an average 106,400 AFY of Plan Area water use between 2020 and 2024. Demand for golf course irrigation is met with groundwater, Coachella Canal water, and recycled water. Figure 5-14 shows golf water use over the 2010–2024 timeframe. Consistent with the *2022 Indio Subbasin Water Management Plan Update*, future demand estimates assume a continuation of existing golf courses and the addition of planned golf courses in approved WSAs.

Five-year averages from 2020 to 2024 were used to calculate a golf industry demand baseline of 106,735 AFY. This baseline is slightly higher than the total average from 2020 to 2024 as one new golf course came online in 2022, and its average water use from 2022 to 2024 was included in the baseline. Three future golf courses were assumed when developing golf industry demand projections, based on the list of approved WSAs provided by CVWD staff. These three new golf courses were assumed to comply with CVWD's *Ordinance No. 1302.4: An Ordinance of the Coachella Valley Water District Establishing Landscape and Irrigation System Design Criteria* (Landscape Ordinance) (CVWD, 2019), which mandates golf course water use efficiency. Additional demand for two of the golf courses was conservatively estimated using the project maximum water demand assumed in the WSA. The remaining golf course did not have an estimated project maximum demand in the WSA. Future demand for this course was estimated using an average water demand per hole from 2020 to 2024 for existing golf courses and applying it to the 36-hole future golf course. Estimated demand for each golf course was added to the demand projection when the golf courses are anticipated to come online per the WSA. The three new golf courses are estimated to add 1,873, 960, and 1,910 AFY in 2026, 2028, and 2029 respectively, for a total of 4,743 AFY added to the baseline demand by 2030.

Figure 5-14 Golf Course Water Use, 2010–2024 (AFY)



5.5.1 Golf Conservation



CVWD WRP-10 recycled water serves golf demands in the mid- Valley area.

New golf course development and retrofitted landscape water efficiency standards are governed by DWR's MWELO. All water supply agencies must adopt, implement, and enforce MWELO or a more stringent ordinance. As guidance, MWELO includes a water budget calculation called the Maximum Applied Water Allowance that depends on estimates of evapotranspiration and establishes the upper limit of annual applied water for landscaped areas. Any areas of activity with intense foot or vehicular traffic in the CVWD service area, including golf courses, must comply with CVWD's Landscape Ordinance. The Landscape Ordinance was developed in conjunction with the Coachella Valley Association of Governments (CVAG), Riverside County, Coachella Valley cities, and major water purveyors. Similar to and based on MWELO, a golf course's area of irrigated turf used for tees, fairways, greens, and practice areas is limited for all new courses, and for additions or renovations to existing golf courses. Under the Landscape Ordinance, the total turf area of golf courses is limited to a maximum of 4 irrigated acres average per golf hole, and practice areas such as driving ranges and short game areas must not exceed 10 acres of turf. The Landscape Ordinance defines a recreational turf grass ETAF of 0.82. This ETAF adjusts for the additional stress of high traffic on recreational turfgrass and the higher irrigation efficiencies of long-range rotary sprinklers. This ETAF for golf courses in the CVWD service area was estimated by dividing 0.7, which is the seasonal average factor for a mixed cool/warm season turfgrass, by 0.85, which is the irrigation efficiency of long-range sprinklers.

The golf course demand projection (Table 5-29) assumed no passive conservation on existing golf courses, as CVWD and DWA do not anticipate future golf course renovations unless they are associated with their Golf Rebate Program. Chapter 11, *Projects and Management Actions* discusses the Golf Rebate Program, which is considered active conservation. The Golf Rebate Program provides financial support for turf removal on golf courses.

5.5.2 Final Golf Demand Projections

The total golf industry demand estimate for the Plan Area is 108,203 acre-feet in 2025, increasing to 112,947 acre-feet by 2030, which is an increase of 4,743 acre-feet (4 percent). Table 5-29 lists the golf industry demand projection through 2050.

Table 5-29 Golf Course Demand Projection (AFY)

--	2025	2030	2035	2040	2045	2050
Plan Area Total	108,203	112,947	112,947	112,947	112,947	112,947

5.6 Other Demands

The Plan Area's other water demands have historically accounted for fish farms and duck clubs, along with polo/turf irrigation and environmental water (i.e., Coachella Canal lining mitigation, which occurred from 2013 to 2015). These demands are relatively small, comprising 3 percent (10,731 AFY) of Plan Area water use over the 5-year period from 2020 to 2024. Figure 5-15 shows other water use over the 2020 to 2024 timeframe. These demands were met with groundwater and Coachella Canal water supplies.

Water demand projections in the *2010 CVWMP Update* assumed that fish farm and duck club water use would decrease as some large fish farm owners ceased operation, and replacement use at these farms was expected to have significantly lower water demand. However, some of these fish farms came back into operation with the economic upturn.

A 5-year average (i.e., 2020 to 2024) of 10,236 AFY, which excludes temporary environmental water used to mitigate for the Coachella Canal lining, was used as the baseline for projecting other demands for existing users through 2050. For this *2027 Alternative Plan Update*, water demand projections for existing other uses were assumed to be flat. These estimates include no future passive conservation savings for these existing other uses.

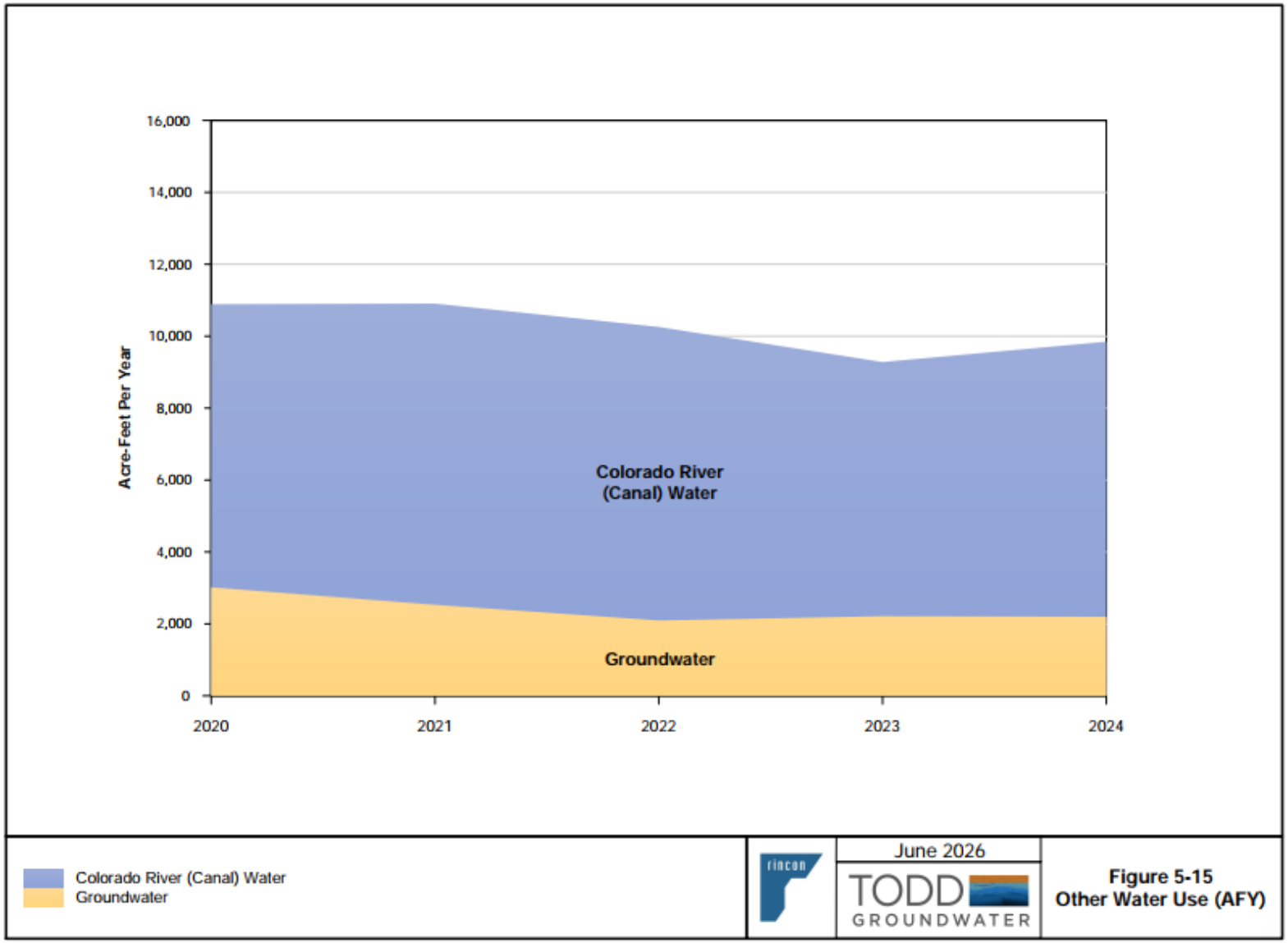
5.6.1 Final Other Demand Projections

Total other demand is estimated for the Plan Area at 10,236 AFY in 2025 and remains unchanged through 2050. Table 5-30 lists the other demand projection through 2050.

Table 5-30 Other Demand Projection (AFY)

	2025	2030	2035	2040	2045	2050
Plan Area Total	10,236	10,236	10,236	10,236	10,236	10,236

Figure 5-15 Other Water Use, 2020–2024 (AFY)



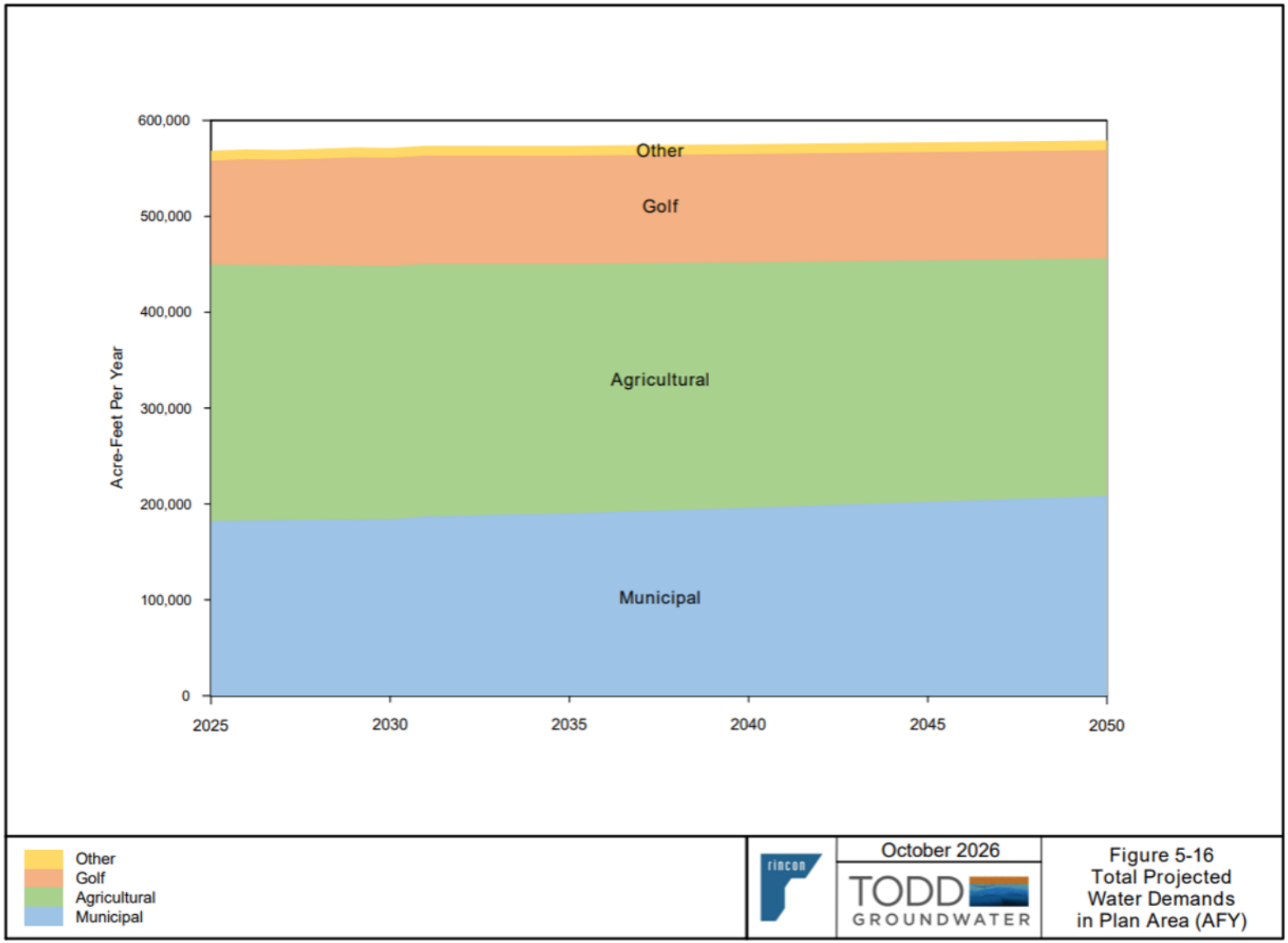
5.7 Total Water Demands

Table 5-31 and Figure 5-16 present the updated water demand projections for the Plan Area. Total water demand projected for 2050 using the assumptions described above is approximately 579,300 AFY. Projected water demand for 2050 is approximately 579,300 AFY, about 306,100 AFY lower than the 885,400 AFY originally projected for 2045 in the *2010 CVWMP Update*. This reduction is a direct result of significantly reduced sociodemographic growth projections, along with water use efficiency savings that have been achieved by Indio Subbasin water users over the last decade and are assumed for the future through passive conservation.

Table 5-31 Total Projected Water Demands in Plan Area (AFY)

Water Demand Type	2025	2030	2035	2040	2045	2050
Municipal	182,342	184,069	190,390	196,139	202,275	208,415
Agricultural	267,655	264,131	260,024	255,917	251,810	247,702
Golf	108,203	112,947	112,947	112,947	112,947	112,947
Other	10,236	10,236	10,236	10,236	10,236	10,236
Plan Area Total	**568,436**	**571,383**	**573,597**	**575,239**	**577,268**	**579,300**

Figure 5-16 Total Projected Water Demands in Plan Area (AFY)



6 Water Supply

6.1 Overview of Water Supply

The Plan Area relies on a combination of local groundwater, Colorado River water, State Water Project (SWP) exchange water, local surface water, and recycled water to meet water demands. This chapter describes the existing water supplies available to the Plan Area and discusses the key assumptions associated with each water supply source. Plan scenarios, which reflect variable supply assumptions to meet future demands, are described in Chapter 7, *Numerical Model and Plan Scenarios*.

6.2 Local Groundwater



The Whitewater River provided water supply for early development in Coachella Valley, including agricultural, urban, and rural land uses.

Groundwater from the Indio Subbasin represents a source of supply for domestic, agricultural, and municipal water demands. In this arid region, natural recharge to groundwater is limited, and groundwater supply historically has been insufficient to satisfy local water demands without leading to overdraft. However, groundwater remains a key part of the supply portfolio for the Plan Area. Moreover, the Indio Subbasin serves an important role in providing storage capacity that is replenished when surface water is available and then utilized when needed, such as during drought or shortage. The Indio Subbasin also serves to convey water through groundwater flow from areas of recharge to areas of discharge, including production wells. For example, the Indio Subbasin receives substantial replenishment with imported water at three Groundwater Replenishment Facilities (GRFs) and distributes this water through the aquifer to production wells.

The overall purpose of the Sustainable Groundwater Management Act (SGMA) is to establish a plan for basin management that achieves long-term groundwater sustainability. A sustainable groundwater basin is one in which groundwater use is balanced with the replenishment from natural sources, return flows, and artificial recharge. The Indio Subbasin is described in detail in Chapter 3, *Hydrogeologic Conceptual Model* and Chapter 4*, Current and Historical Groundwater Conditions*.

6.2.1 Uses of Groundwater

Local groundwater was the principal source of municipal and rural domestic supply, as well as agricultural water supply, until construction of the Coachella Canal in 1949. Groundwater continues to supply municipal, agriculture, golf courses, and other demands such as fish farms and duck clubs (see Chapter 5, *Demand Projections*). Managed aquifer recharge with imported water at the GRFs ensures an adequate supply for users extracting groundwater through numerous production wells. Chapter 2*, Plan Area,* briefly describes the uses of groundwater, and Figure 2-13 illustrates the distribution of groundwater production wells across the Indio Subbasin.

6.2.2 Groundwater Supply

Groundwater has been a principal source of water supply in the Coachella Valley since the early part of the 20th century. Management of groundwater resources requires knowledge of the groundwater balance, which is an estimate of the inflows (gains) and outflows (losses) from the groundwater system. Historically, the demand for groundwater annually exceeded the limited natural inflows of the arid Indio Subbasin. Sources of natural inflow to the Indio Subbasin average approximately 60,000 acre-feet per year (AFY) from watershed runoff and subsurface inflows from adjacent Subbasins. Limited natural recharge has been supplemented with imported water supplies beginning with the delivery of Colorado River water through the Coachella Canal in 1949. Imported water is now a major component of the inflows to the groundwater balance of the Indio Subbasin through managed aquifer recharge and return flows of applied Colorado River water. This section discusses the sources of inflows and outflows of the Indio Subbasin and compares the groundwater balance for the 10-year period of 2000 to 2009 (as reported in the *2010 CVWMP Update*) and the recent 15-year period of 2010 to 2024.

6.2.2.1 Groundwater Inflows

The groundwater inflows to the Indio Subbasin consist of a combination of sources, as listed below.

- **Watershed runoff** including subsurface inflow from mountain front areas and surface runoff from the Whitewater River, Snow and Falls Creek channels, minor tributaries along the San Jacinto, Santa Rosa, and Little San Bernardino mountain front, and several smaller streams that flow during wet years (excluding outflow to Salton Sea and surface water diversions);
- **Subsurface inflows** from the San Gorgonio Pass, Desert Hot Springs, and Mission Creek Subbasins;
- **Return flow of applied water, treated wastewater, and septic** including deep percolation of water applied to agricultural fields, golf courses, and urban landscapes; septic tanks/leachfield systems, which are distributed across rural portions of the Indio Subbasin and some urban areas; and treated wastewater from municipal wastewater treatment plants; and
- **Imported water recharge** using Colorado River and SWP exchange supplies, as described in Sections 6.4 and 6.5 below.

Of the above, irrigation return flows and imported water recharge are now the major sources of inflow to the Indio Subbasin. Chapter 7*, Numerical Model and Plan Scenarios,* provides estimates of future groundwater inflows for various management scenarios.

6.2.2.2 *Groundwater Outflows*

Groundwater outflows are part of the Subbasin's water balance, as listed below.

- **Net drain flow and subsurface outflows** including subsurface flow from the agricultural tile drain system to the Coachella Valley Stormwater Channel (CVSC) or directly to the Salton Sea and subsurface outflows to the Salton Sea at the Subbasin boundary; and
- **Groundwater production** for municipal, agricultural, golf and other users who are not served by direct delivery of other sources (recycled, Canal, or surface water).

Chapter 8, *Emerging Issues*, describes the relationship between groundwater levels in the East Valley and drain flow volumes. Higher groundwater levels, supported by ongoing recharge with imported water, create an upward hydraulic gradient that drives shallow, more saline groundwater into the drain system. Groundwater recharge and source substitution programs have stabilized or increased groundwater levels in portions of the Subbasin, reinforcing this condition. Chapter 9, *Sustainable Management,* describes the relationships between groundwater levels, drain flows, and groundwater quality.

As described in Chapter 4, *Current and Historical Groundwater Conditions*, groundwater management, including increased managed recharge, has reversed decades of declining groundwater levels. The groundwater balance over the last 15 years has been positive, contributing to increasing storage in the Subbasin. Chapter 7, *Numerical Model and Plan Scenarios,* provides estimates of future groundwater outflows across the various management scenarios.

6.2.3 Groundwater Storage

The geologic framework of the Indio Subbasin is described in Chapter 3, *Hydrogeologic Conceptual Model*. This framework defines the Subbasin's storage capacity, namely its lateral basin boundaries (bedrock boundaries and faults), depth of the basin bottom (insofar as data are available), and water-storing characteristics of the aquifer materials in the Subbasin. In 1964, DWR estimated that the Subbasins in the Coachella Valley Groundwater Basin contained approximately 39,200,000 acre-feet (AF) of water in the first 1,000 feet below the ground surface, of which 29,800,000 AF is in the Indio Subbasin. The capacities of the individual Subareas of the Indio Subbasin are shown in Table 6-2.

Table 6-1 Indio Subbasin Groundwater Storage Capacity

Subarea	Groundwater Storage (AF)[a]
Garnet Hill Subarea	1,000,000
Oasis Subarea	3,000,000
Palm Springs Subarea	4,600,000
Thermal Subarea	19,400,000
Thousand Palms Subarea	1,800,000
Indio Subbasin Total	**29,800,000**

[a] Storage volume in first 1,000 feet below the ground surface (DWR, 1964).

While use of this groundwater in storage has practical limitations (for example, by the depth of production wells), the significant water storage capacity in the Indio Subbasin provides flexibility for the management of groundwater resources. In brief, storage capacity in the Indio Subbasin allows

for local storage of water supplies when available and use of stored water supplies when needed. Sustainable management requires that inflows and outflows to the Subbasin are balanced over the long term such that net storage remains stable.

The Indio Subbasin was at its minimum storage in 2009, with a calculated storage loss of 1,890,000 AF from 1970 to 2009 (see Chapter 4*, Current and Historical Groundwater Conditions,* and Figure 4-9). This represents use of stored groundwater until the management actions identified in the *2002 CVWMP* and *2010 CVWMP Update* resulted in cessation of overdraft, a positive Subbasin groundwater budget, and groundwater storage increases. Since 2009, groundwater pumping has decreased, and replenishment activities have increased, leading to the observed recovery of groundwater in storage. The GSAs' management activities have resulted in replacement of approximately 1,186,000 AF of groundwater in storage, or about 63 percent of the cumulative depletion observed from 1970 to 2009.

This *2027 Alternative Plan Update* builds on recent management activities for a long-term sustainable groundwater supply. The remainder of this Chapter 6, *Water Supply,* documents the local and imported water supplies that provide water for direct use and for replenishment to help sustain the Indio Subbasin groundwater supply. Chapter 7*, Numerical Model and Plan Scenarios,* describes the Subbasin's water budget.

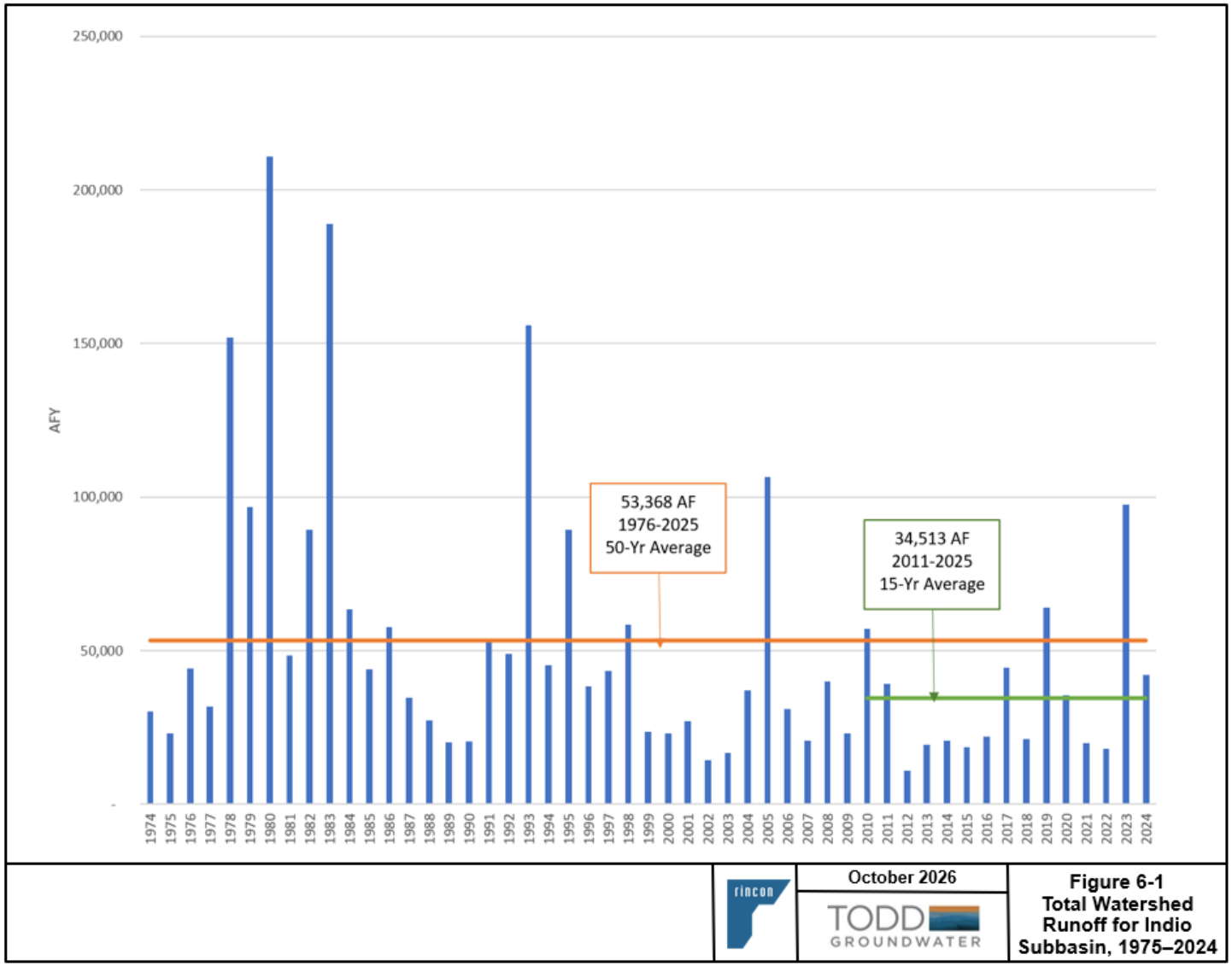
6.3 Surface Water

Natural surface water flow in the Coachella Valley occurs as a result of precipitation, precipitation runoff, subsurface flow, and stream flow originating from the San Bernardino and San Jacinto Mountains, with lesser amounts from the Santa Rosa Mountains. This watershed runoff is diverted for use, percolates into streambeds, or is captured in mountain-front percolation basins where it recharges the Subbasin. As shown in Figure 6-1, the 50-year hydrologic period from 1976 to 2025 had an annual average watershed runoff of 53,368 AFY (calculated from U.S. Geological Survey [USGS] stream gages, precipitation, and ungauged tributary estimates), with approximately 51,594 AFY in natural infiltration when accounting for outflows to Salton Sea. Runoff during the 15-year period from 2011 to 2025 was below average, with 34,513 AFY in watershed runoff and 33,061 AFY in natural infiltration. This 15-year hydrologic period contained multiple drought cycles with below average rainfall.

DWA and CVWD both hold State of California surface water rights. CVWD's rights[1] total up to 328,591 AFY for Whitewater River and multiple tributaries, which exceeds the long-term average watershed runoff of 51,594 AFY. These rights allow CVWD to capture available watershed runoff for replenishment of the groundwater basin. DWA's rights[2] total up to approximately 13,309 AFY for Chino, Snow, Falls Creek, and Whitewater River flow. DWA acquired the water rights of the Whitewater River Mutual Water Company for 10 cubic feet per second (cfs) from Whitewater River in 2008. Local surface water is diverted by DWA for use in its domestic water supply system. Because surface water supplies are affected by variations in annual precipitation, however, the annual supply is highly variable. Since 1960, the historical surface water diversions have ranged from approximately 1,400 to 8,500 AFY. For the period of 2010 to 2024, DWA's average annual surface water diversions from all sources totaled 2,135 AFY. The remaining undiverted surface water has historically been recharged into the Indio Subbasin through natural streambeds.

[1] Whitewater River: A001122 (400 cfs up to 289,591 AFY); Creeks: A002922 (up to 39,000 AFY)
[2] Snow Creek: A004752 (1.5 cfs); Snow Creek: A013067 (4 cfs); Falls Creek: A008957 (1.5 cfs with 640 AFY cap); Chino West: G331035 (2 cfs); Whitewater Canyon (10 cfs): G330840, G330841, G330842, G330843, G330846, and G331466

Figure 6-1 Total Watershed Runoff for Indio Subbasin, 1975–2024



DWA's existing surface water diversions include the following:



DWA diverts surface water from Snow Creek.

- **Chino West**—This diversion serves the domestic water needs of the Palm Springs Aerial Tramway from a small reservoir, which overflows back into the stream. The diversion only provides water supply needs to the Tramway.
- **Chino North**—This diversion operates by discharging and then recharging the water further downstream nearer to the Whitewater River. This diversion was damaged in a February 2019 storm, and diversions have not occurred since then.
- **Snow Creek/Falls Creek**—This diversion involves two separate diversion dams, but the flow is combined before it is diverted for delivery. The diversion is delivered to urban users in the Palm Springs area. A February 2019 storm damaged the Falls Creek diversion, and diversions have not occurred since then. Additionally, water is diverted to WWR-GRF for use in DWA's domestic water supply system.
- **Whitewater Canyon**—This diversion is an old water distribution system, purchased from the Whitewater River Mutual Water Company, which diverts subsurface stream water using wells that are less than 50 feet deep. This diversion is delivered within Palm Springs to a ranch owned and operated by Agua Caliente Band of Cahuilla Indians for agricultural purposes, to Caltrans for landscape irrigation of freeway right of ways, to a rock supply company for dust suppression, and periodically to other entities for non-potable water use. Additionally, water is diverted to WWR-GRF for use in DWA's domestic water supply system.

6.3.1 Use of Surface Water Supply

DWA plans to divert as much surface water within its water rights as may be available and deliver that diverted surface water for direct use, and for replenishment into the Indio Subbasin and subsequent extraction for use in DWA's domestic water supply system. This *Alternative Plan Update* assumes DWA will increase annual surface water diversions rights to 6,000 AFY in 2026, however, will only factor in a percentage of this volume to reflect annual supply variation due to climate change conditions. A small portion of the current watershed runoff is diverted for municipal and agricultural use, and the Indio Subbasin benefits from the natural infiltration of watershed runoff that is not diverted. This *Alternative Plan Update* assumes a long-term average of 96 percent of the undiverted watershed runoff recharges the groundwater aquifer, but this percent varies widely based on hydrologic year type and observed conditions. See Chapter 7, *Numerical Model and Plan Scenarios*, Section 7.3.5 for more information about groundwater inflows.

6.3.2 Methodology for Future Surface Water

As described above, total watershed runoff has averaged 53,368 AFY over the 50-year period from 1976-2025 but has decreased by 35 percent to 34,513 AFY in the last 15 years. Future climate conditions are expected to further impact watershed runoff volumes, with longer and more

frequent periods of drought. Future climate conditions were evaluated in Chapter 7, *Numerical Model and Plan Scenarios.* The USGS Basin Characterization Model (BCM) was used to simulate watershed hydrologic response to projected changes in precipitation and temperature under several Representative Concentration Pathway (RCP) climate scenarios. The BCM estimates for watershed runoff were then applied to the existing streamflow and mountain flow recharge methodologies to develop groundwater recharge inputs for the numerical model.

In Chapter 7, *Numerical Model and Plan Scenarios,* this *Alternative Plan Update* considers two local hydrology scenarios for future scenarios based on climate forecasts:

1) **Moderate Climate Change Conditions (RCP 4.5)** – For this scenario, the watershed recharge is based on BCM-derived runoff projections using the RCP 4.5 precipitation scenario, which reflects moderate climate change conditions. With projected surface water diversions at a maximum of 6,000 AFY beginning in 2026, natural infiltration is assumed to average approximately 35,587 AFY through the planning horizon. Due to decreased flow in Snow, Fall, and Chino Creeks, DWA will only be able to divert an average of 3,671 AFY over the 50 years.
2) **Severe Climate Change Conditions (RCP 8.5)** – Natural infiltration is based on BCM-derived runoff projections using the RCP 8.5 precipitation scenario, which reflects more severe climate change conditions. Assuming the maximum DWA diversions, natural infiltration is assumed to average approximately 13,434 AFY through the planning horizon. Due to decreased flow in Snow, Fall, and Chino Creeks, DWA will only be able to divert an average of 1,751 AFY over the 50 years .

6.4 Colorado River Water

Colorado River water has been a significant water supply source for the Indio Subbasin since the Coachella Canal was completed in 1949. CVWD is the only agency in the Indio Subbasin that receives Colorado River water allocations.

The Colorado River is managed and operated in accordance with the *Law of the River,* a collection of interstate compacts, federal and state legislation, various agreements and contracts, an international treaty, a U.S. Supreme Court decree, and federal administrative actions that govern the rights to use Colorado River water within the seven Colorado River Basin states. The *1922 Colorado River Compact* apportioned the waters of the Colorado River Basin between the Upper Colorado River Basin (i.e., Colorado, Wyoming, Utah, and New Mexico) and the Lower Basin (i.e., Nevada, Arizona, and California) (USBR, 1922). The *1922 Colorado River Compact* allocates 15 million AFY of Colorado River water as follows: 7.5 million AFY to the Upper Basin and 7.5 million AFY to the Lower Basin, plus up to 1 million AFY of surplus supplies. The Lower Basin's water was further apportioned among the three Lower Basin states by the 1928 *Boulder Canyon Project Act* (USBR, 1928) and the 1931 *Boulder Canyon Project Agreement* (USBR, 1931), typically called the 1931 *Seven Party Agreement,* which allocates California's apportionment of Colorado River water among Palo Verde Irrigation District (PVID), Imperial Irrigation District (IID), Coachella Valley Water District (CVWD), Metropolitan Water District of Southern California (MWD), City of Los Angeles, City of San Diego, and County of San Diego. The 1964 U.S. Supreme Court decree in *Arizona v. California* established Arizona's basic annual apportionment at 2.8 million AFY, California's at 4.4 million AFY, and Nevada's at 0.3 million AFY. Mexico is entitled to 1.5 million AFY of the Colorado River under the *1944 United States-Mexico Treaty for Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande* (U.S. Government Printing Office, 1946). However, this treaty did not specify

a required quality for water entering Mexico. In 1973, the United States and Mexico signed *Minute No. 242* of the International Boundary and Water Commission (IBWC) requiring certain water quality standards for water entering Mexico (IBWC, 1973).

California's Colorado River supply is protected by the *1968 Colorado River Basin Project Act* (USBR, 1968), which provides that in years of insufficient supply on the main stem of the Colorado River, supplies to the Central Arizona Project shall be reduced to zero before California will be reduced below 4.4 million AF in any year. This assures full supplies to the Coachella Valley, except in periods of extreme drought.



The Coachella Canal extends approximately 123 miles to terminate in Lake Cahuilla.

The Coachella Canal is a branch of the All-American Canal that brings Colorado River water into the Imperial and Coachella Valleys. Under the *1931 Seven Party Agreement* (USBR, 1931), CVWD receives 330,000 AFY of Priority 3A Colorado River water diverted from the All-American Canal at the Imperial Dam. The Coachella Canal originates at Drop 1 on the All-American Canal and extends approximately 123 miles, terminating in CVWD's Lake Cahuilla. The service area for Colorado River water delivery under CVWD's contract with the U.S. Department of the Interior Bureau of Reclamation (USBR) is defined as Improvement District No. 1 (ID-1), which encompasses 136,400 acres covering most of the East Valley and a portion of the West Valley north of Interstate 10. Under the *1931 Seven Party Agreement*, CVWD has water rights to Colorado River water as part of the first 3.85 million AFY allocated to California. CVWD is in the third priority position along with IID.

6.4.1 2003 Quantification Settlement Agreement (QSA)

In 2003, CVWD, IID, and MWD successfully negotiated the *2003 Quantification Settlement Agreement* (*2003 QSA*) (CVWD, 2003), which quantifies California's Colorado River allocations through 2077 and supports the transfer of water between agencies. Under the *2003 QSA*, CVWD has a base entitlement of 330,000 AFY. CVWD negotiated water transfer agreements with MWD and IID that increased CVWD supplies by an additional 123,000 AFY. CVWD's net QSA supply increased to 424,000 AFY in 2026 and will remain at that level until 2047, then decrease to 421,000 AFY. While the current QSA agreement will terminate in 2077 (Secretary of the Interior, 2003), this *Alternative Plan Update* assumes the agreement will be renegotiated and extends QSA deliveries (minus the voluntary reductions currently in place) through the full model period. CVWD's available Colorado River diversions through 2050, this *Alternative Plan Update* horizon, are shown on Table 6-3.

As of the mid-2020s, CVWD's available Colorado River water diversions at Imperial Dam reflect multiple QSA components, including the 330,000 AFY base entitlement, the MWD/IID Transfer of 20,000 AFY, the IID/CVWD First Transfer of 50,000 AFY, and the IID/CVWD Second Transfer, which increases incrementally to 53,000 AFY by 2026 and will remain at that level until 2047, then decrease to 50,000 AFY. These supplies are offset by the -26,000 AFY transfer to the San Diego County Water Authority (SDCWA) associated with the Coachella Canal Lining Project and approximately -3,000 AFY associated with Indian Present Perfected Rights.

The QSA requires most of the Colorado River water to be delivered at Imperial Dam, via the All-American Canal to the Coachella Canal. Additionally, under the 2003 QSA, MWD transfers 35,000 AFY of its State Water Project (SWP) Table A amount to CVWD. This SWP water is exchanged for Colorado River water and can be delivered at Imperial Dam for delivery via the Coachella Canal to the eastern portion of the Indio Subbasin or at Lake Havasu for delivery via the Colorado River Aqueduct to the western portion of the Indio Subbasin at the WWR-GRF. The 2019 *Second Amendment* (CVWD, 2019b) guaranteed delivery of the 35,000 AFY from 2019 to 2026, for a total of 280,000 AF of water to the WWR-GRF during that timeframe. The 2025 *Third Amendment* (MWD and CVWD, 2025) extended the delivery period to 2035 and committed to working toward a long-term extension to 2077 provided the *Exchange and Advance Delivery Agreement* has been extended to 2085. MWD can deliver the water through CVWD's Whitewater Service Connections (for recharge at WWR-GRF) or via the Advance Delivery account. Deliveries at the Whitewater Service Connections are subject to a supplemental energy charge for Colorado River Aqueduct pumping. The MWD SWP Transfer supply of up to 35,000 AFY may be delivered on a flexible schedule pursuant to the agreement terms and is not subject to SWP allocation variability. Either MWD or CVWD may request a reduction or elimination of delivery in a given year subject to mutual consent. However, QSA water may only be recharged to Indio Subbasin, not to Mission Creek Subbasin. Delivery of this water to the WWR-GRF began in 2010, with annual volumes fluctuating based on available supply conditions.



The Colorado River Aqueduct conveys water to the western portion of the Indio Subbasin at the WWR-GRF.

The MWD/IID Transfer originated in a 1989 agreement with MWD to receive 20,000 AF of its Colorado River supply. The *2019 Amended and Restated Agreement for Exchange and Advance Delivery of Water* (CVWD, 2019a) defined the exchange and delivery terms between MWD, CVWD, and DWA. The *2019 Second Amendment to Delivery and Exchange Agreement* (CVWD, 2019b) reduced CVWD's annual delivery of the MWD/IID Transfer to 15,000 AFY, for a total of 105,000 AF, if taken at the Whitewater Service Connections (for recharge at WWR-GRF) between 2020 and 2026. For those seven years, MWD keeps the remaining 5,000 AFY, after which CVWD's allocation increases back up to 20,000 AFY. The 2025 *Third Amendment* extends exchange deliveries through 2035 and establishes the parties' intent to work toward extending the Delivery and Exchange Agreement through 2077, contingent upon extension of the Exchange and Advance Delivery Agreement through 2085.

For planning purposes, this *Alternative Plan Update* assumes that both the 35,000 AFY MWD SWP Transfer and the 20,000 AFY MWD/IID Transfer continue to be available consistent with existing agreements and historical operations through the planning horizon. CVWD's total allocations under the QSA, including these two transfers, increase to approximately 459,000 AFY by 2026 and are assumed to remain at that level through the planning horizon.

CVWD's available Colorado River diversions through 2050, this *Alternative Plan Update* horizon, are shown on Table 6-2.

Table 6-2 Colorado River Water Entitlements (AFY)

Diversion	2025	2030	2035	2040	2045	2050	2055
Base Entitlement	330,000	330,000	330,000	330,000	330,000	330,000	330,000
1988 MWD/IID Approval Agreement	20,000	20,000	20,000	20,000	20,000	20,000	20,000
IID/CVWD First Transfer	50,000	50,000	50,000	50,000	50,000	50,000	50,000
IID/CVWD Second Transfer	48,000	53,000	53,000	53,000	53,000	50,000	50,000
Coachella Canal Lining	-26,000	-26,000	-26,000	-26,000	-26,000	-26,000	-26,000
Indian Present Perfected Rights Transfer	-3,000	-3,000	-3,000	-3,000	-3,000	-3,000	-3,000
QSA Diversions	419,000	424,000	424,000	424,000	424,000	421,000	421,000
MWD SWP Transfer	35,000	35,000	35,000	35,000	35,000	35,000	35,000
Total Diversions	449,000	459,000	459,000	459,000	459,000	456,000	456,000
MWD/IID Approval Agreement Transfer[1]	-5,000	0	0	0	0	0	0
Assumed Conveyance Losses (5%)	-22,700	-22,950	-22,950	-22,950	-22,950	-22,800	-22,800
Total Available Deliveries	426,550	436,050	436,050	436,050	436,050	433,200	433,200

6.4.2 Colorado River Water Consumptive Use

Each year, CVWD submits its water order to USBR for its total QSA entitlement. USBR provides an annual Colorado River Accounting and Water Use Report that provides diversions, return flows, and consumptive use of water diverted from the mainstream of the Colorado River below Lee's Ferry (USBR, 2020b).

In recent years, CVWD's consumptive use of Colorado River water has varied relative to its QSA allotment, with differences reflecting recharge operations, delivery constraints, and annual hydrologic conditions. Consistent with historical operations, CVWD retains the ability to transfer up to 20,000 AFY of water under the *1989 Approval Agreement* to MWD to balance annual demands and deliveries.

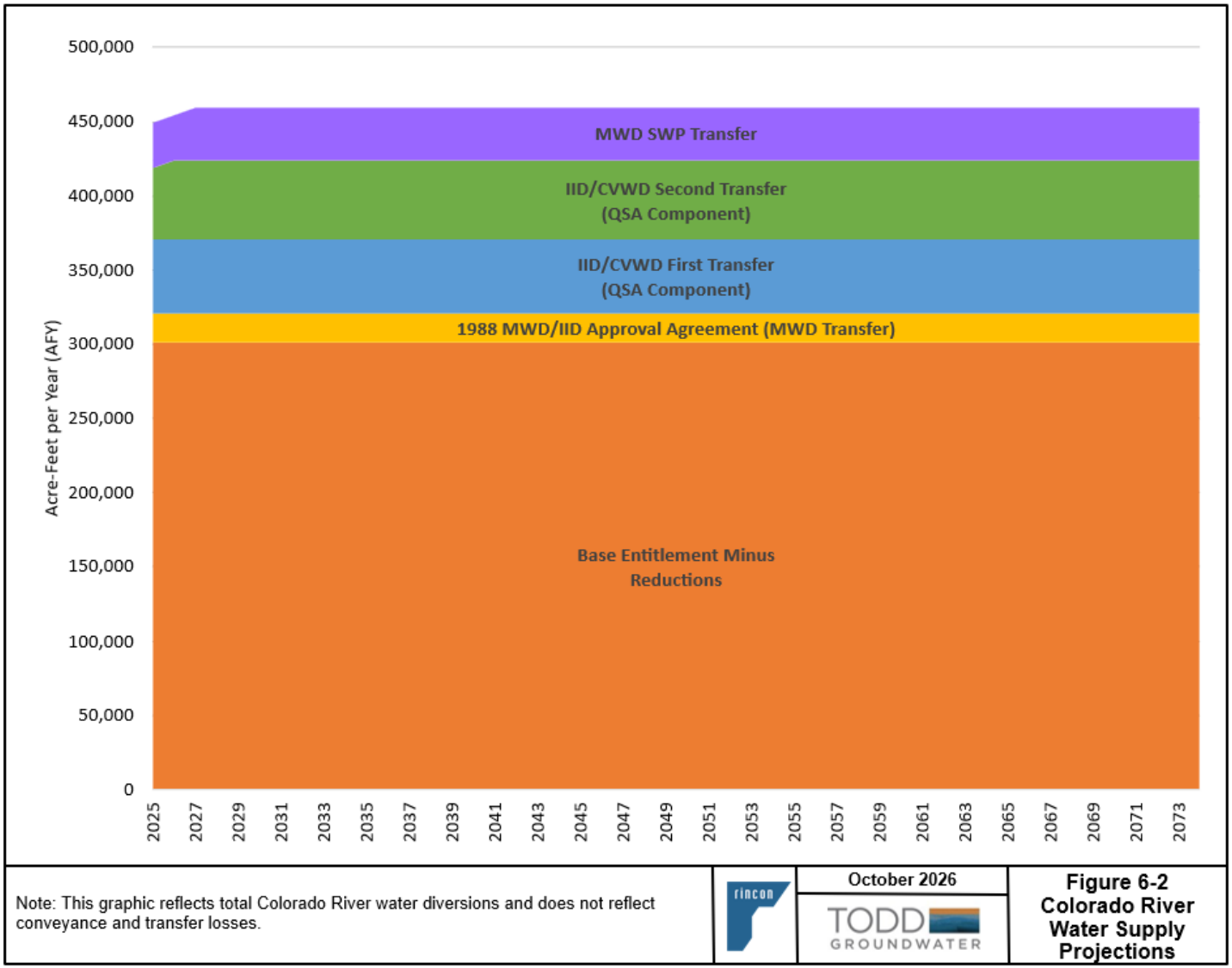
Looking ahead, CVWD anticipates that consumptive use will continue to approach available supplies over the long term; however, annual use will vary depending on recharge operations, delivery capacity, and Colorado River system conditions. As a result, full utilization of total QSA supplies may not occur in all years within the planning horizon. Payback for the overconsumption that occurred in 2001 and 2002 has been completed, and no additional payback obligations are assumed under existing QSA accounting conditions during the planning horizon.

Assumptions regarding Colorado River (Canal water) supplies available for use are based on CVWD's delivery schedule from the QSA, minus estimated Canal conveyance losses (see discussion below). Figure 6-2 provides CVWD's contracted Colorado River water entitlement through 2074. Table 6-3 lists total Colorado River entitlements under existing agreements. However, this *2027 Alternative Plan Update* does not assume that full QSA ramp up volumes will be available because of ongoing drought and forecasted climate change on the Colorado River system.

6.4.2.1 Conveyance Losses

Conveyance losses, which are defined as the loss of water to evaporation, seepage, or other similar causes resulting from any transportation or delivery of water, are also factored into the water available for delivery. Conveyance losses in the Coachella Canal are estimated to be approximately 6.6 percent annually based on the percentage annual average conveyance losses from 2020 to 2025. Regulatory water is defined as metered releases of excess water from the Canal water delivery system needed to meet scheduled deliveries in the gravity flow irrigation water delivery system. Regulatory water is released into the open drain system and flows to the Salton Sea. Although regulatory water is metered, it is considered a loss and not accounted for in the direct deliveries.

Figure 6-2 Colorado River Water Supply Projections



6.4.3 Supply Reliability

Colorado River supplies face a number of challenges to long-term reliability including the extended Colorado River Basin drought and shortage sharing agreements, endangered species and habitat protection, and climate change. Due to both California's and CVWD's high-priority position regarding Colorado River allocations, CVWD's Colorado River supply is expected to be reliable.

6.4.3.1 QSA Litigation

The *2010 CVWMP Update* cautioned against the reliability of CVWD's Colorado River supplies because of ongoing QSA litigation at the time. However, the QSA has held up to scrutiny under several unsuccessful legal challenges in state and federal court. Immediately following passage of the QSA, in November 2003, IID filed a complaint in Imperial County Superior Court to confirm the validity of the QSA and 12 of the 34 QSA-related agreements. The case was coordinated for trial with other lawsuits challenging QSA environmental and regulatory approvals in the Sacramento County Superior Court. CVWD, IID, MWD, SDCWA, and the State defended these suits, which sought validation of the contracts. In February 2010, a California Superior Court judge ruled that the QSA and 11 related agreements were invalid because the QSA-JPA Agreement created an unconditional obligation for the State to pay for excess environmental mitigation costs, in violation of California's constitution. The court declined, for jurisdictional reasons, to validate the thirteenth agreement, the IID-CVWD Salton Sea Flooding Settlement Agreement.

The QSA parties appealed this decision. In March 2011, the California Court of Appeal, Third Appellate District issued a temporary stay of the trial court judgment. In December 2011, the California Court of Appeal reversed the lower court ruling and remanded the case back to trial court for decision on the environmental challenges to the QSA Program EIR. In July 2013, a Sacramento Superior Court entered a final judgment validating the QSA and rejecting all of the remaining legal challenges. In May 2015, the California Court of Appeal issued a ruling that dismissed all remaining appeals.

6.4.3.2 Colorado River Interim Guidelines

Since 2000, drought conditions in the Colorado River basin have led to significant fluctuations and decreases in water elevations at key Colorado River reservoirs. Each year, the Secretary of the Interior is required to declare the Colorado River water supply availability conditions for the Lower Basin States in terms of normal, surplus, or shortage.

In 2007, USBR adopted the *Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead* (*2007 Interim Guidelines*), which established rules for reservoir operations, shortage sharing, and coordinated releases between Lake Powell and Lake Mead. These guidelines governed Colorado River operations through 2026 and provided the foundation for annual operating decisions during a period of prolonged drought.

Since adoption of the *2007 Interim Guidelines*, additional measures have been implemented to address worsening hydrologic conditions, including the *2019 Lower Basin Drought Contingency Plan* and subsequent voluntary conservation programs. These actions have helped stabilize reservoir elevations but have not eliminated structural imbalances in the system.

In 2023, USBR initiated a formal process to develop a new long-term operating framework for the Colorado River system to replace the *2007 Interim Guidelines* after 2026. As part of this effort, USBR

released a Final Environmental Impact Statement (FEIS) in July 2026 that evaluates multiple operational alternatives for managing the system over the next 20 years.

The DEIS presents a range of alternatives that include varying approaches to shortage sharing, reservoir operations, and reductions in deliveries across Basin States under low reservoir conditions. Final operating guidelines are expected to be adopted prior to 2027; however, at the time of this *Alternative Plan Update*, these guidelines have not been finalized and remain subject to ongoing federal, interstate, and stakeholder negotiations. While the process may result in new shortage-sharing agreements or conservation programs, it does not alter the existing priority structure established under the California Seven-Party Agreement.

6.4.3.3 *Lower Basin Drought Contingency Plan*

In May 2019, CVWD entered into the *Lower Basin Drought Contingency Plan Agreement* (USBR, 2019) to provide an additional mechanism to prevent Lake Mead from reaching critically low elevations by establishing that certain Colorado River users in the Lower Basin make Drought Contingency Plan contributions if Lake Mead reaches certain elevations. The *Implementation Agreement* (CVWD 2019c) explains that the *Lower Basin Drought Contingency Plan (Lower Basin DCP*) provides that USBR's annual 24-month study's projection of Lake Mead's January 1 elevation will determine the amount of California Drought Contingency Plan contributions for the subsequent year, if any.

CVWD's share of California's Drought Contingency Plan contributions is approximately seven percent, equivalent to roughly 14,000 to 24,500 AFY depending on reservoir conditions. CVWD implements its contributions through a combination of mechanisms, including reduced deliveries and storage of water in MWD's Intentionally Created Surplus (ICS) accounts.

CVWD has actively participated in broader drought response efforts associated with the Colorado River system, including voluntary conservation programs implemented through USBR's Lower Colorado River Basin Conservation and Efficiency Program. These efforts have included reductions in recharge operations and other measures to conserve water and support reservoir storage.

The *Lower Basin Drought Contingency Plan* remains in effect through 2026 and operates in conjunction with the *2007 Interim Guidelines*. Following expiration of these agreements, future drought response and shortage sharing requirements will be governed by the post-2026 operating framework currently under development by USBR.

6.4.4 Use of Colorado River Water

Colorado River water supplies available to CVWD under the QSA are used to meet a combination of groundwater replenishment and non-potable water demands throughout the Indio Subbasin. In this *Alternative Plan Update*, Colorado River water use is represented based on a detailed, project-level implementation framework that reflects CVWD's current capital improvement program, operational practices, and planned customer connections.

A primary use of Colorado River water within the Indio Subbasin is for source substitution, whereby Canal water deliveries replace existing groundwater pumping for agricultural, golf course, and municipal irrigation demands. This approach reduces groundwater extraction and supports long-term sustainability of the Subbasin.

The timing and magnitude of Colorado River water use are driven by the phased implementation of Canal conveyance projects and associated customer connections. These projects include agricultural

deliveries in the East Valley, expansion of non-potable water systems supplied by CVWD's water reclamation facilities, and additional Canal connections serving golf courses and landscape irrigation demands.

Non-potable water systems supplied by CVWD deliver recycled water, Canal water, or a blend of recycled water and Canal water to end users. For the blended system, recycled water typically comprises most of the delivered supply, with Canal water providing a supplemental component to meet peak demand and maintain system flexibility.

Projected Canal water use associated with new capital projects increases over time as implementation progresses. New Canal demands associated with source substitution and non-potable water connections have been on the order of approximately 15,000 to 20,000 AFY in the mid-2020s, and are planned to increase to approximately 30,000 AFY by the late-2020s and to exceed 40,000 AFY under full implementation of currently identified projects.

A substantial portion of this demand is associated with agricultural conversion in the East Valley, namely the Oasis area, where Canal water deliveries increase incrementally over time as infrastructure is constructed and landowners connect to the system. Additional demand is associated with golf course conversions and municipal irrigation users served through CVWD's non-potable water systems.

Colorado River water delivered through these systems supports groundwater sustainability by offsetting pumping and enabling greater use of recycled water supplies. In combination, these actions increase the effective use of available imported supplies while managing groundwater elevations and Subbasin storage over time.

6.5 SWP Exchange Water

The SWP is managed by the California Department of Water Resources (DWR) and includes more than 705 miles of aqueduct and conveyance facilities extending from Lake Oroville in Northern California to Lake Perris in Southern California. While the SWP has contracts to deliver 4.172 million AFY to the State Water Contractors, only 4.133 million AFY of this water is available for delivery from the Delta (excluding Butte County, Yuba City, and Plumas County Flood Control and Water Conservation District). The State Water Contractors consist of 29 public entities with long-term contracts with DWR to satisfy all, or a portion of, their water supply needs. In 1962 and 1963, DWA and CVWD, respectively, entered contracts with the State of California for a total of 61,200 AFY of SWP water. However, CVWD and DWA have since executed agreements with other State Water Contractors for additional SWP water for a total of 194,100 AFY.

SWP water has been an important component of the region's water supply mix since CVWD and DWA began receiving and recharging SWP exchange water at the WWR-GRF. Starting in 1973, CVWD and DWA began exchanging their SWP water with MWD for Colorado River water delivered via MWD's Colorado River Aqueduct. Because CVWD and DWA do not have a physical connection to SWP conveyance facilities, MWD takes delivery of CVWD's and DWA's SWP water, and in exchange, delivers an equal amount of Colorado River water to the Whitewater Service Connections (for recharge at WWR-GRF and MC-GRF). The exchange agreement was most recently re-established in the 2019 *Amended and Restated Agreement for Exchange and Advance Delivery of Water* (CVWD, 2019a). The 2025 *Third Amendment* (MWD and CVWD, 2025) committed to working toward a long-term extension to 2085.

6.5.1 SWP Table A Amounts



SWP exchange water is recharged at the WWR-GRF.

Each SWP contract contains a "Table A" exhibit that defines the maximum annual amount of water each contractor can receive excluding certain interruptible deliveries. DWR uses Table A amounts to allocate available SWP supplies and some SWP project costs among the contractors. Each year, DWR determines the amount of water available for delivery to SWP contractors based on hydrology, reservoir storage, the requirements of water rights licenses and permits, water quality, and environmental requirements for protected species in the Sacramento-San Joaquin River Delta (Delta). The available supply is then allocated according to each SWP contractor's Table A amount.

CVWD's and DWA's collective increments of Table A water are listed in Table 6-4. Original Table A SWP water allocations for CVWD and DWA were 23,100 AFY and 38,100 AFY, respectively, for a combined amount of 61,200 AFY. CVWD and DWA obtained a combined 100,000 AFY transfer from MWD under the 2003 Exchange Agreement. In 2004, CVWD purchased an additional 9,900 AFY of SWP Table A water from the Tulare Lake Basin Water Storage District (Tulare Lake Basin) in Kings County (DWR, 2004). In 2007, CVWD and DWA made a second purchase of Table A SWP water from Tulare Lake Basin totaling 7,000 AFY (DWR, 2007a and 2007b). In 2007, CVWD and DWA also completed the transfer of 16,000 AFY of Table A Amounts from the Berrenda Mesa Water District in Kern County (DWR, 2007c and 2007d). These latter two transfers became effective in January 2010. With these additional transfers, the combined total SWP Table A Amount for CVWD and DWA is 194,100 AFY.

Previously, the 100,000 AFY MWD Transfer obtained under the *2003 Exchange Agreement* included a "Call Back" component that allowed MWD to call-back the 100,000 AFY and assume the entire cost of delivery if it needed the water. In 2019, the *Amended and Restated Agreement for Exchange and Advance Delivery of Water* (CVWD, 2019a) ended MWD's right to call back that 100,000 AFY of Table A water.

Table 6-3 SWP Table A Amounts (AFY)

Agency	Original SWP Table A	MWD Transfer	Tulare Lake Basin Transfer 1	Tulare Lake Basin Transfer 2	Berrenda Transfer	Total Table A
CVWD	23,100	88,100	9,900	5,250	12,000	138,350
DWA	38,100	11,900	-	1,750	4,000	55,750
Total	**61,200**	**100,000**	**9,900**	**7,000**	**16,000**	**194,100**

In some years, DWA and CVWD carry over SWP water to the following year by storing it in San Luis Reservoir. This carryover water is SWP water that is allocated to a State Water Contractor and approved for delivery in a given year but was not able to be delivered to the Contractor by the end of that year. This water is exported from the Delta, but instead of being delivered to the Contractor,

it is stored in the SWP's share of San Luis Reservoir south of the Delta, when space is available, for the Contractor to use in the following year. This variability is reflected in the historical delivery values.

6.5.2 Other SWP Water Types

There are other types of SWP water that can be purchased, such as individual water purchase opportunities and transfers/exchanges. These may be conveyed to CVWD and DWA as available, but no commitments exist.

6.5.2.1 Yuba Accord

In 2008, CVWD and DWA entered into separate agreements with DWR for the purchase and conveyance of supplemental SWP water under the Yuba River Accord Dry Year Water Purchase Program (Yuba Accord). This program provides dry year supplies through a water purchase agreement between DWR and Yuba County Water Agency, which settled long-standing operational and environmental issues over instream flow requirements for the lower Yuba River. Yuba Accord water transfers could include both surface water and groundwater substitution transfers for an estimated total of up to 140,000 AFY through 2050. The amount of water available for purchase varies annually and is allocated among participating SWP contractors based on their Table A amounts. CVWD and DWA may purchase up to 1.72 percent and 0.69 percent, respectively, of available Yuba Accord water, in years it is made available.

Yuba Accord deliveries have varied in volume from zero in multiple years to a historic high of 2,664 AFY to CVWD and DWA in 2013. Over the 17-year period from 2008-2024, the average annual amount of Yuba Accord water purchased was 633 AFY by CVWD and 147 AFY by DWA. This *Alternative Plan Update* assumes the same 17-year average of Yuba Accord deliveries annually through 2050.

6.5.2.2 Article 21

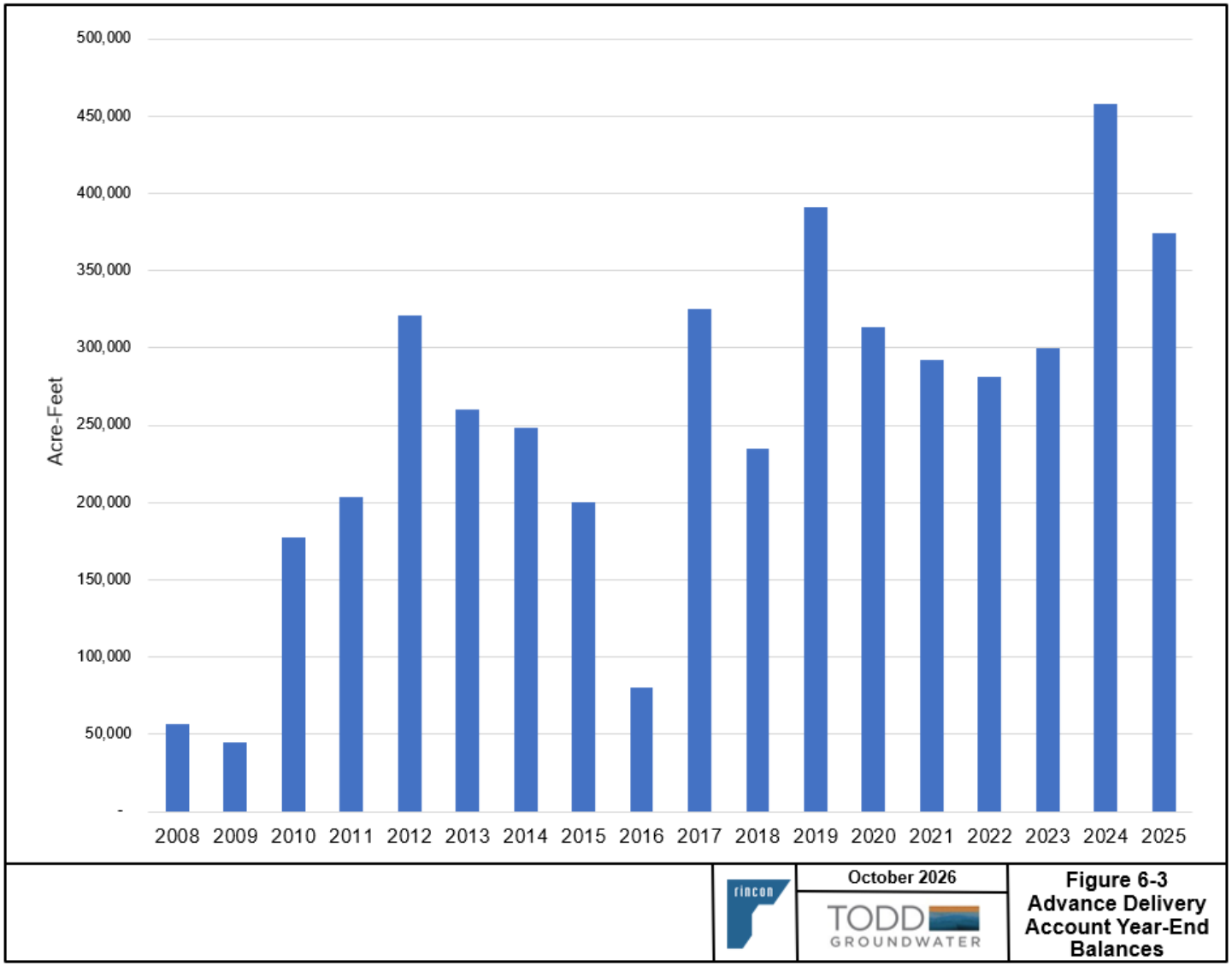
Article 21 water (described in Article 21 of the SWP water contracts), "Interruptible Water", is water that State Water Contractors may receive on a short-term basis in addition to their Table A water if they request it in years when it is available. Article 21 water is used by many Contractors to help meet demands in low allocation years. Article 21 water is not available every year, amounts vary when it is available, and the water is proportionately allocated among participating Contractors. The availability and delivery of Article 21 water cannot interfere with normal SWP operations and cannot be carried over for delivery in a subsequent year. Between 2010-2024, DWA and CVWD received an annual average of 37,082 AFY in Article 21 and carryover supplies. Given the uncertainty associated with future availability of Article 21 and carryover supplies, this *Alternative Plan Update* does not include Article 21 and carryover supplies in the future scenarios in Chapter 7, *Numerical Model and Plan Scenarios*.

6.5.3 Advance Deliveries

The 1984 *Advance Delivery* A*greement* (amended in 2019 by the *Amended and Restated Agreement for Exchange and Advance Delivery of Water* [CVWD 2019a]) allows MWD to deliver up to 800,000 AFY of Colorado River water for storage in the Coachella Valley Groundwater Basin to be credited against its future SWP exchange obligations, with deliveries occurring on a flexible schedule through an extended period. Advance deliveries of exchange water are highly variable and concentrated in

wet years, with the Indio Subbasin providing most of the storage. Figure 6-3 shows the year-end Advance Delivery Account (ADA) balance for 2008 to 2025, with increases representing MWD's advance deliveries (water in excess of SWP exchange obligations) and decreases representing deductions taken from the account when MWD credits against previously stored water in lieu of delivering SWP exchange water. As of December 2025, there were 374,404 AF stored in MWD's Advance Delivery account in the Indio and Mission Creek Subbasins. This *Alternative Plan Update* assumes that through the planning horizon, MWD will continue to exercise its right to deliver more water in wet years and credit against the ADA account in dry years.

Figure 6-3 Advance Delivery Account Year-End Balance



6.5.4 Supply Reliability

SWP supplies vary annually due to weather and runoff variations in Northern California and regulatory limitations on exports from the Delta.

6.5.4.1 Delta Exports

Exports from the Delta through the SWP and Central Valley Project (CVP; managed by USBR) have decreased since 2005 due to several key environmental decisions. While both the SWP and CVP provide water for municipal, industrial, and agricultural uses, the CVP serves a large portion of the State's agricultural demand. In 2005, the U.S. Fish and Wildlife Service (USFWS) released a Biological Opinion that Delta export (combined SWP and CVP) pumping operations would not jeopardize the continued existence of the Delta smelt, a small, endangered fish endemic to the Delta. Environmental groups challenged the action and in May 2007, federal Judge Oliver Wanger ruled that the Biological Opinion was faulty in its assumptions and needed to be performed again. In 2008, the USFWS and National Marine Fisheries Service (NMFS) released a new Biological Opinion that addressed Delta fisheries, restricting operations of the SWP and CVP diversion pumps. In 2009, Wanger struck down the USBR acceptance of the new Biological Opinion, saying USBR failed to comply with the National Environmental Policy Act (NEPA) related to cutbacks in water exports for Central Valley farmers.

In 2009, the *Sacramento-San Joaquin Delta Reform Act of 2009* (Delta Reform Act) established the Delta Stewardship Council to create a comprehensive, long-term, legally enforceable plan to guide management of the Delta's water and environmental resources. *The Delta Plan* (Delta Stewardship Council, 2013) includes policies and recommendations to achieve the "coequal goals," which means the two goals of providing more reliable water supply for California *and* protecting, restoring, and enhancing the Delta ecosystem. In 2016, USBR and DWR developed the California WaterFix, a twin-tunnels alternative for conveying flows across the natural channels of the Delta, focused on conveyance and ecosystem improvements to significantly reduce reverse flows and fish species impacts associated with the existing south Delta intakes. In 2019, USFWS and NMFS issued revised *Biological Opinions* (USFWS, 2020) to address California WaterFix. Concurrently, USBR issued the *2018 Addendum* (USBR, 2018) to the *1986 Coordinated Operations Agreement* (USBR, 1986) with accompanying SWP and CVP operations changes which reduced SWP exports and increased CVP exports, along with more conservative operation of Lake Oroville. In 2019, Governor Newsom directed state agencies to proceed with modernizing Delta conveyance with a single tunnel project.

More recently, updated regulatory requirements, including new Biological Opinions issued in 2024 (USFWS, 2024, NMFS, 2024) and the SWP Incidental Take Permit (CDFW, 2024), have further refined operational constraints on Delta exports. These evolving regulatory frameworks continue to influence the timing and magnitude of SWP and CVP deliveries under a wide range of hydrologic conditions.

6.5.4.2 SWP Reliability

State Water Contractors are required to submit annual delivery schedules to DWR who then issues a periodic water allocation updates based on water year hydrology; for example, 5 percent, 15 percent, 20 percent, 35 percent, 40 percent, and 50 percent were provided for calendar year 2025. DWR makes an initial SWP Table A allocation for planning purposes, typically in December, prior to the start of each calendar year. Throughout the year, as additional information regarding water

availability becomes available and DWR performs hydrologic analyses, the SWP allocation and delivery estimates are updated. Typically, the final SWP allocation for the year is derived by June, and although not typical, can still be updated into the Fall. Table 6-5 presents the historical draft and final Table A allocations over the past 20 years (i.e., 2006 to 2025). Note that CVWD's and DWA's contracted Table A amounts increased substantially in 2010.

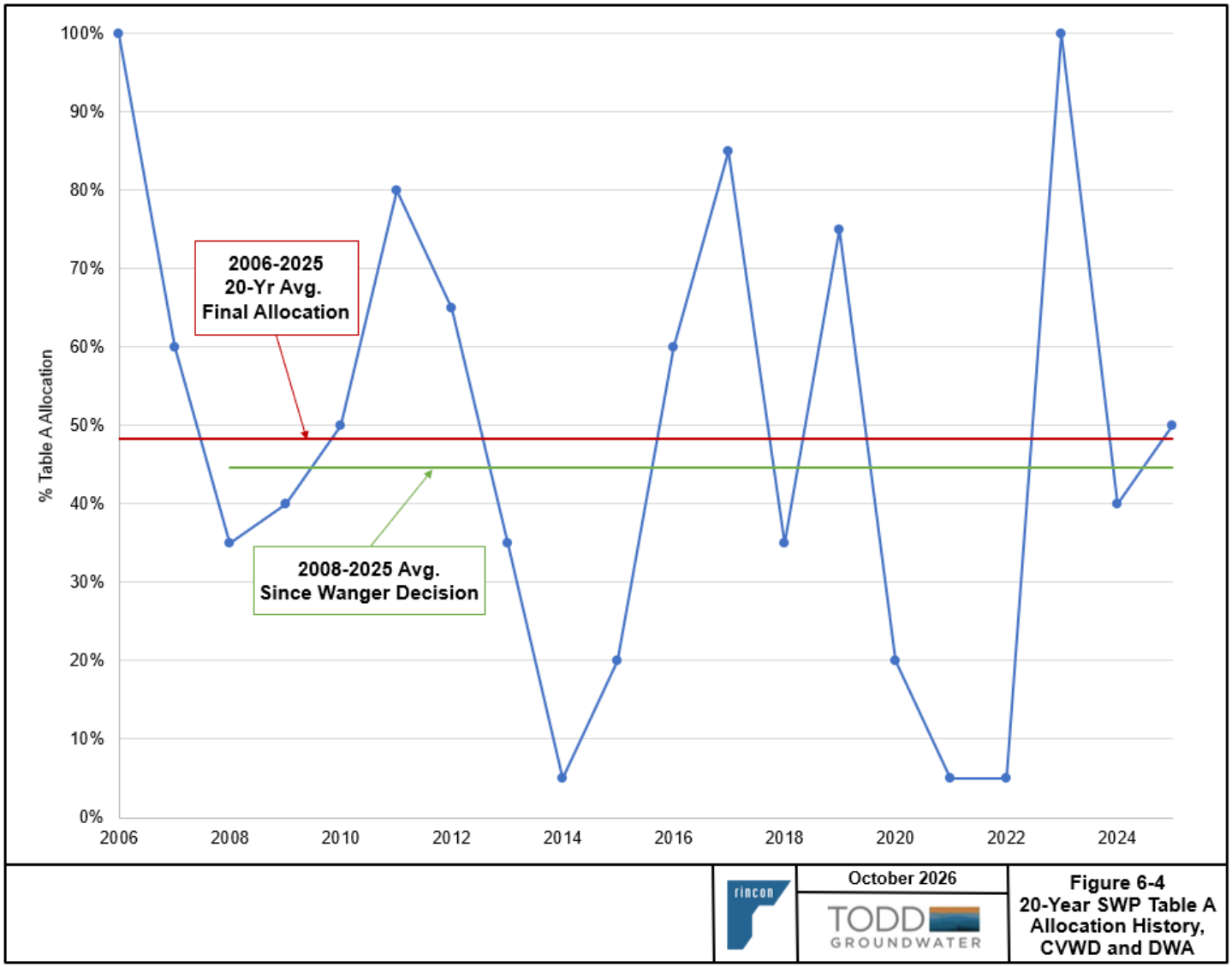
Final SWP allocations between 2006 and 2025 have ranged from a high of 100 percent in 2006 and 2023 to a low of five percent during critically dry years in 2014, 2021, and 2022. Figure 6-4 shows the variability of Table A allocations for the period 2002 through 2025. The reliability of SWP deliveries has declined since 2007 when Judge Wanger overturned the Biological Opinion regarding Delta export pumping operations. This decision significantly impacted DWR's ability to convey SWP supplies across the Delta for export. Since the 2007 Wanger decision, SWP final allocations have averaged 45 percent annually. This period has also been marked by five critically dry years.

Table 6-4 Historical SWP Table A Allocations, CVWD and DWA (2002-2025)

Year	100% Table A Volume Max Contract (AFY)[a]	Water Year Type[b]	SWP Initial Allocation (%)	SWP Final Allocation (%)
2002	61,200	Dry	20%	70%
2003	61,200	Above Normal	20%	90%
2004	71,100	Below Normal	35%	65%
2005	171,100	Above Normal	40%	90%
2006	171,100	Wet	55%	100%
2007	171,100	Dry	60%	60%
2008	171,100	Critically Dry	25%	35%
2009	171,100	Dry	15%	40%
2010	194,100	Below Normal	5%	50%
2011	194,100	Wet	25%	80%
2012	194,100	Below Normal	60%	65%
2013	194,100	Dry	30%	35%
2014	194,100	Critically Dry	5%	5%
2015	194,100	Critically Dry	10%	20%
2016	194,100	Below Normal	10%	60%
2017	194,100	Wet	20%	85%
2018	194,100	Below Normal	15%	35%
2019	194,100	Wet	10%	75%
2020	194,100	Dry	10%	20%
2021	194,100	Critically Dry	10%	5%
2022	194,100	Critically Dry	0%	5%
2023	194,100	Wet	5%	100%
2024	194,100	Above Normal	10%	40%
2025	194,100	Above Normal	5%	50%
20-year Average (2006-2025)	--	--	**19%**	**48%**
18-Year Average Since Wanger (2008-2025)	--	--	**15%**	**45%**

[a] Source: DWR, 2026, Bulletin 132-23 and notices to contractors https://water.ca.gov/programs/state-water-project/management/swp-water-contractors.[b] Source: DWR 2026, Water year type for Sacramento Valley

Figure 6-4 20-Year SWP Table A Allocation History, CVWD and DWA



DWR's *2025 SWP Draft Delivery Capability Report* (DWR, 2025) was released for public comment in December 2025. The delivery reliability of water from the SWP system is an important component for the SWP Contractors' water supply planning. SWP delivery amounts were modeled for the *2025 SWP Draft Delivery Capability Report (2025 DCR)* using the CalSim 3 simulation model that incorporates climate-adjusted historical hydrology over a 100-year simulation period (Water Years 1922 through 2021). DWR's analysis indicates that long-term average SWP deliveries under existing conditions remain substantially below maximum Table A amounts available for export from the Delta, reflecting the combined influence of hydrologic variability, regulatory constraints, and operational limitations on system performance. DWR's analysis for the *2025 DCR* indicates that the long-term average SWP Table A delivery under existing conditions is approximately 2.234 million acre-feet (MAF) per year, or about 54 percent of the approximately 4.133 MAF available for delivery from the Delta. Table 6-6 provides a summary of the SWP delivery amounts for existing conditions using the CalSim 3 modeling for the *2025 DCR*. By using this adjusted 100-year historical flow record, the delivery estimates modeled for existing conditions reflect a reasonable range of potential hydrologic conditions from wet years to critically dry years.

Table 6-5 Estimated Average, Wet-, and Dry-Period Deliveries of SWP Table A Water

	Estimated SWP Table A Deliveries (AFY)	Percent of Maximum SWP Table A for Export (4,133,000 AFY)
Long-term Average	2,234,000	54%
Wet Periods		
Single Wet Year (1983)	3,869,000	94%
Single Wet Year (1998)	3,970,000	96%
Single Wet Year (2017)	3,469,000	84%
2-Year (1982-1983)	3,640,000	88%
4-Year (1980-1983)	3,118,000	75%
6-Year (1978-1983)	3,085,000	75%
10-Year (1978-1987)	2,896,000	70%
Dry Periods		
Single Dry Year (1977)	237,000	6%
Single Dry Year (2014)	321,000	8%
Single Dry Year (2021)	397,000	10%
2-Year Drought (1976-1977)	936,000	23%
2-Year Drought (2014-2015)	403,000	10%
6-Year Drought (1929-1934)	627,000	15%
6-Year Drought (1987-1992)	897,000	22%

Source: 2025 Draft SWP Delivery Capability Report, Table 5-2 (DWR, 2025)

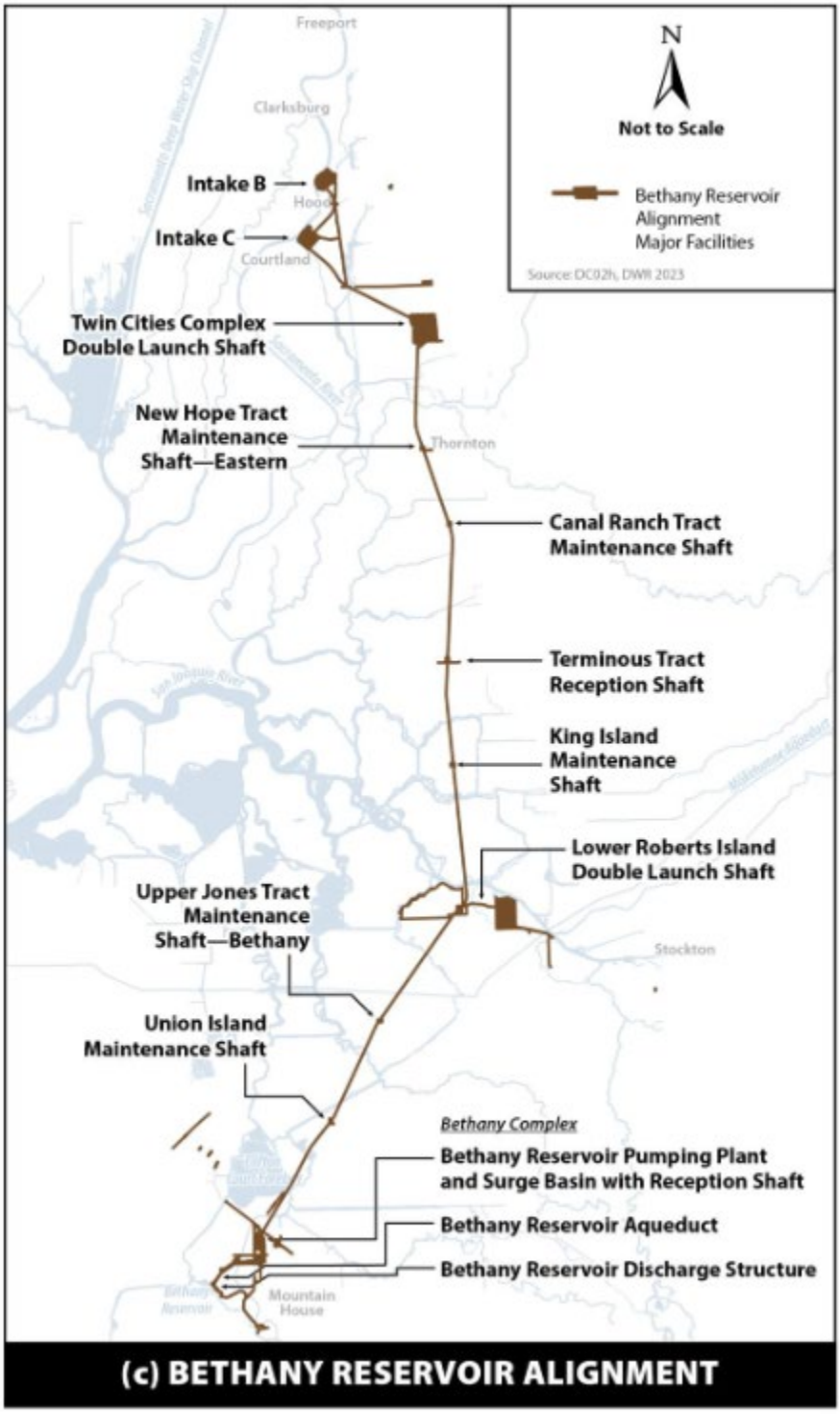
The 2025 DCR incorporates updated climate and system conditions and presents future delivery estimates using risk-based "Level of Concern" (LOC) scenarios (DWR 2025). Under historical hydrology, long-term average SWP Table A deliveries are approximately 2.234 MAF (54 percent of contracted amounts). Under the 95 percent LOC scenario, deliveries decrease to approximately 1.77 MAF (43 percent), or about a 21 percent reduction (DWR, 2025). Chapter 7, *Numerical Model and*

Plan Scenarios, incorporates DWR's 95 percent LOC into the supply forecast for moderate climate change conditions.

6.5.5 Delta Conveyance Project

The Delta Conveyance Project (DCP) is a DWR project that would improve SWP reliability and result in increased deliveries in the future. The existing SWP water conveyance facilities in the Delta, which include Clifton Court Forebay and the Banks Pumping Plant, enable DWR to divert water to the California Aqueduct. The DCP would construct and operate new conveyance facilities in the Delta, primarily a new tunnel to bypass existing natural channels used for conveyance. The original concept of two tunnels has been replaced with a single large-diameter tunnel extending from new intake facilities in the north Delta along the Sacramento River to a pumping facility near Bethany Reservoir. DWR certified the Final Environmental Impact Report in December 2023 (DWR, 2023) and adopted the Bethany Alignment as the approved route. As with the earlier design, the new facilities would provide an alternate diversion point and would be operated in coordination with the existing south Delta pumping facilities (see Figure 6-5).

Figure 6-5 Delta Conveyance Project



Source: DWR, 2023, Delta Conveyance Project Final EIR

Construction of the DCP will improve water supply reliability for SWP Contractors by addressing in-Delta conveyance, with its myriad of constraints. Because the SWP currently relies on the Delta's natural channels to convey water, it is vulnerable to earthquakes, sea level rise, climate change, and pumping restrictions established to protect in-stream species and habitats. Certain pumping restrictions in the south Delta can prevent the SWP from reliably capturing water when it is available, especially in wet weather. The DCP would add new diversions in the north Delta to promote a more resilient and flexible SWP in the face of unstable future conditions. Combined with the current through-Delta method, the addition of DCP is referred to as the "dual conveyance" system, because there would be two complimentary methods to divert and convey water.

Following the *2022 Alternative Plan Update*, CVWD and DWA continue to participate in planning for the DCP. The DCP is currently in its pre-construction phase and in May 2024, interim funding for pre-construction costs for 2026-2027 was requested from participants. Currently, CVWD's participation in the Delta Conveyance Project is 3.78 percent (14,900 AFY) and DWA's participation is 1.52 percent (5,900 AFY), resulting in a total anticipated increase in SWP reliability of 20,800 AFY as shown in Table 6-6. While this is not a new or additional source of supply, CVWD and DWA anticipate that delivery of an additional 20,800 AFY of their Table A amounts will support the existing replenishment programs and overall groundwater sustainability.

Table 6-6 Delta Conveyance Project Supply Amounts Assumed for Region

Description	CVWD	DWA	Total
Delta Conveyance Project Additional Supply (%)	3.78%	1.52%	5.30%
Annual Estimate (AFY)	**14,900**	**5,900**	**20,800**
Table A Supply (AFY)	8,000	3,200	11,200
Article 21 Supply (AFY)	6,900	2,700	9,600

Source: Vasileva 2025

6.5.6 Sites Reservoir Project

The Sites Project Authority is developing the Sites Reservoir Project. The Sites Reservoir Project would construct 1.5 MAF off-stream storage to capture and store stormwater flows from the Sacramento River for dry year releases. Sites Reservoir would be situated on the west side of the Sacramento Valley, approximately 10 miles west of Maxwell, CA. When operated in coordination with other Northern California reservoirs such as Shasta, Oroville, and Folsom, which function as the backbone to both the SWP and the Central Valley Project, Sites Reservoir would increase flexibility and reliability of statewide water supplies in drier periods. Project implementation would also increase water storage capacity in Northern California by up to 15 percent (USBR, 2026). Water supply and storage capacity will be made available to water purveyors throughout California who elect to purchase supply from the Sites Reservoir Project.

In 2019, CVWD and DWA both entered into an agreement with the Sites Project Authority for the next phase of planning for the Sites Reservoir (Sites Project Authority, 2019). Since execution of the 2019 agreement, the Sites Project Authority has advanced the Sites Reservoir project into the implementation phase. The project has received $1.094 billion in state contributions via the Water Storage Investment Program (WSIP), along with $798 million in federal contributions via Department of the Interior and the Water Infrastructure Improvements for the Nation Act (WIIN Act). The Sites Project Authority has advanced permitting,[3] continued engineering, modeling, and

[3] Sites Reservoir Project permits are available at: https://sitesproject.org/permitting/.

community outreach efforts, and completed the first land acquisition for the project. USFWS has issued a Construction Biological and Conference Opinion. CDFW has issued Incidental Take Permits for construction and operation, as well as a Lake and Streambed Alteration Agreement. A Draft Water Right Permit was issued in 2026. Construction is anticipated to begin by early 2027, subject to completion of remaining approvals and financing.

CVWD and DWA are participating members at 5.2 percent (6,400 AFY) and 3.4 percent (5,100 AFY) levels, respectively, as shown in

Table 6-7. These estimated supply amounts account for anticipated 30 percent conveyance losses as modeled in CalSim3 modeling performed in July 2025. For the purpose of this analysis, deliveries from the Sites Reservoir Project are anticipated starting in 2035.

Table 6-7 Sites Reservoir Supply Amounts

Description	CVWD	DWA	Total
Percent of Sites Reservoir Supply (%)	5.2%	3.4%	8.6%
Annual Estimate (AFY)	6,400	5,100	11,500

6.5.7 SWP Delivery to Subbasins

All SWP exchange water delivered to DWA and CVWD is recharged at WWR-GRF in the Indio Subbasin and at MC-GRF in the Mission Creek Subbasin. According to the *2014 Mission Creek Water Management Agreement* (CVWD and DWA, 2014), this includes any water that is paid for or planned to be paid for by the SWP tax, or split between the RAC paid by groundwater producers in the West Whitewater River Subbasin Management Area (which includes CVWD's West Whitewater River Subbasin Area of Benefit [AOB] and DWA's West Whitewater River Subbasin AOB) and the Mission Creek Subbasin Management Area (which includes CVWD's Mission Creek Subbasin AOB and DWA's Mission Creek Subbasin AOB). As such, this includes Table A, Article 21, and Yuba Accord water, in addition to any future increase in Table A reliability (i.e., DCP), and Sites Reservoir.

Available SWP Exchange water allocated to MC-GRF and WWR-GRF is based on proportional assessable groundwater production between the Mission Creek Subbasin Management Area and the West Whitewater River Subbasin Management Area, to be balanced over a 20-year period beginning December 2004. In 2024, total assessable groundwater production in the Mission Creek Subbasin Management Area (inclusive of CVWD's Mission Creek AOB and DWA's Mission Creek AOB) was 12,754 AF (7.5 percent), while total assessable groundwater production in the West Whitewater River Subbasin Management Area (again inclusive of CVWD's West AOB and DWA's West AOB) was 158,118 AF (92.5 percent). Based on a cumulative total of 170,872 AF in assessable groundwater production between the two management areas, this resulted in an approximate 7 percent/93 percent split between the Mission Creek and West Whitewater River management areas in 2024.

As shown in Table 6-8, the projected allotment of SWP exchange water to the two management areas was calculated to increase from the current split to an approximate 10 percent/90 percent split between MC-GRF and WWR- GRF by 2050. Urban growth and associated water demand in the Mission Creek Subbasin will result in slightly more SWP exchange water being delivered to that Subbasin over time. This *Alternative Plan Update* is coordinated with the *Mission Creek Subbasin Alternative Plan Update* to establish production estimates and associated SWP delivery estimates for the two management areas through the 2074 planning horizon.

Table 6-8 Forecast Split of SWP Delivery to WWR-GRF and MC-GRF Based on Annual Groundwater Production

Assessable Production	2025	2030	2035	2040	2045	2050
West WWR Management Area (AFY)	150,532	152,772	155,342	156,385	157,655	158,929
% West WWR Management Area	92%	91%	91%	91%	90%	90%
Mission Creek Management Area (AFY)	13,817	14,686	15,712	16,243	16,808	17,373
% Mission Creek Management Area	8%	9%	9%	9%	10%	10%
Total West WWR + Mission Creek (AFY)	**164,348**	**167,458**	**171,054**	**172,628**	**174,463**	**176,302**

6.5.8 Use of SWP Exchange Water

This *2027 Alternative Plan Update* accounts for all anticipated SWP exchange water to be recharged at WWR-GRF and MC-GRF to ensure that all available supply is used. In order to fully use available SWP exchange supplies, the GSAs will continue to replenish groundwater at maximum delivery levels and pursue additional SWP supplies as they become available.

6.5.9 Methodology for Calculating Future SWP Supply

Future climate conditions were evaluated using the USGS BCM, which simulates watershed hydrologic response to projected changes in precipitation and temperature under RCP climate scenarios. SWP delivery variability was developed using empirical relationships between Feather River watershed (source waters for the SWP) hydrologic conditions and historical Table A allocations. Baseline SWP supply was defined using delivery reliability estimates derived from DWR's *2025 SWP DCR* (DWR, 2025), where higher LOC percentages correspond to more conservative assumptions about system conditions and therefore lower expected deliveries.

In Chapter 7, *Numerical Model and Plan Scenarios,* this *Alternative Plan Update* considers the following two SWP exchange delivery scenarios:

1) **Moderate Climate Change Conditions (RCP 4.5)** – SWP deliveries are based on Table A allocation percentages derived from BCM-informed hydrologic projections using the RCP 4.5 precipitation scenario, which reflects moderate climate change conditions. These allocation percentages are translated into annual delivery variability and applied to an assumed SWP reliability of 43 percent (95% LOC).
2) **Severe Climate Change Conditions (RCP 8.5)** – SWP deliveries are based on Table A allocation percentages derived from BCM-informed hydrologic projections using the RCP 8.5 precipitation scenario, which reflects more severe climate change conditions. The average normalized allocation percentages based on RCP 8.5 is 39 percent.

Scenario modeling described in Chapter 7, *Numerical Model and Plan Scenarios,* assumes annual variability of Table A deliveries and DCP supplies associated with different projected climate years (DCP supplies are not assumed to be affected by SWP delivery reliability). However, Yuba Accord and Sites Reservoir supplies are assumed at their full anticipated amounts each year.

The projected annual average deliveries for all potential SWP exchange supplies under moderate climate change conditions are shown in Table 6-9. The scenarios in Chapter 7, *Numerical Model and Plan Scenarios,* reflect annual variability for SWP supplies based on the two hydrologic models.

Table 6-9 Forecast of SWP Table A Supplies to WWR-GRF and MC-GRF Under Moderate Climate Change Conditions

	2025	2030	2035	2040	2045	2050
Existing SWP Supplies						
Table A Amount	194,100	194,100	194,100	194,100	194,100	194,100
Assumed SWP Reliability	46%	46%	46%	46%	46%	46%
Average Annual Table A Deliveries w/Assumed SWP Reliability	**89,286**	**89,286**	**89,286**	**89,286**	**89,286**	**89,286**
Yuba Accord	780	780	780	780	780	780
Rosedale-Rio Bravo[b]	0	13,050	13,050	-	-	-
Sum of Existing SWP Supplies	**90,066**	**103,116**	**103,116**	**90,066**	**90,066**	**90,066**
Estimated Replenishment (AFY)[a]						
WWR-GRF Replenishment	82,494	95,217	94,843	81,591	81,389	81,191
MC-GRF Replenishment	7,572	7,899	8,273	8,475	8,677	8,875
Future SWP Supplies						
Sites Reservoir	-	-	11,500	11,500	11,500	11,500
Delta Conveyance Project[c] (Additional SWP Table A/Article 21)	-	-	-	-	-	20,800
Sum of Existing + Future SWP Supplies	**90,066**	**103,116**	**114,616**	**101,566**	**101,566**	**122,366**
Estimated Replenishment (AFY)[a]						
WWR-GRF Replenishment	82,494	95,217	105,287	92,009	91,781	110,308
MC-GRF Replenishment	7,572	7,899	9,329	9,557	9,785	12,058

[a] Additional 35,000 AFY MWD/SWP Transfer under the QSA is accounted for under Colorado River water above (see Table 6-3) and though replenished at WWR-GRF, that supply is not accounted for in replenishment volumes in this table.

[b] Rosedale-Rio Bravo supplies are a 252,500 AF transfer to CVWD from Rosedale Rio-Bravo from 2012-2035. All Rosedale-Rio Bravo water is delivered via the MWD exchange agreement to WWR-GRF. While not a SWP supply, Rosedale-Rio Bravo deliveries are accounted for here due to their use for replenishment at WWR-GRF. No Rosedale-Rio Bravo supplies were delivered in WY 2025.

[c] Delta Conveyance Project supply made of additional Table A and Article 21 water made available through infrastructure modernization, variability index not applied.

6.6 Recycled Water

Recycled water is a reliable local resource that can be used to help offset groundwater pumping. Recycled water has been used for golf course irrigation in the Indio Subbasin since the late 1960s. There are currently eight wastewater treatment plants (WWTPs) or water reclamation plants (WRPs) and one fish farm operation within the Plan Area. Table 6-12 lists the projected wastewater flow at each of the facilities within the planning horizon. Wastewater flows were projected using estimated indoor water demand within each treatment plant's service area. Methodology to estimate indoor water use and conservation is described further in Chapter 5, *Demand Projections*. CVWD and DWA currently deliver recycled water from three of the WRPs for municipal and golf course irrigation use in the Indio Subbasin.

Table 6-10 Projected Wastewater Flow in Plan Area (AFY)

WWTP/WRP[a]	2025	2030	2035	2040	2045	2050
MSWD Regional WRF	2,229	2,262	1,324	195	0	0
Palm Springs WWTP/DWA WRP	4,890	4,764	4,641	4,606	4,652	4,699
CVWD WRP-10	10,645	12,125	13,610	13,469	13,410	13,351
CVWD WRP-7	7,008	7,335	7,664	7,665	7,736	7,807
CVWD WRP-4	8,357	8,408	8,462	8,903	9,407	9,912
CVWD WRP-2	16	16	16	16	16	16
Coachella WRP[a]	2,622	3,310	4,000	4,732	5,474	6,216
VSD WWTP	7,488	7,695	7,904	7,923	8,023	8,124
Kent SeaTech	6,260	6,260	6,260	6,260	6,260	6,260
Total	**49,514**	**52,175**	**53,881**	**53,770**	**54,977**	**56,385**

[a] Wastewater from areas outside of current WRP tributary areas are accounted for in return flows from septic systems.

CVWD operates WRP-7 and WRP-10, which currently generate recycled water for irrigation of golf courses and large landscaped areas. DWA's WRP treats secondary supply from the City of Palm Springs WWTP for delivery to irrigation customers. Table 6-13 provides a summary of recycled water currently in use based on data from WY 2023-2024.

Table 6-11 Recycled Water Supply Based on WY 2023-2024 Wastewater Flows (AFY)

	Palm Springs WWTP/DWA WRP	CVWD WRP-10	CVWD WRP-7	Total
AFY of Tertiary Capacity	11,200	16,800	2,800	30,800
Wastewater Treated[a]	6,394	9,366	3,514	19,274
Recycled Water Use (Delivery + Onsite)	3,122	7,987	2,055	13,164

[a] Wastewater treatment includes both secondary and tertiary treatment volumes for subject plants. Not all secondary-treated wastewater is tertiary treated and recycled. Recycled water use depends on tertiary capacity and customer demand.

6.6.1 MSWD Nancy Wright Regional WRF

In late 2024, MSWD completed construction of the Nancy Wright Regional WRF (Regional WRF) to treat wastewater flows to secondary levels including nitrification and denitrification. The Regional WRF is located in the Garnet Hill Subarea and helps divert wastewater flows from existing WWTPs located in the Mission Creek Subbasin that are at capacity. The Regional WRF became operational in 2025 and is projected to reach 1.5 million gallons per day (mgd) (1,680 AFY) treatment capacity by approximately 2030 as influent volumes continue to increase from septic-to-sewer conversions in the Desert Hot Springs Subbasin, Mission Creek Subbasin, and Garnet Hill Subarea of the Indio Subbasin. For calendar year 2025, the Regional WRF averaged approximately 0.18 MGD as flows began to gradually transition to the facility following start up.

Treated wastewater is discharged from the Sequence Batch Reactors (SBR) to evaporation/percolation ponds in the Garnet Hill Subarea. Growth projected by 2050 is expected to provide wastewater flows to a buildout capacity of 3 mgd (3,360 AFY) available for recycling. However, future use of recycled water from the Regional WRF is expected to occur in the Mission Creek Subbasin, where projected recycled water production is anticipated to offset groundwater pumping and support groundwater sustainability goals. Recycled water use is expected to increase over time with population growth and expansion of the Regional WRF, providing an additional local water supply that improves drought resilience and reduces demand on imported replenishment supplies.

6.6.2 Palm Springs WWTP/DWA WRP

DWA WRP, located in the City of Palm Springs, has a tertiary treatment capacity of 10 mgd (11,200 AFY). DWA provides tertiary treatment of secondary treated supply from the City of Palm Springs's WWTP for irrigation of parks and large landscapes in the Palm Springs area. The five-year average wastewater flow for water years 2020-2024 was approximately 3,851 AFY, while recycled water demand totaled 2,961 AFY. With existing wastewater flows and available tertiary treatment capacity, this facility could produce approximately 890 AFY of additional recycled water supply. However, recycled water production is limited by the volume of wastewater received at Palm Springs WWTP. Wastewater flows have declined in recent years due to water conservation measures and indoor water use efficiency fixtures. To offset expected seasonal peak demand (summer months), DWA maintains the ability to supplement recycled water supplies with non-potable groundwater from shallow wells surrounding the WRP.



DWA WRP has a tertiary treatment capacity of 10 mgd (11,200 AFY).

6.6.3 CVWD WRP-10

CVWD WRP-10 is located in the City of Palm Desert and began delivering recycled water in 1987. The plant is an 18.0 mgd secondary treatment facility with a current tertiary treatment capacity of 15 mgd (16,800 AFY). The plant consists of an activated sludge treatment plant, a tertiary

wastewater treatment plant, a lined holding basin, 6 storage basins, and 21 infiltration basins. WRP-10 delivers recycled water for irrigation of golf courses and homeowner's associations (HOAs) landscaping. The five-year average wastewater flow from 2020 to 2024 was approximately 11,094 AFY, while recycled water demand averaged 7,592 AFY. With existing wastewater flows and available tertiary treatment capacity, this facility could produce approximately 3,502 AFY of additional recycled water supply. Growth projected by 2050 is expected to provide approximately 13,351 AFY of additional wastewater flow available for recycling, based on projected indoor water use, but would require expansion of the non-potable water distribution system with new connections.

6.6.4 CVWD WRP-7

CVWD's WRP-7 is located in north Indio. The plant is a 5.0 mgd secondary treatment facility with current tertiary treatment capacity of 2.5 mgd (2,800 AFY). The tertiary treated wastewater is used for irrigation of golf courses at Sun City in north Palm Desert and Shadow Hills in north Indio. The plant consists of aeration basins, circular clarifiers, and polishing ponds. Recycled water not used for irrigation is percolated at on-site and off-site percolation ponds. The five-year average wastewater flow from 2020 to 2024 was approximately 4,001 AFY, while recycled water demand averaged approximately 2,166 AFY. With existing wastewater flows and available tertiary treatment capacity, this facility could produce approximately 1,835 AFY of additional recycled water supply (tertiary capacity is the limiting factor). Growth projected by 2050 is expected to provide approximately 7,807 AFY of additional wastewater flow available for recycling, based on projected indoor water use, but would require expansion of the tertiary capacity of the WRP-7 plant and expansion of the non-potable water distribution system with new connections.

CVWD is planning to expand its WRP-7 non-potable water system, including upgrades to Mile Post 113.2 pump station to convey additional Canal supplies for blending with recycled water to meet peak irrigation demands. CVWD has secured significant state and federal funding, including CWSRF loans and grants as well as WIIN grant funding, with additional financing agreements in progress through 2026. CVWD anticipates initiating bidding and construction of the expansion in spring 2026 following execution of the final grant agreement. In parallel, CVWD is advancing related non-potable water pipeline projects to connect new users, including Shadow Hills High School, Talavera, and Shadow Hills Golf Course to the recycled water system.

6.6.5 CVWD WRP-4



CVWD's WRP-4 has a secondary treatment capacity of 9.9 mgd (11,090 AFY) and has a planned tertiary expansion

CVWD WRP-4 is a 9.9 mgd (11,090 AFY) secondary treatment facility located in the unincorporated community of Thermal. The five-year average wastewater flow from 2020 to 2024 was approximately 5,978 AFY. WRP-4 provides secondary treatment consisting of pre-aeration ponds, aeration lagoons, polishing ponds, and disinfection. The treated effluent is currently discharged to the CVSC pursuant to a National Pollution Discharge Elimination System (NPDES) permit. However, CVWD has submitted a Change Petition (WW0093) and plans to construct tertiary treatment and begin delivery of recycled water. Through this project, CVWD is planning to construct WRP-4 tertiary treatment capacity in three phases, starting at 1.0 mgd (1,120 AFY), increasing to 2.5 mgd (2,800 AFY), and ultimately reaching a full capacity of 10.0 mgd (11,200 AFY). Design of the WRP-4 expansion is underway and expected to be completed in fall 2026, with construction anticipated to begin following CEQA certification and approval of the associated wastewater change petition. Environmental review is well advanced, with the Draft EIR circulated for public review in 2025, and Final EIR certification anticipated in 2026. Customers are currently projected to begin receiving recycled water supply by approximately 2029. The WRP-4 expansion is described further in Chapter 11, *Projects and Management Actions*. CVWD continues to work toward resolution of its 2016 wastewater change petition (WW0093), which remains pending and is required to reallocate treated wastewater from discharge to beneficial reuse for irrigation.

By 2050, up to approximately 9,912 AFY of wastewater could be beneficially reused within the Planning Area; however, achieving this supply depends on implementation of the tertiary treatment facilities and associated non-potable distribution system improvements.

6.6.5.1 CVWD WRP-2

CVWD WRP-2 is a small treatment plant serving the nearby community of North Shore. WRP-2 has a secondary treatment capacity of 0.18 MGD (202 AFY). Because this WRP serves an existing built-out community, wastewater flows are expected to remain the same as previous years for an annual average of 14 AFY of percolation and 3 AFY of evaporation through 2050.

6.6.6 Valley Sanitary District WWTP

Valley Sanitary District (VSD) owns and operates an 11 mgd (12,320 AFY) capacity wastewater treatment facility that serves most of the City of Indio. The five-year average wastewater flow from 2020 to 2024 was approximately 7,091 AFY. Secondary treatment is provided by three process trains – activated sludge, oxidation ponds, and wetlands treatment. Effluent from the oxidation ponds and the wetlands is either routed to pasture irrigation or blended with activated sludge effluent, disinfected, dechlorinated, and discharged to the CVSC. Approximate projected volumes by 2050 are expected to provide a total of 8,124 AFY of wastewater flow that could be tertiary treated and

reused within the Planning Area but would require construction of both tertiary treatment and new non-potable system connections.

In 2013, VSD and the City of Indio established the East Valley Reclamation Authority (EVRA), a joint powers authority, to implement water reuse in the Indio area. EVRA completed a recycled water feasibility study in 2018 and has recommended a recycled water program that would deliver 1 mgd of recycled water for irrigation to nearby golf courses. The project remains in early phases of development, and the estimated implementation timeline of 2035 is dependent on continued design, funding, and regulatory approvals. The EVRA potable reuse project is described in Chapter 11, *Projects and Management Actions*.

6.6.7 Coachella Sanitary District WWTP

The City of Coachella through its Coachella Sanitary District owns and operates a 4.5 mgd (5,040 AFY) secondary treatment wastewater facility utilizing activated sludge and oxidation ditch processes. Treated wastewater is discharged to the CVSC. The average annual wastewater flow from 2023 to 2024 was approximately 3,082 AFY. Approximate projected volumes by 2050 are expected to provide a total of 6,216 AFY of wastewater flow that could be tertiary treated and reused within the Planning Area but would require construction of both tertiary treatment and new non-potable system connections. The City of Coachella currently has no plans to pursue water recycling.

6.6.8 Kent SeaTech

Kent SeaTech is a fish farm with total design flow of 10.5 mgd. The current wastewater treatment system consists of a channel stocked with tilapia to remove solids, and an earthen "constructed wetland" system that provides further nitrification, denitrification, fine solids polishing, alkalinity restoration, and temperature buffering. The wetland is bypassed from the treatment process during the colder winter months to maintain system-wide warm temperatures for fish production. Water that is not recirculated, reused, or land applied is discharged to the CVSC. The average annual wastewater flow discharged to CVSC from 2023 to 2024 was approximately 6,495 AFY.

6.7 Planned Water Reuse

Table 6-14 below provides forecasted recycled water deliveries at the three WRPs that currently reuse water. These estimates are based on existing tertiary capacity and planned recycled water connections listed in the GSAs' 5-year capital programs and include current water reuse plus increases in wastewater flows anticipated with municipal growth (described in Chapter 5*, Demand Projections*). These potential supplies would require construction of new non-potable distribution pipelines and facilities (see Chapter 11*, Projects and Management Actions*).

Table 6-12 Planned Water Reuse at WRPs with Tertiary Capacity (AFY)

WWTP/WRP	2025	2030	2035	2040	2045	2050
Palm Springs WTP/DWA WRP	3,413	3,413	3,413	3,413	3,413	3,413
CVWD WRP-10	10,276	12,125	13,610	13,469	13,410	13,351
CVWD WRP-7	1,928	2,800	2,800	2,800	2,800	2,800
Total	**15,618**	**18,338**	**19,822**	**19,682**	**19,622**	**19,564**

CVWD's goal is to recycle all wastewater that is currently percolated at its WRPs, except for WRP-2 serving an isolated community. CVWD's planned non-potable connections will expand deliveries from WRP-10 and WRP-7 within existing tertiary capacity and are reflected in Table 6-14 above. CVWD also has tertiary expansions planned for WRP-7 and WRP-4, as mentioned above. The EVRA is evaluating the reuse of wastewater from the VSD WWTP for golfcourse irrigation, with a planning-level target of approximately 1,120 AFY. In the Garnet Hill Subarea, MSWD has constructed the Regional WRF, which is now operational and provides a foundation for future recycled water production. MSWD plans to develop recycled water conveyance and groundwater recharge facilities to enable replenishment of treated water from the Regional WRF to the Mission Creek Subbasin.

Chapter 7, *Numerical Model and Plan Scenarios* describes these modeled future projects. Table 6-15 provides forecasted wastewater at the region's WWTPs and WRPs that may be available for recycling with addition of future treatment or distribution system expansions.

Table 6-13 Projected Wastewater Remaining for Future Reuse (AFY)

WWTP/WRP	2025	2030	2035	2040	2045	2050
MSWD Regional WRF	2,229	2,262	1,324	195	0	0
Palm Springs WTP/DWA WRP	1,477	1,351	1,229	1,193	1,240	1,287
CVWD WRP-10	368	0	0	0	0	0
CVWD WRP-7	5,080	4,535	4,864	4,865	4,936	5,007
CVWD WRP-4	8,357	8,408	8,462	8,903	9,407	9,912
CVWD WRP-2	16	16	16	16	16	16
Coachella WRP	2,622	3,310	4,000	4,732	5,474	6,216
VSD WWTP	7,488	7,695	7,904	7,923	8,023	8,124
Kent SeaTech	6,260	6,260	6,260	6,260	6,260	6,260
Total	**33,897**	**33,837**	**34,059**	**34,088**	**35,355**	**36,821**

6.7.1 Use of Recycled Water

The *Alternative Plan Update* recognizes the potential local water supply available in recycling wastewater. By 2050, a total of 36,821 AFY of wastewater flow could be available for recycling if the GSAs and other regional partners were able to construct the necessary treatment and conveyance facilities. Full use of this potential recycled water supply would require construction of plant expansions or upgrades, along with distribution pipelines and facilities (see Chapter 11*, Projects and Management Actions*). Recycled water is considered a drought resilient supply that is not limited under climate change conditions. Recycled water deliveries are assumed to be the same in historical hydrology conditions and climate change conditions.



Recycled water (or blended non-potable water) is used on parks and open space in the Plan Area.

Water reuse provides a reliable, locally controlled supply for non-potable demands such as irrigation and, when appropriately treated, can be used for groundwater recharge to offset groundwater pumping for municipal supply. In areas where treated wastewater has historically been discharged to land and contributed incidental recharge, implementation of recycled water projects may reduce return flows to the Subbasin while concurrently decreasing groundwater extraction. In addition to water supply benefits, recycled water use can support water quality objectives in both groundwater and surface water systems. For example, the use of recycled water for agricultural and landscape irrigation can provide nutrients that reduce reliance on synthetic fertilizers. Consistent with SGMA objectives, CVWD continues to pursue the expansion of recycled water use to maximize beneficial reuse of available wastewater supplies.

6.8 Other Supplies

CVWD and DWA, along with other local agencies, have investigated and will continue to pursue other water transfer opportunities.

6.8.1 Rosedale-Rio Bravo

In 2008, CVWD entered into an agreement with Rosedale-Rio Bravo Water Storage District (Rosedale Rio- Bravo) for a one-time transfer of 10,000 AF of Glorious Lands Company (GLC) water intended for a property development located in Riverside County within CVWD's boundary. In 2012, CVWD entered into an Assignment Agreement with GLC to take over GLC's water rights for the term of the 2005 Water Supply Agreement between GLC and Rosedale Rio-Bravo. The Assignment Agreement provides a total of 252,500 AF to CVWD from Rosedale Rio-Bravo through 2035. CVWD also entered into a letter agreement with MWD in 2012 for the delivery and exchange of up to 16,500 AFY of non-Table A SWP water that Rosedale Rio-Bravo provides to CVWD (CVWD, 2019a). The water from Rosedale Rio-Bravo is delivered to CVWD as exchange water from MWD at the WWR-GRF. In 2020, CVWD finalized a supplemental letter agreement with Rosedale Rio-Bravo and a Point of Delivery Agreement with DWR that increased the limit on the amount Rosedale Rio-Bravo can deliver to CVWD in any one year (from 16,500 to 20,000 AFY) but does not change the total volume delivered during the life of the agreement through 2035.

The balance of Rosedale Rio-Bravo water due to CVWD from 2026 to 2035 is 130,500 acre-feet or an annual average of 13,050 AFY. No Rosedale Rio-Bravo supplies are assumed after year 2035.

6.9 Supply Risks and Uncertainties

Water supplies used in the Planning Area face risks and uncertainties that could affect long-term supply reliability. These risks include hydrologic variability, prolonged drought conditions in the southwestern United States, evolving regulatory and operational requirements for the Colorado River system, and uncertainties associated with future water management policies.

In addition, implementation of planned supply projects and variability in customer demand influence the timing and magnitude of available supplies represented in this Alternative Plan Update. Climate change may also affect both water supplies and demands and is discussed in Chapter 8, *Regulatory and Policy Issues*.

6.9.1 Colorado River

Although CVWD's Colorado River supply has historically been highly reliable, prolonged drought conditions in the Colorado River Basin have resulted in sustained declines in reservoir storage over the past two decades. Since 2000, the Basin has experienced one of the driest extended periods in the historical record, resulting in reduced inflows to Lake Powell and Lake Mead (USBR 2020a).

Reservoir storage reached historically low levels in the early 2020s. In July 2022, Lake Mead declined to approximately 1,040 feet above mean sea level, its lowest elevation since initial filling, representing roughly 27 percent of total capacity. During this same period, Lake Powell declined to approximately 22 percent of capacity. Combined storage in Lakes Powell and Mead fell to roughly 28 percent of total system capacity, among the lowest levels observed in the modern operating period (USBR 2023; USBR 2024).

These conditions prompted implementation of shortage declarations under the *2007 Interim Guidelines* and additional conservation actions under *the Lower Basin Drought Contingency Plan* (USBR, 2007). The *Lower Basin Drought Contingency Plan* was designed to: a) require Arizona, California, and Nevada to contribute water to Lake Mead storage at specified reservoir elevations, and b) incentivize voluntary conservation of water to be stored in Lake Mead (USBR 2019; USBR 2020a).

Following implementation of these measures, reservoir storage conditions improved modestly in 2023 and 2024 due to a combination of conservation actions and favorable hydrologic conditions; however, storage levels remain below historical averages and sensitive to continued drought (USBR 2024).

The *2007 Interim Guidelines* and *Lower Basin Drought Contingency Plan* have been succeeded by a new operating framework for the Colorado River system. As of this *Alternative Plan Update*, federal and interstate agreements governing post-2026 operations are being developed through ongoing planning processes, including environmental review and multi-state negotiations, and may include revised shortage-sharing and conservation requirements (USBR 2026).

CVWD will continue to monitor Colorado River conditions, adapt operations as needed, and participate in regional efforts to stabilize reservoir storage and support long-term reliability of the Colorado River system.

6.9.2 SWP Exchange

SWP exchange supplies are a key component of the Plan Area water portfolio and are used primarily for groundwater replenishment. The reliability of these supplies is influenced by hydrologic variability, Delta regulatory constraints, and climate change.

To evaluate these uncertainties, this *Alternative Plan Update* incorporates climate-informed runoff projections developed using the BCM under RCP 4.5 and RCP 8.5 scenarios, along with SWP reliability estimates from DWR. The *2025 SWP DCR* incorporates updated climate and system conditions and presents future delivery estimates using risk-based LOC scenarios (DWR 2025). This *Alternative Plan Update* incorporates the 95th percentile LOC scenario as the moderate climate change scenario, and relies on the average normalized allocation percentages under RCP 8.5 for the severe climate change scenario.

Under historical hydrology, long-term average SWP Table A deliveries are approximately 2.23 MAF (54 percent of contracted amounts). Under the moderate climate change scenario, deliveries decrease to approximately 1.77 MAF (43 percent), or about a 21 percent reduction (DWR 2025). Under the severe climate change scenario, deliveries decrease to approximately 0.87 MAF (39 percent), or about a 61 percent reduction.

DWA's and CVWD's SWP exchange supplies are managed within an integrated system and are used for groundwater recharge. Variability in deliveries is addressed through operational adjustments and use of stored groundwater. DWA and CVWD will continue to monitor SWP delivery capability and incorporate updated DWR projections into future planning and operations.

Implementation of improvements to the SWP conveyance system, including the DCP, is expected to improve the long-term reliability and operational flexibility of SWP deliveries by addressing risks associated with climate change, environmental constraints, and seismic vulnerability in the Sacramento–San Joaquin Delta. These improvements would enhance the ability to capture and convey water during high-flow periods and reduce the risk of supply disruptions; however, project timing and ultimate benefits remain subject to ongoing planning, permitting, and regulatory processes.

In December 2023, DWR released and certified the Final Environmental Impact Report (Final EIR) for the DCP, marking completion of the environmental review analysis under the California Environmental Quality Act (CEQA). Additional permitting, financing, and contractual agreements among State Water Project contractors are underway. Construction would occur over a multi-year period following project approval and permitting, with implementation extending into the 2040s.

6.9.3 Surface Water

Surface water, including natural infiltration of watershed runoff, represents about six percent of the Indio Subbasin water supply. Although CVWD and DWA retain water rights to most of this surface water, there is uncertainty about potential changes in precipitation in the Whitewater River watershed due to climate change. To evaluate these uncertainties, this *Alternative Plan Update* incorporates climate-informed runoff projections developed using the BCM under RCP 4.5 and RCP 8.5 scenarios. Under these scenarios (see Chapter 7, *Numerical Model and Plan Scenarios*), projected surface water availability reflects climate-driven variability, with RCP 4.5 maintaining runoff conditions similar to historical patterns and RCP 8.5 resulting in reduced long-term runoff and increased frequency of dry conditions.

6.9.4 Recycled Water

Recycled wastewater has historically been used for irrigation of golf courses and urban landscaping in the Indio Subbasin. The existing WRPs that have tertiary wastewater treatment for recycled water supply currently deliver approximately two percent of the Subbasin's water supply (12,720 AFY of recycled water delivered for a five-year average from 2020-2024). The amount of wastewater available for reuse in the future primarily depends on growth in the Valley, along with the agencies' plans for construction of tertiary treatment and conveyance.

However, the level of water conservation implemented in the future—particularly under the long-term efficiency standards established pursuant to Assembly Bill 1668 (Friedman) and Senate Bill 606 (Hertzberg), and subsequent "Making Conservation a California Way of Life" regulations—could reduce the volume of wastewater generated and available for reuse. As indoor water use efficiency improves and conservation measures become more stringent over time, influent flows to wastewater treatment facilities may decline, thereby affecting recycled water supply reliability. In addition, evolving waste discharge requirements and water quality regulations will influence both the required level of treatment and the allowable volume and method of discharge, further shaping recycled water production capacity. Collectively, future changes in land use, population growth, water use efficiency, and regulatory requirements will determine the amount of recycled water supply available within the Indio Subbasin.

This *Alternative Plan Update* also acknowledges the financial and institutional challenges associated with expanding non-potable water treatment and distribution systems. Implementation of recycled water infrastructure across the Indio Subbasin will continue to depend heavily on securing grant funding, low-interest loans, and regional partnerships to support capital investments. Despite these constraints, the GSAs remain committed to advancing cost-effective water reuse projects that reduce reliance on groundwater pumping, enhance drought resilience, and maximize the beneficial use of local water supplies.

6.9.5 Summary

The Indio Subbasin has both imported water and local water sources in its current water supply portfolio. This available water supply portfolio will be used to meet growing demands – municipal, agriculture, golf, and other demands as described in Chapter 5, *Demand Projections* – and to achieve groundwater sustainability. The water budgets described in Chapter 7*, Numerical Model and Plan Scenarios,* provide a deeper understanding of some of the demand and supply uncertainties and associated management actions that will help to meet growing demand and continue groundwater sustainability. Chapter 11*, Projects and Management Actions,* summarizes the management actions and capital projects that may need to be implemented to achieve basin sustainability and meet future demands. In addition, the GSAs will continue to prepare Annual Reports to evaluate their demands, supplies, and groundwater conditions to understand when those projects must be implemented.

A summary of the projected currently available and future water supplies is presented in **.** The Indio GSAs are committed to achieving sustainability under changing climate conditions and are planning for supply limitations anticipated for both local and imported supplies. Figure 6-6 shows the supply projection under moderate climate change conditions. Figure 6-7 shows the supply projection under severe climate change conditions. This summary documents available imported and local surface water supplies and does not include the groundwater supply; the available groundwater supply will vary under different management conditions and is quantified in Chapter 7*, Numerical Model and*

Plan Scenarios. The uncertainties surrounding both imported and local water supplies make it important that this *2027 Alternative Plan Update* continue to implement a management strategy that sustainably manages the groundwater basin through new supplies and source substitution.

Table 6-14 Summary of Projected Non-Groundwater Supplies (AFY)

Available Supplies	2025[a]	2030	2035	2040	2045	2050
Existing Entitlements and Supplies under Moderate Climate Change Conditions						
Surface Water Infiltration[b]	33,061	33,061	33,061	33,061	33,061	33,061
Surface Water Diversions[c]	2,740	2,093	4,137	3,271	4,329	5,262
Colorado River Water[d]	391,300	400,850	402,050	402,050	402,050	400,340
SWP Exchange Water[e]	117,335	73,053	74,057	119,129	55,750	120,041
Recycled Water[f]	10,066	10,066	10,066	10,066	10,066	10,066
Other: Rosedale Rio-Bravo	0	13,050	13,050	0	0	0
Existing Supplies under Moderate Climate Change Conditions Subtotal	**554,501**	**532,173**	**536,421**	**567,577**	**505,255**	**568,769**
Existing Entitlements and Supplies under Severe Climate Change Conditions						
Surface Water Infiltration[b]	33,061	33,061	33,061	33,061	33,061	33,061
Surface Water Diversions[c]	2,740	2,105	1,154	2,254	3,039	18
Colorado River Water[d]	391,300	400,850	402,050	402,050	402,050	400,340
SWP Exchange Water[e]	97,050	76,475	86,180	68,711	64,441	67,159
Recycled Water[f]	10,066	10,066	10,066	10,066	10,066	10,066
Other: Rosedale Rio-Bravo	0	13,050	13,050	0	0	0
Existing Supplies under Severe Climate Change Conditions Subtotal	**534,216**	**535,606**	**545,561**	**516,142**	**512,656**	**510,643**
Near Term and Future Projects						
Delta Conveyance Project[g]	0	0	0	0	0	21,442
Sites Reservoir[h]	0	0	2,089	10,402	10,402	10,377
Planned Recycled Water[o]	0	5,294	8,303	9,086	9,325	9,710
Projected Near Term and Future Supplies Subtotal	**0**	**5,294**	**10,392**	**11,175**	**19,753**	**41,529**
Total Existing + Projected Supplies under Moderate Climate Change Conditions	554,501	537,467	546,813	578,751	525,008	610,297
Total Existing + Projected Supplies under Severe Climate Change Conditions	534,216	540,901	555,953	527,316	532,410	552,172

[a] 2025 values are projected; they are not actuals.

Available Supplies	2025[a]	2030	2035	2040	2045	2050

[b] Natural infiltration of watershed runoff is based on 15-year (2011 to 2025) historical average and excludes anticipated future diversions. See Chapter 7*, Numerical Model and Plan Scenarios* for detail on groundwater inflows and outflows.

[c] Surface water diversions in year 2025 are actual values.

[d] Colorado River water accounts for base entitlement and transfers listed in Table 6-3, 5 percent conveyance losses, and 34,000 AFY of voluntary contributions.

[e] SWP exchange water includes Yuba Accord and excludes transfers to the MC-GRF. See Section 6.5.9 for detail on supply methodology.

[f] Recycled water includes existing annual average deliveries as of 2025 (10,066 AFY).

[g] Delta Conveyance Project (DCP) values are average annual deliveries based on reliability assumptions and excludes transfers to the MC-GRF. DCP is anticipated to begin operation in 2047.

[h] Sites Reservoir excludes 30 percent conveyance losses and transfers to the MC-GRF.

[o] Projected future recycled water includes planned non-potable connections at WRP-7, WRP-10, and DWA-WRP, as well as construction of WRP-4 and the EVRA Project.

Figure 6-6 Total Existing + Projected Supplies under Moderate Climate Change Conditions

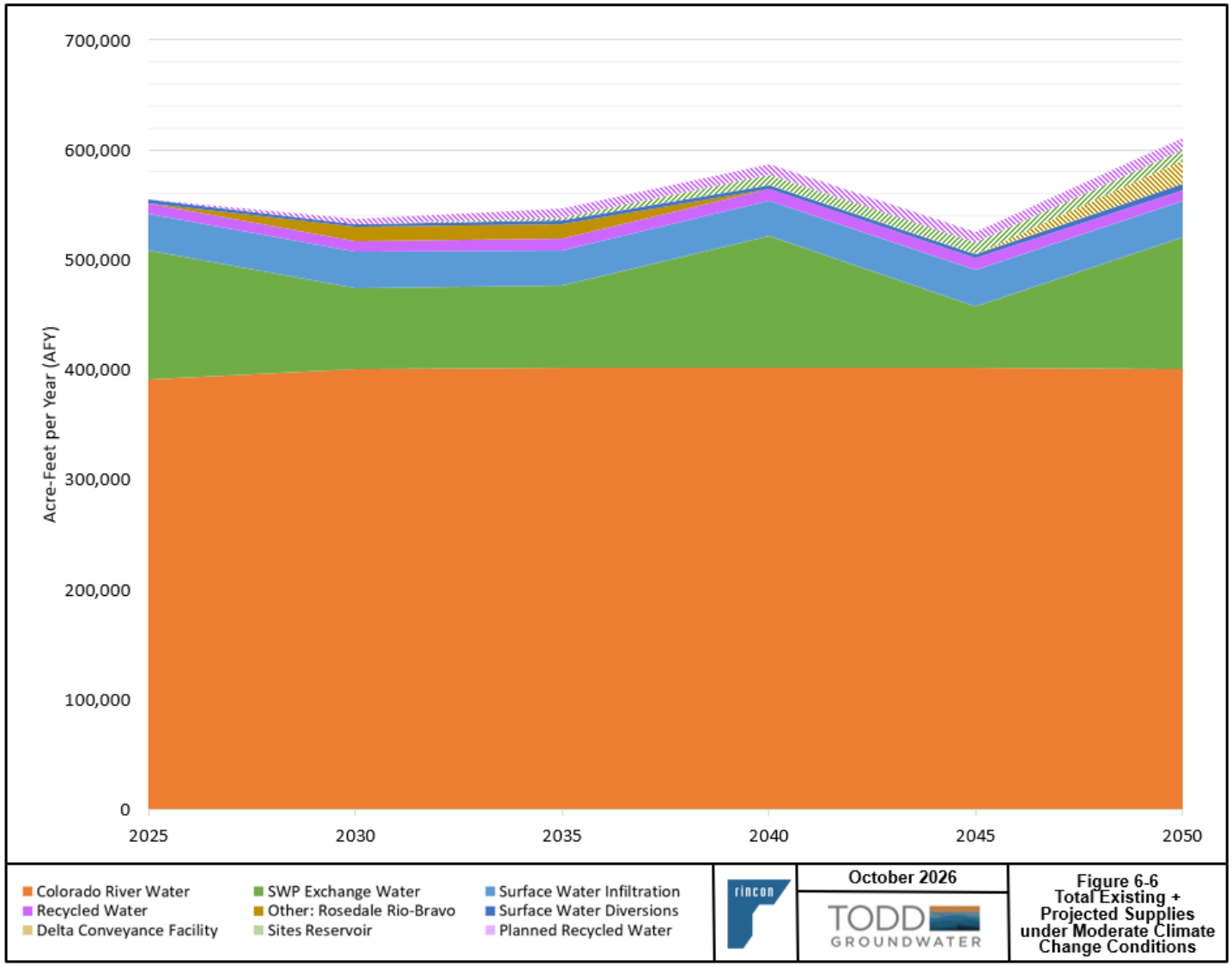
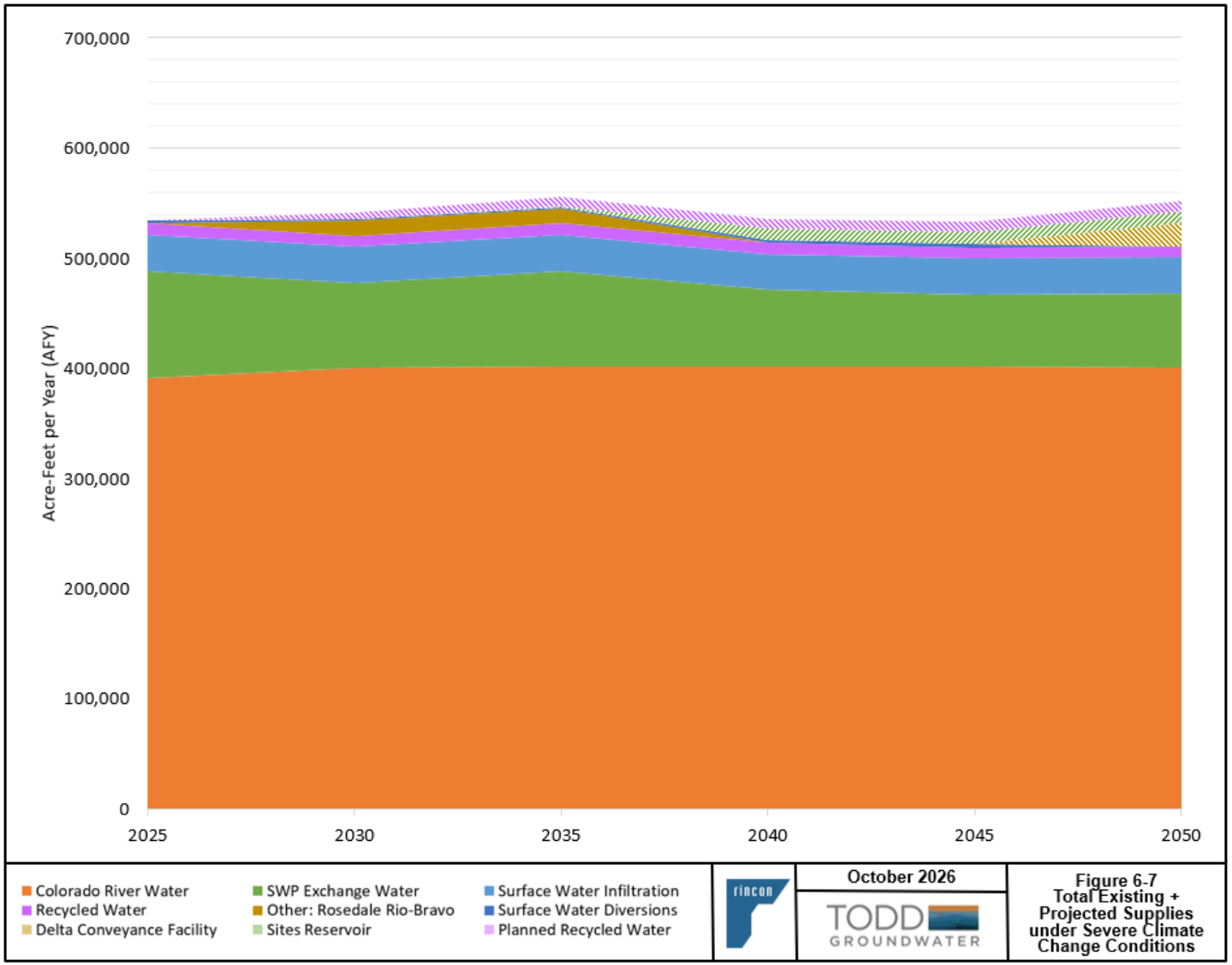


Figure 6-7 Total Existing + Projected Supplies under Severe Climate Change Conditions



7 Numerical Model and Plan Scenarios

This chapter describes the MODFLOW groundwater flow model, the Indio Subbasin water budget, and the Plan Scenarios developed to assess future groundwater conditions and sustainability under different planning assumptions. The Indio Subbasin water budget (or balance) and groundwater flow model are closely linked in that some Indio Subbasin inflows and outflows (including various sources of recharge and well pumping) have been developed using measurements and estimates and then used as input to the groundwater flow model. Other water budget components (including amounts of evapotranspiration, drain flow, Salton Sea inflow and outflow, and changes in groundwater storage) are outputs of the groundwater model and are used as a part of the Indio Subbasin water budget. Water budgets are provided for each future Plan scenario, as described in Section 7.5. Model characteristics are summarized including model area and boundaries, layers, aquifer properties, sources and amounts of basin recharge and discharge, and methodologies to develop the inflow and outflow amounts used as model inputs. Previous and updated model performance results are presented, along with Subbasin water budgets for the period 2010 to 2025. The model is well calibrated and capable of accurately simulating groundwater conditions throughout the Subbasin and over the simulation period.

7.1 MODFLOW Model Description

The numerical groundwater flow model was constructed using the United States Geological Survey (USGS) MODFLOW code. It simulates transient three-dimensional groundwater flow within and between the semi-perched, shallow and deep aquifer zones and the separating aquitard, includes various sources of subbasin recharge, discharge to production wells, evapotranspiration, flow to drains, and groundwater flow to and from the Salton Sea.

7.1.1 Previous Versions of the Indio Subbasin MODFLOW Model

Several versions of the Indio Subbasin model were developed prior to this version for the *2027 Alternative Plan Update*:

1. The original MODFLOW model was developed by Graham Fogg (Fogg) in the mid-1990s and calibrated for a 61-year historical period from 1936 to 1996.
2. The original model was subsequently extended by Fogg as a part of the 2002 *Coachella Valley Final Water Management Plan (2002 CVWMP)* for the Indio Subbasin (Coachella Valley Water District [CVWD], 2002) and the *Coachella Valley Water Management Plan 2010 Update (2010 CVWMP Update)* (CVWD, 2012) and used to simulate future Subbasin management scenarios beginning in 1997 through a future planning period. The *2010 CVWMP Update* version of the model used the best available estimates of groundwater inflows and outflows through 2008; inflow amounts for 2009 and future years were synthesized using assumed future water supply and demand projections.
3. The *2022 Alternative Plan Update* model extended the 2010 CVWMP Update version by incorporating updated recharge, pumping, and boundary condition data through 2019 and performing a calibration check for the period from 1997 to 2019, while retaining the original model grid, layering, and aquifer properties.

Historical calibration quality of the original 1936 to 1996 model and *2010 CVWMP Update* version (through 2008) was good, as documented in a Fogg (2000) Technical Memorandum and in Technical Memorandum No. 2 prepared for the Indio Subbasin Groundwater Sustainability Agencies (GSAs) in 2020. The original and *2010 CVWMP Update* models accurately simulated regional and local groundwater flow conditions and changes over time (as indicated by low observed-versus-simulated head error residuals). For the *2022 Alternative Plan Update*, the *2010 CVWMP Update* model input data were updated through 2019 using available data. After updating the model recharge and discharge inputs, a calibration check was performed for the period 1997 to 2019.

The 1997-2019 version of the model was used as the starting point for this *2027 Alternative Plan Update*, with several major updates made to the way conditions are simulated. The model now simulates the period of Water Year (WY) 2010 to 2025, reflecting improved pumping data availability associated with the Replenishment Assessment Charge (RAC) program a period with higher quality data availability. The model grid was extended to the San Gorgonio Pass Subbasin boundary, and updated to use quarterly stress periods, allowing for reporting of water budgets for calendar years or water years.

For future management alternative scenarios evaluation, new estimates of future recharge, pumping, and other boundary conditions are synthesized for predictive simulations of future conditions, as described in Section 7.6.

7.1.2 Changes to Model for 2027 Alternative Plan Update

The groundwater model developed for the *2022 Alternative Plan Update* served as the basis for revisions completed for the current planning effort. Several updates were implemented to improve the temporal resolution, better align the model with subbasin boundaries, refine the representation of wells and recharge, and incorporate updated boundary conditions. In addition, the model was recalibrated to reflect these changes and to ensure consistency with observed groundwater conditions over the revised simulation period. Details of changes made include:

Updated Model Code and Pre-Processors

- The model code was upgraded from MODFLOW-2005 to MODFLOW-NWT, incorporating the Newton (NWT) solver to improve numerical stability and better address issues associated with drying and rewetting of model cells
- A recharge preprocessing tool was developed to streamline the calculation and spatial distribution of recharge. The tool integrates multiple recharge sources (e.g., agricultural, urban, stream, and recharge facility contributions) and applies them to the model grid. Recharge polygons are now based on model cells, allowing for variations in density of recharge based on land use data.

Improved Model Grid and Boundary Conditions

- The model grid was extended to align with the San Gorgonio Pass (SGP) Subbasin boundary by adding additional rows. Previous versions of the model did not fully coincide with the subbasin boundary and relied on estimated interbasin flows. These flows have been revised to be consistent with outputs from the SGP Subbasin groundwater model.
- The base of the lowest model layer was extended to accommodate wells with screened intervals that extend below the previously defined model bottom.

- Horizontal flow barriers were added and extended in the northwestern portion of the model where the grid was expanded to the SGP Subbasin boundary. These updates were implemented to better represent observed differences in groundwater levels between nearby wells. Additional details are provided in the San Gorgonio Pass flow reconciliation memorandum (Appendix 3-A).
- Interbasin fluxes from the Mission Creek Subbasin were updated for the period 2010 through 2025 using quarterly stress periods, consistent with the Mission Creek Subbasin model.
- The model was recalibrated to incorporate updated interbasin flows (including inflows from the SGP and Mission Creek Subbasins) and revised recharge estimates. Calibration was performed using a combination of automated parameter estimation (PEST) and manual adjustments, with a focus on refining hydraulic properties and selected boundary parameters.

Extended Model Simulation Period

- The model simulation period was updated to span January 2010 through September 2025, and the temporal discretization was refined from annual to quarterly stress periods. This change not only supports improved seasonal analysis and improved data quality but also allows reporting of model results on both a calendar year and water year basis.
- All recharge-related conditions were updated for the 2010 through 2025 simulation period at a quarterly time step. This includes agricultural return flows, municipal return flows (including septic systems), golf course return flows, Stream recharge, mountain front recharge and groundwater replenishment.
- Initial conditions were updated to represent groundwater levels at the start of 2010. Starting heads were developed based on an average of observed groundwater elevations from October 2009 through March 2010 and assumed to be representative of January 2010 conditions. Initial conditions were also adjusted as needed to ensure active (wet) model cells at the start of the simulation.
- Observation wells used for calibration were updated to reflect screened intervals, consistent with the updated production well representation, rather than being assigned to a single model layer.

Refined Production Wells and Drain Vertical Distribution

- Production wells were updated to use the MODFLOW Multi-Node Well (MNW2) package, which represents wells based on screened intervals rather than assigning them to a single model layer. Where well construction data were unavailable, screened intervals were estimated based on average well construction in the area.
- Production well pumping was updated to a quarterly stress period using available pumping records for the simulation period.
- Agricultural drains in the model were updated to reflect the average depth of tile drains in the East Valley.

Model input preparation, management, and post-processing were conducted using the Aquaveo Groundwater Modeling System (GMS), supported by GIS-based workflows, spreadsheets, and Python-based tools for preprocessing. Model inputs are maintained within the GMS framework as map-based and grid-based datasets, and model outputs, including groundwater elevations, hydrographs, and water budgets, are processed within the same system.

7.2 Model Input and Construction

The groundwater model area is shown on Figure 7-1. The upstream and downstream ends of the model are from the SGP Subbasin boundary in the northwest and the northern portion of the Salton Sea in the southeast, respectively. The southwest edge of the model represents the interface between the unconsolidated sedimentary aquifers of the Indio Subbasin and the consolidated to semi-consolidated rocks of the San Jacinto and Santa Rosa Mountains. The northeast flank of the model represents the interface between the unconsolidated aquifers of the Subbasin and consolidated to semi-consolidated rocks of the Little San Bernardino Mountains, Indio Hills, and Mecca Hills, and the Mission Creek and Desert Hot Springs Subbasins. The adjacent San Gorgonio Pass, Mission Creek and Desert Hot Springs Subbasins are not included in the active model area, but subsurface outflow from these Subbasins into the Indio Subbasin is included in the boundary conditions.

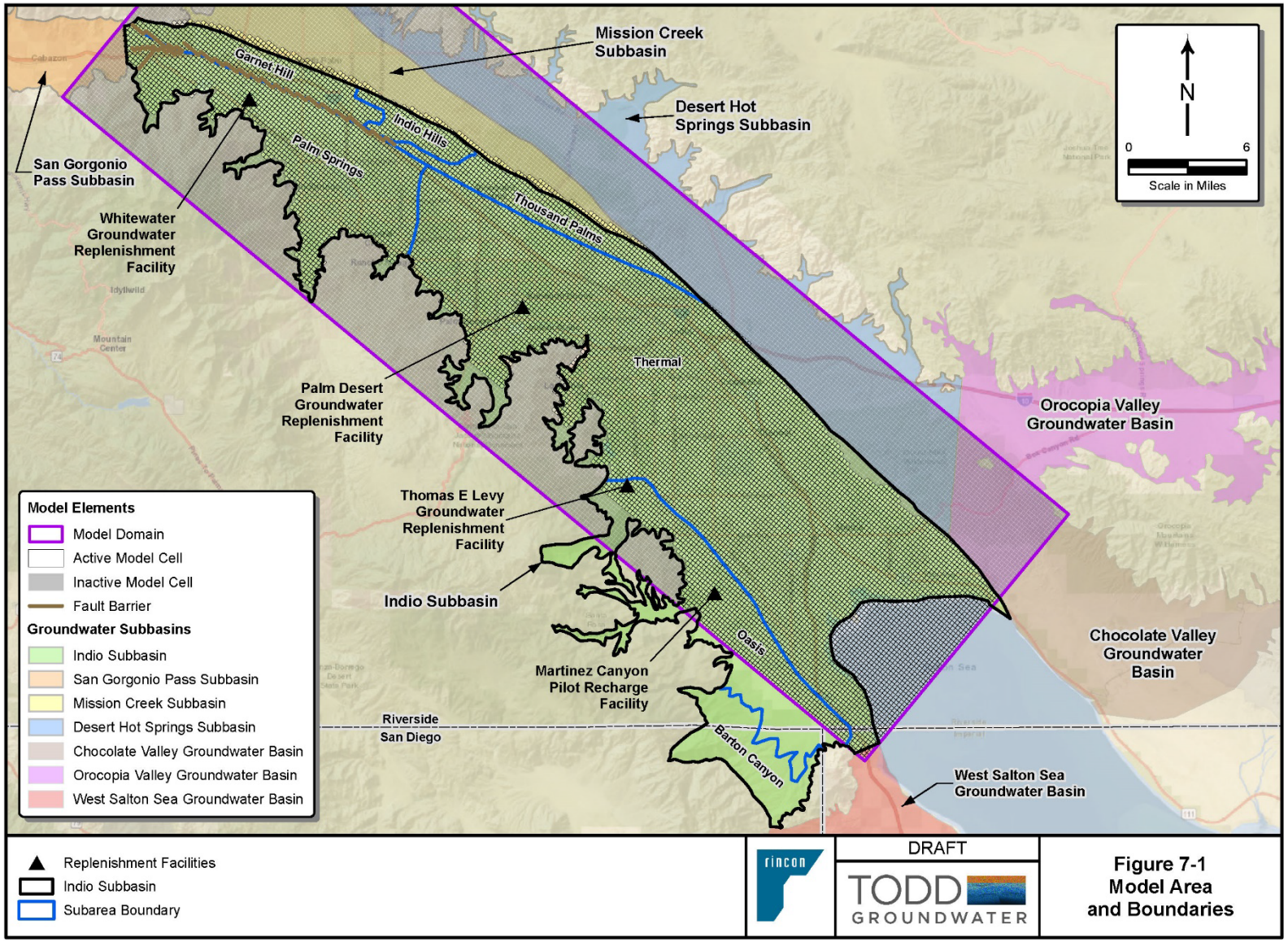
7.2.1 MODFLOW Code and Input Packages

The original Indio Subbasin model was constructed using the USGS 'MODFLOW 88' code. For the *2010 CVWMP Update* and *2022 Alternative Plan Update* versions of the model, the code was updated to 'MODFLOW 2005'. For the current model update, the code was upgraded to MODFLOW-NWT to improve numerical stability and convergence in areas subject to drying and rewetting of model cells through implementation of the NWT solver.

The model utilizes the following standard MODFLOW Packages:

- Basic (BAS)
- Upstream Weighting (UPW)
- Horizontal Flow Barrier (HFB)
- Well (WEL)
- Multi-Node Well (MNW2)
- Recharge (RCH)
- Drain (DRN)
- Evapotranspiration (EVT)
- General Head Boundary (GHB)
- Newton (NWT) Solver

Figure 7-1 Model Area and Boundaries



7.2.2 Model Grid and Layers

The model consists of a three-dimensional, finite-difference grid of blocks called cells, the locations of which are described in terms of 280 rows, 86 columns, and 4 layers. At the center of each cell there is a point called a node at which groundwater elevation (head) is calculated. Inflows and outflows through each model cell, through Subareas, and within the entire model grid are also calculated. The Indio Subbasin model has a cell size of 1,000 feet (ft) by 1,000 feet (ft) in the x-y plane, and variable vertical node spacing representing variable thicknesses of the corresponding aquifer or aquitard intervals. The grid is oriented from northwest to southeast along the length of the valley, coinciding with the principal direction of regional groundwater flow.

The MODFLOW model comprises four layers, representing the following hydrostratigraphic units:

- Layer 1 – semi-perched aquifer in East Valley and upper shallow aquifer in West Valley
- Layer 2 – shallow aquifer zone
- Layer 3 – regional aquitard in East Valley and shallow-deep transition zone in West Valley
- Layer 4 – deep aquifer

The elevation of the tops and bottoms of the model layers are referenced to land surface elevations and reflect aquifer and hydrostratigraphic unit thickness as inferred from borehole data across the basin. Figure 7-2 shows the elevations of the base of each of the four model layers. The model layer elevations in the *2027 Alternative Plan Update* model are unchanged from the original and *2010 CVWMP Update* versions of the model for layers 1 through 3. Layer 4 was deepened in areas where simulated production well screened intervals were deeper than the previous version of the model bottom. The top of Layer 1 is represented by the ground surface elevation and elevation of the bottom of the Salton Sea. The bottoms of each layer generally dip to the southeast, subparallel to the ground surface. In the East Valley, model layer thickness follows geologic characterizations by the California Department of Water Resources (DWR) (1979) that were corroborated by analysis of subsurface data. For example, Model Layer 1 approximately corresponds with the semi-perched zone (100 ft thick), Layer 2 with the upper aquifer unit (80 to more than 260 ft thick), Layer 3 with the regional aquitard (80 to more than 270 ft thick), and Layer 4 with a lower aquifer unit (up to 1,400 ft thick). In the West Valley, aquifer thickness estimated by USGS (Reichard and Meadows, 1992) was initially used and later revised during model calibration.

7.2.3 Aquifer Properties and Horizontal Flow Barrier

Aquifer hydraulic properties control the rates of groundwater flow, the amount of water stored within the aquifer system, and aquifer responses to recharge, pumping, and boundary fluxes. Hydraulic property distributions used in the original model were developed based on available hydrogeologic information, pumping test data, specific capacity data, lithologic interpretations, and model calibration. For the current model update, aquifer hydraulic properties were re-evaluated and refined to reflect the updated model framework, expanded model domain, revised boundary conditions, and updated observational dataset used for calibration.

The current model utilizes the MODFLOW-NWT Upstream Weighting (UPW) package to represent aquifer hydraulic properties. Hydraulic conductivity, anisotropy, and storage parameters were updated through the calibration process to improve agreement between simulated and observed groundwater conditions over the 2010 through 2025 simulation period. Detailed descriptions of the calibration approach and resulting parameter adjustments are provided in Section 7.3.1.

Horizontal flow barriers continue to be used to represent structural features that impede groundwater flow. Existing barrier representations were reviewed and updated as part of the current model revision, including extensions to accommodate the expanded model domain and improved representation of hydraulic gradients near the San Gorgonio Pass Subbasin boundary.

7.2.3.1 Hydraulic Conductivity and Storage Coefficients

Figure 7-3 shows the distribution of horizontal hydraulic conductivity in each model layer. Hydraulic conductivity values were developed to represent the spatial variability of aquifer materials throughout the basin and reflect the predominance of coarse-grained alluvial deposits within much of the modeled area. Lower hydraulic conductivity values were assigned in areas containing greater proportions of fine-grained sediments, including portions of the southeastern basin where silts and clays contribute to reduced aquifer permeability and localized semi-perched groundwater conditions.

Hydraulic conductivity distributions from previous model versions were used as the basis for the current update; however, hydraulic conductivity values and zonation were refined during model recalibration to improve representation of groundwater flow patterns and observed groundwater elevations. Vertical hydraulic conductivity was represented through specified horizontal-to-vertical hydraulic conductivity ratios that vary spatially.

Figure 7-4 shows the distribution of storage properties used in the model. Specific yield was applied to unconfined conditions, while specific storage was used to represent confined aquifer storage. Storage parameter distributions from previous model versions were reviewed and updated during model recalibration to better reproduce observed groundwater-level responses throughout the simulation period. The resulting parameter distributions reflect generally higher storage capacity within the more transmissive unconfined alluvial deposits and lower storage capacity within deeper and more confined portions of the aquifer system.

Additional information regarding the calibration of hydraulic conductivity and storage parameters is presented in Section 7.3.1.

7.2.3.2 Horizontal Flow Barrier

The MODFLOW Horizontal Flow Barrier (HFB) package is used to represent geologic structures that restrict groundwater flow within the model domain. The Garnet Hill Fault continues to be simulated as a horizontal flow barrier in Model Layers 1 through 4 to represent its influence on groundwater movement between the Garnet Hill and Palm Springs Subareas.

For the current model update, the horizontal flow barrier network was reviewed and revised as part of the model recalibration process. Existing barrier segments associated with the Garnet Hill Fault were refined, and additional barrier segments were extended within the northwestern portion of the model domain where the grid was expanded to coincide with the SGP Subbasin boundary. These updates were incorporated to improve representation of observed differences in groundwater elevations across localized structural features and to better simulate hydraulic gradients in the expanded model area.

Barrier hydraulic characteristics were adjusted during calibration in conjunction with revisions to aquifer properties and boundary conditions. Detailed evaluation of horizontal flow barrier performance and calibration results is provided in Section 7.3.1.

Figure 7-2 Base of Model Layer Elevations

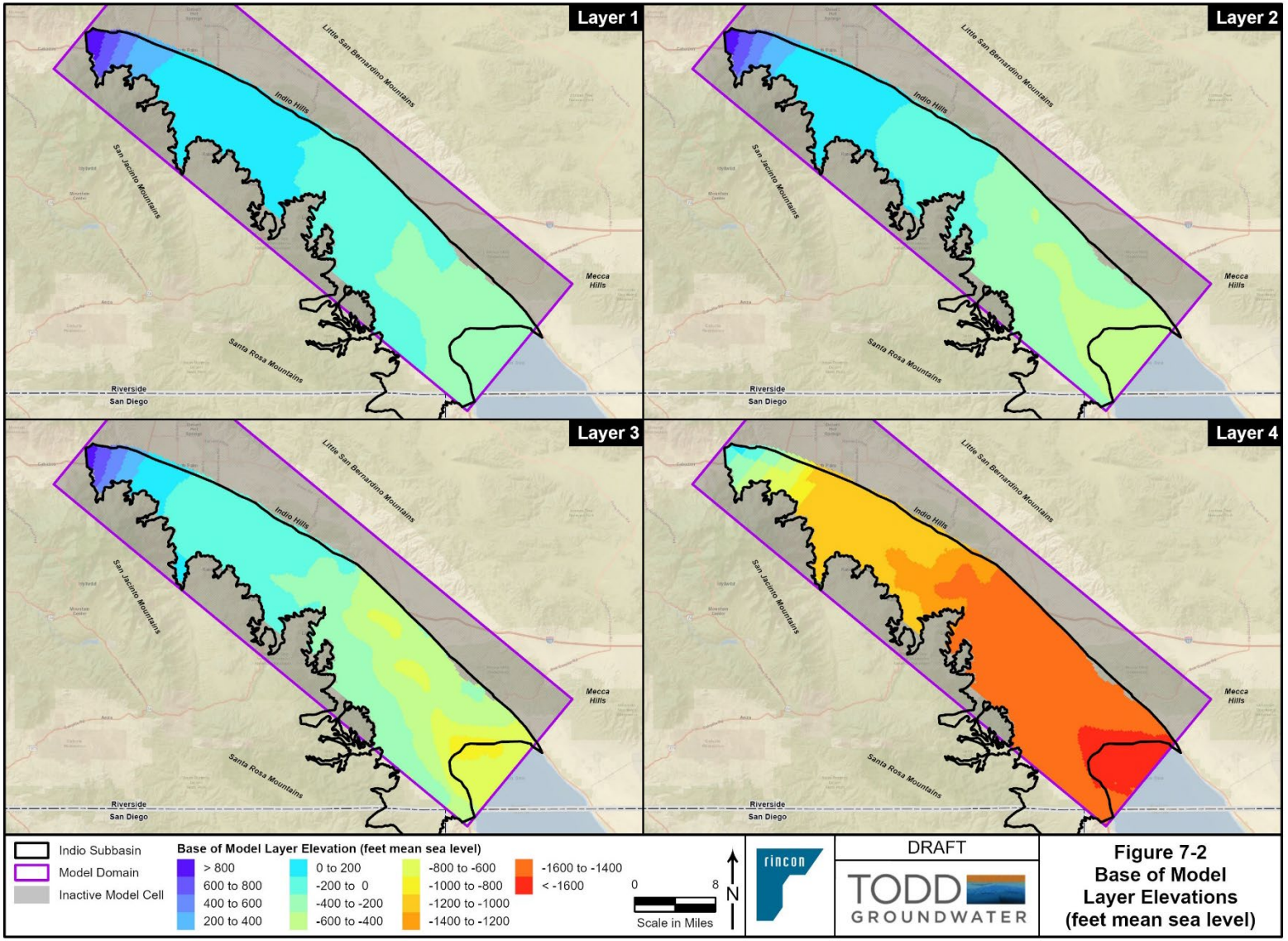


Figure 7-3 Model Layer Hydraulic Conductivities

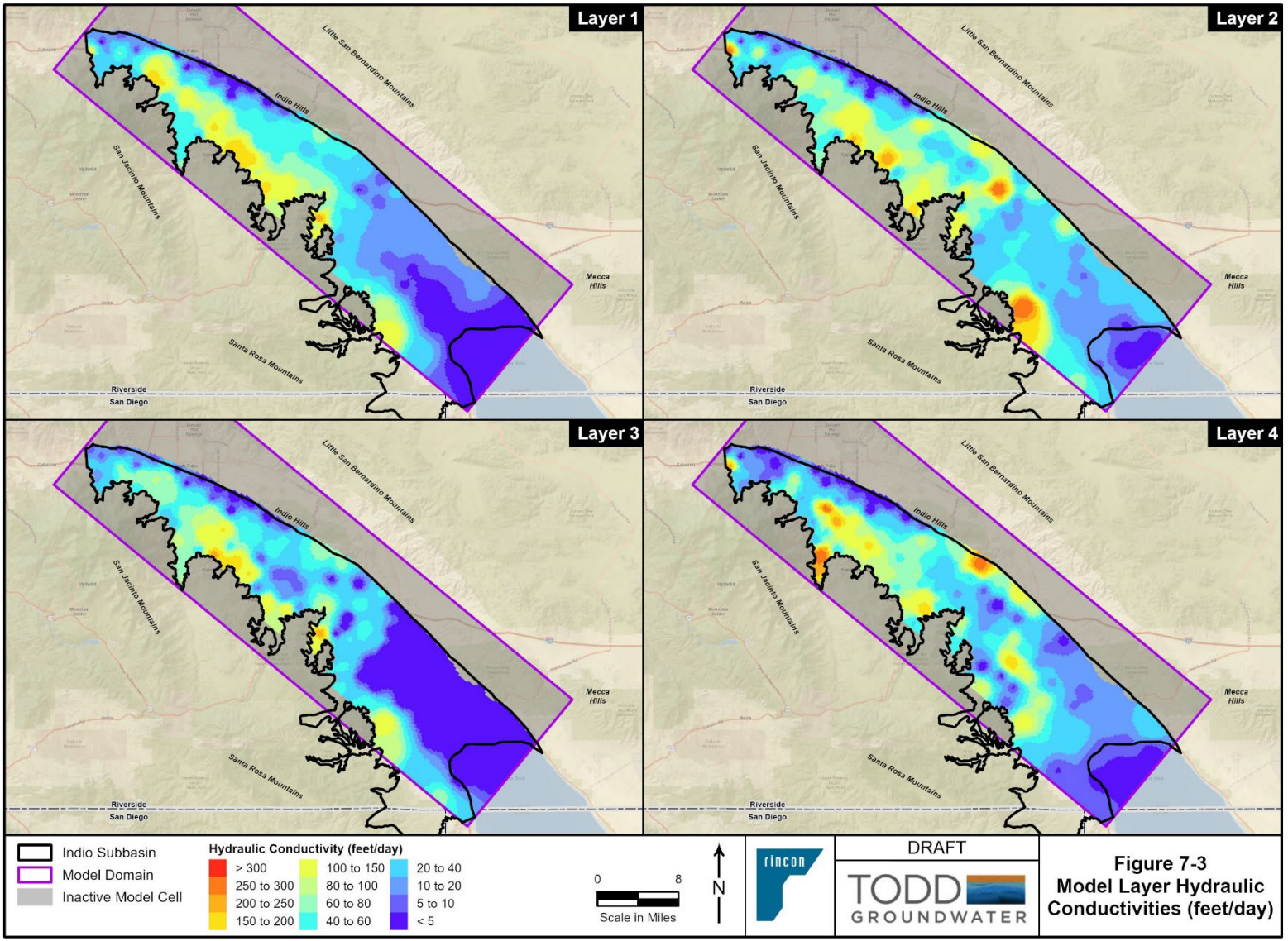
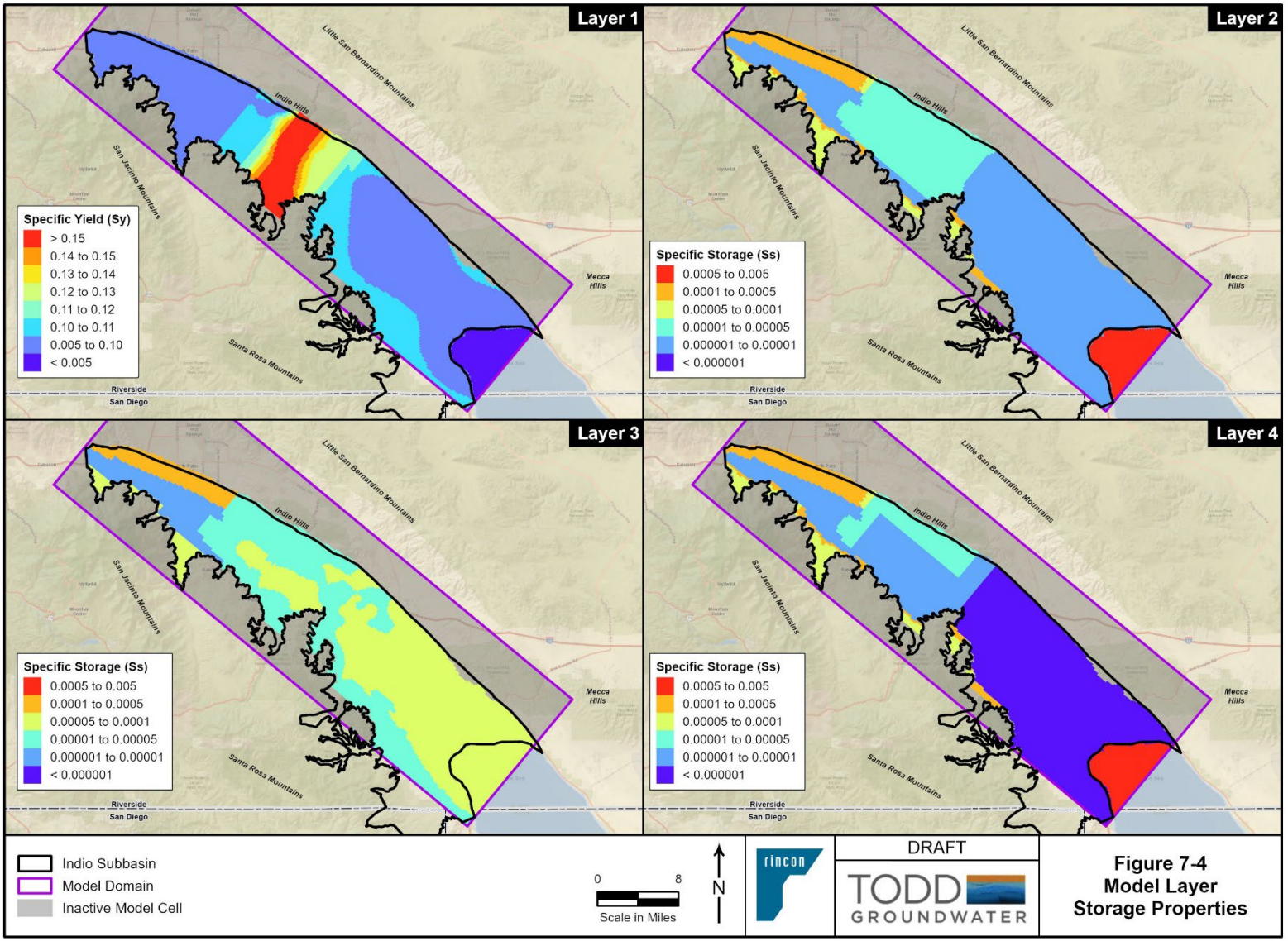


Figure 7-4 Model Layer Storage Properties



7.2.4 Initial Conditions

Initial conditions for the model were developed to represent groundwater levels at the beginning of 2010. Initial conditions from the *2022 Alternative Plan Update* model were not adopted directly because the current model includes an expanded model grid that extends to the SGP Subbasin boundary. The additional model rows required development of a new initial groundwater elevation surface covering the revised model domain.

Starting groundwater elevations were estimated using the average of observed groundwater levels measured between October 2009 and March 2010 and were assumed to be representative of January 2010 conditions. Groundwater elevations were spatially interpolated across the model domain to develop initial hydraulic heads for each model cell.

To further stabilize the model at the start of the simulation, the model was initially run using the preliminary starting conditions. Simulated groundwater elevations from the second stress period were then extracted and used to develop the final initial condition dataset. This approach reduced model instability associated with the transition to the revised model domain and updated boundary conditions at quarterly stress periods. The initial conditions used in the model are shown in Figure 7-5.

7.2.5 Inflows

The Indio Subbasin is recharged through a combination of natural inflows of surface water and groundwater, recharge of imported water, wastewater percolation, and irrigation return flows. Sources of recharge to the Subbasin include:

- Subsurface inflow from the SGP, Mission Creek, and Desert Hot Springs Subbasins
- Mountain front and stream channel recharge
- Artificial recharge of imported water
- Wastewater percolation
- Return flows from irrigation (municipal/domestic, agricultural, and golf course) and septic systems

Previous model evaluations considered potential groundwater exchange with the Salton Sea as part of the overall groundwater budget. Based on results of the current model update, groundwater flow along the southeastern boundary of the Subbasin is now simulated as predominantly directed toward the Salton Sea, indicating that the Salton Sea functions as a groundwater discharge area (sink) rather than a source of recharge to the Subbasin. This is consistent with current observed water level and Salton Sea elevations. Although model results suggest this transition occurred during the historical simulation period, groundwater levels in the vicinity of the Salton Sea are somewhat underpredicted by the model, and therefore the timing of the transition should be considered approximate.

Figure 7-6 illustrates the recharge components represented in the groundwater model. Recharge sources include agricultural irrigation return flow, municipal return flow (including septic systems), golf course irrigation return flow, stream recharge, mountain front recharge, groundwater replenishment, and artificial recharge facilities. Recharge for the simulation period from 2010 through 2025 was developed using a recharge preprocessing workflow that integrates the various recharge components and distributes recharge to individual model cells across the model grid. Recharge inputs were applied using quarterly stress periods and were based on available

operational records, land use information, hydrologic data, and results from adjacent groundwater basin models where applicable. The recharge preprocessing tool allows recharge volumes from multiple sources to be combined, spatially distributed using mapped recharge zones, and converted to model-ready recharge rates. The overall recharge methodology is consistent with previous model versions, although refinements were made to improve the spatial distribution of recharge and to incorporate updated information for the Mission Creek and SGP Subbasins.

Subsurface inflows from the Mission Creek and SGP Subbasins were updated for the entire 2010 through 2025 simulation period using results from their respective groundwater flow models. Mission Creek Subbasin inflows were obtained from the Mission Creek Subbasin MODFLOW model (WSP, 2026), while SGP Subbasin inflows were obtained from the San Gorgonio Pass Subbasin groundwater model (INTERA, 2026). Subsurface inflows used in the model are shown on Figure 7-7. These boundary fluxes are simulated using the MODFLOW WEL Package.

Each recharge component was estimated independently and processed using the recharge preprocessing workflow prior to being combined into a single MODFLOW RCH Package. Recharge volumes were distributed on a model cell basis while preserving total recharge amounts and converted to recharge rates for each quarterly stress period. Recharge was applied to the uppermost active model layer (primarily Model Layer 1, except where the layer is dry). The MODFLOW RCH Package was also used to simulate mountain front and stream channel recharge rather than one of the MODFLOW Streamflow Routing Packages, which are sometimes used to simulate groundwater-stream interactions.

Figure 7-8 shows the annual contribution of each source of recharge from 2010 through 2025. Recharge estimates were developed using the recharge preprocessing workflow described above, which integrates multiple recharge components and distributes recharge spatially across the model grid. Recharge inputs were updated for the current model revision using available operational records, land use information, hydrologic data, and results from adjacent groundwater basin models, while maintaining consistency with the overall recharge methodology used in previous model versions.

The following sections describe each of the sources of recharge to the Subbasin.

Figure 7-5 Model Initial Conditions 2010

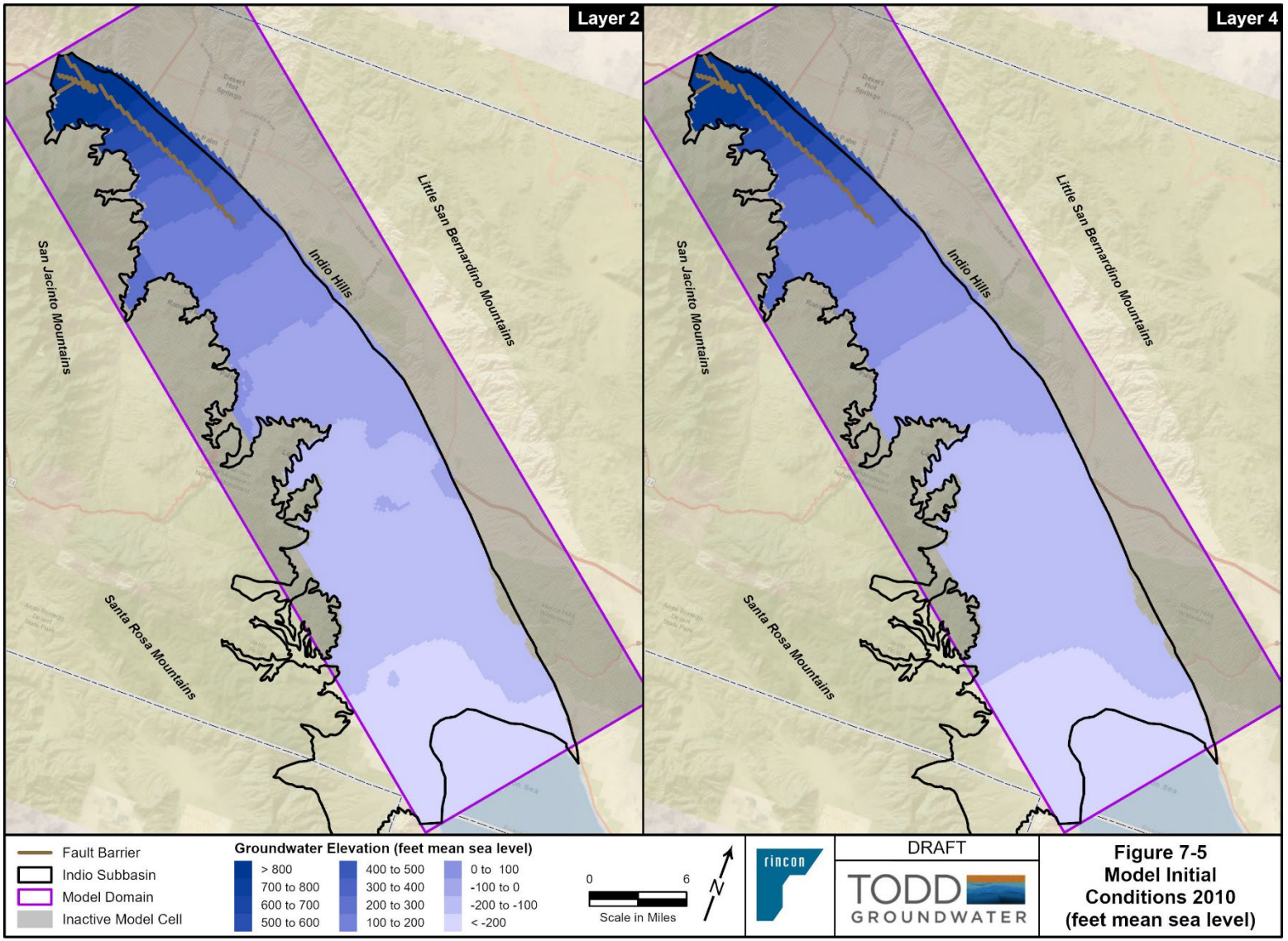


Figure 7-6 Model Recharge Sources

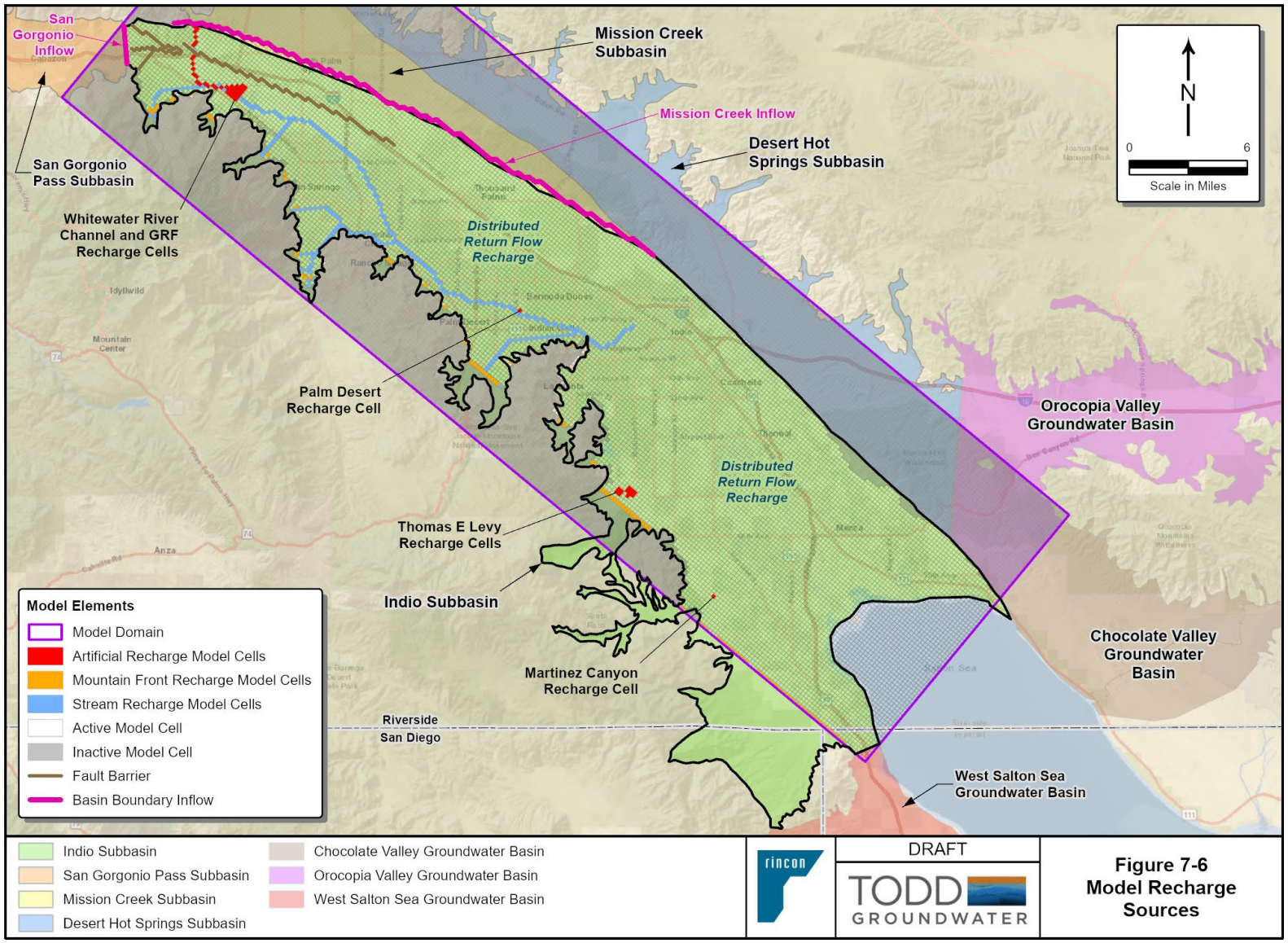


Figure 7-7 Subsurface Inflow from Mission Creek/Desert Hot Springs and San Gorgonio, 2010-2025

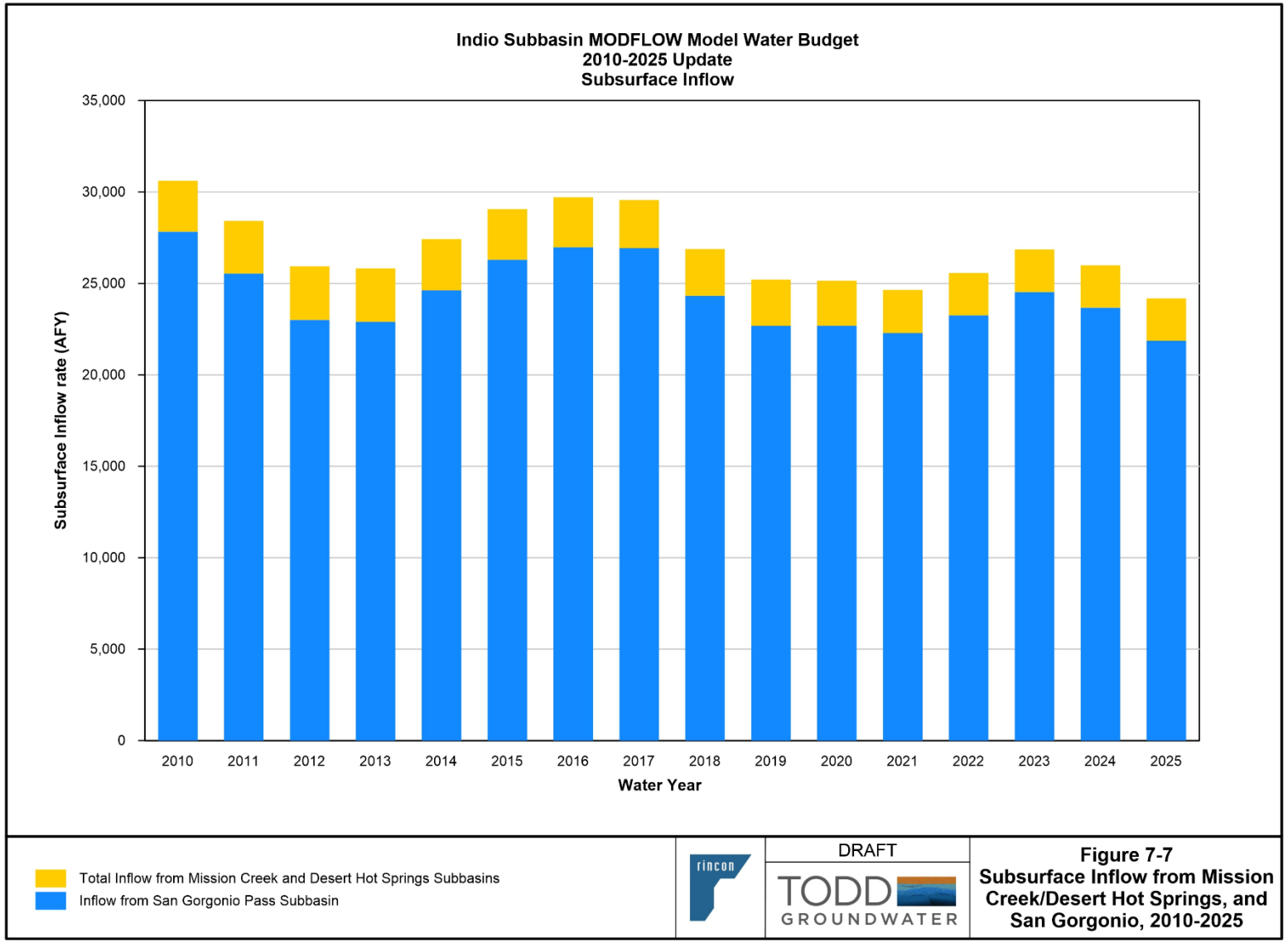
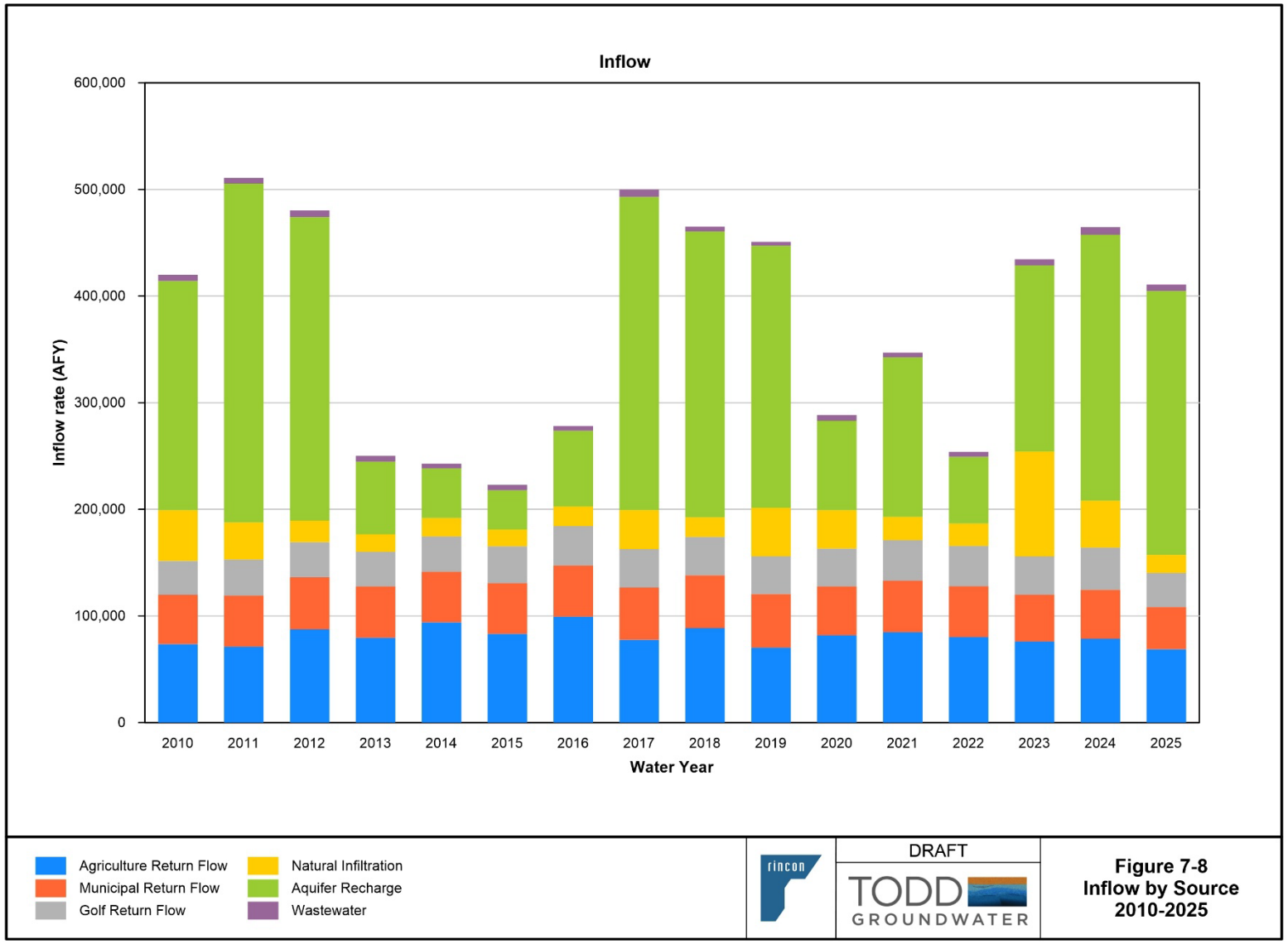


Figure 7-8 Inflow by Source 2010-2025



7.2.5.1 Subsurface Inflows

Figure 7-6 shows the locations of subsurface inflows specified in the northwestern and eastern boundaries of the model. These boundaries simulate inflow from SGP and Mission Creek Subbasins. Flux estimates for each boundary were applied to Model Layers 1 through 4.

In previous versions of the Indio Subbasin model, inflow from the SGP Subbasin was represented using estimated boundary fluxes derived from historical model results. For the current model update, subsurface inflows from the SGP Subbasin were revised using simulated groundwater outflows from the calibrated SGP Subbasin groundwater flow model (INTERA, 2026). These updated boundary flows were incorporated as specified flux boundary conditions in the Indio Subbasin model using the MODFLOW WEL Package. The revised estimates indicate average subsurface inflow from the SGP Subbasin of approximately 24,000 acre-feet per year (AFY) during the 2010 through 2025 simulation period, substantially greater than the values used in previous model versions.

Because the SGP and Indio Subbasin models were developed independently and utilize different model domains, hydrogeologic assumptions, and calibration datasets, a reconciliation effort was completed to establish a consistent representation of groundwater flow across the shared subbasin boundary. Details regarding the development, evaluation, and implementation of these revised boundary flows are provided in Appendix 3-A.

Subsurface inflow also occurs from the Mission Creek and Desert Hot Springs Subbasins into the Indio Subbasin, across the Banning and San Andreas faults.[1] These faults consist of several parallel faults and form the northeastern boundary of the Indio Subbasin. Groundwater level differences across the Banning Fault in this area have historically been on the order of 200 to 250 feet.

For the current model update, inflow estimates from the Mission Creek Subbasin were updated using simulated boundary flows from the Mission Creek Subbasin groundwater model (WSP, 2026). Inflow estimates were provided up to the end of WY 2024 and repeated for WY 2025. Similar to previous model versions, inflows were distributed among multiple boundary segments representing groundwater movement from the Mission Creek Subbasin into the Garnet Hill Subarea and Indio Subbasin, as well as flow between the Indio Hills East and Indio Hills West areas across the fault.

Combined inflows from the Mission Creek and Desert Hot Springs Subbasins average approximately 2,500 AFY during the 2010 through 2025 simulation period. In addition, a small amount of mountain front recharge is applied along portions of the eastern model boundary where inflows are not explicitly represented by the Mission Creek Subbasin model. These supplemental inflows are intended to represent subsurface recharge originating from adjacent bedrock uplands and average approximately 180 AFY over the simulation period. Figure 7-7 shows the temporal distribution of simulated subsurface inflows from neighboring subbasins used in the model.

The Garnet Hill Fault also forms a partial barrier to flow and demarcates the Garnet Hill and Palm Springs Subareas within the model. This barrier is simulated using the MODFLOW HFB Package, as previously described, and allows limited groundwater flow between the two subareas.

[1] Refer to Figures 3-1 and 3-2 in Chapter 3, *Hydrogeologic Conceptual Model*, for Subbasins and Subareas. The Indio Hills West area is within the Indio Subbasin and Indio Hills East is in the Mission Creek Subbasin.

7.2.5.2 Surface Water Inflows

Recharge from mountain front inflow and from percolation of stream flows into the Indio Subbasin was estimated for 24 watersheds and stream channels along the southwest edge of the model, along the interface between the Indio Subbasin and the consolidated rocks of the San Jacinto and Santa Rosa Mountains. Many of these watersheds are gaged; gage locations are shown on Figure 2-9 in Chapter 2, *Plan Area*.

Figure 7-6 shows the model cells used to represent mountain front recharge and stream channel recharge. Most mountain front recharge within the model is applied along the southwestern boundary at the interface between the basin-fill aquifer and the San Jacinto and Santa Rosa Mountains. Along the eastern boundary, subsurface inflows from the Mission Creek and Desert Hot Springs Subbasins are represented separately as described in the previous section. In addition, a limited amount of mountain front recharge is applied along portions of the eastern boundary that are not represented by the Mission Creek Subbasin model. These inflows represent recharge from adjacent bedrock areas and contribute approximately 180 AFY on average during the simulation period.

The same methodologies used in the original and *2010 CVWMP Update* models (Fogg, 2000) and the *2022 Alternative Plan Update* were applied to estimate annual mountain front and stream channel recharge for the 2020 to 2025 model update. Previously estimated values for 2010 to 2019 used in the *2022 Alternative Plan Update* model, and new estimates of mountain front and stream channel recharge were developed for 2020 to 2025. Total available water from each neighboring watershed was calculated based on annual precipitation, and gaged streamflow (where available). If streamflow was not gaged at a watershed, a rating factor was developed to compare the gaged precipitation and watershed area of a nearby watershed with gaged data. Total watershed runoff was calculated for each watershed on an annual basis. Surface water diversions from the Snow, Falls, Whitewater, and Chino watersheds were accounted for before available streamflow was routed through the Subbasin. Figure 7-8 shows the annual amounts of mountain front and stream channel recharge between 2010 and 2025 (labeled as natural infiltration).

Stream Flow

For stream percolation, it is assumed that 95 percent of the total watershed runoff is available for stream percolation with a portion of that available stream percolation leaving the Subbasin in wet years through surface water flow to the Salton Sea. Watershed runoff is estimated using all available precipitation and stream gauge measurements from the tributary watersheds located along the western edge of the model. The expected runoff and routing, as well as the recharge locations, use the same methodology as the previous models.

The model cells receiving streamflow percolation are shown in blue on Figure 7-6. The resulting available stream flow (95 percent of total watershed runoff) less diversions and subsurface flow for the upper valley (Snow, Falls, and Whitewater streams) is expected to completely percolate to the Subbasin. In a change from the original model but consistent with the *2022 Alternative Plan Update* model, water is routed down the upper portion of the Whitewater River in all years. Previously, all available stream recharge in dry years was assumed to recharge the model at the edge of the basin, causing increased simulated water levels over observed water levels in some years.

Further down the valley, only selected watersheds are assumed to recharge the Subbasin in wet years along streams tributary to the Whitewater River (Andreas, Chino, Dead, Deep, Murray, Palm, Tahquitz, and Unnamed Watershed #2). In wet years, the available streamflow is routed through

stream cells such that the resulting simulated flow at the Whitewater River gauge at Indio matches the observed volume. This means that in extremely wet years, up to 12,800 acre-feet (AF) flows from the lower valley watersheds through the Whitewater River into the Coachella Valley Stormwater Channel (CVSC) and the Salton Sea, as measured in 2019 at the Whitewater @ Indio USGS stream gauge.

The flow of each surface waterway was distributed over the model cells using a stream channel routing factor, one for the upper valley streams and one for streams further down the valley. The respective routing factors were calculated for each wet year, such that flow recharges the model over the course of the surface waterway in the upper valley. The stream routing results in a calculation of the volume of water that percolates and the volume that remains as surface water for each cell of the surface waterway. The remaining surface water flow at the location of the USGS Indio gage is equal to the monitored flow at that gage. In short, the available streamflow less flow out of the basin percolates along the surface waterways.

Mountain Front Recharge

In addition to stream channel recharge, a portion of watershed runoff recharges the Indio Subbasin as subsurface inflow from fractured bedrock along the margins of the alluvial aquifer. Most mountain front recharge is applied along the southwestern mountain front; however, a small amount of supplemental mountain front recharge is also applied along portions of the eastern boundary that are not explicitly represented by the Mission Creek Subbasin boundary inflow estimates. The locations in the model for such mountain front recharge are shown as the green model cells on Figure 7-6. Mountain front recharge has been estimated using total watershed runoff and assuming that an additional 10 percent of the 4-year moving average of total watershed runoff is available for subsurface flow. This is an estimate based on the expected runoff and relative difference of hydraulic properties between the fractured bedrock and permeable basin (Fogg, 2000). The longer timeframe acknowledges that subsurface flow is slower than surface water flow and affected by hydrologic conditions of previous years. The annual volume of recharge from stream flow and mountain front recharge is shown on Figure 7-8 as natural infiltration.

7.2.5.3 Artificial Recharge

The annual volumes of artificial recharge were compiled and applied to the locations of the groundwater replenishment facilities (GRFs) shown on Figure 7-6. These include the Whitewater River GRF (WWR-GRF), Thomas E. Levy GRF (TEL-GRF) (formerly called Dike 4), and the Palm Desert GRF (PD-GRF). While Mission Creek GRF (MC-GRF) is also used for artificial recharge, it is located in the Mission Creek Subbasin and not in the model domain. Evaporative losses were assumed to be four percent of recharged volume for the WWR-GRF and two percent for all other locations, reflecting the larger surface area and windier conditions at the WWR-GRF. These estimates are consistent with evaporative losses estimated in previous planning reports. Total annual recharge volumes at the replenishment facilities are shown on Figure 7-8, indicated as Aquifer Recharge.

7.2.5.4 Wastewater Discharges

There are nine wastewater treatment plants/water reclamation plants (WWTPs and WRPs) currently operating in the Indio Subbasin (see Figure 2-5 for locations). All nine are within the active area of the model. Four of these (WRP-2, WRP-4, WRP-7, and WRP-10) are currently operated by CVWD, while a fifth, WRP-9, was decommissioned in 2015. WWTPs also are operated by City of Palm Springs (Palm Springs WWTP/Desert Water Agency [DWA] WRP), Valley Sanitation District (VSD),

and Coachella Sanitation District (CSD). A new Nancy Wright Regional Water Reclamation Facility (Regional WRF) in the Garnet Hill Subarea constructed by Mission Springs Water District (MSWD) became operational in September 2024. Five wastewater plants currently discharge to disposal ponds (Palm Springs WWTP and CVWD WRP-2, WRP-7, and WRP-10), with discharge from the MSWD Regional WRF starting in September 2024. The ponds have evaporative losses, calculated by the area of ponds and expected annual evaporation. The remaining volume percolates into the Subbasin, as shown on Figure 7-8. It should be noted that, as percolated wastewater is recycled for use, groundwater pumping decreases, but net return flows to groundwater are reduced.

The other wastewater plants (CVWD WRP-4, VSD, and CSD) discharge to the CVSC, and no percolation to the Subbasin is assumed from the stormwater channel. The VSD WWTP is currently working on plans to begin treating and delivering recycled water to nearby customers, more information is included in Chapter 11, *Project and Management Actions*.

7.2.5.5 Applied Water Return Flows

In areas with irrigated crops, golf courses, and municipal landscaping, irrigation is assumed to be applied when soil moisture falls below a certain threshold. When soil moisture exceeds the root zone storage capacity, the excess irrigation becomes deep percolation to the aquifer. Rainfall and irrigation water comingle in the root zone and in deep percolation. For the purposes of displaying an itemized water balance, the amount of deep percolation derived from each type of irrigation is estimated as a percentage of the simulated irrigation quantity.

Agricultural Return Flow

This inflow component accounts for the portion of irrigation water that is applied in excess of the evapotranspiration (ET) requirements of the crop, as well as excess precipitation that either percolates directly or runs off and percolates in nearby areas (defined herein as irrigation return flows). Agricultural return flows are represented in the groundwater model as specified recharge and do not require explicit simulation of crop water use, irrigation practices, or land-surface processes.

Previous groundwater modeling and planning efforts evaluated agricultural return flows through an independent analysis of agricultural water supplies and consumptive use. Results of those evaluations indicated average irrigation efficiencies of approximately 70 percent, implying that approximately 30 percent of applied agricultural water becomes deep percolation to recharge groundwater.

Based on these prior studies, the current groundwater model applies a representative agricultural return flow factor of 30 percent. Because the model does not explicitly simulate individual crop types, cropping patterns, irrigation methods, or temporal changes in agricultural land use, a single average return flow percentage is assumed throughout the simulation period. This approach is consistent with previous model versions and reflects the level of detail needed for basin-scale groundwater budget analyses. Total agricultural water supply was estimated as the sum of surface water deliveries, recycled water deliveries, and groundwater pumping from agricultural (RAC) wells.

Return flows were spatially distributed using agricultural land use mapped from 2024 conditions. Agricultural land use polygons were intersected with the model grid, and recharge volumes were allocated to model cells based on the proportion of agricultural acreage within each model cell. The land use was assumed to be constant throughout the 2010 to 2025 simulation period. The model

uses agricultural land to spatially distribute return flows and does not simulate differences in water use or return flows associated with specific crop types. Total annual agricultural return flows for the 2010 through 2025 simulation period are shown on Figure 7-8.

Golf Course Return Flow

Like agricultural return flows, irrigation water applied in excess of golf course water demand will result in return flow. Golf courses in the Indio Subbasin are supplied through a variety of sources including imported water, recycled water, potable water from water systems, and onsite groundwater wells. Irrigation demand for a golf course is dependent on the number of holes, the type and area of turf, and other landscaping. CVWD estimates irrigated area for some golf courses in their service area (for example, in reports on non-potable water use). The approximate irrigated area for each golf course was digitized from aerial photos and compared to CVWD estimates (if available) to help calculate the estimated irrigation demand.

Previous groundwater modeling and planning studies evaluated golf course irrigation demand and water supplies and found return flow percentages generally ranging from about 20 to 45 percent, with basin-wide average estimates in the mid-30 percent range. Based on these evaluations, the current groundwater model assumes that 35 percent of total golf course water supply becomes groundwater recharge.

Annual golf course water supplies were estimated from available delivery and pumping records. Annual return flow volumes were calculated as 35 percent of total supply and distributed to quarterly stress periods using a representative ET curve to reflect seasonal irrigation demand. Return flows were spatially distributed to model cells based on mapped golf course irrigated areas. Figure 7-8 shows the estimated annual golf course return flow over the simulation period.

Municipal and Domestic Return Flow

Municipal and domestic return flows to the groundwater basin can result from indoor use (septic tank effluent), outdoor use (landscaping irrigation returns in excess of ET), system losses (pipe leaks) and other losses that result in aquifer recharge. The magnitude of these return flows varies throughout the Subbasin depending on land use, irrigation practices, and the extent of supply distribution and sewer systems.

Previous plans evaluated municipal return flows by considering outdoor water demands, septic system contributions, and the distribution of developed areas throughout the Subbasin. These analyses indicated that municipal return flow factors range from approximately 15 to 40 percent across different portions of the basin, with an average basin-wide return flow of approximately 27 percent of total municipal demand.

For the current groundwater model update, municipal and domestic return flows are represented using a constant return flow factor of 24 percent. This factor is intended to represent the combined effects of landscape irrigation return flow, distribution system losses, and septic system recharge. The assumed return flow falls within the range developed during previous planning analyses and is considered representative of basin-scale conditions.

Municipal water supplies were estimated for each Subarea using available delivery records and supply estimates. Annual supply volumes were distributed to quarterly stress periods using a representative ET curve to reflect seasonal variations in outdoor water use. The return flow factor was then applied to the quarterly supply volumes and distributed spatially to developed areas

within each Subarea. Figure 7-8 shows the estimated annual municipal and domestic return flow applied during the simulation period.

7.2.6 Outflows

Outflows include groundwater production from agricultural, municipal, golf course, and other pumping wells, drain flows, ET, and groundwater outflows to the Salton Sea.

7.2.6.1 Groundwater Production

Groundwater production is the largest outflow from the Indio Subbasin. Production well pumping was updated for the 2010 through 2025 simulation period using available metered records for municipal, agricultural, golf course, fish farm, and other known production wells. Municipal system pumping data were compiled from available records provided by CVWD, DWA, CWA, and IWA. Pumping for agricultural wells and golf course wells were available from RAC program records.

For homesteads and small water systems in the East Valley that pump less than 25 AFY and are exempt from well metering required for replenishment assessments, an additional 1,000 AFY was distributed to hypothetical Layer 2 wells at each water system and estimated location of private wells. Wells were added to Layer 2 to reflect the relatively shallow depths of domestic wells. For West Valley unincorporated areas, an additional 500 AFY of pumping was distributed to hypothetical wells across the area.

Figure 7-9 shows the location of all simulated pumping wells. Production wells were simulated using the MODFLOW Multi-Node Well (MNW2) package, which represents pumping over the screened interval of each well rather than assigning to a single model layer. Well construction information was used where available to define screen intervals; for wells lacking construction data, screened intervals were estimated based on available information of nearby wells of a similar type. Where multiple wells occur within the same model cell, pumping rates are combined within the MNW2 framework while maintaining the vertical distribution of pumping based on screened intervals.



Groundwater production is the largest outflow from the Indio Subbasin.

Pumping records were compiled and applied at a quarterly stress period. Total annual pumping amounts simulated between 2010 and 2025 are shown on Figure 7-10. Groundwater production has generally declined from historical levels due to water conservation measures and source substitution, including use of Colorado River water and recycled water. In the past decade, pumping has largely stabilized, with 2015 to 2024 having an average of around 270,000 AFY. The previous version of the model estimated pumping over the period of 1997 to 2014 averaging about 350,000 AFY.

Figure 7-9 Location of Production Wells Known to be Active, 2010-2025

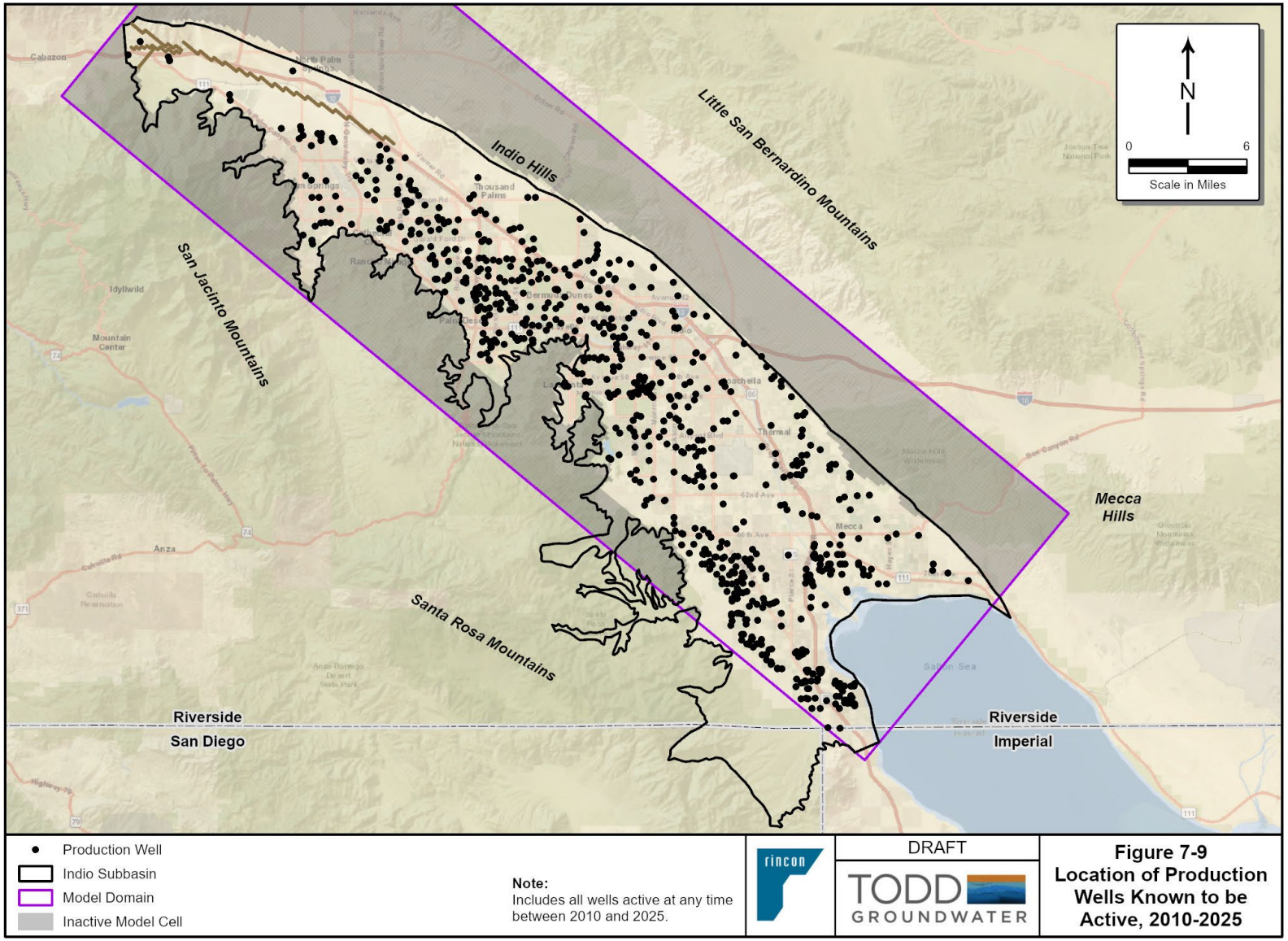
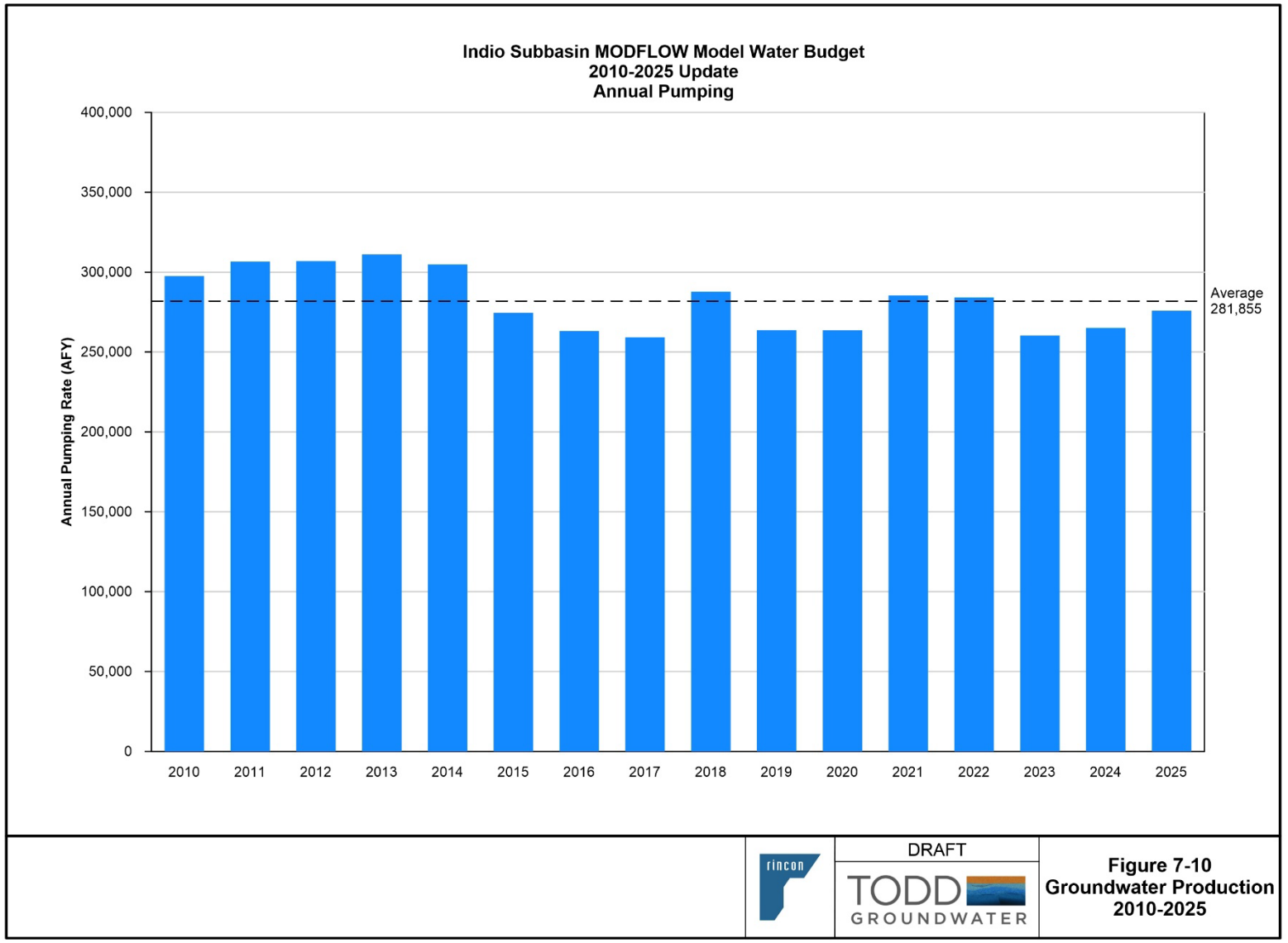


Figure 7-10 Groundwater Production, 2010-2025



7.2.6.2 Drain Flows

Shallow groundwater drainage systems have been installed over a large portion of the East Valley (see Figure 2-5 for locations) where they serve to maintain the water table below crop rooting depths. The model simulates drains in Layer 1 using the MODFLOW DRN Package. Drain locations were based on the mapped CVWD drainage network, and drain elevations were updated based on the results of a recent CVWD Drain Flow Study (Todd, 2023).

7.2.6.3 Evapotranspiration

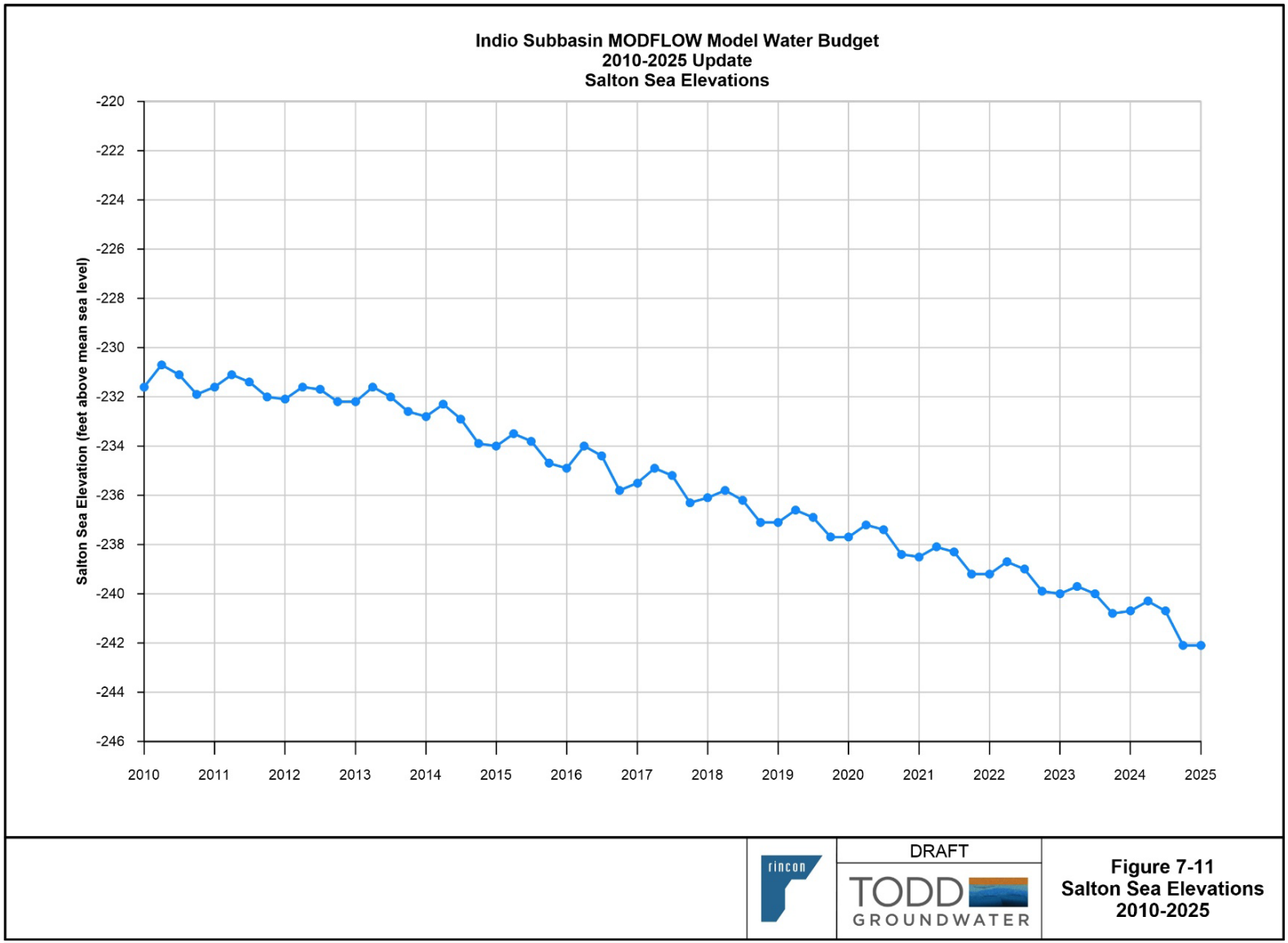
Evapotranspiration from shallow groundwater is simulated in the eastern portion of the model using the MODFLOW EVT Package. Note that the package only estimates ET losses from shallow groundwater levels; other ET and surface water evaporation losses are calculated separately as part of the methodology for other components, including applied water return flows, groundwater replenishment, wastewater percolation, and watershed runoff. An ET boundary condition was initially assigned to all cells within the semi-perched zone (see Figure 3-5) in the original historical simulation. As land within the semi-perched zone was developed for agriculture, in locations where drains were installed, the ET boundary was replaced with a drain boundary. Because no additional drain systems were installed after 1997, the ET boundaries were maintained at their 1997 conditions in the model. Inclusion of such ET in the model ensures a complete water budget and acknowledges the hydrologic possibility of phreatophyte ET, including potential groundwater dependent ecosystems (GDEs) but also non-GDE vegetation around agricultural fields and along drainage channels. ET amounts are calculated based on specified plant rooting depths, reference ET values, and simulated shallow groundwater elevations.

7.2.6.4 Salton Sea

The Salton Sea is simulated as a general head boundary (GHB) with time-varying elevations. For the current model update, Salton Sea elevations were updated for the 2010 to 2025 simulation period using quarterly values derived from observed sea elevations, with sea elevations dropping around 12 feet over the period (see Figure 7-11).

The active GHB cells were revised to reflect the 2025 shoreline conditions resulting from the continued decline in Salton Sea elevation. The GHB package allows groundwater flow to occur either into or out of the model domain depending on the simulated hydraulic gradient between groundwater levels and the Salton Sea stage. Model results indicate that groundwater discharge to the Salton Sea has increased over time as Sea elevations have declined and groundwater elevations near the shoreline have remained above the Sea level. During the simulation period, the Salton Sea transitions from a minor source of groundwater inflow to a net groundwater discharge area, and by end of simulation period, functions as a groundwater sink, with net groundwater flow from the Indio Subbasin toward the Sea.

Figure 7-11 Salton Sea Elevations, 2010-2025



7.3 Model Update Process and Results

This section summarizes the model update process and calibration results for the current Indio Subbasin groundwater flow model. The updated model builds upon the *2022 Alternative Plan Update* model and incorporates revisions to the model code, simulation period, stress periods (temporal discretization), model domain, boundary conditions, recharge estimates, pumping datasets, drain system representation, and aquifer parametrization. The model simulation period was updated to span January 2010 through September 2025 using quarterly stress periods.

The current effort included a comprehensive model recalibration. The model was migrated from MODFLOW-2005 to MODFLOW-NWT to improve numerical stability and representation of drying and rewetting conditions. As part of this transition, aquifer hydraulic conductivity, storage properties, horizontal flow barrier characteristics, and selected boundary condition properties were reevaluated and refined through the calibration process. Boundary conditions were also updated using revised estimates of interbasin flows from the SGP and Mission Creek Subbasin models, updated Salton Sea conditions, revised and refined recharge distributions, updated pumping records, and updated initial conditions.

Model calibration was performed over the full 2010 through 2025 simulation period using a combination of automated parameter estimation (PEST) and manual parameter adjustment. Approximately 180 monitoring wells distributed throughout the Subbasin were used as calibration targets. Presentation of hydrographs and statistics are based on the Key Well monitoring network which includes observations from both shallow and deep portions of the aquifer system. One additional well was also included in the San Gorgonio Pass area to demonstrate the model's performance in the newly extended grid area.

Model performance was evaluated through comparison of simulated and observed groundwater elevations, review of groundwater elevation contour maps and hydrographs, and evaluation of groundwater budget components and changes in storage over time. Calibration focused on accurately reproducing groundwater-level trends throughout the Subbasin while maintaining consistency with known hydrologic conditions and independently estimated inflow and outflow components.

Overall, the updated model provides a good representation of observed groundwater conditions across the Indio Subbasin and represents a significant improvement relative to the *2022 Alternative Plan Update* model. Recalibration of aquifer parameters and boundary conditions resulted in substantially improved agreement between simulated and observed groundwater elevations while preserving characteristics of groundwater flow processes. Detailed descriptions of the calibration methodology, calibration statistics, and model performance are provided in the following sections.

7.3.1 2010-2025 Model Update Process

The current groundwater model update builds upon the *2022 Alternative Plan Update* model and incorporates substantial revisions to the model framework, input datasets, and boundary conditions. The primary objectives of the update were to extend the model boundary to the SGP Subbasin, increase temporal resolution to quarterly stress periods, and improve model stability and calibration performance.

Initial model update efforts were completed using the MODFLOW-2005 version of the model with the Block Centered Flow (BCF) flow package. Although calibration results were generally acceptable,

numerical stability issues were encountered in portions of the model subject to drying and rewetting conditions. To improve model robustness and provide a more reliable representation of changing groundwater conditions, the model was converted from MODFLOW-2005 to MODFLOW-NWT. This conversion included replacement of the flow package to Upstream Weighting (UPW), which was developed specifically for use with MODFLOW-NWT, and implementation of the NWT solver, which is specifically designed to improve convergence and stability in unconfined aquifer systems.

Initial calibration efforts focused on the northwestern portion of the model where the grid was extended to align with the SGP Subbasin boundary. This area required incorporation of revised subsurface flow estimates from the SGP Subbasin groundwater model, extension of horizontal flow barriers, and updates to groundwater level observations where the model grid was extended to the basin boundary. Early calibration efforts were targeted to this section of the model to accommodate the additional flows coming into the model while maintaining downstream performance in the mid and eastern Coachella Valley sections of the model.

As additional updates were incorporated into the model, including revised recharge estimates, updated production well pumping and change to the MNW2 package, and revised interbasin flows, it became apparent that the cumulative effects of these changes necessitated a comprehensive recalibration of the model.

The recalibration process included refinement of aquifer hydraulic conductivity distributions, vertical hydraulic (anisotropy) ratios, storage properties, and horizontal flow barrier characteristics. Calibration was performed using a combination of automated parameter estimation (PEST) and manual parameter adjustments. Observation wells were represented using screened intervals to be consistent with the updated MNW2-based well framework.

Model performance was evaluated through comparison of simulated and observed groundwater elevations, groundwater-level trends, and groundwater budget components. The resulting recalibrated model provides improved agreement with the observed groundwater conditions relative to previous model versions and serves as the basis for predictive simulations presented later in this chapter.

7.3.2 Water Level Calibration Results

The updated Indio Subbasin model meets both qualitative and quantitative calibration objectives. Simulated groundwater level trends throughout the Subbasin are generally consistent with observed groundwater flow directions and hydraulic gradients characterized in the Subbasin hydrogeologic conceptual model. The model reproduces observed responses to variations in recharge, pumping, and interbasin flows, including groundwater level changes associated with operations of the WWR-GRF, TEL-GRF, PD-GRF, and other major recharge sources.

Model calibration quality is demonstrated through both visual comparison of observed and simulated groundwater levels, and quantitative calibration statistics, summarized in Table 7-1. For the quantitative assessment, water level data from 58 shallow and deep monitoring and production wells were used to calculate water level residuals (differences between observed and simulated levels). The observation well dataset includes all of the Key Wells in the Subbasin monitoring network, and one additional well near the SGP Subbasin boundary. Summary calibration statistics for the 58 wells are presented in Table 7-1 below.

Table 7-1 Model Calibration Summary Statistics 2010 – 2025

Calibration Measure	Calibration Results
Mean Residual (Head)	3.24 feet
Mean Absolute Residual (Head)	8.15 feet
Root Mean Squared Residual (RMS-Head)	11.32 feet
Groundwater Elevation Range	1,461 feet
Mean Residual/Range	0.22 percent
RMS/Range	0.77%

The updated model demonstrates substantially improved calibration performance relative to previous model versions. Improvements are attributable to the incorporation of updated recharge, pumping, and boundary flow datasets, and implementation of the MNW2 package for production wells, followed by comprehensive recalibration of aquifer parameters and boundary conditions.

The American Society for Testing and Materials (ASTM) recommendations for Mean Residual/Range and RMS/Range are less than 5 percent and 10 percent, respectively (ASTM, 1994, 1998). The Indio Subbasin model calibration quality exceeds these ASTM recommendations.

In the Indio Subbasin model, there are several sources of apparent head residuals that are unrelated to potential inaccuracies in conceptualization of the hydrogeologic system or simulated amounts of inflow and outflow. These include the following.

- Simulated groundwater levels represent average conditions within each quarterly stress period, whereas observed groundwater levels reflect conditions at discrete points in time
- Recharge inputs, particularly irrigation return flows, municipal return flows, septic return flows, and other distributed recharge components are estimated rather than directly measured. While the overall magnitude of recharge is constrained by water supply records and supported through model calibration, the precise location, timing, and amount of recharge occurring within individual model cells are inherently uncertain. As a result, some local groundwater level residuals may reflect uncertainty in recharge distribution
- Simulated groundwater levels are calculated at the node or center of each model cell containing an observation well. The actual observation wells may be located anywhere within the 1,000 x 1,000-foot model cell, resulting in offsets of as much as 700 feet between the simulated and observed calibration well location
- The simulated head within the 1,000 x 1,000-foot cell represents the model-calculated average level in the cell. Hydraulic gradients near recharge sources or pumping wells can cause steep local gradients and variable actual elevations within areas simulated by the model cells
- Some observation wells are completed (screened) in multiple aquifers and model layers, resulting in composite observed level or levels that are reflective of a particular aquifer zone, depending on the local vertical flow conditions

Despite these limitations, the updated model accurately simulates groundwater conditions through the Subbasin and simulation period, as further documented below.

7.3.2.1 Simulated Groundwater Elevation Contour Maps

Figure 7-12 and Figure 7-13 show simulated shallow and deep groundwater elevations in September 2015 and in September 2025, at the end of the updated simulation period. Comparison of the simulated groundwater elevations with measured elevation contours indicate that the model reasonably reproduces observed groundwater flow directions and regional groundwater elevation patterns.

As shown on Figure 7-12, simulated groundwater flow directions in 2015 in the shallow and deep aquifers are from northwest-to-southeast across the Subbasin. Hydraulic gradients are steepest along the northwestern portion of the Subbasin and decrease toward the southeastern portion of the valley. Groundwater elevations in the shallow and deep aquifers are consistent with the conceptual understanding of groundwater flow within the Subbasin. Local groundwater mounding associated with recharge operations at the GRFs is evident in the shallow layer.

Figure 7-13 shows simulated groundwater elevations in 2025. The overall groundwater flow pattern is consistent with that observed in 2015, with groundwater flowing from the northwestern part of the Subbasin towards the southeastern boundary with the Salton Sea. Simulated recharge mounding with the WWR-GRF is evident. In the area of the TEL-GRF, water levels have declined as less water has been recharged over the past three years.

The model maintains consistent regional groundwater flow patterns while reproducing localized changes in groundwater elevations associated with recharge facilities, pumping areas, and boundary fluxes. The simulated groundwater elevations contours are consistent with observed groundwater conditions and provide additional confirmation that the model reasonably represents the groundwater flow system throughout the calibration period.

Figure 7-12 Simulated Shallow and Deep Groundwater Elevations, 2015

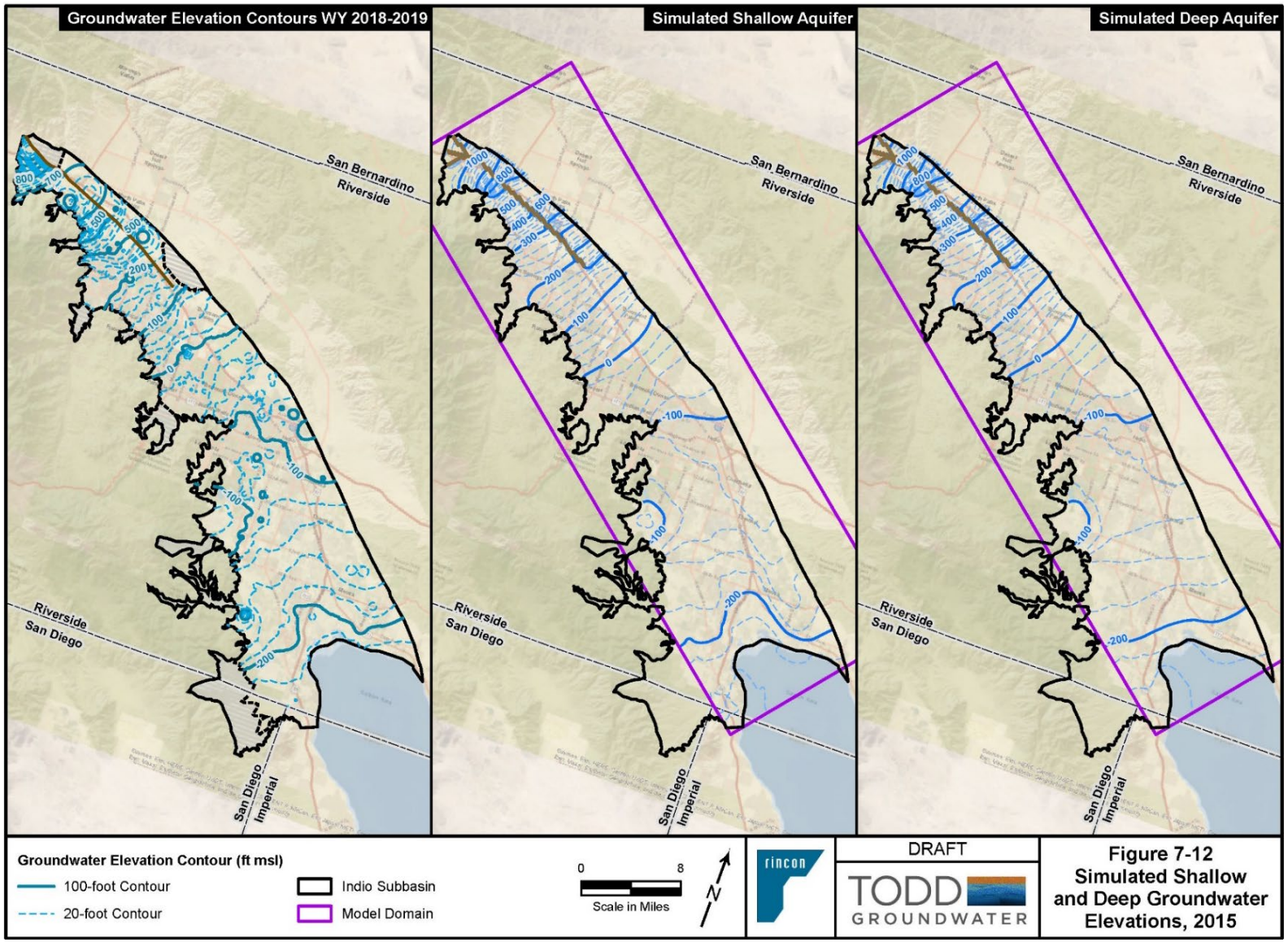
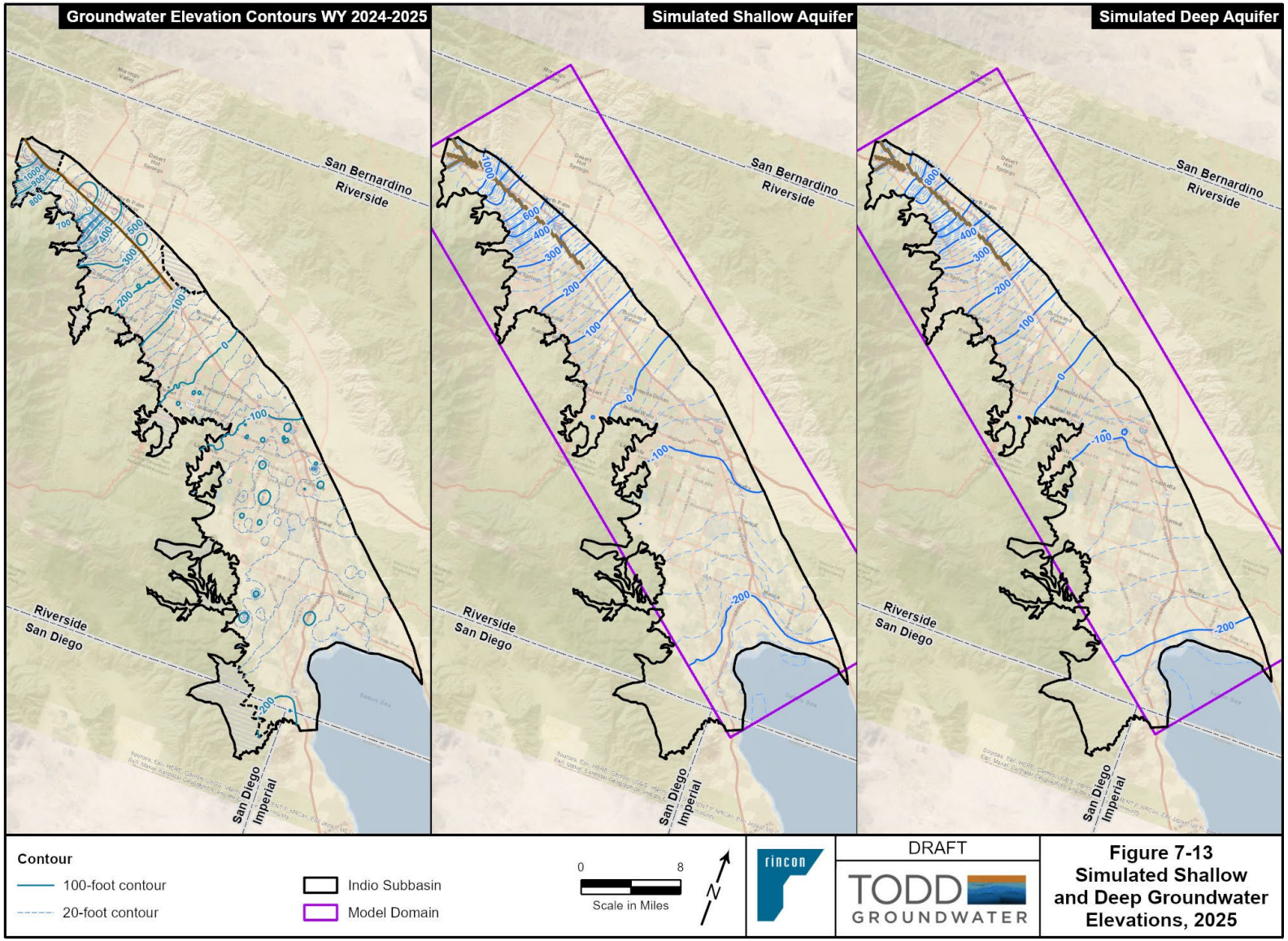


Figure 7-13 Simulated Shallow and Deep Groundwater Elevations, 2025



7.3.2.2 Observed vs. Simulated Hydrographs

Water level data from the 58 monitoring and production wells used for model calibration assessment were plotted on hydrographs and compared with simulated levels. Figure 7-14 shows the locations of the calibration target wells, and full-size hydrographs are in Appendix 7-A. Water level measurements between 2010 and 2025 are available for most of the wells.

Figure 7-15 and Figure 7-16 show the observed and simulated groundwater elevation hydrographs in the West Valley and East Valley, respectively. Observed levels are shown as black points on the graphs, while simulated levels are shown as the orange lines. All hydrographs use a 200-foot elevation range. The simulated water levels are generally very well matched with the observed groundwater trends for all shallow and deep wells across the Indio Subbasin, as described below.

West Valley/Palm Springs Subarea

Figure 7-15 shows wells in the West Valley portion of the model. The newly extended section of the model grid adjacent to the SGP Subbasin boundary includes well 03S03E08M01S, which shows the model responding effectively to the inflows coming from the updated interbasin flows. The five calibration wells in the upper West Valley/Palm Springs Subarea downstream of the WWR-GRF (KW_003, KW_005, KW_007, KW_009, and KW_011) show dynamic fluctuations associated with recharge events at the WWR-GRF, with water level mounding and recovery cycles decreasing in magnitude down the valley. Model-simulated levels in these wells are very closely matched with observed levels, both with respect to peak and valley magnitudes and timing. The mounding and recovery responses are progressively muted further down valley, but observed and simulated levels remain well-calibrated. The large gradients in this area are also evident when comparing groundwater levels in the well near the SGP Subbasin boundary, compared to wells closer to Palm Springs.

West Valley/Garnet Hill Subarea

Two calibration wells are in the Garnet Hill Subarea (KW_001 and KW_002 of Figure 7-15). KW_001 is near the WWR-GRF and shows mounding and recovery in response to WWR-GRF recharge, even though it is on the eastern side of the Garnet Hill Fault and HFB. The model reproduces the rising and declining water levels observed in this well between 1997 and 2019. KW_002 shows more stable levels, and the model is well matched with the trend, although it is noted to be somewhat under-simulating groundwater levels.

Mid-Valley/Thousand Palms to Indian Wells Area

Calibration wells in the Thousand Palms to Indian Wells area include KW_008, KW_012, KW_013, KW_015, KW_016, KW_019, KW_021, and KW_023 (Figure 7-15). Observed levels in these wells exhibit steady increases throughout the simulation period and capture the observed trend of increasing groundwater levels from lows observed around the start of simulation period. Almost all wells in this area exhibit a strong relationship between the observed water levels and the simulated hydrographs, although KW_023 is noted to have some divergence in the simulated values when compared with the observed trend.

Figure 7-14 Shallow and Deep Model Calibration Wells

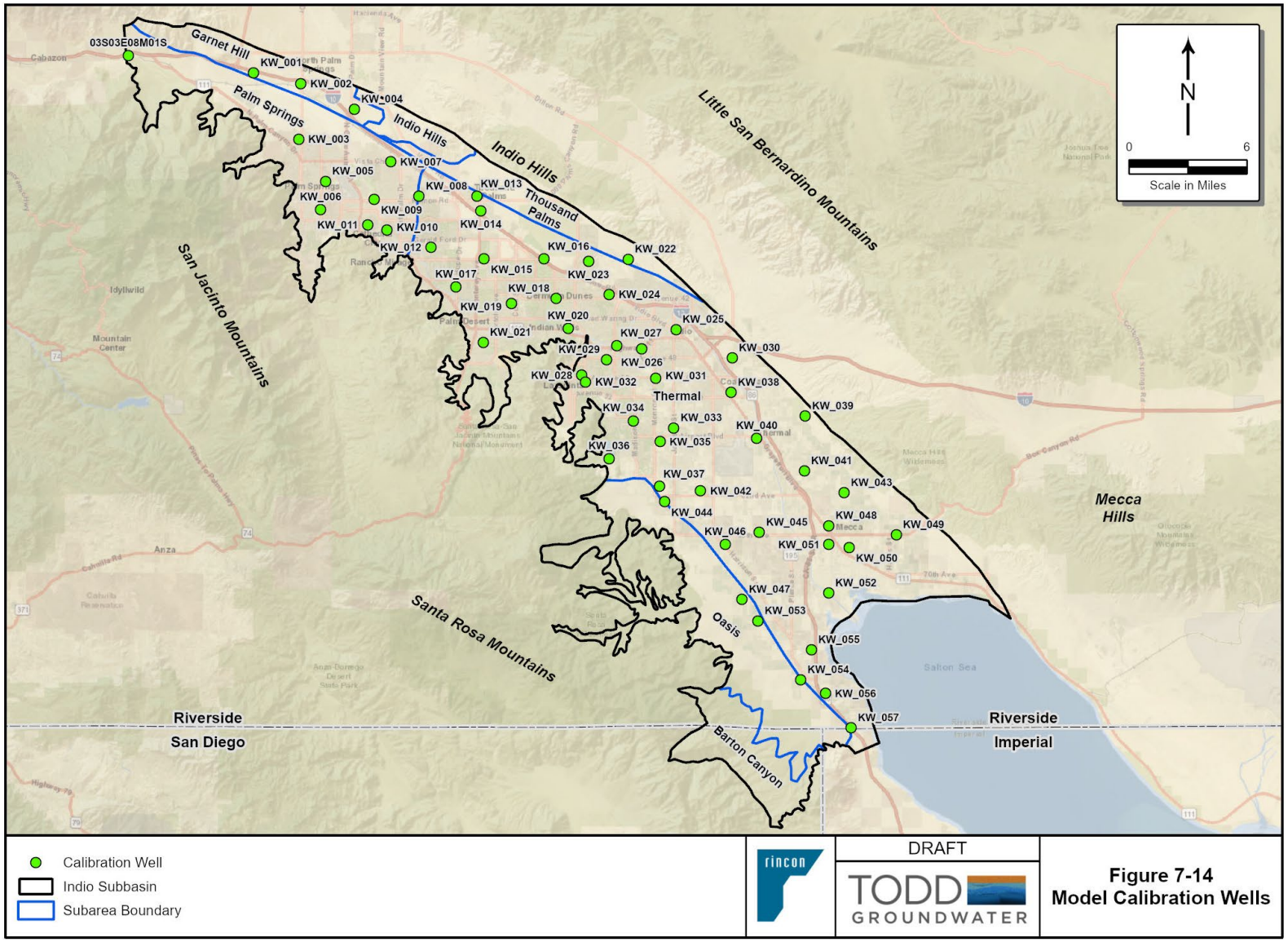


Figure 7-15 Model Calibration Hydrographs, West Valley 2010-2025

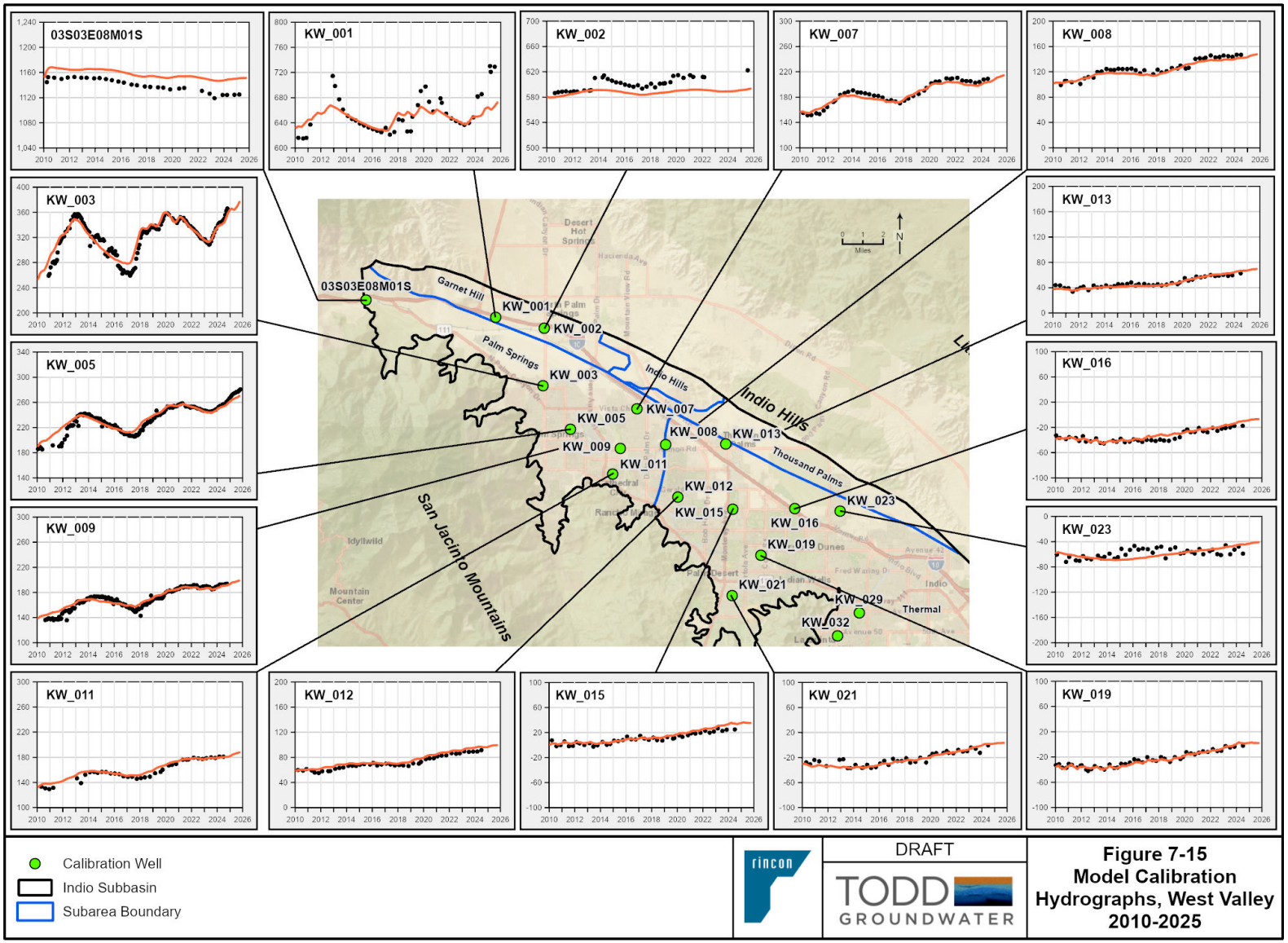
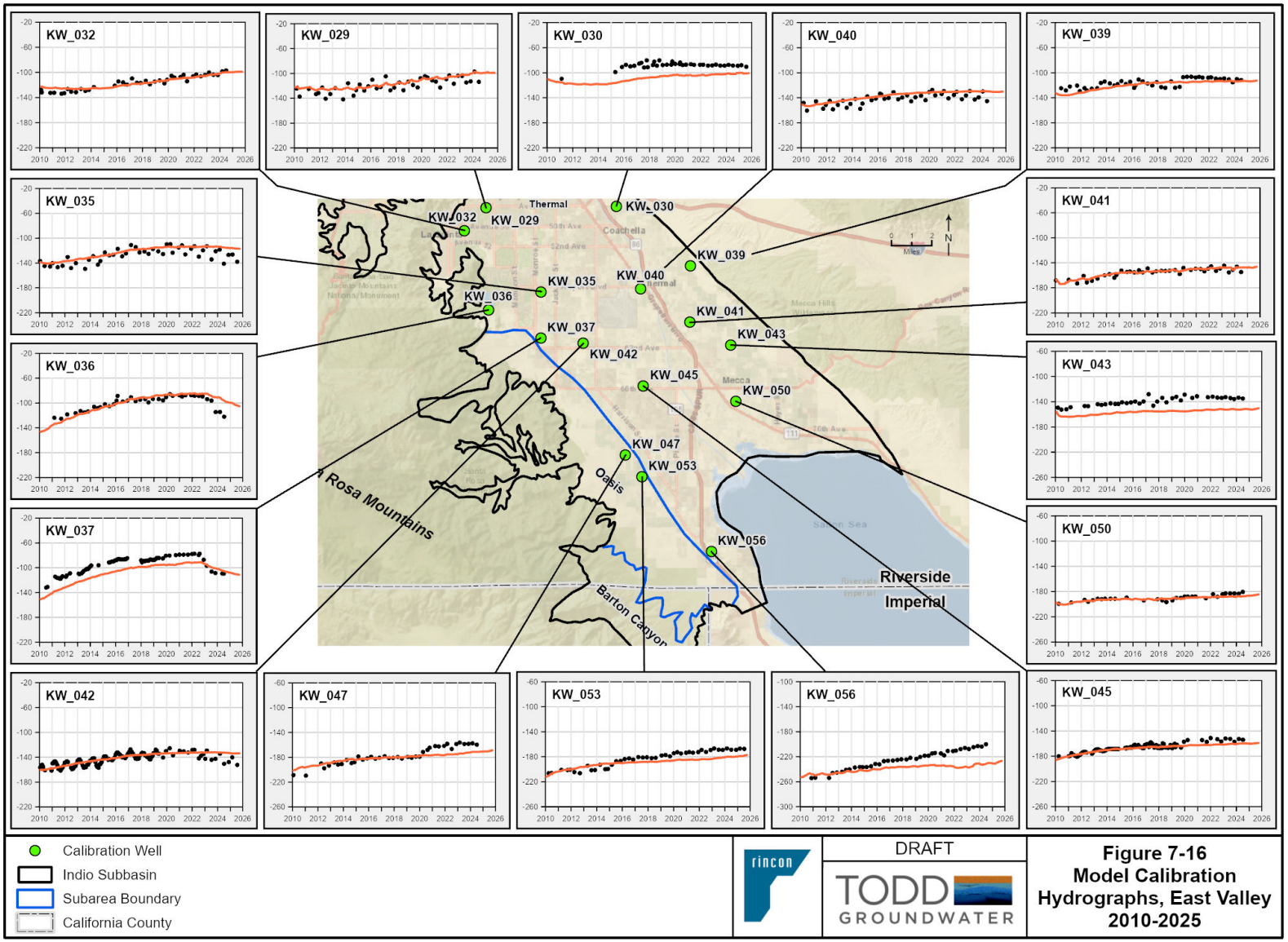


Figure 7-16 Model Calibration Hydrographs, East Valley 2010-2025



East Valley/La Quinta, Coachella, and Thermal Areas

Calibration wells in the La Quinta, Coachella, and Thermal areas include hydrographs KW_029, KW_030, KW_032, KW_039, and KW_040. Figure 7-16). Observed levels in these wells stabilized or increased through the simulation period. The model simulates these trends well, although simulated levels in one well (KW_030) near Coachella are lower than observed near the end of the simulation.

East Valley/TEL-GRF Area

Three calibration wells are in the East Valley near the TEL-GRF (hydrographs KW_035, KW_036, and KW_037 of Figure 7-16). Observed levels in these wells exhibit rapid increases from 2010 to 2022 in response to initiation of TEL-GRF operations. Beginning in late 2022, recharge operations were sharply curtailed due to elevated groundwater levels in the eastern basin, resulting in a rapid decline in observed groundwater levels, particularly in KW_036 and KW_037. The model generally reproduces these trends, including the rise in groundwater levels associated with recharge operations and the subsequent decline following reductions in recharge. However, the model does not fully capture the magnitude of the observed decline in the later simulation period, particularly in KW_036 and KW_037.

East Valley/Mecca, Oasis, and Salton Sea Areas

Eight calibration wells are in the East Valley in the Mecca, Oasis, and Salton Sea areas (hydrographs KW_041, KW_042, KW_043, KW_045, KW_047, KW_050, KW_053, and KW_056 of Figure 7-16). Observed levels in wells on the eastern side of the valley are generally stable to slightly increasing, and the model reproduces these trends reasonably well. Wells in the western to southwestern portion of the area exhibit a more pronounced increasing trend in groundwater levels. The model generally captures these increases; however, simulated groundwater levels are lower than observed in several wells, particularly KW_047, KW_053, and KW_056. This discrepancy is most likely related to the complex interbedding of coarse- and fine-grained sediments in this area, which is simplified in the four-layer model. Overall, the model adequately reproduces the regional groundwater trends in this portion of the Subbasin, although the under-simulation of groundwater levels near the Salton Sea may result in a conservative estimate of groundwater outflow to the Sea.

7.3.3 Drain Flow Comparison Results

As an independent model check, estimated agricultural drain flow rates were compared with model-simulated drain flows, as shown on Figure 7-17. Measured drain flows reflect a combination of processes, including agricultural return flows, rootzone dewatering, stormwater runoff, wastewater return flows, fish farm return flows, and groundwater discharge. MODFLOW drain package simulates only groundwater discharge that occurs when the saturated aquifer water levels rise above the conceptualized drain elevation. Drain elevations were represented using an average drain depth of approximately 7 feet below ground surface, consistent with the CVWD Drain Flow Study (Todd, 2023).

Figure 7-17 shows that simulated drain flows do not exactly match measured flows but generally reproduce the long-term increase in drain discharge associated with rising groundwater levels. Differences are expected due to components of drain flow that are not directly simulated. The difference between simulated and observed drain flow occurs when groundwater elevations were at their all-time low, around 2010. Flow into the drains at this time may have been from water in the

vadose zone or other source water rather than the saturated aquifer. The results indicate that the model reasonably captures groundwater discharge trends to the drain network.

7.4 Water Budget

7.4.1 2010-2025 Water Budget

Figure 7-18 shows the transient simulated water budget for all components in the model from 2010 to 2025. The water budget components include specified recharge, pumping, and subsurface inflows from the SGP and the Mission Creek Subbasins, along with model-computed flows to ET, drains, and subsurface flow to and from the Salton Sea.

Throughout the simulation, recharge remained the dominant inflow component, ranging from approximately 225,000 to 525,000 AFY. Groundwater production was the largest outflow component, ranging from approximately 290,000 to 330,000 AFY. Annual inflows exceeded outflows in most years, resulting in positive changes to groundwater in storage. Annual changes in storage were positive for most years of the simulation period (indicated by the black storage line being above zero), with brief declines observed in drier periods in 2013-2015 and 2022. As a result, cumulative groundwater storage increased substantially over the 2010-2025 period. This overall increase in storage is consistent with the stabilization and recovery of groundwater levels observed throughout much of the Indio Subbasin, reflecting long term effects of managed recharge and reduced groundwater production.

7.4.1.1 Evapotranspiration

Transient ET is simulated in the model from 2010 to 2025. The ET rates are relatively uniform over this period, ranging from 3,000 to 4,800 AFY. As discussed in Section 7.2.6.3, this only includes ET losses from shallow groundwater and other ET losses are calculated separately. ET loss from shallow groundwater is mainly in the perched aquifer area in the East Valley.

7.4.1.2 Salton Sea

Figure 7-19 shows the transient simulated flow between the shallow aquifer and Salton Sea from 2010 to 2025. Both groundwater outflow to the Sea and inflow from the Sea are simulated, depending on location, time period, and hydraulic gradients between the shallow aquifer and sea, as illustrated on Figure 7-19. Note the simulated flows are for the northern portion of the Sea included in the model domain, and do not include any inflows or outflows in the southern portion of the Sea beyond the Indio Subbasin.

The model indicates substantial reduction in inflow from the Salton Sea over the simulation period, decreasing from approximately 3,500 AFY in 2010 to less than 100 AFY from 2022 on. At the same time, outflow to the Salton Sea increased from approximately 300 AFY to nearly 1,700 AFY. As a result, net groundwater exchange shifted from an inflow to the basin, to an outflow (groundwater sink) around 2019. The simulated reversal in net flow is consistent with declining Salton Sea elevations and increasing groundwater levels observed in shoreline areas during the model update period. Calibration results indicate generally good agreement between simulated and observed groundwater levels near the Salton Sea; however, several wells within the southeastern portion of the model domain show the model underestimating observed groundwater level increases. Consequently, the simulated groundwater discharge to the Salton Sea may be conservative and actual groundwater outflow may be greater than shown by the model. Nevertheless, the results

indicate that hydraulic gradients along much of the shoreline increasingly favor groundwater flow toward the Salton Sea, reducing the potential for saline water migration from the Sea into the groundwater basin.

7.4.1.3 Change in Groundwater Storage

Accumulation of the simulated inflows and outflows results in changes in groundwater storage. Figure 7-20 shows the annual model-predicted changes in storage between 2010 and 2025. Positive annual changes in storage occur during most years of the simulation period, with the largest gains occurring in 2011, 2017-2019, and 2024-2025. Declines in storage occurred during drier periods from 2013-2015 and in 2022.

The model-predicted changes in storage can be compared with the empirical water budget described in Chapter 4, *Current and Historical Groundwater Conditions.* The model uses changes in simulated heads between years at each of the model cells, multiplied by a specific yield value, while the empirical method uses a water balance approach accounting for all inflows and outflows. Regardless, both methods to estimate annual changes in storage yield similar results and are largely in agreement as to periods of increasing or decreasing storage, with both indicating a substantial gain in groundwater storage during the 2010-2025 period.

As documented in Section 7.3, Model Update Process and Results, the model generally reproduces observed groundwater-level trends throughout the Indio Subbasin and provides a reasonable representation of changes in groundwater storage over the simulation period.



Production wells are located throughout the Subbasin.

Figure 7-17 Simulated vs. Measured Drain Flows, 2010-2025

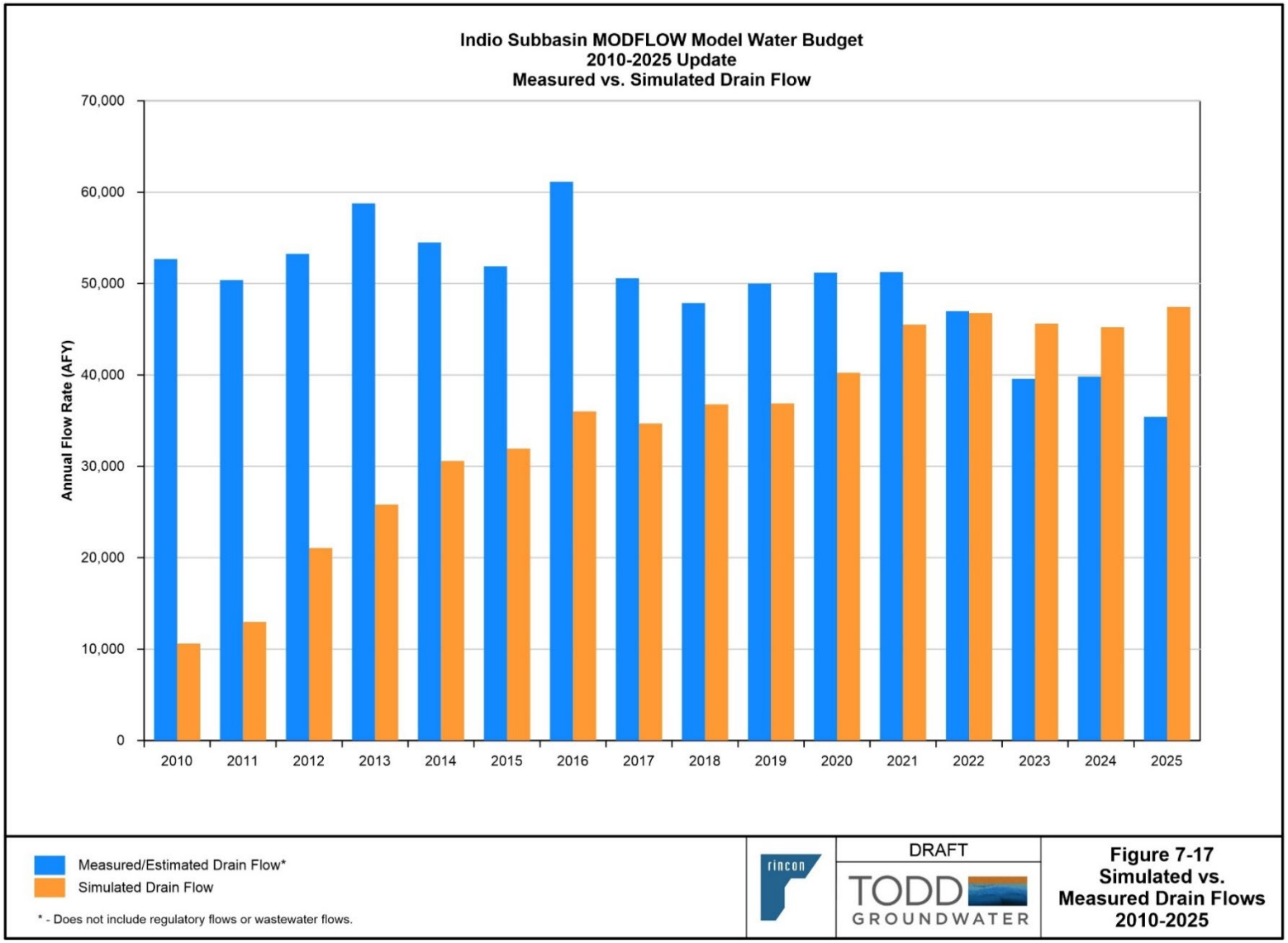


Figure 7-18 Annual Model Water Budget, 2010-2025

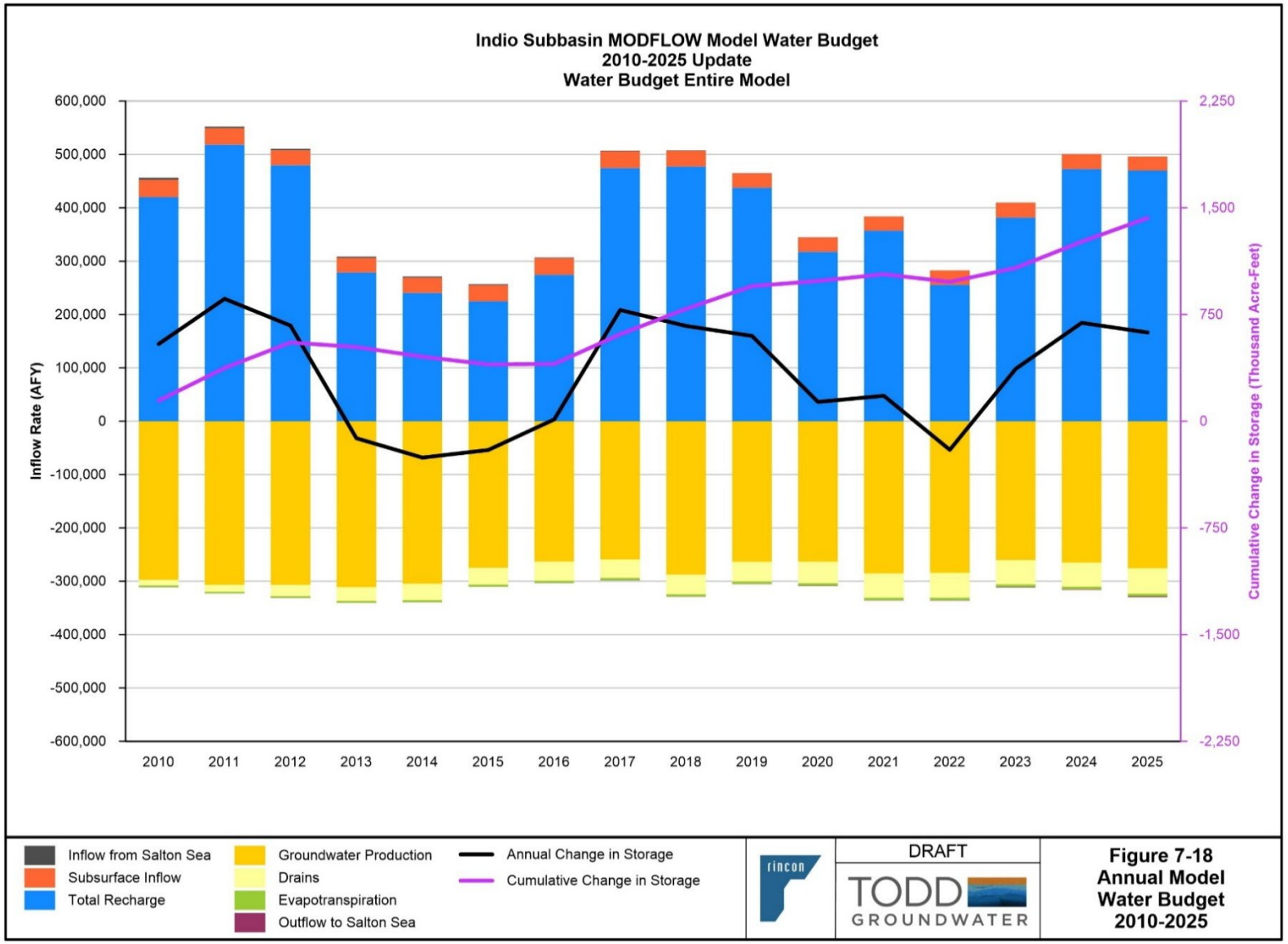


Figure 7-19 Simulated Salton Sea Inflows and Outflows, 2010-2025

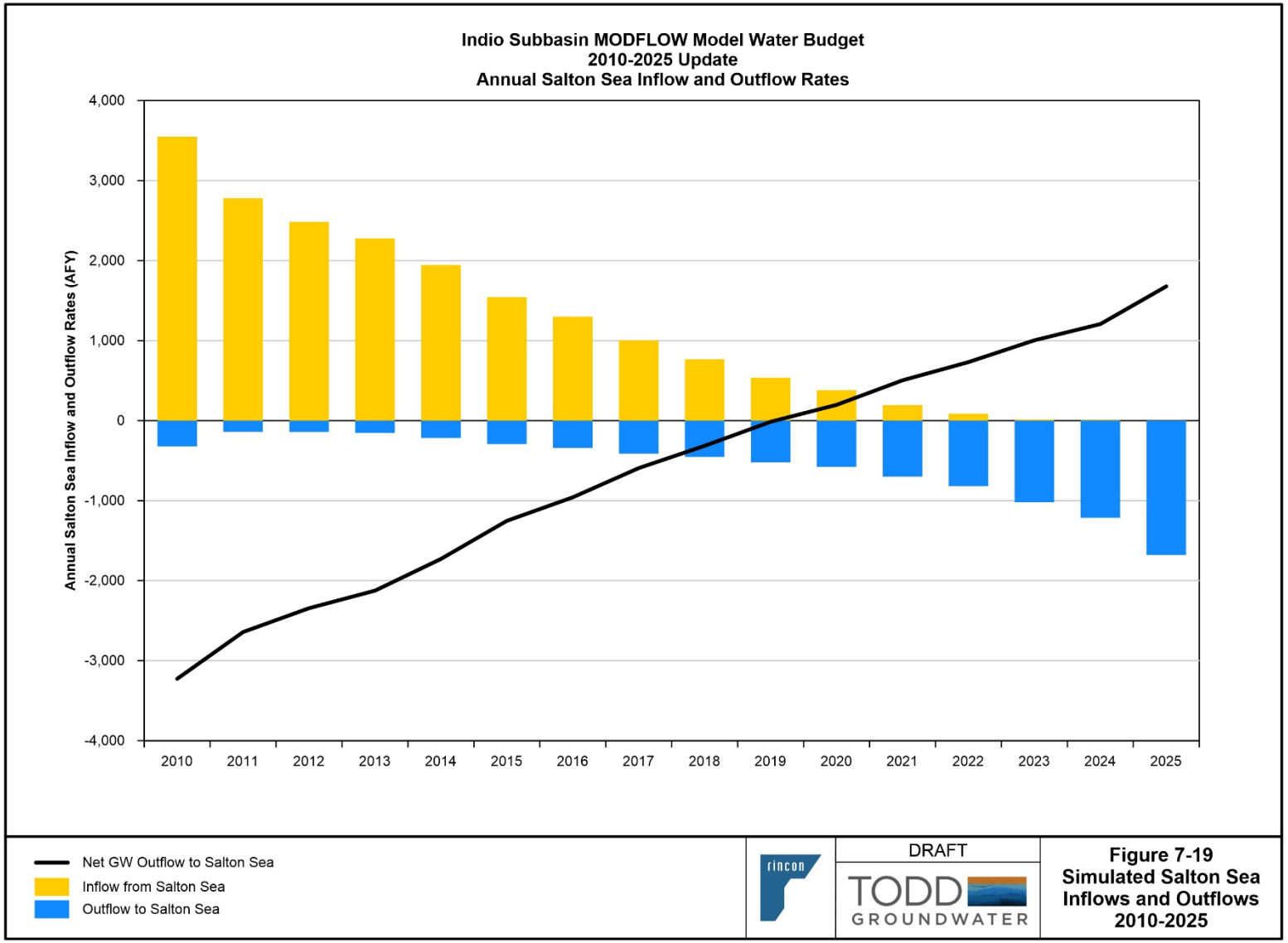
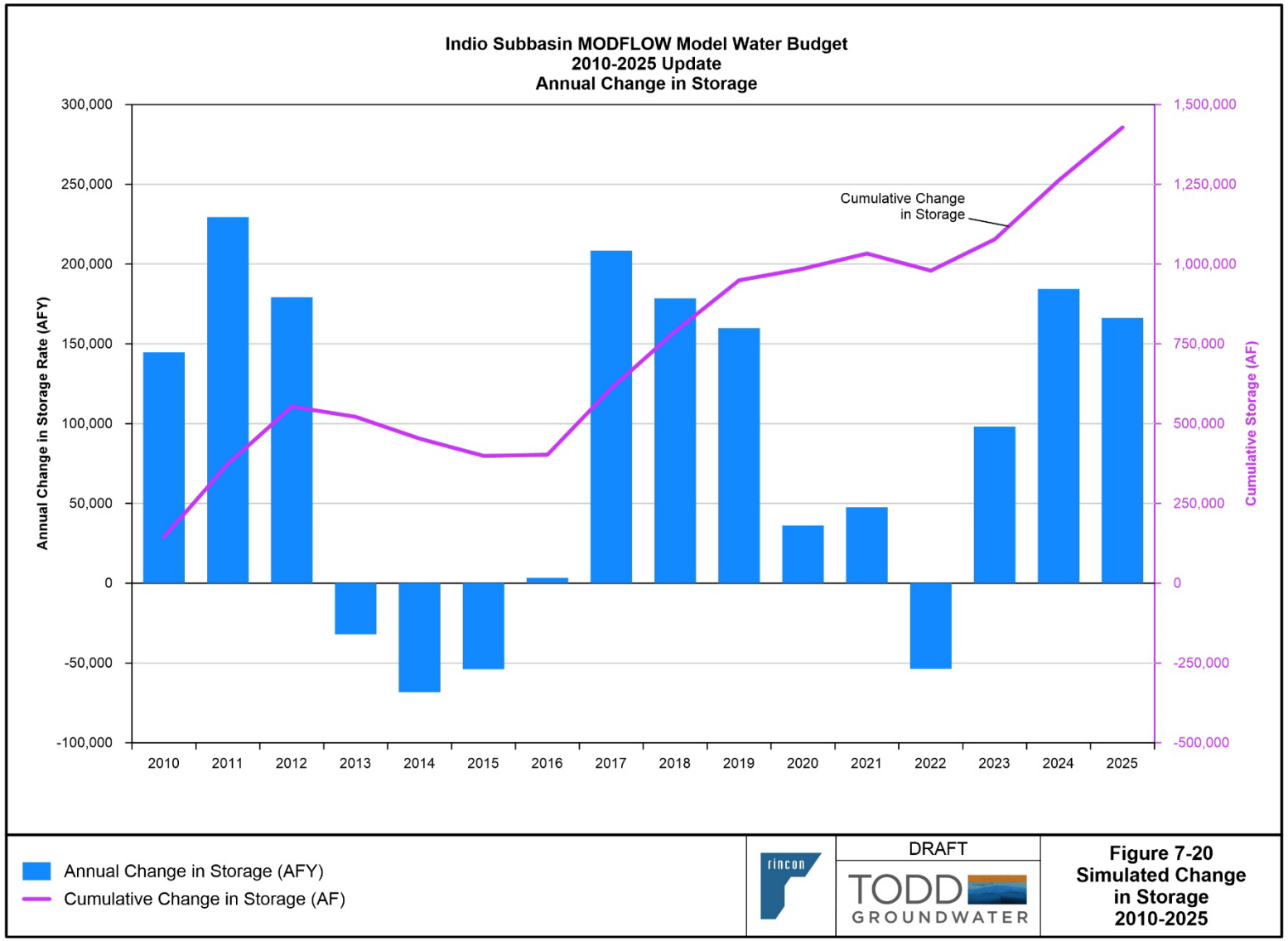


Figure 7-20 Simulated Change in Storage, 2010-2025



7.5 Plan Scenarios

Six future conditions scenarios were developed for the *2027 Alternative Plan Update*. These include Baseline scenarios, Near-Term Projects scenarios, and Future Projects scenarios that address potential changes in implementation of water management projects such as source substitution and new water supply projects. Climate change conditions were assumed for all Plan scenarios as described in Section 7.5.1, consistent with the Indio GSAs' commitment to achieving sustainability under changing climate conditions.

Each scenario was simulated over a 50-year period consistent with SGMA requirements, covering a simulation period from WY 2026 to 2075. However, the demand and supply assumptions were only projected for the first 25 years through the 2050 planning horizon. Thereafter, growth and supply assumptions were assumed to continue at the same rate for the remainder of the simulation. While extending beyond foreseeable land use and water resource planning projections, projections through 2075 allow long-term evaluation of water supply and demand conditions, effectively testing Indio Subbasin sustainability under long-term hydrologic variability over 50 years.

The following scenarios are described in this chapter:

1. **Baseline with Moderate Climate Change:** No new supply or management projects, along with assumptions of the impact of moderate climate change on local hydrology and imported water supplies (climate change hydrology). This scenario is described for comparison purposes only and will never happen, because new projects and management actions (PMAs) are in the process of being implemented. However, a baseline is useful to assess the other scenarios.
2. **Baseline with Severe Climate Change**: No new supply or management projects, along with assumptions of the impact of severe climate change on climate change hydrology. As with the Baseline under Moderate Climate Change Conditions scenario, this scenario is described for comparison purposes only and is unlikely to occur as simulated but is useful to assess the other scenarios.
3. **Near-Term with Moderate Climate Change**: Baseline conditions plus new supplies and PMAs included in the Indio GSAs' 5-year capital improvement plans (CIPs), along with potential moderate climate change hydrology.
4. **Near-Term with Severe Climate Change Conditions**: Baseline conditions plus new supplies and PMAs included in the GSAs' 5-year CIPs, along with potential severe climate change hydrology.
5. **Future Projects with Moderate Climate Change:** Near-Term conditions plus implementation of additional supplies and PMAs that are projected to be completed in the 25-year planning horizon, along with potential moderate climate change hydrology.
6. **Future Projects with Severe Climate Change:** Near-Term conditions plus implementation of additional supplies and PMAs that are projected to be completed in the 25-year planning horizon, along with potential severe climate change hydrology.

7.5.1 Climate Change Conditions

Future climate conditions were evaluated using the USGS Basin Characterization Model (BCM), which simulates watershed hydrologic response to projected changes in precipitation and temperature under several Representative Concentration Pathway (RCP) climate scenarios. For this *2027 Alternative Plan Update*, two RCPs were used to capture a range of potential future hydrologic conditions:

- ***RCP 4.5****: Moderate Climate Change Conditions*
- ***RCP 8.5****: Severe Climate Change Conditions*

RCP 4.5 and RCP 8.5 represent two of several emissions trajectories developed for use in global climate modeling and are not intended to represent the full range of plausible future outcomes with equal likelihood. Recent literature evaluating observed emissions trends, energy sector developments, and climate policy implementation suggests that RCP 8.5 represents a high-end emissions trajectory that has become increasingly unlikely, while RCP 4.5 may understate emissions reductions needed to be considered a central-tendency outcome (Hausfather and Peters, 2020). The IPCC's Sixth Assessment Report does not assign likelihoods to individual emissions scenarios, treating each as a plausible prescribed future for climate response modeling (IPCC, 2021). For purposes of this Plan, RCP 4.5 and RCP 8.5 are used to bound a reasonable range of future hydrologic conditions for planning purposes, with actual future conditions expected to fall somewhere between these two scenarios.

7.5.1.1 Surface Water Runoff

BCM outputs were used to generate synthetic monthly runoff datasets under both RCP scenarios spanning water years 1936 through 2099. Because BCM produces distributed runoff at the grid-cell level without routing flows through stream channels, raw model outputs were not directly representative of measured streamflow. Therefore, BCM runoff was calibrated against observed discharge to establish baseline discharge conditions consistent with measured hydrology within the region. The resulting dataset represents a synthetic but calibrated time series of local watershed runoff. Additionally, because the calibration is based on measured streamflow, the resulting discharge conditions reflect existing surface water diversions and represent net streamflow available for recharge and downstream uses.

To apply these climate-based runoff projections to the 24 watersheds represented in the Indio Subbasin groundwater model, monthly scaling factors were developed. The resulting discharge values are used directly to develop stream recharge and mountain front recharge time series for each watershed under each climate scenario and incorporated into the groundwater model to simulate future climate conditions.

7.5.1.2 State Water Project Delivery Variability

The impacts of the RCP scenarios on State Water Project (SWP) delivery variability were developed using empirical relationships between Feather River watershed (source waters for the SWP) hydrologic conditions and historical Table A allocations. Observed water year precipitation (treated as rainfall) and April 1 snowpack water equivalent data within the Lake Oroville watershed were correlated with final SWP Table A allocations for water years 2008 through 2025, excluding years affected by Oroville Dam spillway operations. Linear regression relationships were developed to relate hydrologic indicators to allocation percentages, incorporating antecedent conditions where applicable to improve fit.

The empirically derived relationships were then applied to BCM-simulated precipitation outputs under RCP 4.5 (moderate) and RCP 8.5 (severe) scenarios to generate time series of Table A allocation percentages. For the moderate scenario, these allocation estimates were normalized to the observed historical period to account for differences between modeled and observed hydrologic data and to ensure consistency with recent system performance. For the severe scenario, the model generated allocations were used directly as they represented a reduced system performance.

This *2027 Alternative Plan Update* used the allocation estimates to simulate annual changes in SWP deliveries due to climate change conditions as follows:

1. **Moderate Climate Change (RCP 4.5)** – In order to model moderate climate change conditions, an annual variability factor was developed using the RCP 4.5 normalized allocation percentages and applied to an estimated baseline SWP supply. The annual variability factor was developed by dividing each year's normalized allocation percentage by the long-term average allocation percentage over the modeling horizon (2026-2075). The baseline SWP supply was defined using the delivery reliability estimates derived from DWR's *2025 SWP Draft Delivery Capability Report* (DWR, 2025), which expresses system performance using levels of concern (LOC), where higher LOC percentages correspond to more conservative assumptions about system conditions and therefore lower expected deliveries. This *2027 Alternative Plan Update* applies the 95th percentile LOC scenario (which assumes a reliability of 43 percent) into the total SWP supplies available to CVWD and DWA to calculate SWP deliveries under the moderate climate change conditions.
2. **Severe Climate Change (RCP 8.5)** – In order to model severe climate change conditions, an annual variability factor was developed based on the RCP 8.5 raw allocation percentages from the BCM projections. The variability factor was then applied to the total SWP supplies available to CVWD and DWA to calculate annual SWP deliveries. The average raw allocation (reliability) percentage based on RCP 8.5 is 39 percent.

7.6 Predictive Model Inputs

The calibrated Indio Subbasin model described in Sections 7.2 through 7.4 was extended to simulate future groundwater conditions under each of the six Plan scenarios described in Section 7.5. This section describes the model configuration and the methodologies used to develop future model inputs that are common to all scenarios. Scenario specific supply, demand, project assumptions, and model results are described individually in the scenario sections that follow.

7.6.1 Predictive Model Configuration

The predictive models simulate a future 50-year period from WY 2026 to 2075 (October 2025 through September 2075), immediately following the end of the historical model simulation period. The predictive models retain the same framework as the historical model, including model code, input packages, grid, layering, aquifer properties, and horizontal flow barriers. Temporal discretization is quarterly stress periods with three monthly timesteps per stress period, allowing for reporting of model results on either a calendar year or water year basis.

Initial groundwater elevations were set to the simulated groundwater elevations at the end of the calibrated historical model simulation. The Salton Sea is simulated as a time-varying GHB, using elevations based on the Salton Sea Accounting Model (SSAM). Figure 7-21 shows the SSAM projected sea levels used in the predictive models. Drain locations and elevations and evapotranspiration zones are unchanged from the historical model for all future scenarios. Future simulated groundwater levels are reported for the Key Well monitoring network used to calibrate the historical model.

7.6.2 Inflows

The predictive models utilize the same sources of inflows as the historical model, including subsurface inflow from adjacent groundwater basins, mountain front and stream channel recharge, artificial recharge of imported water, wastewater percolation, and irrigation return flows. The methods used to estimate each of these components are described below.

7.6.2.1 Subsurface Inflows

Future subsurface inflow from the SGP, Mission Creek, and Desert Hot Springs Subbasins is represented from corresponding future scenario simulations of the SGP Subbasin groundwater model (INTERA, 2026) and the Mission Creek Subbasin groundwater model (WSP, 2026), consistent with the Plan scenarios evaluated for the Indio Subbasin.

7.6.2.2 Surface Water Inflows

Future mountain front recharge and stream channel percolation are estimated using BCM-derived runoff projections for the Indio watersheds under the moderate climate change and severe climate change scenarios. Stream routing, assumptions on the mountain front recharge component, and spatial coverage of the watersheds and recharge cells are the same as the historical model.

7.6.2.3 Groundwater Replenishment

Future replenishment volumes at the WWR-GRF, TEL-GRF, and PD-GRF are modeled based on the availability of imported water supplies determined in each of the scenarios. Evaporative loss assumptions are the same as those used in the historical model calibration. A detailed description of scenario specific replenishment volumes is presented in each scenario section below.

7.6.2.4 Wastewater Percolation

Future wastewater percolation is based on total municipal water use and estimated percentages that become wastewater. Some of the treated wastewater is utilized as recycled water to meet irrigation demands, while the remaining portion is either percolated in ponds or discharged to the CVSC. Assumptions for recycled water deliveries and percolated wastewater are detailed in the scenario sections below.

7.6.2.5 Applied Water Return Flows

Future agricultural, golf course, and municipal return flows are calculated as a portion of applied water for each land use type. The predictive models use the same values for municipal (24 percent) and golf course (35 percent) return flows. For agricultural return flow, a reduced factor of 20 percent of applied water was applied for the predictive simulations, compared to the 30 percent factor developed through historical model calibration. The groundwater model represents deep percolation as a fixed percentage of applied water and does not explicitly simulate future changes in crop ET; potential increases in ET associated with rising temperatures over the planning period are therefore not directly captured by the model. Agricultural operations are expected to become more efficient over time, including in response to increasing crop water demand, further reducing the fraction of applied water available for deep percolation. While these efficiency gains are unlikely to occur immediately following the end of the historical simulation period, applying a single, reduced return flow factor across the full predictive period was determined to be a reasonably conservative

approach, avoiding an overstatement of future groundwater recharge attributable to agricultural return flow.

7.6.3 Outflows

For each Plan scenario, groundwater production is the only outflow directly prescribed as a model input. Drain flow, evapotranspiration, and groundwater flow to and from the Salton Sea are computed by the model as a function of simulated groundwater levels.

7.6.3.1 Groundwater Production

Future groundwater production is based on forecasted municipal, golf, agricultural, and other demands through the planning horizon. Future production is distributed to the set of production wells known to have been active during WY 2021 to 2025, based on available metered and reported pumping data. Each active well was mapped to its corresponding demand unit and assigned a fixed share of that demand unit's future groundwater production equal to the well's percentage of known historical pumping within the demand unit over the WY 2021 to 2025 period. Any portion of a demand unit's projected future demand not met through direct delivery of imported or recycled water under a given scenario's water management projects is assumed to be met by groundwater production. Scenario-specific pumping volumes and source substitution assumptions are described in each scenario section below.

7.7 Baseline Models

The Baseline models simulate anticipated future land use and water demand changes and no changes to current supply conditions. Two scenarios are simulated – moderate climate change and severe climate change. Figure 7-22 provides a flow chart that illustrates the water balance (inflows and outflows) of the Baseline models, as well as the water supplies used to meet demands.

The Baseline models assume that passive conservation savings, surface water diversions, recycled water deliveries, and GRF operations will continue at current levels.

Figure 7-21 Salton Sea Estimated Future Elevations

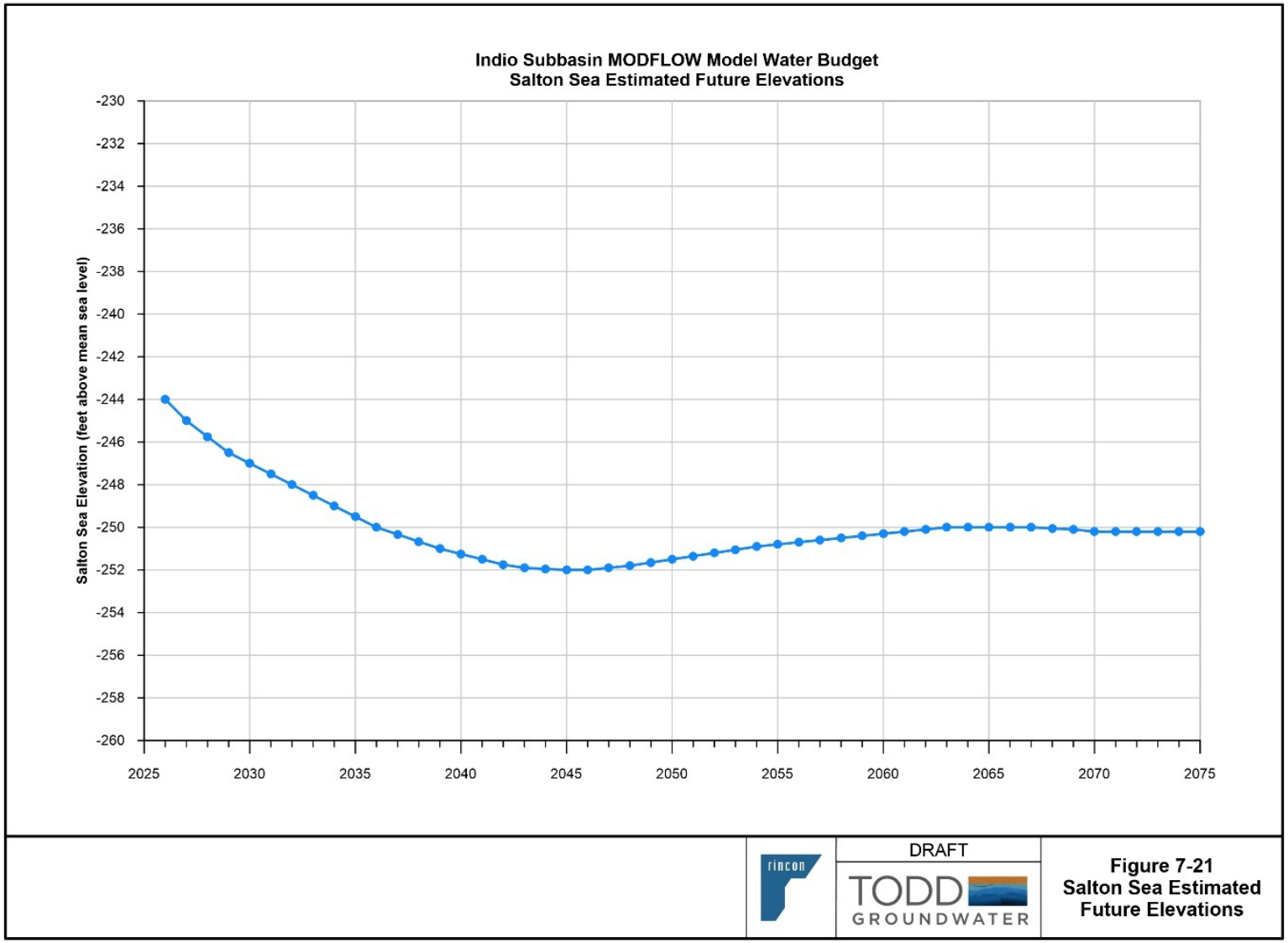
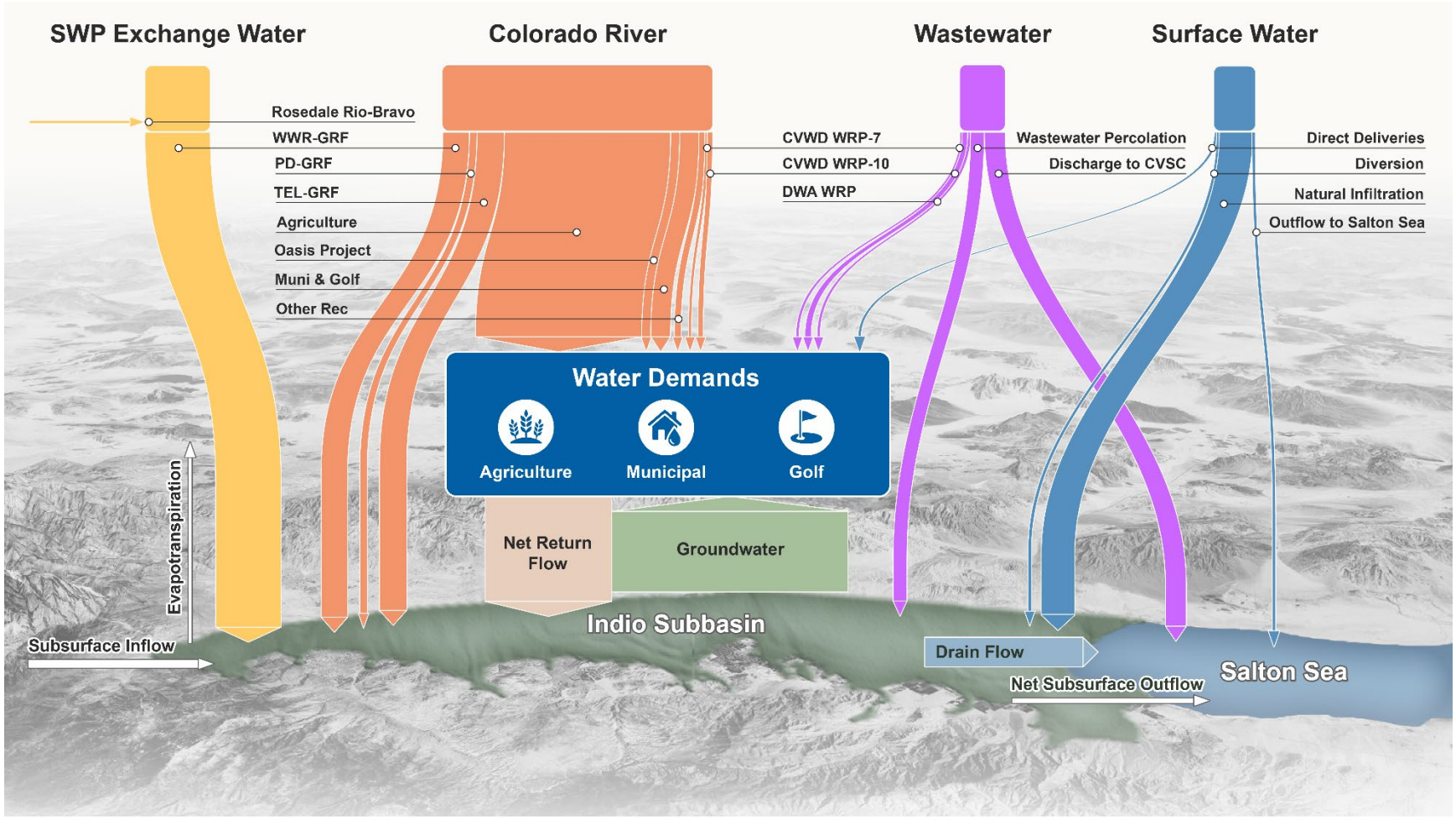


Figure 7-22 Baseline Models Supply and Demand Flow Chart



7.7.1 Baseline with Moderate Climate Change

The Baseline with Moderate Climate Change scenario includes only those supplies and facilities currently in place to support Subbasin management and assumes that no new projects or water supplies will be implemented. Baseline with Moderate Climate Change propagates current management practices into the future under assumptions of moderate climate conditions (RCP 4.5) and associated supply impacts. While new projects are already being implemented, the Baseline scenarios propagate current conditions into the future to use as a basis for comparing 'with and without' project conditions.

7.7.1.1 Demand and Supply

Table 7-2 provides a summary of modeled water supplies in the Baseline with Moderate Climate Change scenario used to directly meet demand and for replenishment. Forecasted demand for municipal, agricultural, golf course, and other users as described in Chapter 5, *Demand Projections*, along with a 10 percent buffer applied to municipal water use to ensure adequacy of supply, was applied across all six scenarios. Other model inflows and outflows (septic system flows, return flows, subsurface inflow and outflow, drain flows, ET, and watershed runoff) including groundwater pumping are discussed in Section 7.6. A summary of the assumptions for each supply source is provided below.

Table 7-2 Modeled Deliveries - Baseline with Moderate Climate Change Scenario

Supply (Acre-Feet)	2025	2030	2035	2040	2045	2050
Modeled Deliveries for Direct Use (AFY)						
Groundwater[a]	291,788	297,955	304,353	310,120	316,314	318,960
Colorado River[b]	285,841	282,794	279,243	275,691	272,140	272,140
Recycled Water	10,066	10,066	10,066	10,066	10,066	10,066
Total Direct Use Supplies	**587,695**	**590,814**	**593,661**	**595,877**	**598,519**	**601,166**
Modeled Deliveries for Replenishment (AFY)						
Colorado River[c]	61,400	82,000	82,000	82,000	82,000	82,000
SWP Exchange[d]	83,463	83,463	83,463	83,463	83,463	83,463
Other: Rosedale Rio-Bravo	0	13,050	13,050	0	0	0
Surface Water Diversions[e]	3,671	3,671	3,671	3,671	3,671	3,671
Total Replenishment	**148,534**	**182,184**	**182,184**	**169,134**	**169,134**	**169,134**

[a] Groundwater inflows and outflows (septic systems, return flows, subsurface inflow and outflow, drain flows, ET, watershed runoff) are described in Section 7.6.

[b] Colorado River deliveries for direct use decrease over time due to conversion of agriculture that receives Canal deliveries to municipal uses.

[c] Colorado River volumes assume that 20,000 AFY MWD-SWP transfer to WWR-GRF (MWD keeps 5,000 AFY of the amount) ends in 2027.

[d] SWP Exchange volumes assume an overall reliability of 43 percent. Actual volumes fluctuate annually based on climate variability. ADA adjustments are not included in this average annual reliability estimate.

[e] Surface water diversion estimates shown are annual averages. Actual volumes fluctuate annually based on climate variability. Diversions include a small fraction of direct deliveries; for simplicity, all diversion volumes are assumed herein to be directed to WWR-GRF for recovery.

Local Inflows and Outflows: As illustrated in Figure 7-22, inflows to groundwater include subsurface inflow, mountain front recharge, surface water runoff that is diverted for replenishment or percolates along the mountain front or in local channels (minus losses to the Salton Sea), wastewater percolation, and return flows from use (which include septic system percolation). Total surface water runoff from local watersheds is estimated based on the BCM model for RCP 4.5. Runoff inflows are assumed to vary monthly, with estimated natural infiltration of watershed runoff (minus diversions and outflows to the Salton Sea) amounting to an annual average of 33,000 AFY for the 50-year hydrologic period. Wastewater percolation serves as an inflow to the Subbasin and occurs at five wastewater treatment facility sites (Palm Springs WWTP, CVWD WRP-2, WRP-7, and WRP-10, and MSWD Regional WRF). Wastewater percolation is assumed to provide an average Subbasin inflow of 16,000 AFY over the 50-year simulation period. Return flows from municipal, agricultural, and golf course demands are based on estimates of outdoor water use, as described in Section 7.2.5.

Outflows from the Indio Subbasin include drain flow, evapotranspiration, and subsurface outflow. Subsurface inflow, drain flow, evapotranspiration, and subsurface outflow are derived from the MODFLOW model as described in Section 7.2.5 above.

As shown in Table 7-2, local supplies used for replenishment include surface water diversions. Local surface water diversion rights for DWA are up to 6,000 AFY, but maximum diversions vary annually based on hydrologic conditions and available surface water flow. Diversions in the Baseline with Moderate Climate Change scenario average 3,671 AFY and range from 18 AFY to 5,799 AFY within the 50-year period. Some of the diverted surface water is directly served to customers as water supply, with a majority diverted to WWR-GRF subsurface storage and then recovered for delivery.

Colorado River: Colorado River water supplies available for the Baseline with Moderate Climate Change scenario include CVWD's base entitlement under the 2003 Quantification Settlement Agreement (QSA) (see Chapter 6, *Water Supply*), along with transfers where there are agreements in place. CVWD's net QSA supply increased to 424,000 AFY in 2026 and will remain at that level until 2047, then decrease to 421,000 AFY. This increase will allow the CVWD to fully utilize available Colorado River water at its maximum entitlement. While the current QSA agreement will terminate in 2077 (Secretary of the Interior, 2003), this *2027 Alternative Plan Update* assumes the agreement will be renegotiated and extends QSA deliveries (minus the voluntary reductions currently in place) through the full model period. The Colorado River supplies used in Baseline with Moderate Climate Change include a 35,000 AFY transfer of QSA water from Metropolitan Water District of Southern California (MWD) delivered to WWR-GRF. The Baseline scenarios also assume annual Canal conveyance losses of 5 percent.

Colorado River supplies are assumed to be used for replenishment and direct use, as follows:

- Colorado River replenishment:
  - WWR-GRF: Recharge of 35,000 AFY of MWD-QSA transfer through the modeling horizon, with an additional 15,000 AFY of MWD-SWP transfer through 2026
  - TEL-GRF: Recharge limited to existing capacity of 37,000 AFY. Annual recharge of 1,400 AFY was assumed for WY 2025 and WY 2026 due to voluntary reductions in Colorado River water use. Recharge at the existing capacity of 37,000 AFY was assumed for WY 2027 through the remainder of the modeling horizon.
  - PD-GRF: Recharge limited to Phase I capacity of 10,000 AFY

- Colorado River direct deliveries:
  - Current agricultural users: Demand reduced from 2025 to 2045 due to urban conversion
  - Oasis Distribution System: Deliveries limited to Phase I capacity of 12,000 AFY
  - Existing deliveries to MVP and East Valley golf courses, other recreation, and WRP-7 and WRP-10 direct users

SWP Exchange: SWP exchange supplies modeled in the Baseline with Moderate Climate Change scenario are varied annually as described in Section 7.5.1.2. Final SWP allocations between 2006 and 2025 have ranged from a high of 100 percent in 2006 and 2023 to a low of five (5) percent during critically dry years in 2014, 2021, and 2022. Baseline with Moderate Climate Change applies DWR's 95th percentile LOC delivery reliability of 43 percent, along with annual variability factors associated with the RCP 4.5 climate scenario to SWP exchange deliveries through the 2075 modeling horizon. Additional SWP exchange water is available through Yuba Accord deliveries (see Chapter 6, *Water Supply*).

SWP exchange water is used for replenishment at WWR-GRF and MC-GRF, and the split of water between these replenishment facilities is based on proportional assessable groundwater production between the Mission Creek Subbasin Management Area and the West Whitewater River Subbasin Management Area. The projected allotment of SWP exchange water to the two management areas was calculated to increase from the current split to an approximate 10 percent/90 percent split between MC-GRF and WWR- GRF by 2050 due to urban growth and associated water demand in the Mission Creek Subbasin.

MWD's Advanced Delivery Account (ADA) allows wet year supplies to be banked in the Coachella Valley Groundwater Basin and subsequently deducted in dry years; during dry years, physical deliveries of CVWD and DWA's SWP supplies are reduced and that amount is deducted from the ADA account. The ADA had 374,404 AF in storage at the start of 2026. Forecasted ADA operations are factored into the SWP exchange replenishment supplies based on predicted water year type and associated historic ADA balance from 2007-2025. ADA deliveries are allocated between the WWR-GRF and MC-GRF according to the modeled annual recharge proportions noted above, while cumulative MC-GRF over-deliveries are tracked and periodically rebalanced with WWR-GRF at 5-year intervals to maintain the intended long-term allocation between facilities.

Other Supplies: One additional supply included in the Baseline with Moderate Climate Change scenario is Rosedale-Rio Bravo deliveries to WWR-GRF of 10,563 AFY from 2026 to 2035.

Recycled Water: Recycled water supplies are currently produced at three locations: CVWD WRP-7 and WRP-10, and Palm Springs WWTP/DWA WRP. Recycled water supply availability is expected to increase due to population growth, indoor water use and associated wastewater flows within the Plan Area. However, for the Baseline with Moderate Climate Change scenario, total recycled water use is expected to remain at 10,066 AFY as no new projects or non-potable connections are assumed to be implemented.

7.7.2 Baseline with Severe Climate Change

The Baseline with Severe Climate Change scenario includes only those supplies and facilities currently in place to support Subbasin management and assumes that no new projects or water supplies will be implemented. Baseline with Severe Climate Change propagates current management practices into the future under assumptions of severe climate conditions (RCP 8.5) and associated supply impacts. While new projects are already being implemented, the Baseline

scenarios propagate current conditions into the future to use as a basis for comparing 'with and without' project conditions.

7.7.2.1 Demand and Supply

Table 7-3 provides a summary of modeled water supplies in the Baseline with Severe Climate Change scenario used to directly meet demand and for replenishment. Forecasted demand for municipal, agricultural, golf course, and other users as described in Chapter 5, *Demand Projections*, along with a 10 percent buffer applied to municipal water use to ensure adequacy of supply, was applied across all six scenarios. Other model inflows and outflows (septic system flows, return flows, subsurface inflow and outflow, drain flows, ET, and watershed runoff) including groundwater pumping are discussed in Section 7.6. A summary of the assumptions for each supply source is provided below.

The Baseline models assume that passive conservation savings, surface water diversions, recycled water deliveries, and GRF operations will continue at existing levels.

Table 7-3 Modeled Deliveries - Baseline with Severe Climate Change Scenario

Supply (Acre-Feet)	2025	2030	2035	2040	2045	2050
Modeled Deliveries for Direct Use (AFY)						
Groundwater[a]	291,788	297,955	304,353	310,120	316,314	318,960
Colorado River[b]	285,841	282,794	279,243	275,691	272,140	272,140
Recycled Water	10,066	10,066	10,066	10,066	10,066	10,066
Total Direct Use Supplies	**587,695**	**590,815**	**593,662**	**595,877**	**598,520**	**601,166**
Modeled Deliveries for Replenishment (AFY)						
Colorado River[c]	61,400	82,000	82,000	82,000	82,000	82,000
SWP Exchange[d]	76,333	76,333	76,333	76,333	76,333	76,333
Other: Rosedale Rio-Bravo	0	13,050	13,050	0	0	0
Surface Water Diversions[e]	1,751	1,751	1,751	1,751	1,751	1,751
Total Replenishment	**139,484**	**173,134**	**173,134**	**160,084**	**160,084**	**160,084**

[a] Groundwater inflows and outflows (septic systems, return flows, subsurface inflow and outflow, drain flows, ET, watershed runoff) are described in Section 7.6.

[b] Colorado River deliveries for direct use decrease over time due to conversion of agriculture that receives Canal deliveries to municipal uses.

[c] Colorado River volumes assume that 20,000 AFY MWD-SWP transfer to WWR-GRF (MWD keeps 5,000 AFY of the amount) ends in 2027.

[d] SWP Exchange volumes assume an overall reliability of 39 percent. Actual volumes fluctuate annually based on climate variability. ADA adjustments are not included in this average annual reliability estimate.

[e] Surface water diversion estimates shown are annual averages. Actual volumes fluctuate annually based on climate variability. Diversions include a small fraction of direct deliveries; for simplicity, all diversion volumes are assumed herein to be directed to WWR-GRF for recovery.

Local Inflows and Outflows: As illustrated in Figure 7-23, inflows to groundwater include subsurface inflow, surface water runoff (diverted for replenishment or percolating along local channels minus losses to the Salton Sea), wastewater percolation, and return flows from use (which include septic system percolation). Total watershed runoff is estimated based on the drier BCM model for RCP 8.5. As shown in Figure 7-23, estimated average natural infiltration of watershed runoff (minus diversions and outflows to the Salton Sea) amounts to 13,955 AFY, approximately 19,000 AFY less

than in the Baseline with Moderate Climate Change scenario due to the drier climate change assumptions.

As with Baseline with Moderate Climate Change, available local water inflows also include surface water diverted for replenishment, with local surface water diversion rights for DWA up to 6,000 AFY. However, due to climate impacts on local surface water supply, diversions in the Baseline with Severe Climate Change scenario average 1,751 AFY within the 50-year period. Some of the diverted surface water is directly served to customers as water supply, with a majority diverted to WWR-GRF subsurface storage and then recovered for delivery.

Colorado River: Colorado River water supplies available for the Baseline with Severe Climate Change scenario use the same planning assumptions as Baseline with Moderate Climate Change.

SWP Exchange: SWP exchange supplies modeled in the Baseline with Severe Climate Change scenario are varied annually as described in Section 7.5.1.2. The Baseline with Severe Climate Change applies annual variability factors associated with the RCP 8.5 climate scenario, with an overall delivery reliability of 39 percent. Additional SWP exchange water is available through Yuba Accord deliveries (see Chapter 6, *Water Supply*). SWP exchange water is used for replenishment at WWR-GRF and MC-GRF at the proportions described for the Baseline with Moderate Climate Change scenario. ADA operation is assumed to continue through the modeling horizon.

Other Supplies: Rosedale-Rio Bravo deliveries of 10,563 AFY from 2026 to 2035 assume no loss due to climate change.

Recycled Water: Recycled water supplies for Baseline with Severe Climate Change are identical to the Baseline with Moderate Climate Change planning assumptions, remaining at 10,066 AFY.

7.7.3 Baseline Model Results

As discussed in Section 7.5, two separate future hydrological scenarios were developed so that the GSAs could assess the impacts of moderate and severe climate change. The Baseline with Moderate Climate Change scenario was run assuming impacts to SWP deliveries and local surface water supply associated with the RCP 4.5 climate scenario. The Baseline with Severe Climate Change scenario was run assuming impacts to SWP deliveries and local surface water supply associated with the RCP 8.5 climate scenario.

The two Baseline models reflect the expected inflows from natural infiltration and imported water based on climate change conditions described in Section 7.5.1. Mountain front and stream recharge were developed based on the BCM models, as described in Section 7.5.1.1.

Further details and comparisons of the six scenarios are presented in Section 7.10.

7.7.3.1 Baseline Water Budgets

Figure 7-23 shows the water balances for the Baseline with Moderate Climate Change and Baseline with Severe Climate Change scenarios over the modeling horizon of WY 2026 to 2075. The chart shows simulated total annual inflows and outflows by source, along with simulated annual and cumulative change in storage, for each scenario.

Both Baseline scenarios show an increase in cumulative groundwater storage during approximately the first 25 years of the simulation period, reflecting conditions common to both climate sequences. First, the earlier portion of each simulation includes a comparatively wet hydrologic sequence, resulting in higher total recharge during this period. Second, total Subbasin water demand is not

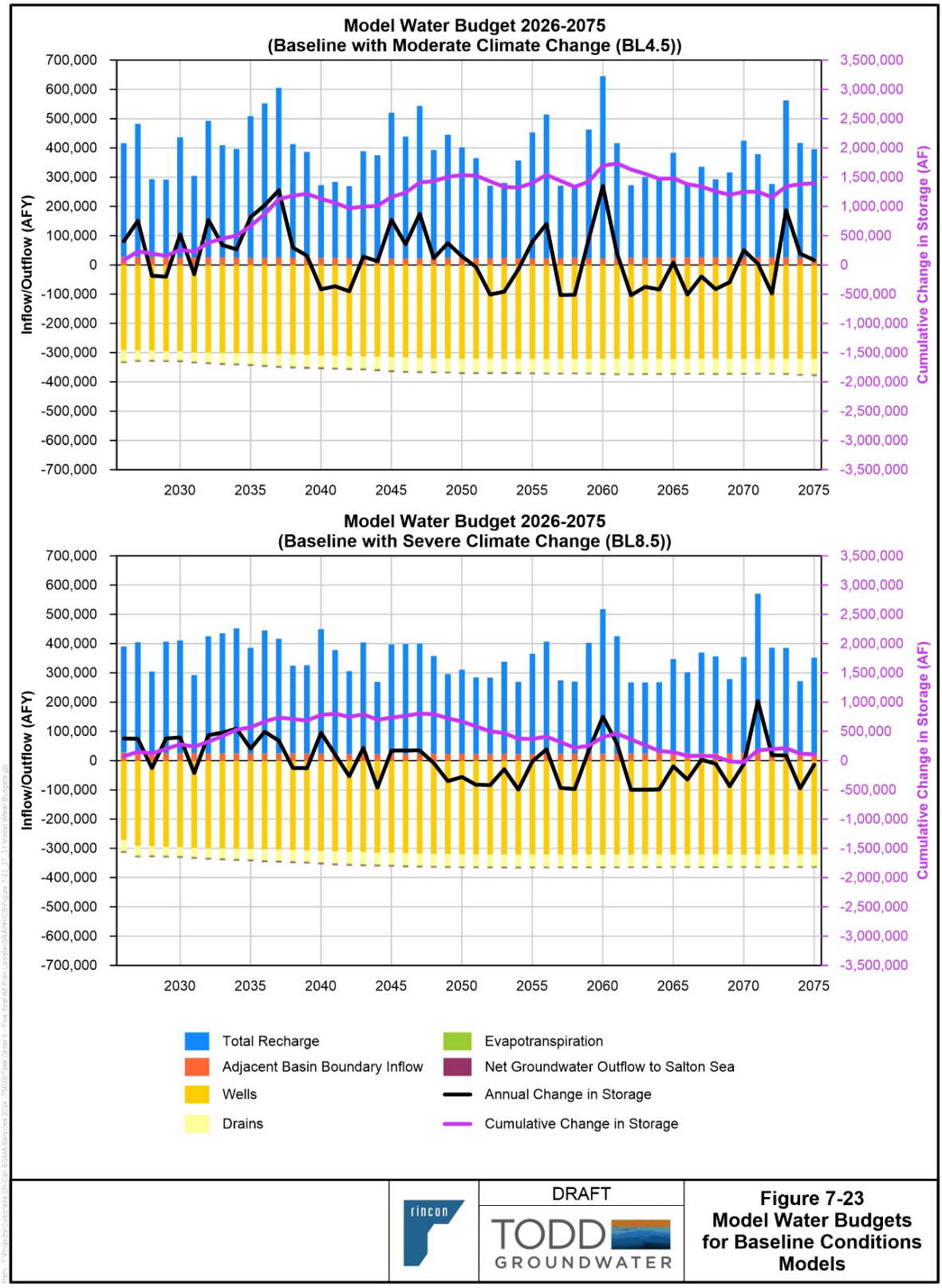
fully phased in until 2050 (see Chapter 5, *Demand Projections*), so groundwater production during this same period is lower than it will be later in the simulation. Because groundwater pumping in the Baseline scenarios reflects current management practices carried forward under a common demand forecast, simulated pumping is nearly identical between the two scenarios.

Following this initial period, the cumulative storage of the two scenarios begin to diverge as recharge is reduced in the drier scenario and demand becomes fully phased in by 2050. In the Baseline with Moderate Climate Change (upper Figure 7-23), recharge availability remains sufficient to sustain most of the storage gains achieved during the earlier, wetter period, and cumulative storage continues to increase, at a reduced rate, before generally stabilizing through the remainder of the simulation. Over the full planning period, the Baseline with Moderate Climate Change scenario shows a projected increase in cumulative storage of approximately 1,397,000 AF.

In the Baseline with Severe Climate Change (lower Figure 7-24), the combination of fully phased-in demand and the reduced recharge associated with severe climate change results in a more limited and less consistent storage trend following the initial wet period. A pronounced increase in storage is simulated around WY 2070 to 2071, occurring during a wet year in the underlying climate sequence. The model then represents a declining period of storage in the later simulation period. This occurs due to a drier hydrology and expected drawdowns from water stored under the MWD Delivery and Exchange Agreement.

The differences between the Baseline models illustrate the combined influence of hydrologic variability and climate-driven reductions in imported water supply reliability on long-term Subbasin storage. Because groundwater production is effectively the same in both models, the divergence in results reflects differences in total recharge, including natural infiltration of watershed runoff and the availability of imported water for replenishment, both of which are reduced under the severe climate change hydrology and SWP delivery variability factors applied under the Baseline with Severe Climate Change, as described in Section 7.5.1. Given the uncertainty inherent in projecting future hydrology, the Baseline models are intended to provide a reasonable range of outcomes for planning purposes rather than a precise prediction of future conditions.

Figure 7-23 Model Water Budgets for Baseline Models



7.7.3.2 Baseline Changes in Groundwater Levels

Simulated changes in groundwater levels between 2009 and 2075 for the Baseline scenarios are shown on Figure 7-25 and Figure 7-26, respectively, representing Model Layer 4 (deep aquifer) conditions. The 2009 comparison point represents the initial conditions of the historical model (Section 7.2.4), developed from the average of observed groundwater levels measured between October 2009 and March 2010. This period was selected as the basis for comparison because it generally reflects historically low groundwater elevations in most of the Subbasin, which are used as the sustainability criteria for groundwater levels. Because this comparison spans both the historical model period and the future predictive simulation, results reflect the combined influence of the historical storage recovery already documented in Section 7.4, Water Budget, and the future conditions specific to the Baseline scenarios.

The far northwestern portion of the model domain, near the San Bernardino Mountains, shows simulated groundwater level declines that are best considered separately from the rest of the Subbasin. This area was added to the model domain in the most recent update to align with the SGP Subbasin boundary (Section 7.2.2), and it's bisected by a structurally complex segment of the San Andreas Fault system. The mountainous terrain in this area limits the availability of groundwater level data on the far side of the fault, constraining the model's ability to characterize hydraulic gradients there. In addition, while wells were drilled near the Subbasin boundary in 2018, historical water level data is not available for 2009. Results in this specific location therefore carry greater uncertainty than the rest of the model domain; this limitation, and recommended improvements to future data collection and model characterization in this area, are discussed further in Section 7.1.2. The discussion below focuses on the main Subbasin area, where results are better constrained by available data.

Across the main Subbasin, the Baseline with Moderate Climate Change model (Figure 7-25) shows groundwater level increases throughout nearly the entire area. The largest increases, generally greater than 80 feet, occur in the upper West Valley and Garnet Hill area in the vicinity of the WWR-GRF, reflecting sustained mounding from recharge operations there. Increases of roughly 40 to 80 feet extend through the Mid-Valley/Thousand Palms area, tapering to increases of roughly 20 to 40 feet through most of the East Valley. In the vicinity of the TEL-GRF, and through the lower East Valley toward Mecca Hills, levels are simulated to be relatively stable to slightly increasing, a shift from the recent historical trend in this area, where recharge operations were curtailed beginning in 2022 in response to elevated groundwater levels (Section 7.3.2). A small area of modest decline, generally less than 20 feet, is simulated near the Salton Sea shoreline.

The Baseline with Severe Climate Change model (Figure 7-26) shows a similar overall spatial pattern of increases across the main Subbasin, but at smaller magnitudes than Baseline with Moderate Climate Change. Increases greater than 60 feet are generally confined to the upper West Valley near the WWR-GRF. Across most of the remaining West Valley, Garnet Hill, and Mid-Valley areas, simulated increases are more typically in the 20 to 40 feet range. A localized zone of greater increase, on the order of 60 to 80 feet, is simulated in the vicinity of the TEL-GRF, consistent with continued localized mounding from recharge operations there even under this more severe climate condition. Across the remaining East Valley, increases are generally in the 20 to 40 feet range, narrowing to more modest conditions approaching the Salton Sea shoreline.

Figure 7-24 Groundwater Level Difference Contours 2009 to 2075 for Baseline with Moderate Climate Change

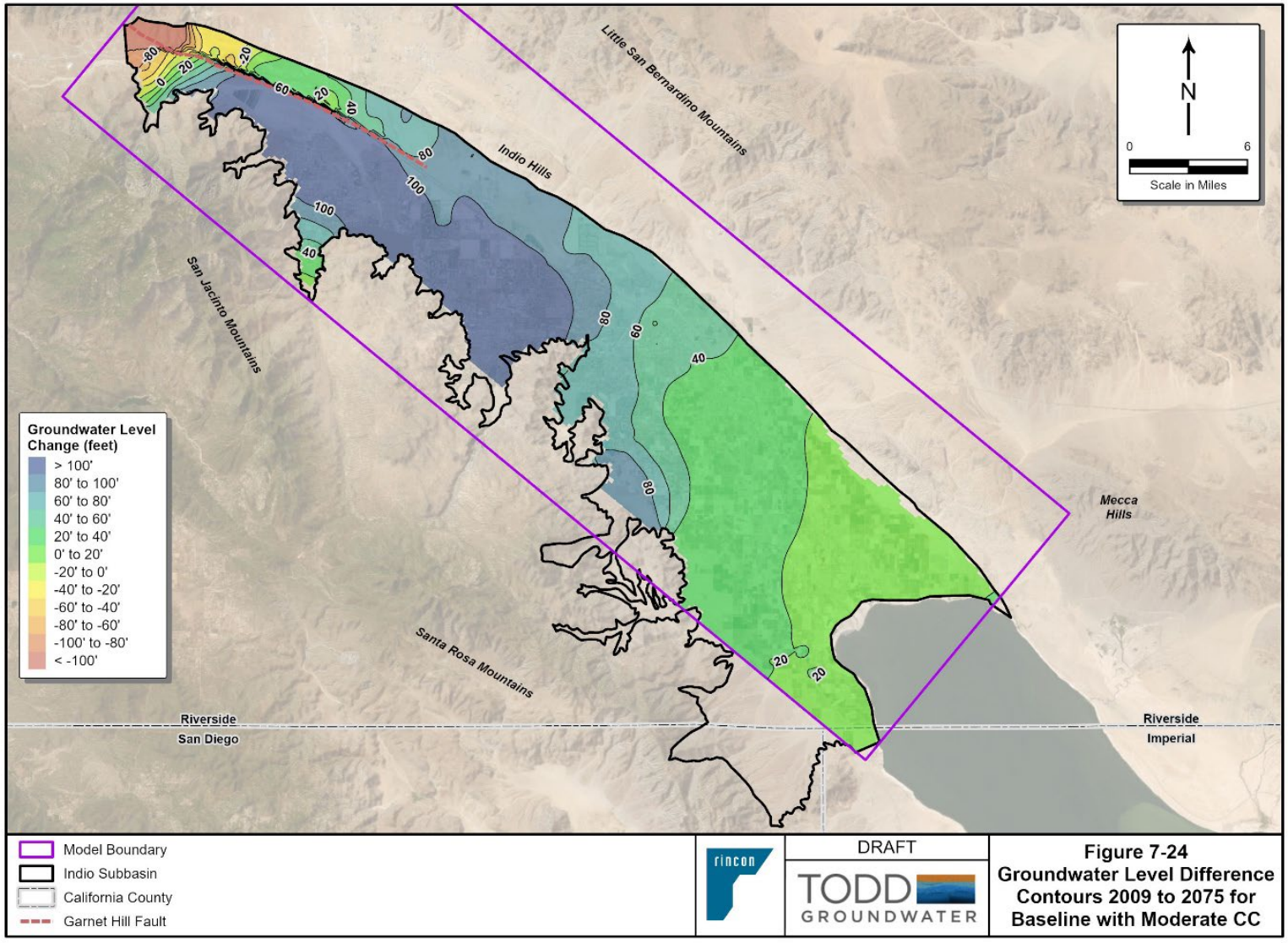
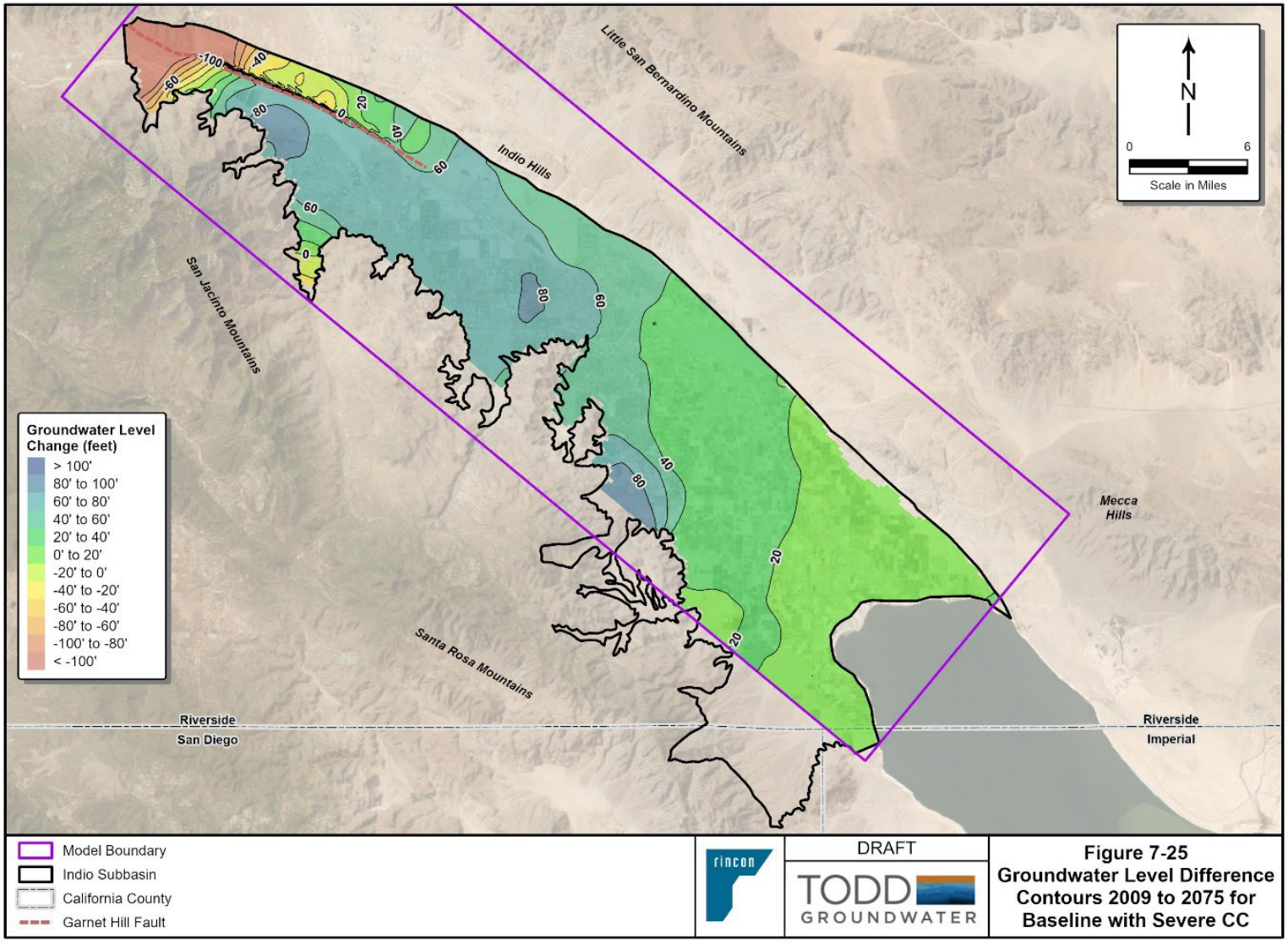


Figure 7-25 Groundwater Level Difference Contours 2009 to 2075 for Baseline with Severe Climate Change

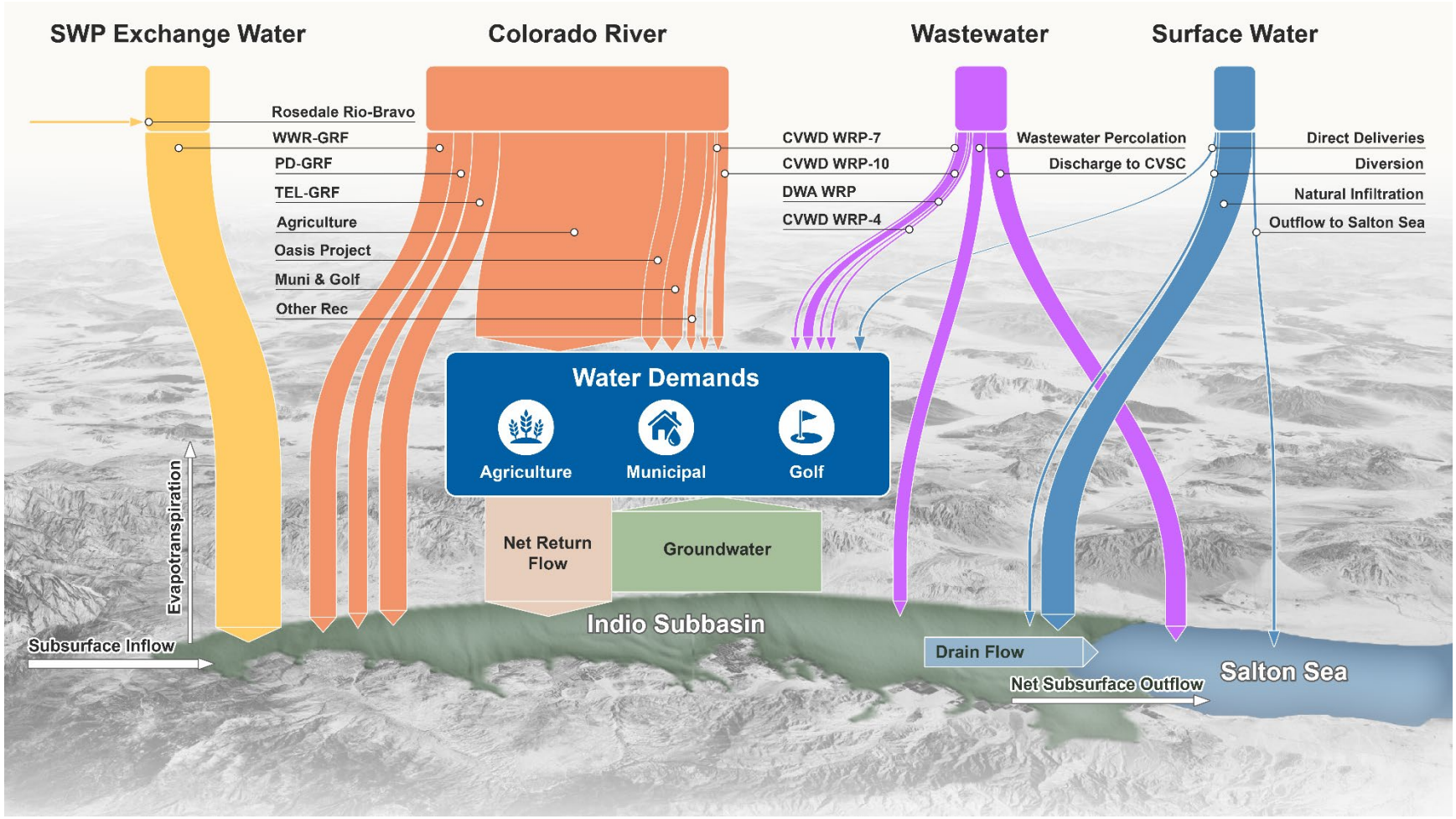


7.8 Near-Term Projects Models

The Near-Term Projects models include supplies and facilities currently in place to support Subbasin management, along with all PMAs expected to come online by 2030. Two versions are simulated – moderate climate change and severe climate change. Figure 7-26 provides a flow chart that illustrates the water balance (inflows and outflows) of the Near-Term Projects models, as well as the water supplies used to meet demands.

The Near-Term Projects models assume that passive conservation savings, surface water diversions, recycled water deliveries, and GRF operations will continue to be implemented, along with potable water and sewer consolidations. Planned non-potable delivery system expansions from WRP-7, WRP-10, and DWA-WRP, along with new tertiary treatment and deliveries from CVWD's WRP-4 are included as near-term PMAs. The Near-Term Projects models also include increased Canal deliveries to East Valley golf courses and other recreational uses, and the expanded Oasis Distribution System. Additionally, the PD-GRF Phase II expansion will allow for greater Subbasin replenishment.

Figure 7-26 Near-Term Projects Models Supply and Demand Flow Chart



7.8.1 Near-Term with Moderate Climate Change

The Near-Term with Moderate Climate Change scenario includes supplies and facilities currently in place to support Subbasin management, along with new PMAs planned to be completed as part of the GSAs' 5-year CIPs. This scenario specifically includes all PMAs expected to come online by 2030, and models moderate future climate conditions (RCP 4.5) and associated supply impacts.

7.8.1.1 Demand and Supply

Table 7-4 provides a summary of modeled water supplies in the Near-Term with Moderate Climate Change scenario used to directly meet demand and for replenishment. Forecasted demand for municipal, agricultural, golf course, and other users as described in Chapter 5, *Demand Projections*, along with a 10 percent buffer applied to municipal water use to ensure adequacy of supply, was applied across all six scenarios. Supply inputs used for the model (septic systems, return flows, subsurface inflow and outflow, drain flows, ET, and watershed runoff) and groundwater pumping are discussed in Section 7.6. A summary of the assumptions for each supply source is provided below.

Table 7-4 Modeled Deliveries - Near-Term with Moderate Climate Change Scenario

Supply (Acre-Feet)	2025	2030	2035	2040	2045	2050
Modeled Deliveries for Direct Use (AFY)						
Groundwater[a]	287,944	262,786	269,184	274,951	281,145	283,791
Colorado River[b]	289,685	310,601	305,574	302,169	298,681	298,744
Recycled Water	10,066	17,428	18,903	18,757	18,693	18,631
Total Direct Use Supplies	**587,695**	**590,815**	**593,661**	**595,877**	**598,519**	**601,166**
Modeled Deliveries for Replenishment (AFY)						
Colorado River[c]	61,400	97,000	97,000	97,000	97,000	97,000
SWP Exchange[d]	83,463	83,463	83,463	83,463	83,463	83,463
Other: Rosedale Rio-Bravo	0	13,050	13,050	0	0	0
Surface Water Diversions[e5]	3,671	3,671	3,671	3,671	3,671	3,671
Total Replenishment	**148,534**	**197,184**	**197,184**	**184,134**	**184,134**	**184,134**

[a] Groundwater inflows and outflows (septic systems, return flows, subsurface inflow and outflow, drain flows, ET, watershed runoff) are described in Section 7.6.

[b] Colorado River deliveries for direct use decrease over time due to conversion of agriculture that receives Canal deliveries to municipal uses.

[c] Colorado River volumes assume that 20,000 AFY MWD-SWP transfer to WWR-GRF (MWD keeps 5,000 AFY of the amount) ends in 2027.

[d] SWP Exchange volumes assume an overall reliability of 43 percent. Actual volumes fluctuate annually based on climate variability. ADA adjustments are not included in this average annual reliability estimate.

[e] Surface water diversion estimates shown are annual averages. Actual volumes fluctuate annually based on climate variability. Diversions include a small fraction of direct deliveries; for simplicity, all diversion volumes are assumed herein to be directed to WWR-GRF for recovery.

Local Inflows and Outflows: As illustrated in Figure 7-26, inflows to groundwater include subsurface inflow, mountain front recharge, surface water runoff that is diverted for replenishment or percolates along the mountain front or in local channels (minus losses to the Salton Sea), wastewater percolation, and return flows from use (which include septic system percolation). Surface water hydrology in the Near-Term with Moderate Climate Change is the same as Baseline

with Moderate Climate Change, as are return flows and septic system inflows. Wastewater percolation is expected to be reduced due to an increase in recycled water use (described below). In the Near-Term Project scenarios, wastewater from the MSWD Regional WRF is transferred north for use in the Mission Creek Subbasin starting in 2027. Subsurface inflow, drain flow, evapotranspiration, and subsurface outflow are derived from the MODFLOW model described in Section 7.2.5.

Colorado River: Colorado River water supplies available for the Near-Term with Moderate Climate Change scenario are assumed to remain the same as in the Baseline with Moderate Climate Change scenario. However, beneficial use of available Canal supplies increase due to the following planned expansions to replenishment facilities and direct deliveries:

- Colorado River replenishment:
  - PD-GRF: Phase II expansion to 25,000 AFY recharge in 2028
- Colorado River direct deliveries:
  - Oasis Distribution System: Gradual increase in deliveries from 12,000 AFY in 2026 to 27,000 AFY in 2030
  - East Valley golf courses: Increase in direct users in 2025 and 2026
  - Other recreation: Increase in direct users in 2025
  - WRP-7 connections: Approximately 15 percent of new WRP-7 direct user demand (excluding Young's Farmland) starting in 2029 (due to blended non-potable supply delivered in peak months), offset by 750 AFY reduction in Canal water use as new customers are connected to recycled water system
  - WRP-10 connections: Approximately 15 percent of new WRP-10 direct user demand (and excess recycled water demand not met due to limits in wastewater influent) with new connections starting in 2025, 2026, and 2028
  - WRP-4 connections (recycled water offset): 1,120 AFY reduction of agricultural demand met by WRP-4 recycled water starting in 2029

Increases in Colorado River direct deliveries begin in 2025 at 3,844 AFY and total 27,804 AFY in 2030 (deliveries expected to fluctuate due to WRP-10 recycled water capacity). However, as agricultural land is converted to urban development, agricultural demand is expected to decrease by 13,701 AFY from 2025 to 2045. Therefore, while Colorado River supplies used for recharge at the WWR-GRF are not available from 2028 through 2035 due to new direct deliveries, supplies become available again in 2036 and increase to 6,369 AFY in 2045.

SWP Exchange: SWP exchange supplies available for the Near-Term with Moderate Climate Change scenario are the same as for Baseline with Moderate Climate Change, with an average 43 percent reliability along with annual variability factors associated with the RCP 4.5 climate scenario. Additional SWP exchange water is available through Yuba Accord deliveries. SWP exchange water is used for replenishment at WWR-GRF and MC-GRF at the proportions described for the Baseline with Moderate Climate Change scenario. ADA operation is assumed to continue through the modeling horizon.

Other Supplies: Rosedale-Rio Bravo deliveries of 10,563 AFY from 2026 to 2035 assume no loss due to climate change.

Recycled Water: Recycled water availability is expected to increase due to increased wastewater flows, associated recycled water production, and connections to new non-potable customers as follows:

- WRP-7 connections: Deliveries increase from 1,938 AFY in 2025 to 2,800 AFY in 2029
- WRP-10 connections: Demand increases from 7,196 AFY in 2025 to 19,470 AFY in 2030; however recycled water capacity is limited to available wastewater influent which is on average 13,104 AFY (2025-2050)
- DWA WRP connections: Deliveries increase to 1,026 AFY in 2026 and 1,393 AFY in 2030
- WRP-4 connections: Deliveries limited to Phase I capacity of 1,120 AFY online in 2029

Any recycling of wastewater from WRP-10 and WRP-7 that is currently disposed to percolation ponds would offset groundwater pumping, but also reduce net return flows to groundwater. Additionally, planned return of MSWD's Regional WRF discharge to the Mission Creek Subbasin for potable reuse/replenishment will further reduce wastewater return flows in Indio Subbasin.

7.8.2 Near-Term with Severe Climate Change

The Near-Term with Severe Climate Change scenario includes supplies and facilities currently in place to support Subbasin management, along with new projects planned to be completed as part of the GSAs' 5-year CIPs. This scenario specifically includes all PMAs expected to come online by 2030, and models severe future climate conditions (RCP 8.5) and associated supply impacts.

7.8.2.1 Demand and Supply

Table 7-5 provides a summary of modeled water supplies in the Near-Term with Severe Climate Change scenario used to directly meet demand and for replenishment. Forecasted demand for municipal, agricultural, golf course, and other users as described in Chapter 5, *Demand Projections*, along with a 10 percent buffer applied to municipal water use to ensure adequacy of supply, was applied across all six scenarios. Supply inputs used for the model (septic systems, return flows, subsurface inflow and outflow, drain flows, ET, and watershed runoff) and groundwater pumping are discussed in Section 7.6. A summary of the assumptions for each supply source is provided below.

Table 7-5 Modeled Deliveries - Near-Term with Severe Climate Change Scenario

Supply (Acre-Feet)	2025	2030	2035	2040	2045	2050
Modeled Deliveries for Direct Use (AFY)						
Groundwater[a]	287,944	262,786	269,184	274,951	281,145	283,791
Colorado River[b]	289,685	310,601	305,574	302,169	298,681	298,744
Recycled Water	10,066	17,428	18,903	18,757	18,693	18,631
Total Direct Use Supplies	**587,695**	**590,815**	**593,661**	**595,877**	**598,519**	**601,166**
Modeled Deliveries for Replenishment (AFY)						
Colorado River[c]	61,400	97,000	97,000	97,000	97,000	97,000
SWP Exchange[d]	76,333	76,333	76,333	76,333	76,333	76,333
Other: Rosedale Rio-Bravo	0	13,050	13,050	0	0	0
Surface Water Diversions[e]	1,751	1,751	1,751	1,751	1,751	1,751
Total Replenishment	**139,484**	**188,134**	**188,134**	**175,084**	**175,084**	**175,084**

[a] Groundwater inflows and outflows (septic systems, return flows, subsurface inflow and outflow, drain flows, ET, watershed runoff) are described in Section 7.6.

[b] Colorado River deliveries for direct use decrease over time due to conversion of agriculture that receives Canal deliveries to municipal uses.

[c] Colorado River volumes assume that 20,000 AFY MWD-SWP transfer to WWR-GRF (MWD keeps 5,000 AFY of the amount) ends in 2027.

[d] SWP Exchange volumes assume an overall reliability of 39 percent. Actual volumes fluctuate annually based on climate variability. ADA adjustments are not included in this average annual reliability estimate.

[e] Surface water diversion estimates shown are annual averages. Actual volumes fluctuate annually based on climate variability. Diversions include a small fraction of direct deliveries; for simplicity, all diversion volumes are assumed herein to be directed to WWR-GRF for recovery.

Local Inflows and Outflows: As illustrated in Figure 7-26, inflows to groundwater include subsurface inflow, mountain front recharge, surface water runoff that is diverted for replenishment or percolates along the mountain front or in local channels (minus losses to the Salton Sea), wastewater percolation, and return flows from use (which include septic system percolation). Surface water hydrology in the Near-Term with Severe Climate Change is the same as Baseline with Severe Climate Change, as are return flows and septic system inflows. Wastewater percolation is expected to be reduced due to an increase in recycled water use (described below), along with the transfer of MSWD Regional WRF flows to the Mission Creek Subbasin starting in 2027. Subsurface inflow, drain flow, evapotranspiration, and subsurface outflow are derived from the MODFLOW model described in Section 7.2.5.

Colorado River: Colorado River water supplies available for the Near-Term with Severe Climate Change scenario use the same planning assumptions as Near-Term with Moderate Climate Change scenario.

SWP Exchange: SWP exchange supplies available for the Near-Term with Severe Climate Change scenario are the same as for Baseline with Severe Climate Change, with an average 39 percent reliability along with annual variability factors associated with the RCP 8.5 climate scenario. Additional SWP exchange water is available through Yuba Accord deliveries. SWP exchange water is used for replenishment at WWR-GRF and MC-GRF at the proportions described for the Baseline with Moderate Climate Change scenario. ADA operation is assumed to continue through the modeling horizon.

Other Supplies: Rosedale-Rio Bravo deliveries of 10,563 AFY from 2026 to 2035 assume no loss due to climate change.

Recycled Water: Recycled water supplies available for the Near-Term with Severe Climate Change scenario use the same planning assumptions as Near-Term with Moderate Climate Change.

7.8.3 Near-Term Model Results

As discussed in Section 7.5, two separate future hydrological scenarios were developed so that the GSAs could assess the impacts of moderate and severe climate change. The Near-Term with Moderate Climate Change scenario was run assuming impacts to SWP deliveries and local surface water supply associated with the RCP 4.5 climate scenario. The Near-Term with Severe Climate Change scenario was run assuming impacts to SWP deliveries and local surface water supply associated with the RCP 8.5 climate scenario.

The two Near-Term models apply the same climate change conditions as the Baseline models (see Section 7.5.1), with natural infiltration and imported water supplies developed using the same methodology described in Sections 7.5.1.1 and 7.5.1.2. In addition to the supplies and facilities included in the Baseline models, the Near-Term models incorporate the supply and management projects expected to come online by 2030, including planned non-potable expansions at WRP-7, WRP-10, and DWA-WRP, the new WRP-4, the expanded Oasis Distribution System, and the PD-GRF Phase II expansion, as described above.

Further details and comparisons of the six scenarios are presented in Section 7.10.

7.8.3.1 Near-Term Projects Scenario Water Budgets

Figure 7-27 presents the simulated water budgets for the Near-Term Projects models, for the predictive simulation period WY 2026 to 2075. Each panel shows adjacent basin boundary inflow, wells, drains, ET, net groundwater outflow to the Salton Sea, and total recharge, along with annual and cumulative change in groundwater storage.

Both Near-Term scenarios use the same underlying hydrologic sequencing as the Baseline scenarios, with higher recharge during a wetter period in the first 10 to 15 years of simulation and demand not fully phased in until approximately 2050. The Near-Term supply projects (WRP-7, WRP-10, and DWA-WRP expansions; new WRP-4; expanded Oasis Distribution System; and the PD-GRF expansion) are primarily source substitution projects that deliver canal and recycled water directly in place of groundwater use. This results in average annual pumping approximately 34,000 acre-feet per year lower than the corresponding Baseline scenarios. Average annual recharge is also higher due to additional recharge at the expanded PD-GRF.

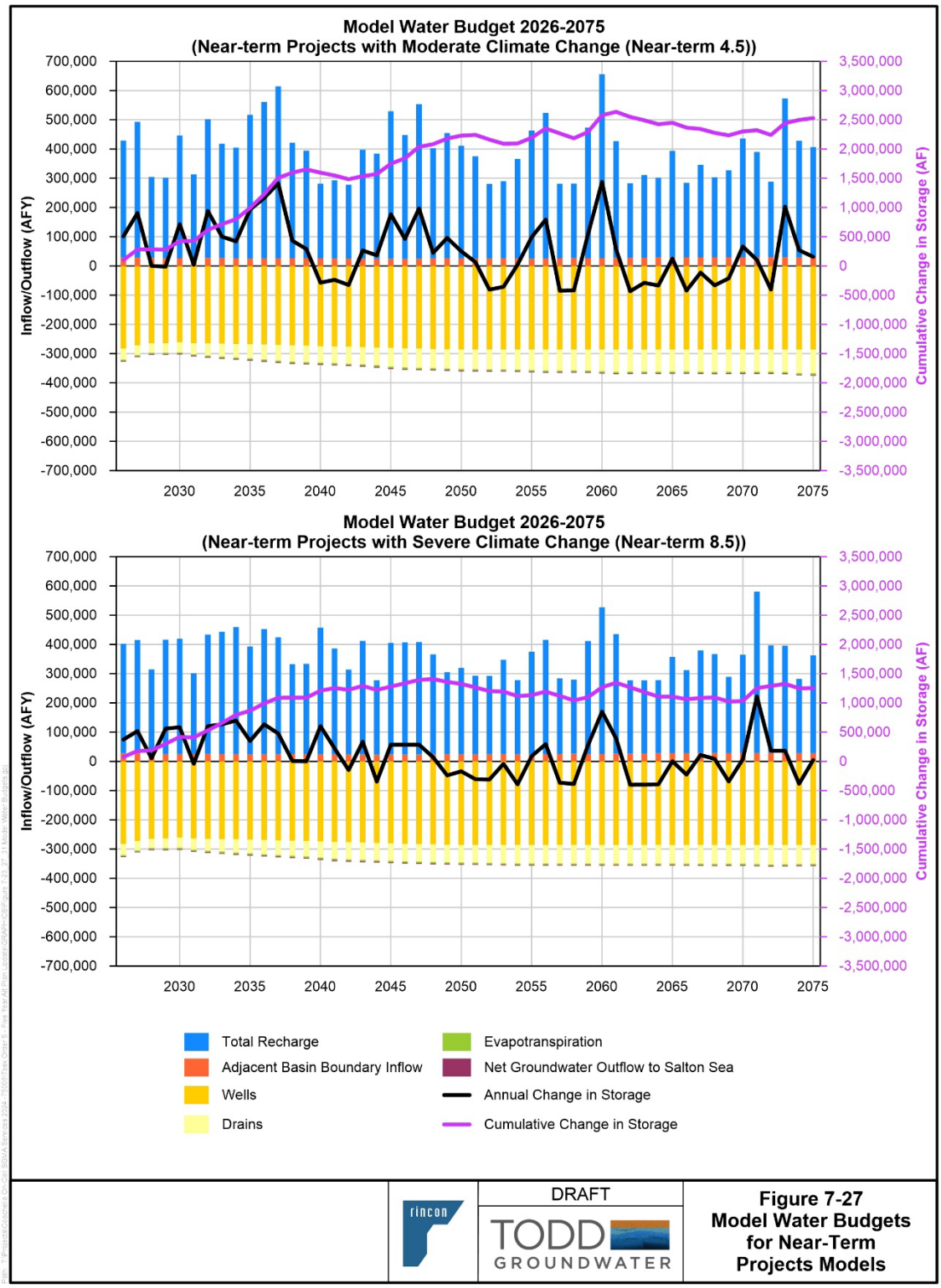
In the Near-Term under Moderate Climate Change (upper Figure 7-27), cumulative change in storage increases through the early simulation period to approximately 1.5 million AF by the early 2040s, continues to increase through the middle of the simulation period, and reaches approximately 2.5 million AF by the end of the simulation.

In the Near-term with Severe Climate Change (lower Figure 7-27), cumulative change in storage increases to approximately 1 million AF by the early 2040s, then remains in the range of approximately 1.2 to 1.4 million AF for the remainder of the simulation period. Unlike the Baseline with Severe Climate Change scenario, which shows a decline in storage late in the simulation period associated with drier hydrology and drawdown of water stored under the MWD Delivery and

Exchange Agreement, the Near-Term with Severe Climate Change scenario maintains stable to slightly increasing cumulative storage through the end of the simulation.

Both Near-Term Projects scenarios show higher cumulative storage than the corresponding Baseline scenarios, consistent with the additional source substitution and recharge provided by the Near-Term supply projects. As with the Baseline scenarios, the difference in outcomes between the moderate and severe climate change scenarios reflects the sensitivity of long-term storage to climate assumptions (and therefore local watershed runoff and imported water deliveries), and results should be interpreted as a reasonable range for planning purposes rather than a precise prediction of future conditions.

Figure 7-27 Model Water Budgets for Near-Term Projects Models



7.8.3.2 Near-Term Projects Change in Groundwater Levels

Simulated changes in groundwater levels between 2009 and 2075 for the Near-Term Projects scenarios are shown on Figure 7-28 and Figure 7-29, respectively, representing Model Layer 4 (deep aquifer) conditions. As with the Baseline scenarios, the 2009 comparison point represents the initial conditions of the historical model (see Section 7.2.4), developed from the average of observed groundwater levels measured between October 2009 and March 2010. Because this comparison spans both the historical model period and the future predictive simulation, results reflect the combined influence of the historical storage recovery documented in Section 7.4 and the future conditions specific to the Near-Term Projects scenarios.

The far northwestern portion of the model domain, near the San Bernardino Mountains, continues to show simulated groundwater level declines that are best considered separately from the rest of the Subbasin. This area was added to the model domain in the most recent update to align with the SGP Subbasin boundary (see Section 7.2.2) and is bisected by a structurally complex segment of the San Andreas Fault system. Limited groundwater level data on the far side of the fault constrain the model's ability to characterize hydraulic gradients in this area, and results here carry greater uncertainty than the rest of the model domain; this limitation is discussed further in Section 7.1.2. The discussion below focuses on the main Indio Subbasin area.

Across the main Indio Subbasin, the Near-Term with Moderate Climate Change model (Figure 7-28) shows groundwater level increases throughout the entire area, at generally greater magnitude than under the corresponding Baseline scenario. Increases greater than 100 feet extend through the upper West Valley and Garnet Hill area in the vicinity of the WWR-GRF and into the Indio Hills/Thousand Palms portion of the Mid-Valley, consistent with the additional source substitution and recharge provided by the Near-Term supply projects. Increases of roughly 60 to 100 feet extend through the remaining Mid-Valley area, tapering to roughly 20 to 40 feet through most of the East Valley. Levels in the vicinity of the TEL-GRF and through the lower East Valley toward Mecca Hills are simulated to be relatively stable to slightly increasing, with a localized area of greater increase near the TEL-GRF. No area of decline is simulated near the Salton Sea shoreline under the Near-Term with Moderate Climate Change scenario, in contrast to the Baseline with Moderate Climate Change results.

The Near-Term with Severe Climate Change model (Figure 7-29) shows a similar spatial pattern of increases across the main Subbasin, at smaller magnitudes than Near-Term with Moderate Climate Change, consistent with the relationship between the two Baseline scenarios. Increases greater than 100 feet are confined to a smaller area of the upper West Valley near the WWR-GRF. Increases of roughly 80 to 100 feet extend through the remaining upper West Valley and into the Mid-Valley, tapering to roughly 40 to 60 feet through most of the remaining Mid-Valley and 20 to 40 feet through most of the East Valley. As under Near-Term with Moderate Climate Change, a localized area of greater increase is simulated near the TEL-GRF, and levels toward the Salton Sea shoreline remain stable to slightly increasing, with no area of decline, in contrast to the Baseline with Severe Climate Change results.

Figure 7-28 Groundwater Level Difference Contours 2009 to 2075 for Near-Term Projects with Moderate Climate Change

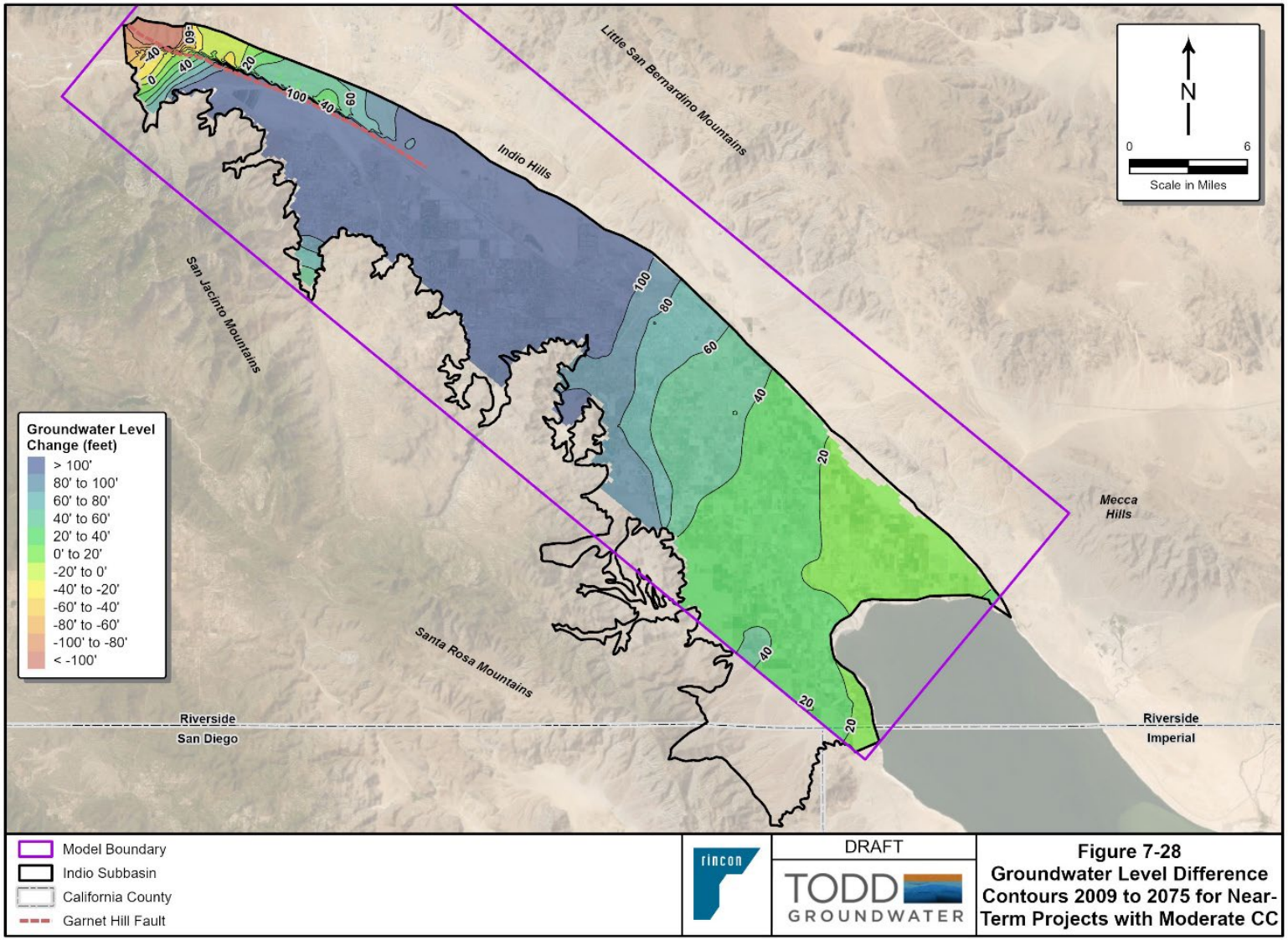
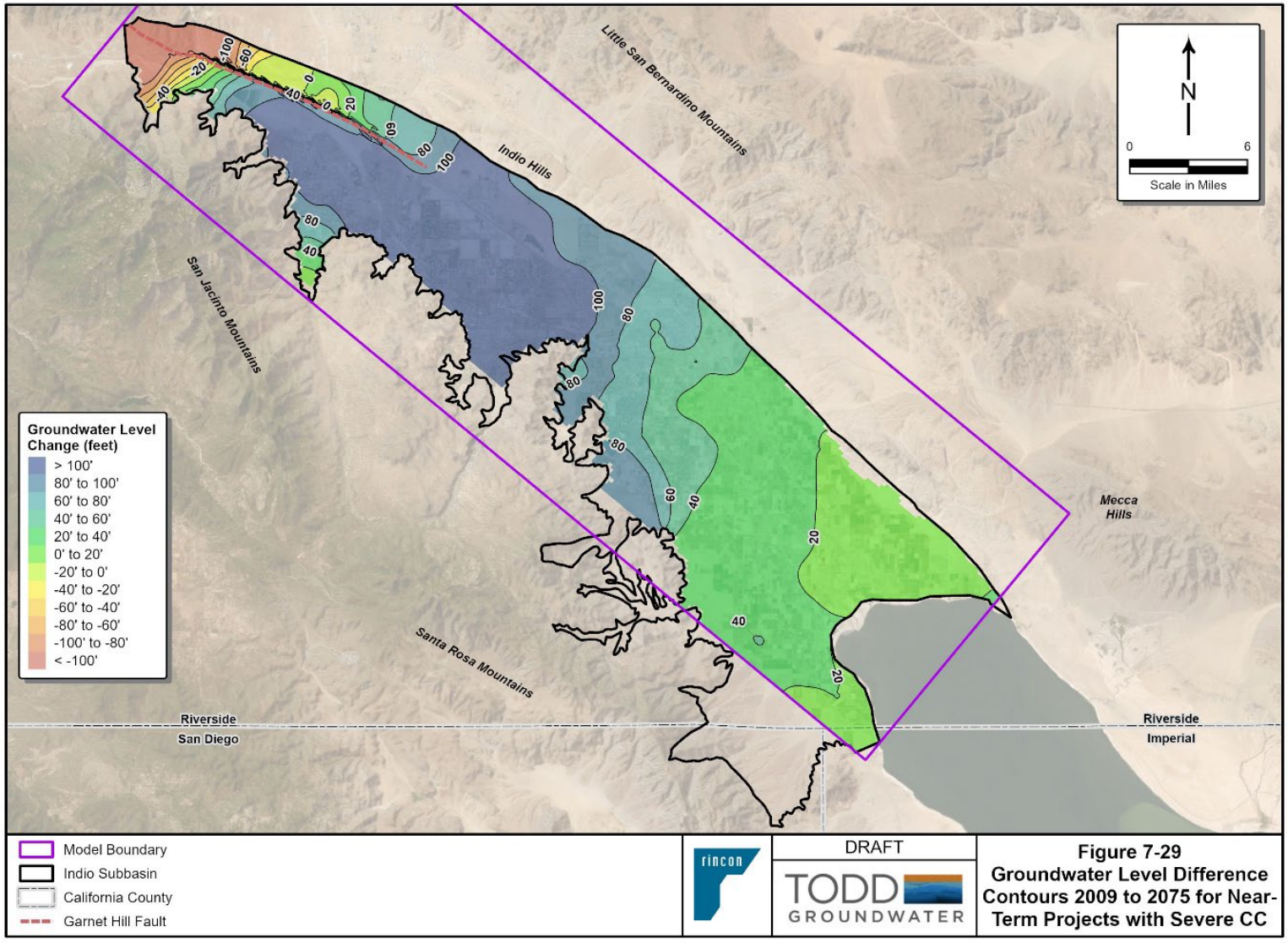


Figure 7-29 Groundwater Level Difference Contours 2009 to 2075 for Near-Term Projects with Severe Climate Change

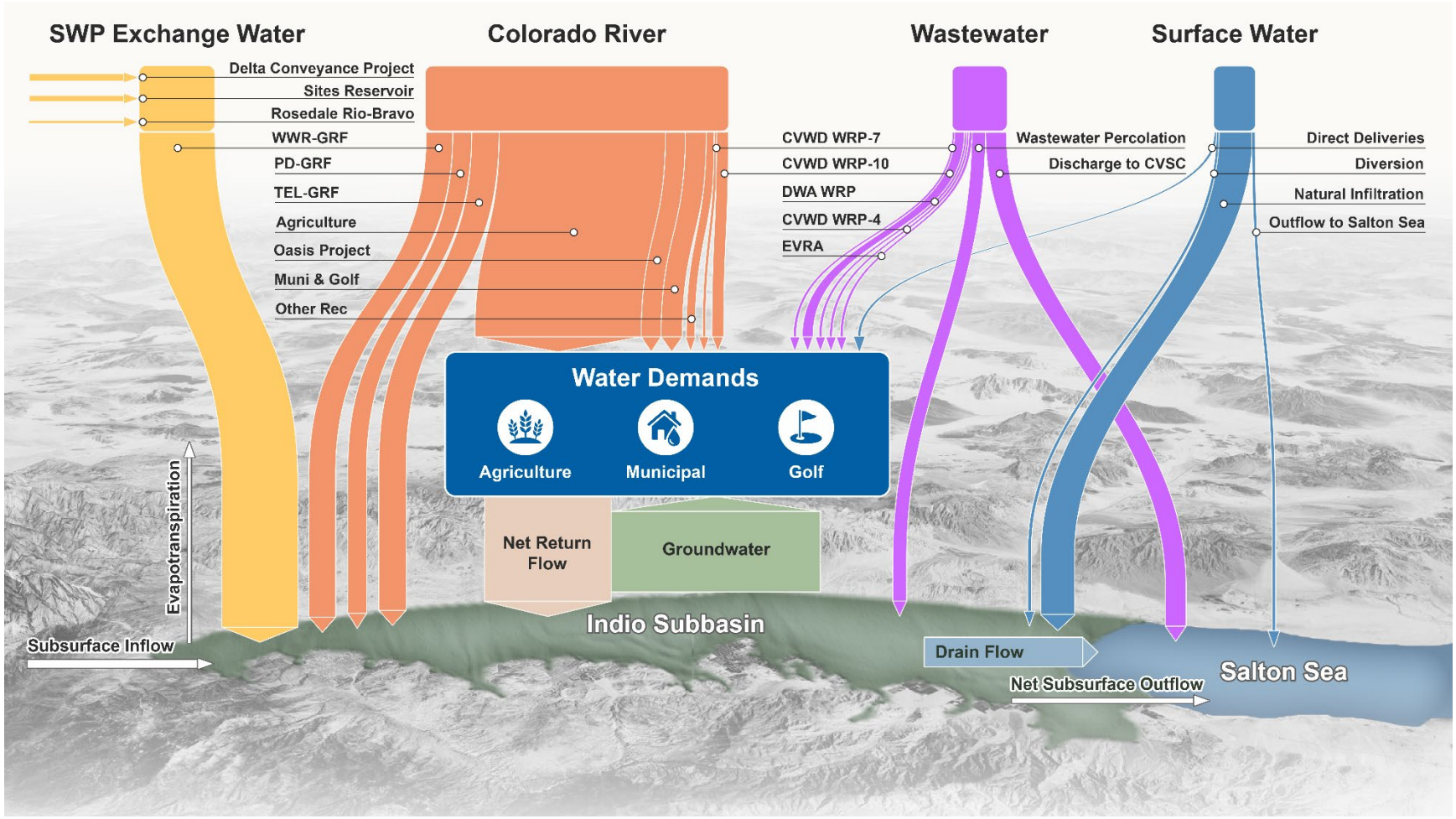


7.9 Future Projects Models

The Future Projects Models include supplies and facilities currently in place to support Subbasin management, along with all new PMAs planned for the Indio Subbasin. Two versions are simulated – moderate climate change and severe climate change. Figure 7-30 provides a flow chart that illustrates the water balance (inflows and outflows) of the Future Projects Models, as well as the water supplies used to meet demands.

The Future Projects models assume that passive conservation savings, surface water diversions, recycled water deliveries, and GRF operations will continue to be implemented, along with potable water and sewer consolidations. Planned non-potable delivery system expansions from WRP-7, WRP-10, and DWA-WRP, as well as the new tertiary treatment and deliveries from WRP-4 and East Valley Reclamation Authority (EVRA) via the VSD WWTP are included as future PMAs. The Future Projects models also include increased Canal deliveries to East Valley golf courses and other recreational uses, and the expanded Oasis Distribution System. Additionally, the Sites Reservoir and Delta Conveyance Projects will increase the reliability and availability of SWP water, and the PD-GRF Phase II expansion will allow for greater Subbasin replenishment.

Figure 7-30 Future Projects Models Supply and Demand Flow Chart



7.9.1 Future Projects with Moderate Climate Change

The Future Projects with Moderate Climate Change scenario includes supplies and facilities currently in place to support Subbasin management, along with all new PMAs planned for the Indio Subbasin. The scenario models moderate future climate conditions (RCP 4.5) and associated supply impacts.

7.9.1.1 Demand and Supply

Table 7-6 provides a summary of modeled water supplies in the Future Projects with Moderate Climate Change scenario used to directly meet demand and for replenishment. Forecasted demand for municipal, agricultural, golf course, and other users as described in Chapter 5, *Demand Projections*, along with a 10 percent buffer applied to municipal water use to ensure adequacy of supply, was applied across all six scenarios. Supply inputs used for the model (septic systems, return flows, subsurface inflow and outflow, drain flows, ET, and watershed runoff) and groundwater pumping are discussed in Section 7.6. A summary of the assumptions for each supply source is provided below.

Table 7-6 Modeled Deliveries - Future Projects with Moderate Climate Change Scenario

Supply (Acre-Feet)	2025	2030	2035	2040	2045	2050
Modeled Deliveries for Direct Use (AFY)						
Groundwater[a]	289,171	259,409	267,557	272,754	278,259	280,780
Colorado River[b]	289,685	310,601	306,034	302,629	299,141	299,204
Recycled Water	8,839	20,805	20,069	20,495	21,119	21,181
Total Direct Use Supplies	**587,695**	**590,815**	**593,660**	**595,878**	**598,519**	**601,165**
Modeled Deliveries for Replenishment (AFY)						
Colorado River[c]	61,400	97,000	97,000	97,000	97,000	97,000
SWP Exchange[d]	83,463	83,463	93,868	93,863	93,859	101,908
Other: Rosedale Rio-Bravo	0	13,050	13,050	0	0	0
Surface Water Diversions[e]	3,671	3,671	3,671	3,671	3,671	3,671
Total Replenishment	**148,534**	**197,184**	**207,589**	**194,534**	**194,530**	**202,579**

[a] Groundwater inflows and outflows (septic systems, return flows, subsurface inflow and outflow, drain flows, ET, watershed runoff) are described in Section 7.6.

[b] Colorado River deliveries for direct use decrease over time due to conversion of agriculture that receives Canal deliveries to municipal uses.

[c] Colorado River volumes assume that 20,000 AFY MWD-SWP transfer to WWR-GRF (MWD keeps 5,000 AFY of the amount) ends in 2027.

[d] SWP Exchange volumes assume an overall reliability of 43 percent. Actual volumes fluctuate annually based on climate variability. ADA adjustments are not included in this average annual reliability estimate.

[e] Surface water diversion estimates shown are annual averages. Actual volumes fluctuate annually based on climate variability. Diversions include a small fraction of direct deliveries; for simplicity, all diversion volumes are assumed herein to be directed to WWR-GRF for recovery.

Local Inflows and Outflows: As illustrated in Figure 7-30, inflows to groundwater include subsurface inflow, mountain front recharge, surface water runoff that is diverted for replenishment or percolates along the mountain front or in local channels (minus losses to the Salton Sea), wastewater percolation, and return flows from use (which include septic system percolation). Surface water hydrology in the Future Projects with Moderate Climate Change is the same as

Baseline with Moderate Climate Change, as are return flows and septic system inflows. Wastewater percolation is expected to be reduced due to an increase in recycled water use (described below), along with the transfer of MSWD Regional WRF flows to the Mission Creek Subbasin starting in 2027. Subsurface inflow, drain flow, evapotranspiration, and subsurface outflow are derived from the MODFLOW model described in Section 7.2.5.

Colorado River: Colorado River water supplies available for the Future Projects with Moderate Climate Change scenario are assumed to remain the same as in the Near-Term with Moderate Climate Change scenario, with the same planned expansions to the PD-GRF and direct deliveries. Additionally, WRP-10 will add one new customer (Rancho Portola Golf Course) in 2035, with 15 percent of demand (as well as excess recycled water demand not met due to limits in wastewater influent) being met by Canal water. Increases in Colorado River direct deliveries begin in 2025 at 3,844 AFY and total 26,792 AFY in 2035 (deliveries expected to fluctuate due to WRP-10 recycled water capacity). However, as agricultural land is converted to urban development, agricultural demand is expected to decrease by 13,701 AFY from 2025 to 2045. Therefore, while Colorado River supplies used for recharge at the WWR-GRF are not available from 2028 through 2036 due to new direct deliveries, supplies become available again in 2037 to 5,909 AFY in 2045.

SWP Exchange: SWP exchange supplies available for Future Projects with Moderate Climate Change include all supplies available for Baseline and Near-Term with Moderate Climate Change scenarios, with an average 43 percent reliability along with annual variability factors associated with the RCP-4.5 climate scenario. Additional SWP exchange water is available through Yuba Accord deliveries. SWP exchange water is used for replenishment at WWR-GRF and MC-GRF at the proportions described for the Baseline with Moderate Climate Change scenario. ADA operation is assumed to continue through the modeling horizon.

Future Projects with Moderate Climate Change also assumes SWP supply increases due to the following projects implemented beyond 2030:

- Sites Reservoir Project: 11,500 AFY available to WWR-GRF and MC-GRF starting in 2035
- Delta Conveyance Project: Increase in SWP reliability by 20,800 AFY (varied annually according to RCP 4.5 variability index) starting in 2047

Other Supplies: Rosedale-Rio Bravo deliveries of 10,563 AFY from 2026 to 2035 assume no loss due to climate change.

Recycled Water: Recycled water availability for the Future Projects with Moderate Climate Change scenario includes all expansions expected in the Near-Term with Moderate Climate Change scenario, as well as the EVRA recycled water project. The EVRA project will come online with one customer in 2035, and will increase to two customers in 2040, and all four customers in 2045.

Any recycling of wastewater from WRP-10 and WRP-7 that is disposed to percolation ponds would offset groundwater pumping, but also reduce net return flows to groundwater. Additionally, planned return of MSWD's Regional WRF discharge to the Mission Creek Subbasin for potable reuse/replenishment will further reduce wastewater return flows in Indio Subbasin.

7.9.2 Future Projects with Severe Climate Change

The Future Projects with Severe Climate Change scenario includes supplies and facilities currently in place to support Subbasin management, along with all new PMAs planned for the Indio Subbasin. The scenario models severe future climate conditions (RCP 8.5) and associated supply impacts.

7.9.2.1 Demand and Supply

Table 7-7 provides a summary of modeled water supplies in the Future Projects with Severe Climate Change supplies used to directly meet demand and for replenishment. Forecasted demand for municipal, agricultural, golf course, and other users as described in Chapter 5, *Demand Projections*, along with a 10 percent buffer applied to municipal water use to ensure adequacy of supply, was applied across all six scenarios. Supply inputs used for the model (septic systems, return flows, subsurface inflow and outflow, drain flows, ET, and watershed runoff) and groundwater pumping are discussed in Section 7.6. A summary of the assumptions for each supply source is provided below.

Table 7-7 Modeled Deliveries - Future Projects with Severe Climate Change Scenario

Supply (Acre-Feet)	2025	2030	2035	2040	2045	2050
Modeled Deliveries for Direct Use (AFY)						
Groundwater[a]	289,171	259,409	267,557	272,754	278,259	280,780
Colorado River[b]	289,685	310,601	306,034	302,629	299,141	299,204
Recycled Water	8,839	20,805	20,069	20,495	21,119	21,181
Total Direct Use Supplies	**587,695**	**590,815**	**593,660**	**595,878**	**598,519**	**601,165**
Modeled Deliveries for Replenishment (AFY)						
Colorado River[c]	61,400	97,000	97,000	97,000	97,000	97,000
SWP Exchange[d]	76,333	76,333	86,738	86,738	86,738	94,091
Other: Rosedale Rio-Bravo	0	13,050	13,050	0	0	0
Surface Water Diversions[e]	1,751	1,751	1,751	1,751	1,751	1,751
Total Replenishment	**139,484**	**188,134**	**198,539**	**185,489**	**185,489**	**192,842**

[a] Groundwater inflows and outflows (septic systems, return flows, subsurface inflow and outflow, drain flows, ET, watershed runoff) are described in Section 7.6.

[b] Colorado River deliveries for direct use decrease over time due to conversion of agriculture that receives Canal deliveries to municipal uses.

[c] Colorado River volumes assume that 20,000 AFY MWD-SWP transfer to WWR-GRF (MWD keeps 5,000 AFY of the amount) ends in 2027.

[d] SWP Exchange volumes assume an overall reliability of 39 percent. Actual volumes fluctuate annually based on climate variability. ADA adjustments are not included in this average annual reliability estimate.

[e] Surface water diversion estimates shown are annual averages. Actual volumes fluctuate annually based on climate variability. Diversions include a small fraction of direct deliveries; for simplicity, all diversion volumes are assumed herein to be directed to WWR-GRF for recovery.

Local Inflows and Outflows: As illustrated in Figure 7-30, inflows to groundwater include subsurface inflow, mountain front recharge, surface water runoff that is diverted for replenishment or percolates along the mountain front or in local channels (minus losses to the Salton Sea), wastewater percolation, and return flows from use (which include septic system percolation). Surface water hydrology in the Future Projects with Severe Climate Change is the same as Baseline with Severe Climate Change, as are return flows and septic system inflows. Wastewater percolation

is expected to be reduced due to an increase in recycled water use (described below), along with the transfer of MSWD Regional WRF flows to the Mission Creek Subbasin starting in 2027. Subsurface inflow, drain flow, ET, and subsurface outflow are derived from the MODFLOW model described in Section 7.2.5.

Colorado River: Colorado River water supplies available for the Future Projects with Severe Climate Change scenario use the same planning assumptions as Future Projects with Moderate Climate Change scenario.

SWP Exchange: SWP exchange supplies available for the Future Projects with Severe Climate Change scenario are the same as for Baseline with Severe Climate Change, with an average 39 percent reliability along with annual variability factors associated with the RCP 8.5 climate scenario. Additional SWP exchange water is available through Yuba Accord, Sites Reservoir (online in 2035), and Delta Conveyance Project (online in 2047). SWP exchange water is used for replenishment at WWR-GRF and MC-GRF at the proportions described for the Baseline with Moderate Climate Change scenario. ADA operation is assumed to continue through the modeling horizon.

Other Supplies: Rosedale-Rio Bravo deliveries of 10,563 AFY from 2026 to 2035 assume no loss due to climate change.

Recycled Water: Recycled water supplies available for the Future Projects with Severe Climate Change scenario use the same planning assumptions as Future Projects with Moderate Climate Change scenario. The EVRA recycled water project rolls on with buildout by 2045.

7.9.3 Future Projects Model Results

As discussed in Section 7.5.1, two separate future hydrological scenarios were developed so that the GSAs could assess the impacts of moderate and severe climate change. The Future Projects with Moderate Climate Change scenario was run assuming impacts to SWP deliveries and local surface water supply associated with the RCP 4.5 climate scenario. The Future Projects with Severe Climate Change scenario was run assuming impacts to SWP deliveries and local surface water supply associated with the RCP 8.5 climate scenario.

The two Future Projects models apply the same climate change conditions as the Baseline and Near-Term scenarios (see Section 7.5.1), with natural infiltration and imported water supplies developed using the same methodology described in Sections 7.5.1 and 7.5.1.1. In addition to the supplies and facilities included in the Near-Term scenarios, the Future Projects models incorporate the supply and management projects expected to come online beyond 2030: increased Colorado River direct deliveries and a new WRP-10 customer in 2035; the Sites Reservoir Project, providing 11,500 AFY to WWR-GRF and MC-GRF starting in 2035; the Delta Conveyance Project, increasing SWP reliability by 20,800 AFY (varied annually according to the climate variability index) starting in 2047; and the EVRA project, phased in from one recycled water customer in 2035 to four customers by 2045.

Further details and comparisons of the six scenarios are presented in Section 7.10.

7.9.3.1 Future Projects Scenario Water Budgets

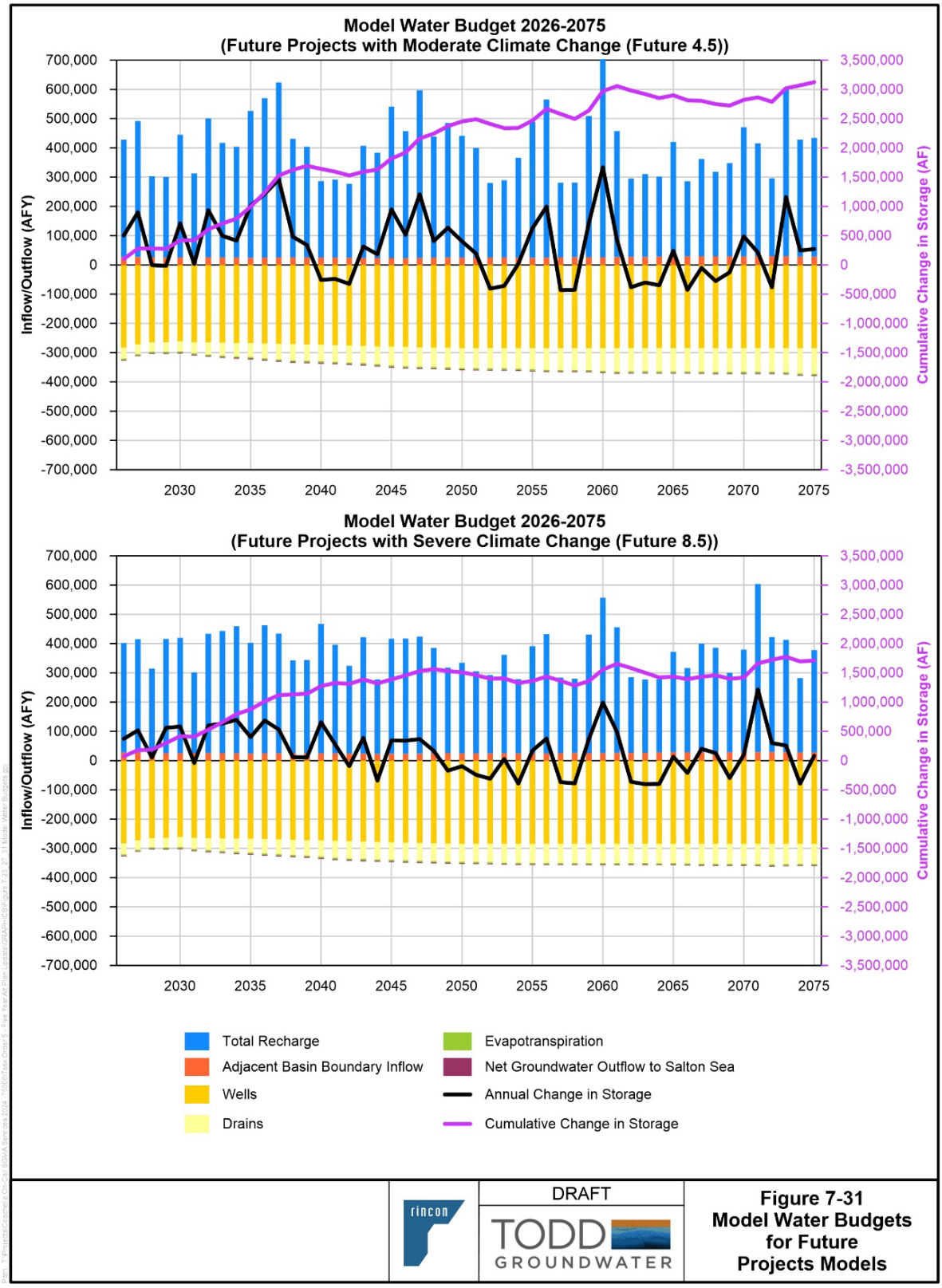
Figure 7-31 presents the simulated water budgets for the Future Projects scenarios, for the predictive simulation period WY 2026 to 2075. Each panel shows adjacent basin boundary inflow, wells, drains, ET, net groundwater outflow to the Salton Sea, and total recharge, along with annual and cumulative change in groundwater storage.

Both Future Projects scenarios use the same underlying hydrologic sequencing as the Baseline and Near-Term scenarios. Total Recharge is higher than in the corresponding Near-Term scenarios throughout the simulation period, reflecting the additional imported water supplies and recharge capacity associated with the Future Projects, including increased Colorado River direct deliveries, the Sites Reservoir Project (starting 2035), the Delta Conveyance Project (starting 2047), and the EVRA Project (phased in 2035 to 2045).

Under Future Projects with Moderate Climate Change (upper Figure 7-31), cumulative change in storage increases through the early simulation period to approximately 1.5 million AF by the early 2040s, continues to increase through the middle of the simulation period to approximately 2.5 million AF by the early 2050s, and reaches approximately 3 million AF by the end of the simulation.

Under Future Projects with Severe Climate Change (lower Figure 7-31), cumulative change in storage increases to approximately 1 million AF by the early 2040s, then increases gradually through the remainder of the simulation period, reaching approximately 1.7 to 1.8 million AF by the end of the simulation. As under Near-Term with Severe Climate Change, and in contrast to the Baseline with Severe Climate Change scenario, cumulative storage under Future Projects with Severe Climate Change does not decline late in the simulation period, consistent with continued recharge benefit from the Future Projects.

Figure 7-31 Model Water Budgets for Future Projects Models



7.9.3.2 Future Projects Change in Groundwater Levels

Simulated changes in groundwater levels between 2009 and 2075 for the Future Projects scenarios are shown on Figure 7-32 and Figure 7-33, respectively, representing Model Layer 4 (deep aquifer) conditions. As with the Baseline and Near-Term scenarios, the 2009 comparison point represents the initial conditions of the historical model (see Section 7.2.4), developed from the average of observed groundwater levels measured between October 2009 and March 2010. Because this comparison spans both the historical model period and the future predictive simulation, results reflect the combined influence of the historical storage recovery documented in Section 7.4 and the future conditions specific to the Future Projects scenarios.

The far northwestern portion of the model domain, near the San Bernardino Mountains, continues to show simulated groundwater level declines that are best considered separately from the rest of the Subbasin. This limitation is discussed further in Section 7.1.2, and the discussion below focuses on the main Indio Subbasin area.

Across the main Indio Subbasin, the Future Projects with Moderate Climate Change model (Figure 7-32) shows groundwater level increases throughout the entire area, consistent with the storage gain documented in Section 7.9.3.1. Increases greater than 100 feet extend through the upper West Valley and Garnet Hill area in the vicinity of the WWR-GRF. Increases of roughly 60 to 100 feet extend through the Mid-Valley area, tapering to roughly 20 to 40 feet through most of the East Valley. Levels in the vicinity of the TEL-GRF and through the lower East Valley toward Mecca Hills remain relatively stable to slightly increasing, with a localized area of greater increase near the TEL-GRF consistent with continued PD-GRF-related recharge.

The Future Projects with Severe Climate Change model (Figure 7-33) shows a similar spatial pattern of increases across the main Subbasin, at smaller magnitudes than Future Projects with Moderate Climate Change, consistent with the relationship observed among the other scenario pairs. Increases greater than 100 feet are simulated through the upper West Valley near the WWR-GRF. Increases of roughly 60 to 100 feet extend through the remaining upper West Valley and into the Mid-Valley, tapering to roughly 40 to 60 feet through most of the remaining Mid-Valley and 20 to 40 feet through most of the East Valley. As under the Future Projects with Severe Climate Change scenario, a localized area of greater increase is simulated near the TEL-GRF, and levels toward the Salton Sea shoreline remain stable to slightly increasing, with no area of decline.

Figure 7-32 Groundwater Level Difference Contours 2009 to 2075 for Future Projects with Moderate Climate Change

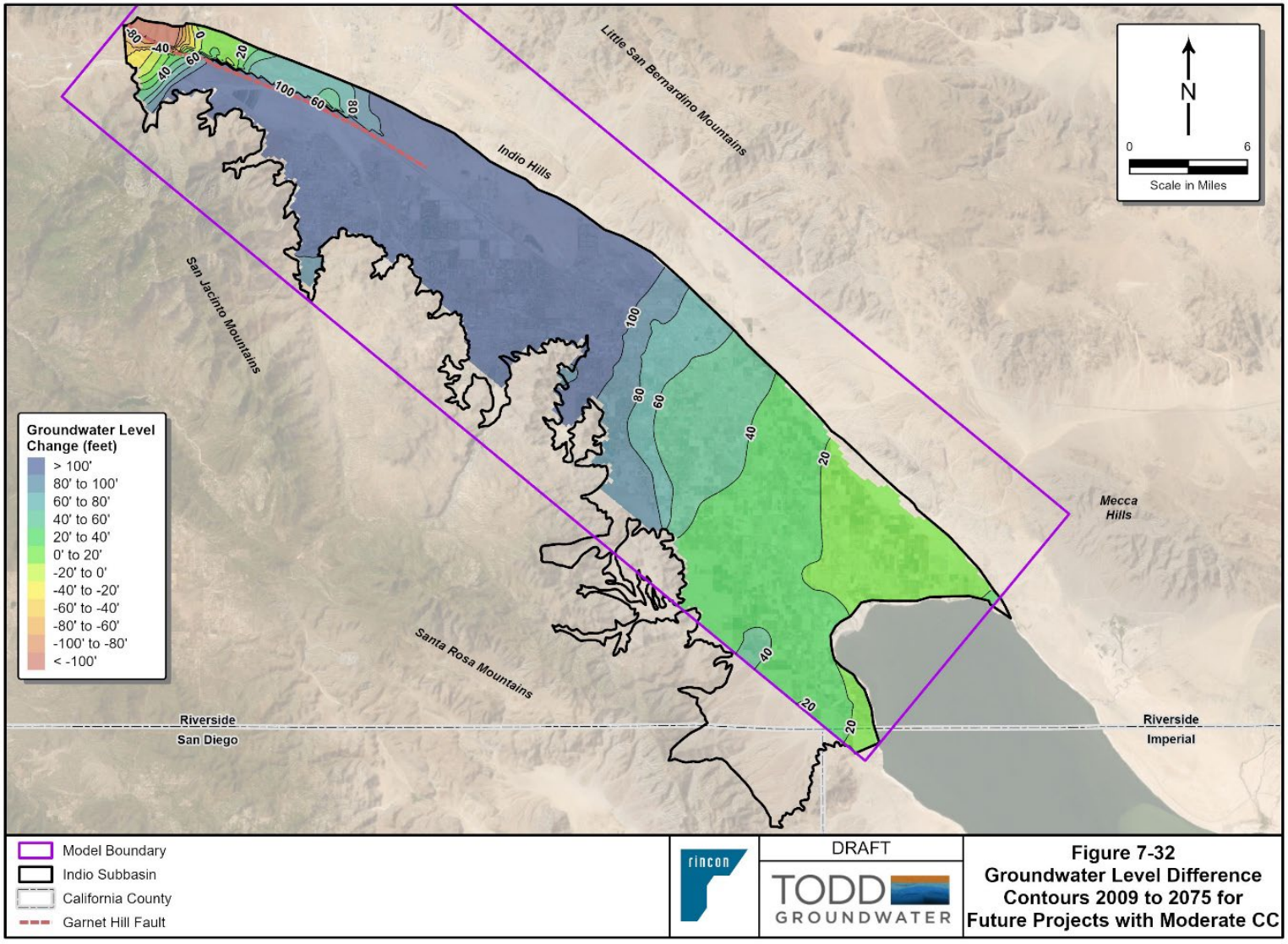
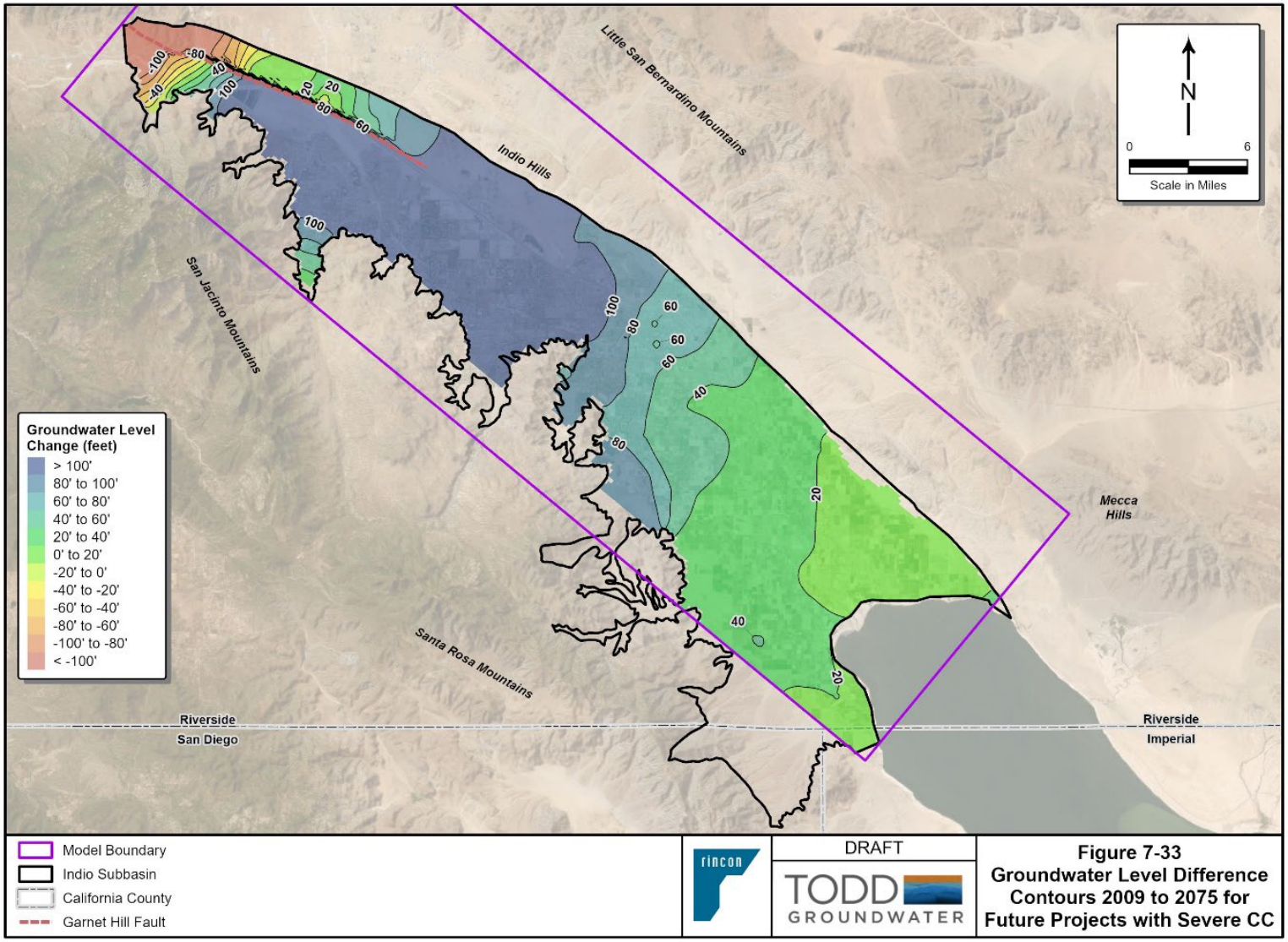


Figure 7-33 Groundwater Level Difference Contours 2009 to 2075 for Future Projects with Severe Climate Change



7.10 Comparative Analysis of Predictive Models

This section compares the six predictive models presented in Sections 7.7 through 7.9, presenting Baseline, Near-Term Projects, and Future Projects scenarios, each simulated under moderate climate change (RCP 4.5) and severe climate change (RCP 8.5) conditions. All six models share the same predictive simulation period (WY 2026 to 2075), model configuration, and climate change methodology described in Sections 7.5 and 7.6. Differences in results among the six models reflect the cumulative effect of the source substitution, groundwater replenishment, non-potable/recycled water, and supply acquisition assumptions specific to each scenario, combined with the differences in surface and imported water supply availability between the moderate and severe climate change conditions.

The following subsections compare average inflows and outflows over the 50-year simulation period (Section 7.10.1), cumulative change in groundwater storage (Section 7.10.2), and simulated groundwater level hydrographs (Section 7.10.3) across all six models. These comparisons illustrate how water budget and groundwater level outcomes evolve across the three stages of Subbasin development represented by the Baseline, Near-Term Projects, and Future Projects scenarios, and how climate change assumptions affect those outcomes.

7.10.1 Model Inflows and Outflows by Scenario

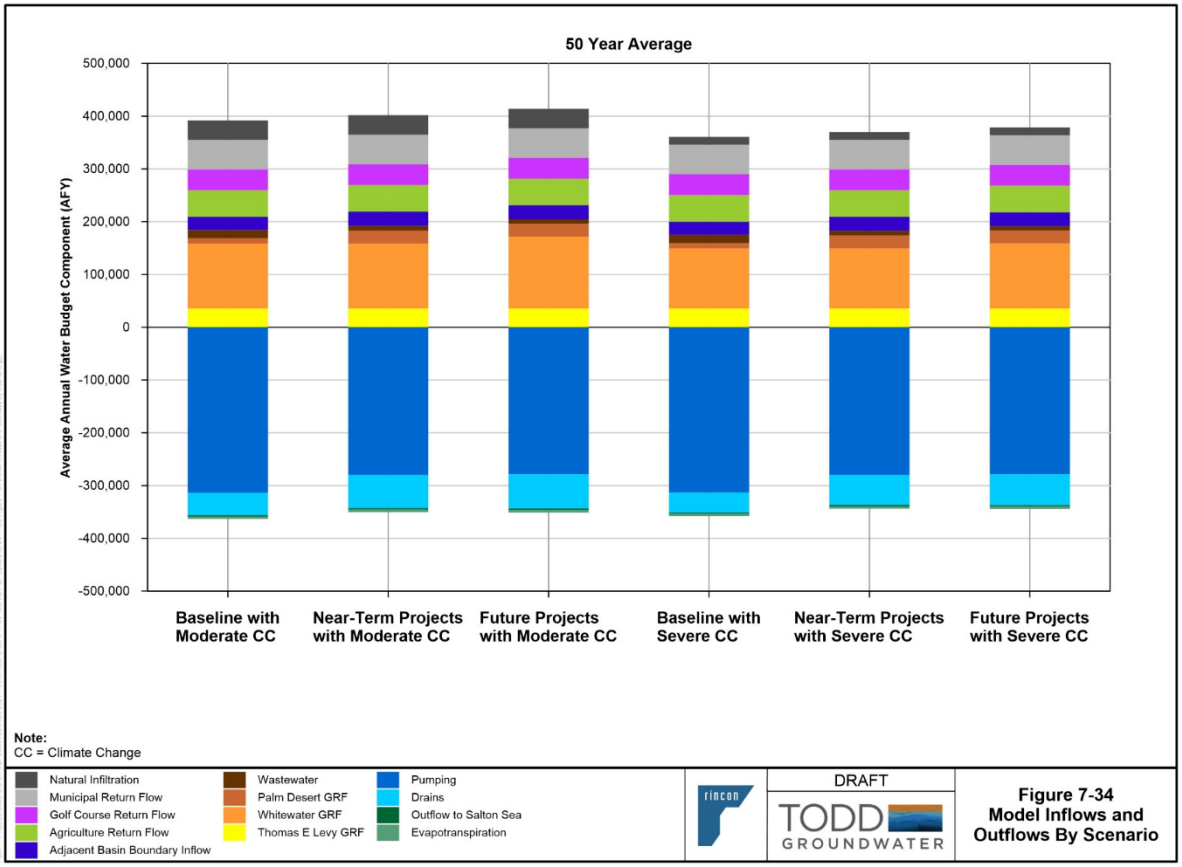
Figure 7-34 presents the average annual water budget components over the 50-year predictive simulation period for all six scenarios, providing greater resolution of individual recharge sources (by GRF and return flow type) than the total water budgets in Sections 7.7.3.1, 7.8.3.1, and 7.9.3.1, which remain the source of the underlying results.

Pumping is the dominant outflow in all six scenarios. Within each climate pairing, average annual pumping is lower under the Near-Term Projects and Future Projects scenarios than under Baseline, reflecting the increased direct use of Canal and recycled water described in Sections 7.8 and 7.9. Drain flow and net outflow to the Salton Sea are relatively consistent across all six scenarios.

Natural infiltration and GRF replenishment account for most average annual recharge in all scenarios, with WWR-GRF the largest single source. Average annual recharge is generally highest under the Future Projects scenarios and lowest under Baseline, reflecting the added imported water supplies described in Sections 7.8 and 7.9. Within each project stage, average annual inflow is modestly lower under Severe Climate Change than Moderate Climate Change conditions, consistent with the reduced natural infiltration and SWP exchange reliability described in Section 7.5.1.1, while average annual pumping is similar between climate variants, since it is driven primarily by forecasted demand.

Across all six scenarios, average annual inflow exceeds average annual outflow, consistent with the net increases in cumulative storage presented in Section 7.10.2.

Figure 7-34 Model Inflows and Outflows by Scenario



7.10.2 Change in Storage

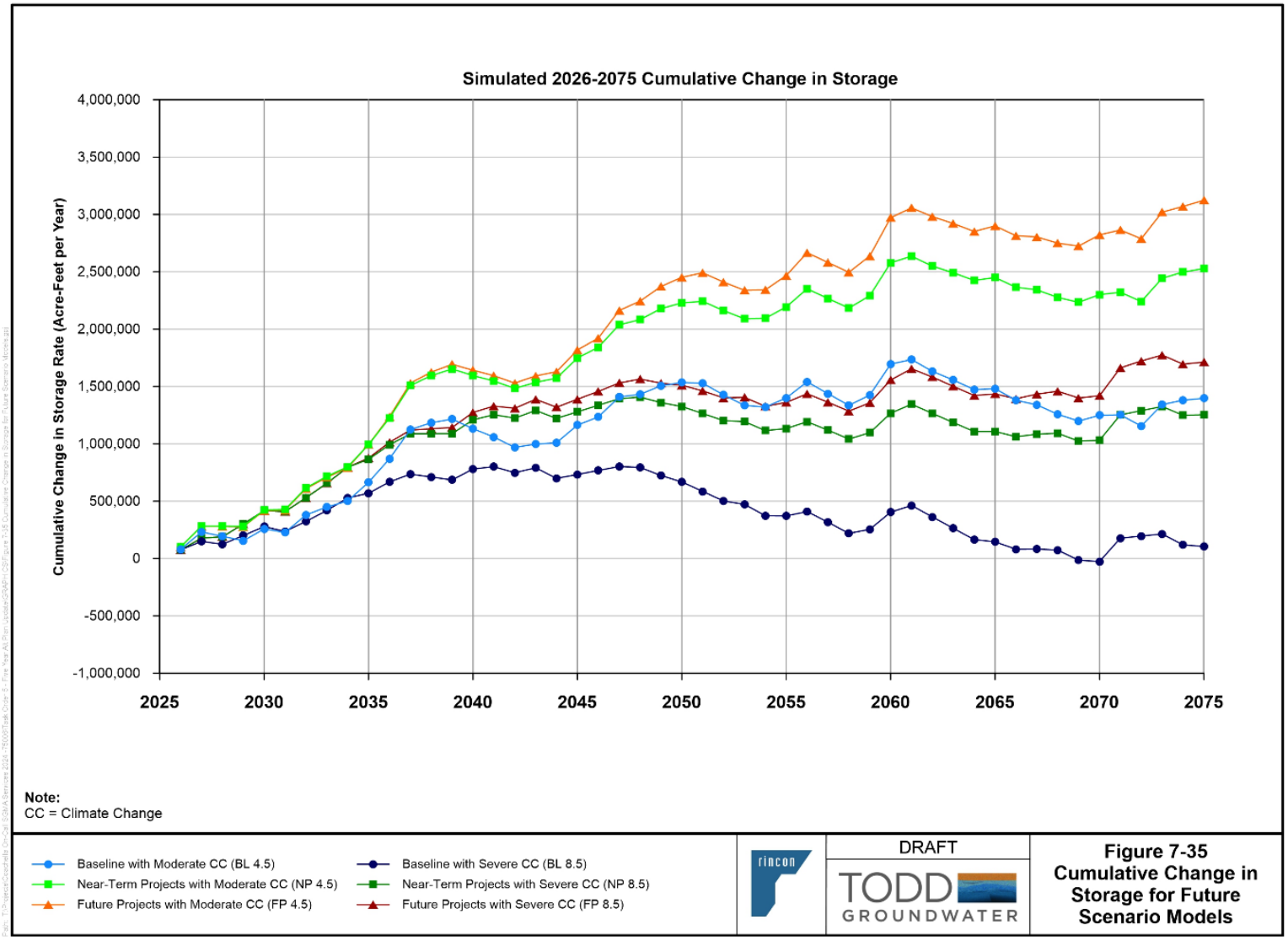
Figure 7-35 presents the simulated cumulative change in groundwater storage for all six scenarios over the WY 2026 to 2075 predictive simulation period. Cumulative storage increase ranges from a high of approximately 3.1 million AF under the Future Projects with Moderate Climate Change scenario to near zero under the Baseline with Severe Climate Change scenario.

Within each project stage, Moderate Climate Change conditions result in greater storage gain than Severe Climate Change conditions, consistent with the reduced recharge and SWP reliability assumed under the Severe Climate Change models (Section 7.5.1). Within each climate scenario, storage gain increases progressively from Baseline to Near-Term to Future Projects, reflecting the added recharge and demand offset from the PMAs described in Sections 7.8 and 7.9. Notably, Baseline with Moderate Climate Change tracks within the same general range as Near-Term with Severe Climate Change and Future Projects with Severe Climate Change for much of the simulation, indicating that the storage benefit from Near-Term or Future Projects with Severe Climate Change is comparable to the impacts of Moderate Climate Change conditions alone under Baseline.

The general increase in storage through approximately 2050 reflects a wetter period in the estimated future hydrology that coincides with forecasted demand not yet being fully phased in; this period corresponds to the Near-Term and Future Projects build-out, as the supply projects described in Sections 7.8 and 7.9 come online. From approximately 2050 to 2075, once demand is fully phased in and the supply projects are in place, storage under Near-Term with Severe Climate Change, Future Projects with Severe Climate Change, and Baseline with Moderate Climate Change

remains generally stable, while storage under Baseline with Severe Climate Change shows a general decline that erodes a portion of the gains achieved earlier in the simulation. This divergence underscores the importance of continued implementation of PMAs to ensure long-term sustainability in the Subbasin.

Figure 7-35 Cumulative Change in Storage for Future Scenario Models



7.10.3 Hydrographs

Figure 7-36 and Figure 7-37 **s**how simulated groundwater elevation hydrographs for all six scenarios at eight Key Wells each in the West Valley and East Valley, respectively. Baseline scenarios are shown in blue, Near-Term Projects scenarios in magenta, and Future Projects scenarios in orange, with Moderate Climate Change as solid lines and Severe Climate Change as dashed lines.

West Valley

In the upper West Valley, near the WWR-GRF (KW-001 and KW-003), simulated groundwater levels show pronounced annual fluctuations associated with recurring recharge events, consistent with the historical calibration period. Peak levels under these recharge cycles are highest under Future Projects with Moderate Climate Change and lowest under Baseline with Severe Climate Change, with the remaining four scenarios falling between these projections.

In the Indio Hills and Thousand Palms area (KW-009 and KW-013), simulated levels show a smoother, steadily increasing trend. Water levels rise on the order of 100 to 150 feet from historical lows by 2075 under the Moderate Climate Change scenarios, with smaller increases under the Severe Climate Change scenarios.

In the Mid-Valley area, from Rancho Mirage through Thermal and Palm Desert (KW-012, KW-016, KW-015, and KW-019), simulated levels increase steadily for all six scenarios. The Future Projects and Near-Term Projects scenarios with Moderate Climate Change produce the largest and most similar increases at these wells, reflecting the combined influence of the Near-Term and Future Projects supply and source substitution projects, while overall increases are more modest than in the upper West Valley, consistent with the location of most source substitution projects in the mid and East Valley areas.

East Valley

Figure 7-37 shows simulated groundwater elevation hydrographs for the Key Wells in the East Valley. In contrast to the West Valley, differences in simulated groundwater levels among the six scenarios are small at most East Valley wells, with levels generally stable to slightly increasing relative to the end of the historical simulation period. One exception is KW-036, which shows a distinct increasing trend reflecting additional recharge at the TEL-GRF.

The generally muted response across the East Valley reflects both the area's greater reliance on agricultural groundwater production, which is inherently more difficult to project with confidence than municipal demand, and the reduced agricultural return flow factor applied in the predictive models. As described in Section 7.6.2.5, agricultural return flow was reduced from 30 percent of applied water in the historical model to 20 percent in the predictive models, reflecting an assumption of increasing irrigation efficiency over the planning period. This reduction lowers simulated recharge from agricultural return flows relative to the historical model across all six scenarios, contributing to the comparatively stable groundwater level trends simulated in the East Valley.

Figure 7-36 Future Model Scenario Hydrographs, West Valley

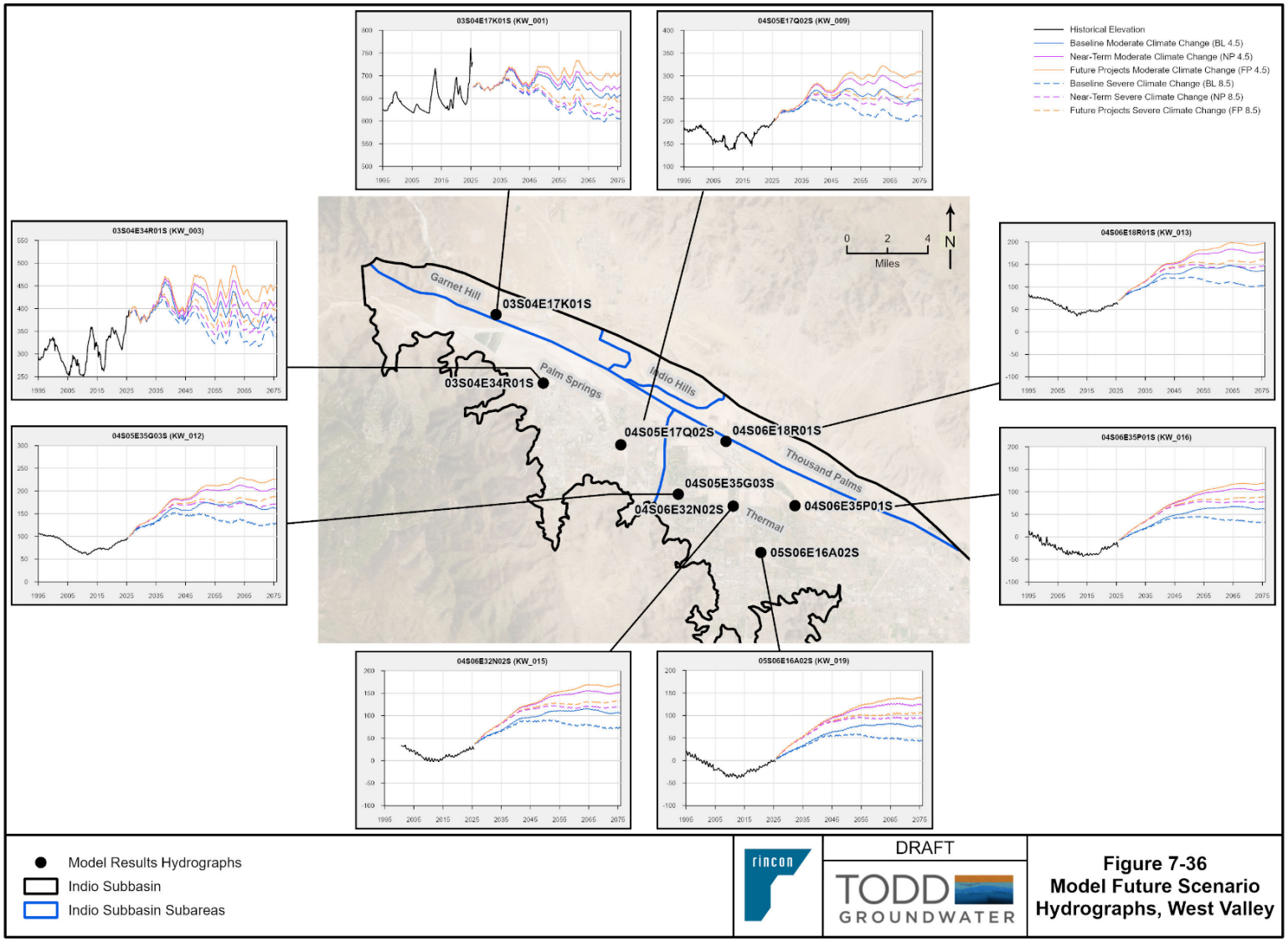
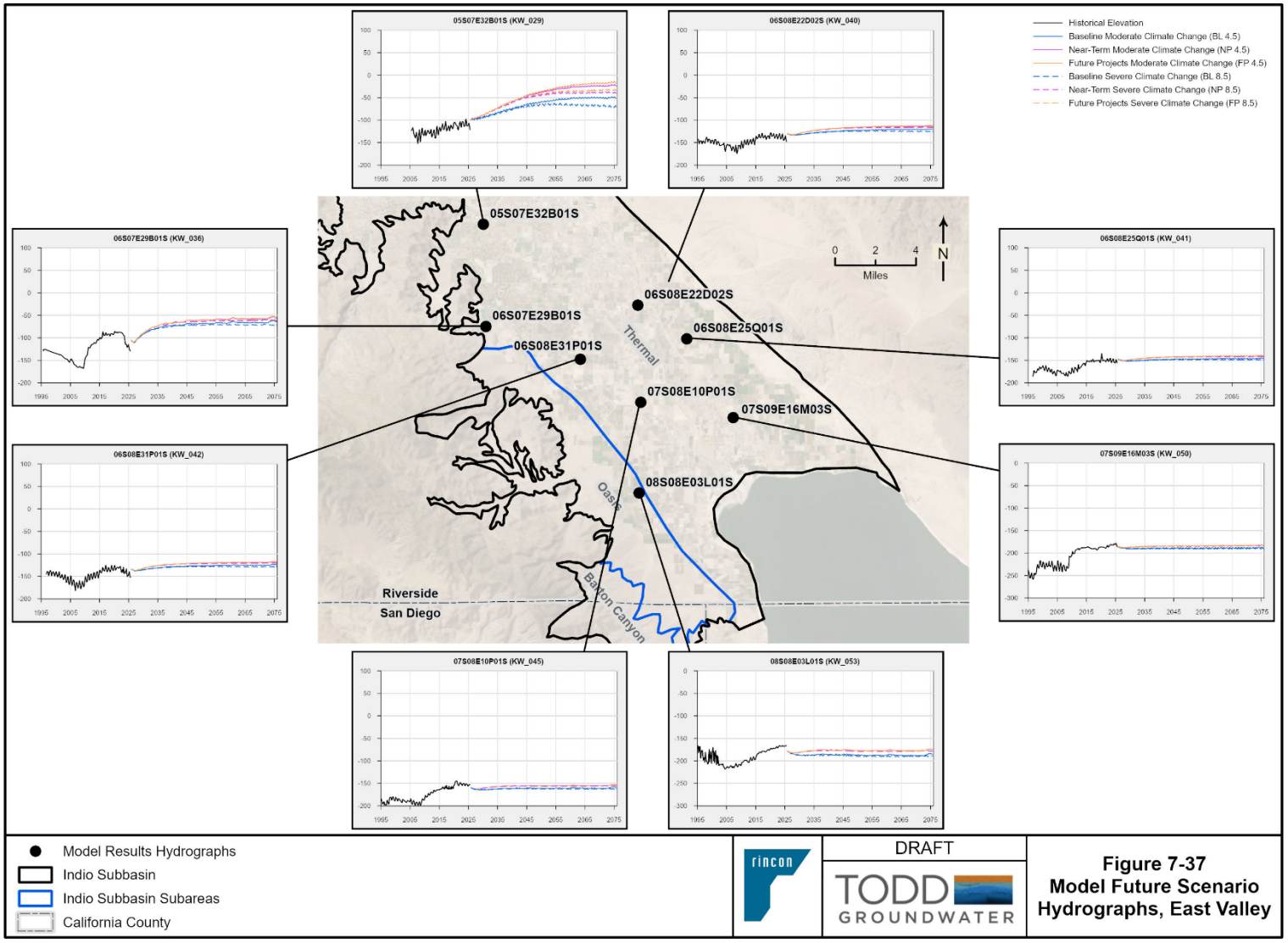


Figure 7-37 Future Model Scenario Hydrographs, East Valley



7.11 Conclusions

The predictive models presented in this chapter build on the historical model described in Sections 7.1 through 7.4, which simulates groundwater conditions in the Indio Subbasin from 2010 through 2025. The historical model incorporates several major updates relative to previous versions, including extension of the model grid to align with the SGP Subbasin boundary, an upgrade from MODFLOW-2005 to MODFLOW-NWT with the Newton solver, refined quarterly stress periods, and a comprehensive recalibration of aquifer parameters and boundary conditions.

The updated historical model is well calibrated. Summary statistics (Table 7-1) show a mean residual of 3.24 feet, a mean absolute residual of 8.15 feet, and are well within ASTM standards for quality of calibration. Simulated hydrographs generally track observed groundwater levels closely across the Subbasin (Figure 7-15 and Figure 7-16), including the dynamic recharge-driven responses near the WWR-GRF and TEL-GRF and the long-term increasing trends observed through most of the Mid-Valley and East Valley. Overall, the historical model is considered a high-quality tool for simulating groundwater conditions in the Indio Subbasin and provides a sound basis for the predictive scenarios presented in this chapter.

The six predictive scenarios presented in Sections 7.7 through 7.10 build on this calibrated historical model to evaluate a range of future Subbasin conditions under varying project implementation and climate assumptions. The Moderate Climate Change (RCP 4.5) and Severe Climate Change (RCP 8.5) projections used in these scenarios (Section 7.5.1) provide reasonable bookends for potential future hydrologic conditions, with actual future conditions expected to fall somewhere between the two. Of the sources of uncertainty inherent in the predictive scenarios, uncertainty in the long-term reliability of imported water supplies, particularly SWP deliveries, represents the greatest source of uncertainty in future Subbasin conditions.

Where possible, conservative assumptions were applied to the predictive scenarios to avoid overstating future Subbasin water balance benefits. These include a 10 percent buffer added to projected municipal demand, and a reduced agricultural return flow factor (20 percent of applied water compared to 30 percent in the historical model) reflecting an assumption of increasing irrigation efficiency over the planning period (Section 7.6.2.5). Both assumptions are applied consistently across the Baseline, Near-Term Projects, and Future Projects scenarios.

Taken together, the results presented in this *2027 Alternative Plan Update* indicate that continued implementation of planned and future source substitution, water conservation, supply acquisition, non-potable/recycled water expansion, and groundwater replenishment projects is important to maintaining a stable Subbasin water balance under a range of climate conditions. The Baseline with Severe Climate Change scenario is the only one of the six scenarios to show a net decline in cumulative groundwater storage over the 50-year simulation period, eroding a portion of the storage gained earlier in the simulation once demand is fully phased in. By contrast, the Near-Term Projects and Future Projects scenarios each generally maintain or increase Subbasin storage over the same period. These results demonstrate the importance of the GSAs' portfolio of planned and future PMAs in maintaining long-term Subbasin sustainability, particularly under less favorable climate conditions.

Interbasin coordination with the adjacent SGP and Mission Creek Subbasins occurred throughout development of both the historical and predictive models. Efforts were made to synthesize model development across the three subbasins where possible, and interbasin boundary fluxes were

developed and applied consistently between the respective groundwater models (Sections 7.2.5 and 7.6.2.1).

While the GSAs have a suite of planned and future PMAs that can maintain the Indio Subbasin water balance across a range of climate outcomes, adaptive management will remain critical to ensure these projects are implemented effectively and in the areas where they are most needed. The updated historical and predictive models presented in this chapter provide the GSAs with improved tools to track actual Subbasin conditions against the six scenarios over time, and to identify when conditions are trending toward the less favorable end of the modeled range. As additional data become available and conditions evolve, the Indio historical and predictive models should continue to be refined and updated to support periodic reassessment of the Plan and to help guide the timing and prioritization of future PMAs.

7.12 Model Improvements

While the model is reliable tool to predict future groundwater conditions, improvements could be made to further increase the accuracy in local areas. Based on the development and application of the historical and predictive models described in this chapter, the following improvements are recommended for consideration in future model updates:

- Refine/regrid the model to a finer spatial discretization, and allow for variability in cell size around key areas such as streams and GRFs, to reduce averaging effects near steep local gradients (Section 7.3.2).
- Refine the vertical layering of the model to increase resolution of interbedded coarse- and fine-grained sediments and better synthesize with the Hydrogeologic Conceptual Model (see Chapter 3, *Hydrogeologic Conceptual Model*); the current four-layer structure simplifies this interbedding, likely contributing to under-simulation near the Salton Sea (Section 7.3.2).
- Update the model code from MODFLOW-NWT to MODFLOW 6, USGS's actively maintained framework, to support improved solvers and the other refinements recommended here.
- Add estimated ET by parcel for better surface accounting of recharge.
- Investigate a possible extension of the Garnet Hill Fault HFB to address under-simulated groundwater levels in the eastern model area around Coachella and Thermal, which may reflect a groundwater gradient not captured by the current HFB extent (Section 7.3.2).
- Review stream recharge routing methodology and compare with recent data. Evaluate adding simulation of streams in the extended northern section, including the San Gorgonio River and the unnamed stream from Cottonwood Canyon.

8 Regulatory and Policy Issues

This chapter describes regulatory and policy issues that could affect implementation of this *2027 Alternative Plan Update*. While these issues may represent challenges, the intent of this chapter is to define the issue, identify potential solutions, and consider opportunities. The *2022 Alternative Plan Update* identified emerging issues, and all are updated with the following exceptions:

- The Antidegradation Policy requires that high-quality surface water and groundwater be maintained unless the State finds that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect beneficial uses, and will not result in water quality lower than applicable standards. The Antidegradation Policy is an integral part of any Salt and Nutrient Management Plan (SNMP). Given that the *Coachella Valley Salt and Nutrient Management Plan* (CV-SNMP) is scheduled for completion in 2027, issues concerning the policy will be updated as part of that document.
- Seismic response was included in the *2010 CVWMP Update* and *2022 Alternative Plan.* As summarized in those documents, DWR is conducting seismic upgrade projects on its own facilities, and local agencies, including Coachella Valley Water District (CVWD), Desert Water Agency (DWA), City of Coachella, and City of Indio have developed disaster/emergency preparedness plans. The *2025 Regional UWMP* includes a seismic risk assessment and mitigation plan for water system facilities.

The remaining issues are updated in this chapter, and some also are discussed in detail in other chapters of this *2027 Alternative Plan Update*. This chapter adds discussion of Drain Flow as a Sustainability Indicator, which was one of the DWR corrective actions defined for the *2022 Alternative Plan*.

8.1 Water Quality Policies and Planning

The *2010 CVWMP Update* and *2022 Alternative Plan* described the changing policies and regulations of the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Board (RWQCB). These are the subject of continuing review and update by the state agencies, and accordingly, warrant regular review by the GSAs.

8.1.1 Basin Plan

California's 1969 Porter-Cologne Water Quality Act established the SWRCB and the nine RWQCBs to preserve and enhance all beneficial uses of the state's water. The RWQCBs develop basin plans that identify beneficial uses for groundwater and surface water within their hydrologic units, establish water quality objectives (WQOs) to protect beneficial uses, and define implementation programs to achieve WQOs. The *Basin Plan for the Colorado River Basin Region* (Colorado River RWQCB 1993; 2006; as amended) was first prepared and adopted by the Colorado River Basin RWQCB in 1993 with subsequent amendments. Prepared in accordance with the Porter-Cologne Water Quality Control Act, the Federal Clean Water Act, and other state and federal rules and regulations, the Basin Plan provides guidelines for optimizing use of state waters within the region by preserving and protecting water quality.

This *2027 Alternative Plan Update* has included review of the Basin Plan adopted by the RWQCB with amendments effective on or before August 20, 2024. This Update also addresses changes to the Clean Water Act 303(d) list of impaired water bodies, Total Maximum Daily Loads (TMDLs) for surface water bodies, and high-priority issues identified in Triennial Reviews. These issues mostly are surface water related, including for example, surface water bacteriological objectives, stormwater channel flow, and agricultural wastewater.

8.1.1.1 303(d) List and TMDLs

Section 303(d) of the Federal Clean Water Act requires states, territories, and authorized tribes to prepare a list of water bodies that do not or are not expected to attain water quality standards after application of required technology-based controls. The 303(d) list includes the size of the water body, the sampled pollutants affecting designated beneficial uses, the source of the pollutant, and the water body's priority status relative to TMDLs. TMDLs are established to limit discharged pollutants and help overcome water quality impairment. TMDLs are implemented through amendments to the Basin Plan or an alternative TMDL plan may be put in place. The 303(d) lists are prepared as part of the Water Quality Assessment of the State's major waterbodies and meet a requirement of Section 303(d) of the Clean Water Act.

Table 8-1 summarizes approved TMDLs for the Coachella Valley Stormwater Channel (CVSC). These are the same as reported in the *2022 Alternative Plan*. Table 8-2 shows the TMDLs under development for the CVSC with completion expected in December 2026.

Table 8-1 Approved TMDLs for the CVSC

Indicator Parameter	30-Day Geometric[a] Mean	Maximum Instantaneous
E. coli	126 MPN[b]/100ml	400 MPN/100ml
Fecal coliform	200 MPN/100ml	–[c]
Enterococci	33 MPN/100ml	100 MPN/100ml

[a] Based on a minimum of no less than 5 samples equally spaced over a 30-day period.

[b] Most probable number.

[c] No more than 10 % of total samples during any 30-day period exceed 400 MPN per 100 ml.

Source: Amendment to Water Quality Control Plan for the Colorado River Basin Region

Table 8-2 TMDL Under Development for CVSC with Completion Expected in 2026

TMDL Project Title	Impairments	Completion Date	Comments
Coachella Valley Stormwater Channel - Ammonia, Dissolved Oxygen, and Toxicity TMDLs	Ammonia	December 2026	The CVSC is 303(d) listed for multiple impairments. Work is ongoing on a TMDL Plan to address these issues.
	Dissolved Oxygen		
	Toxicity		

Source: Water Quality Control Plan for Colorado River Basin Triennial Review 2023 Appendix B

As of February 2026, the California Environmental Protection Agency (CalEPA) and the SWRCB released the *Final Staff Report for the 2026 California Integrated Report: Surface Water Quality Assessments to Comply with Clean Water Act Sections 303(D) and 305(B)* (CalEPA and SWRCB, 2026). This report includes recommendations for 47 new 303(d) "List" Decisions for waterbody-pollutant combinations and 5 "Delist" Decisions for waterbody-pollutant combinations. As approved by the United States Environmental Protection Agency (USEPA), the Colorado River Basin Region's 303(d) list was revised to have a total of 152 waterbody-pollutant combinations on the 303(d) list. This

Final Staff Report was adopted by the SWRCB on February 3, 2026, followed by submittal to the USEPA. The TMDL indicated in Table 8-2 is included in the recommendations.

8.1.1.2 Triennial Review

The Clean Water Act requires states to conduct public review of water quality standards at least once every three years. Accordingly, the RWQCB conducts a public review process and updates the Basin Plan at least once every 3 years—a process known as "triennial review." The triennial review may result in amendments to the Basin Plan over the course of the 3-year review cycle. The previous Triennial Review for the Colorado River Basin Region was completed in December 2023, and the 2026 Triennial Review has been initiated as of March 2026.

The available 2023 Triennial Review (RWQCB, 2023) is presented on the RWQCB website[1] including the Staff Report and Appendices B and C that list and rank proposed projects (RWQCB, 2023). The 2023 Triennial Review identified and ranked 27 priority projects for implementation. Seven of these projects are anticipated to be completed by December 2026. One project directly involves the CVSC and three projects are focused on the Salton Sea. The CVSC and Salton Sea projects are described below (RWQCB, 2023, Appendix B).

- **Salton Sea Dissolved Oxygen and Nutrients TMDLs -** The Salton Sea is 303(d) listed for multiple impairments, including dissolved oxygen and nutrients. Under this project, staff is developing TMDLs for nutrients and dissolved oxygen for the entire Salton Sea Watershed. This project will incorporate New River and Coachella Valley Stormwater Channel (CVSC) proposed TMDLs after they are submitted to USEPA.
- **Salton Sea Watershed, Coachella Valley Stormwater Channel Ammonia, Dissolved Oxygen, and Toxicity TMDLs** - The CVSC is 303(d)-listed for multiple impairments, including ammonia, dissolved oxygen, and toxicity. Staff is developing TMDLs to address these impairments. The Salton Sea is also impaired for ammonia and dissolved oxygen, and developing these TMDLs at the CVSC, which discharges to the Salton Sea, will work toward addressing these impairments at the Salton Sea. The CVSC toxicity TMDLs will also contribute to addressing Salton Sea toxicity impairment if the two impairments are caused by the same pollutants.
- **Salton Sea Beneficial Use Review** –As described in the RWQCB Staff Report Appendix B, the Salton Sea is an endorheic (terminal) lake without an outlet, which means that certain pollutants have been concentrating in it since its formation in 1905. The average TDS concentration (from three sampling locations) increased to roughly 75,000 mg/L in 2024. Given the high salinity, the RWQCB currently is developing a proposed amendment to the Basin Plan that would de-designate the existing Warm Freshwater Habitat (WARM) beneficial use for the Salton Sea and instead designate the Salton Sea as Inland Saline Water Habitat beneficial use. The Salton Sea is not freshwater and because of its endorheic nature may never meet the current water quality objectives for the WARM beneficial use. Under this amendment, staff will determine whether WARM is attainable for these pollutants and establish whether the Salton Sea should be considered a saltwater body for the purposes of applicable water quality objectives. As of 2026, RWQCB staff are conducting a Use Attainability Analysis to modify the Salton Sea beneficial uses.
- **Beneficial Use Designation for Salton Sea Constructed Aquatic Habitats** - The California Natural Resources Agency (CNRA), in coordination with other Salton Sea stakeholders, is developing plans for and building a series of constructed aquatic habitats as part of the Salton Sea

[1] https://www.waterboards.ca.gov/coloradoriver/

Management Program (see Section 8.4). The aquatic habitats will be filled with mixed water from the existing tributaries and the Salton Sea and used to provide wildlife habitat while suppressing dust from the exposed playa, as the Sea recedes. Because the habitats will be using mixed water and will be different from both the Salton Sea and the tributaries, they may have different beneficial uses from those parent water bodies, and possibly from each other. As of 2026, the RWQCB is evaluating existing beneficial uses of the Salton Sea and potential beneficial uses of the constructed habitats including recreation uses and wildlife habitats.

A SNMP meeting the requirements of the Recycled Water Policy is required for certain designated basins in California. SNMPs must include an antidegradation analysis demonstrating that the existing projects, reasonably foreseeable future projects, and other sources of loading to the basin included within the plan will, cumulatively, satisfy the requirements of the Antidegradation Policy. In 2020, development began of a new CV-SNMP, including a full antidegradation analysis consistent with the Antidegradation Policy. As described in Section 8.1.3, the CV-SNMP is underway with completion scheduled for 2027.

8.1.2 Recycled Water Policy

In the Plan Area, recycled water is a significant and reliable local resource used to help offset groundwater pumping for irrigation and other non-potable uses. Recycled water has been used for golf course irrigation in portions of the Plan Area since the late 1960s. CVWD and Desert Water Agency (DWA) currently deliver recycled water from three water reclamation plants (WRPs) for municipal and golf course irrigation use in the East and West Valley. The Recycled Water Policy specifies the levels of treatment for such use of recycled water, while a subsequent general order (SWRCB Order WQ 2016-0068-DDW) provides for permitting, administration, monitoring and reporting. In the Plan Area, three WRPs produce tertiary-treated recycled water consistent with State policy.

The SWRCB, recognizing the importance of recycled water as a water supply, administers the Recycled Water Policy (adopted in 2009) to encourage the increased use of recycled water and to support water supply diversity and sustainability. In 2018, the SWRCB adopted an amendment to the Recycled Water Policy that supports water recycling in the Plan Area and includes the following State-wide goals (SWRCB, 2018) that were updated in Governor Newsom's August 2022 directive, *California's Water Supply Strategy, Adapting to a Hotter, Drier Future*:

- Increase the use of recycled water State-wide to 800,000 AFY by 2030.
- Reuse all dry-weather direct discharges of treated wastewater to enclosed bays, estuaries and coastal lagoons, and ocean waters that can be viably put to a beneficial use.
- Maximize the use of recycled water in areas with groundwater overdraft, to the extent that downstream water rights, instream flow requirements, and public trust resources are protected.

Annual reporting is required so that the SWRCB can evaluate progress toward these goals and revise them as needed. Water reuse must be reported in terms of monthly volume with annual reporting of the distribution to beneficial uses including the following categories: agricultural irrigation, landscape irrigation, golf course irrigation, commercial applications, industrial applications, geothermal energy production, and other non-potable uses. Such reporting also must address direct and indirect potable uses such as groundwater recharge, seawater intrusion barriers, reservoir water augmentation, raw water augmentation, and other potable uses.

The Recycled Water Policy regulates indirect potable reuse (IPR) for groundwater recharge and direct potable reuse (DPR), neither of which are currently practiced in the Indio Subbasin. IPR for groundwater recharge involves planned use of recycled water for replenishment of a groundwater basin that is a source of water supply for a public water system; the groundwater basin provides public health benefits, for example through dilution and travel time. As described in Chapter 11*, Projects and Management Actions*, Indio Water Authority (IWA) is a partner in East Valley Reclamation Authority (EVRA). The EVRA has evaluated the feasibility of an IPR project. As of WY 2025, IWA was working with consultants to implement a groundwater model and complete a master plan that studies a recycled water 'purple pipe' system and groundwater replenishment options. While IPR is not currently practiced in the Indio Subbasin, it has been used for more than 40 years in other California basins as a reliable, high quality, locally controlled supply and may represent a future option.

In October 2024, regulations became effective for Direct Potable Reuse (DPR), allowing highly treated wastewater to directly enter drinking supplies. Strict rules established by the SWRCB require advanced multi-barrier treatment (such as ozone or reverse osmosis), stringent monitoring, high operator certification, robust source control, and public engagement. The DPR regulations provide for a safe, reliable, recycled water source that may become an important supply for California's future.

Given that IPR and DPR are potential future alternatives, it is advisable for the GSAs to stay informed of regulatory requirements (including constituents of emerging concern [CECs]) and the experience of other recycling projects.

8.1.3 Coachella Valley Salt and Nutrient Management Plan

While encouraging the use of recycled water, the Recycled Water Policy states that salts and nutrients from all sources must be managed on a basin-wide or watershed-wide basis to attain water quality objectives and protect beneficial uses. This is typically achieved through the development of an SNMP. Required components of a SNMP include a monitoring network and plan, water recycling use goals and objectives, salt and nutrient source identification, implementation measures, and an antidegradation analysis to ensure adherence to the Antidegradation Policy.

In 2015, CVWD, DWA, and IWA created the CV-SNMP for the Coachella Valley Groundwater Basin (CVWD, et al., 2015). Subsequently, the *2015 CV-SNMP* was evaluated by the Colorado River RWQCB for compliance with the updated Recycled Water Policy (Colorado River Basin RWQCB, 2020). In response to RWQCB comments, the CV-SNMP was restarted in 2020 by an expanded CV-SNMP group that includes all major water and wastewater agencies in the Coachella Valley. The 2020 CV-SNMP partners include CVWD, CWA and Coachella Sanitary District, DWA, IWA, Myoma Dunes Mutual Water Company, Valley Sanitary District, Mission Springs Water District, and City of Palm Springs, collectively the CV-SNMP partners. In 2021, CV-SNMP Agencies submitted a Development Workplan (West Yost, September 2021) that describes a detailed scope of work for updating the CV-SNMP, including a new groundwater monitoring program to support implementation of the CV-SNMP. The Groundwater Monitoring Program Workplan (West Yost, December 2020) was approved by the RWQCB in February 2021 and the CV-SNMP Development Workplan was approved in October 2021.

Progress on the CV-SNMP is being reported in a series of technical memoranda (TM) with guidance from a CV-SNMP Stakeholder Group and Technical Advisory Committee. Stakeholder outreach includes provision of a webpage (https://www.cvsnmp.com/) and workshops. Implementation of the CV-SNMP was incorporated into the *2022 Alternative Plan Update* as two PMAs, *Implement CV-*

SNMP Groundwater Monitoring Program Workplan and *Implement CV-SNMP Development Workplan*, with progress reporting included in subsequent Annual Reports. These two PMAs are updated in Chapter 11.

Implementation of the CV-SNMP groundwater monitoring program began following approval of the Groundwater Monitoring Workplan and acceptance of the CV-SNMP Development Workplan. Implementation of the CV-SNMP Groundwater Monitoring Program started in 2021 with initiation of the first triennial monitoring cycle. To fill identified monitoring gaps, sixteen monitoring wells were installed from 2022 through 2025. In addition, in Water Year 2023, the CV-SNMP partners completed an MOU with the Agua Caliente Band of Cahuilla Indians for sharing of water level and water quality data from three monitored wells on Tribal Trust land. In Water Year 2024, the GSAs (with the other CV-SNMP partners) completed the first triennial monitoring cycle (2021-2024) and initiated monitoring for 2024-2026 triennial monitoring. In 2024 and 2025, DWA constructed two new water quality monitoring well in partnership with DWR's TSS program.

The CV-SNMP partners also established the CV-SNMP stakeholder group and Technical Advisory Committee. As of 2026, four technical memoranda (TMs) have been completed by the CV-SNMP consultant. Final technical deliverables include the following and are posted online at: https://www.cvsnmp.com/resources/.

- Final Task 1 – Characterize TDS/N Mass Loading to the Coachella Valley Groundwater Basin
- Final Task 2 – Characterize Current Groundwater Quality
- Final Task 3 – Delineate Draft Management Zones and Describe Metrics to Characterize Beneficial Use Protection
- Final Task 4 – Develop Technical Approach for Forecasting TDS/N Concentrations in Groundwater

Upcoming TMs will present a baseline scenario, summarize computer modeling scenarios for forecasting TDS/N, and characterize and compare costs of baseline and forecasting scenarios. The Final CV-SNMP will present the entire CV-SNMP; completion of the CV-SNMP is scheduled for 2027.

8.1.4 Salinity Management

For the Indio Subbasin, a key salinity issue is the importation of salts with Colorado River water. Importation of Colorado River water for agricultural irrigation (substituting for groundwater pumping) and for groundwater replenishment has been fundamental to successful management of potential undesirable results such as groundwater level decline, depletion of storage, subsidence, and seawater intrusion. However, Colorado River water has higher average TDS concentrations than native sources. As described in the previous section, the CV-SNMP is the most important current effort to address salt management and provides the basis for characterizing current groundwater quality and TDS/N loading sources, delineating management zones, forecasting, and assessing implementation measures. This section summarizes other programs to manage Colorado River salinity. In addition, previous management plans have identified and assessed various alternatives for local management of salinity.

8.1.4.1 Colorado River Salinity Management

State Water Project (SWP) Exchange supply is provided through the Colorado River Aqueduct (CRA), which delivers water from Lake Havasu (Parker Dam) for recharge at the Whitewater River Groundwater Replenishment Facility (WWR-GRF). Colorado River supply also is provided through the Coachella Canal, a branch of the All-American Canal that brings Colorado River water from Imperial Dam. Water imported via the Coachella Canal is used at the Thomas E. Levy Groundwater Replenishment Facility (TEL-GRF) and Palm Desert Groundwater Replenishment Facility (PD-GRF).



Coachella Canal supplies agricultural irrigation demands in the East Valley.

TDS concentrations generally are lower for CRA supply (averaging about 590 milligrams per liter (mg/L) from 2010 through 2019), while Coachella Canal supply has averaged about 730 mg/L over the same period. At this time, TDS levels in Colorado River water are meeting applicable water quality objectives.

Colorado River water, used for direct delivery and recharge in the Indio Subbasin, generally has higher TDS concentrations that must be appropriately managed. Use of Colorado River water involves salt loading to the Indio Subbasin and local increases in TDS concentrations (see Chapter 4*, Current and Historical Groundwater Conditions*). CVWD and DWA have investigated alternatives including direct importation and recharge of lower TDS SWP water at the WWR-GRF and Mission Creek Groundwater Replenishment Facility (MC-GRF) in Mission Creek Subbasin. However, direct importation would require extensive pipeline construction for conveyance from western Riverside County and would involve technical and environmental constraints, significant costs, and limited benefits. Another alternative summarized in the *2010 CVWMP Update* involved pre-treatment of Colorado River supplies using reverse osmosis. While a proven technology, drawbacks include permitting, environmental issues, and technical and financial feasibility in light of available power and intermittent deliveries of Colorado River water.

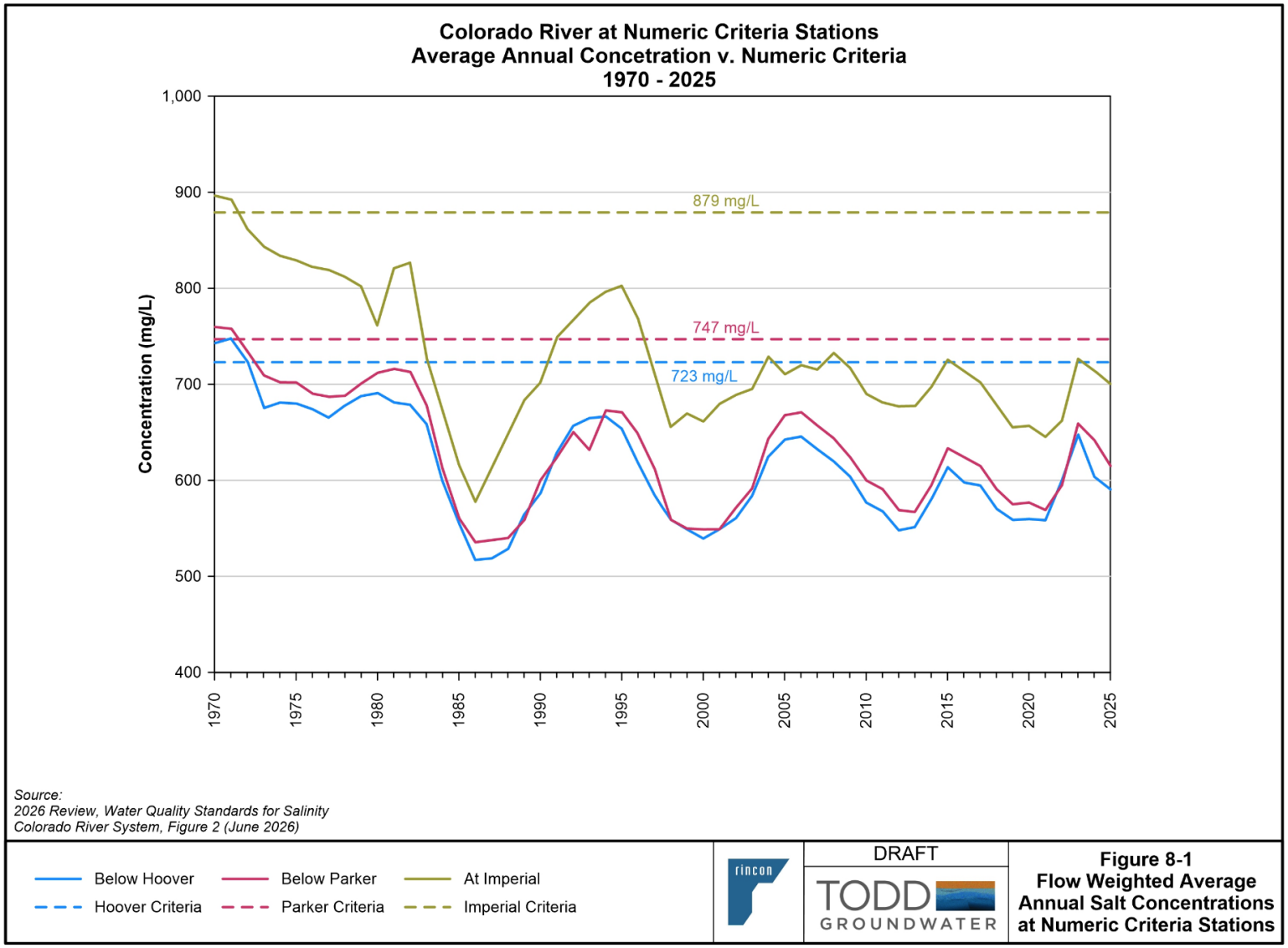
Salinity management includes an ongoing, watershed management approach, the Colorado River Basin Salinity Control Forum (Forum, see https://www.coloradoriversalinity.org/organization.php). This is an organization of the seven Colorado River Basin states of Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming. The Forum coordinates salinity control efforts among the states, coordinates with federal agencies on the implementation of the Colorado River Basin Salinity Control Program (Program), works with Congress on the authorization and funding of the Program, and disseminates information on salinity control. The Forum prepares a triennial report that includes review of water quality standards relating to the salinity of the Colorado River and an update on the Program. The latest report is the draft June 2026 *Review of Water Quality Standards for Salinity, Colorado River System* herein termed 2026 Salinity Review (Colorado River Basin Salinity Control Forum, 2026).

The Program has established numeric criteria for salinity, adopted by the seven Basin states and approved by USEPA. Figure 8-1 (reproduced from the 2026 Salinity Review) shows the criteria and flow-weighted average annual salt concentrations at three numeric criteria stations, from upstream to downstream: Below Hoover, Below Parker, and At Imperial. The last two correspond to the diversion points for the CRA and All-American Canal. As shown on Figure 8-1**,** salinity concentrations have decreased since 1970 at all three numeric criteria stations and waters are currently meeting standards. These decreased TDS concentrations reflect work accomplished by the Program.

As of 2026, the Program has reduced salt loading in the Colorado River by more than 1.346 million tons per year. As documented in the 2026 Salinity Review (see 2026 Salinity Review Table 1) about 90 percent of the current salinity control results from non-point source agricultural measures. These involve improved water delivery and irrigation systems maintained by agricultural producers who are salinity program participants. The Program also includes policies for effluent limitation (for example, addressing discharges from fish hatcheries) and point-source salinity control measures, such as preventing inflow to the river from saline springs and plugging of abandoned, flowing oil and gas wells. The Paradox Valley Unit in Colorado, a deep injection project, has been the single largest point-source control project. It had been discontinued in 2019 due to seismic activity, but was resumed in June 2022 and is being continued, albeit at a reduced rate of about two-thirds the original design rate.

The Plan of Implementation anticipates that the Program will continue through the next review period (2027-2029) and will control an additional 42,000 tons of salt per year, resulting in a total annual salt load reduction of 1,388,400 tons by 2029. These salt load reductions will occur primarily through improved agricultural practices in the Upper Basin.

Figure 8-1 Flow Weighted Average Annual Salt Concentrations at Numeric Criteria Stations



8.1.4.2 Brine Discharge/ Management

The *2010 CVWMP Update* identified brine discharge as a major issue that would be associated with desalination of Colorado River water for municipal or agricultural uses, or replenishment. Desalination of significant flows would result in production of large volumes of brine that would need to be disposed in a cost-effective manner and in compliance with Basin Plan requirements. In discussing Salton Sea restoration, the *2010 CVWMP Update* acknowledged that diversion and desalination of drain flows also would reduce inflow to the Salton Sea, with potential environmental impacts.

Desalination and brine discharge were also addressed in the *2012 Final Subsequent Program EIR* (Final SPEIR) for the *2010 CVWMP Update*, which provided comparison of SWP importation and desalination options. The Final SPEIR noted that permitting of discharge of brine to the Salton Sea via wetlands was uncertain. It also generally considered desalination of recharge water as financially infeasible. Similarly, the *2018 IRWM Plan* addressed considerations including high costs for handling and disposal of brine, large land areas for evaporation ponds, and regulatory issues associated with brine disposal.

As summarized in existing documents, various alternatives have been explored for desalination. These alternatives involve different sources of water for desalination (e.g., CRA, Coachella Canal, drain flows), volumes of supply, methods of storage and conveyance, options for water treatment, and alternatives for brine management and discharge. Any future consideration of brine discharge should include review of pending RWQCB projects (such as the Salton Sea Beneficial Use review; see Section 8.1.1.2) that could result in changed definitions of Salton Sea beneficial uses and water quality objectives that could affect any planned brine discharge. In addition, planning for Salton Sea restoration is ongoing (see Section 8.3), with likely ramifications for any potential brine discharge.

8.1.5 Agricultural Drainage Discharge Regulations

Water discharges from agricultural operations include irrigation runoff, flows from tile drains, and stormwater runoff. These discharges can affect water quality by transporting pollutants (for example, pesticides, nutrients, salts, pathogens, and heavy metals) from cultivated fields into surface waters. The quality of receiving surface water bodies and groundwater can be impaired. Groundwater quality is monitored for numerous constituents (see Chapter 4*, Current and Historical Groundwater Conditions*) and is addressed as an element of sustainable management (see Chapter 9, *Sustainable Management*).

To control the effects of discharges from irrigated agricultural lands, the SWRCB's 2004 Nonpoint Source Implementation and Enforcement Policy (NPS Policy) requires all RWQCBs to regulate agricultural discharges by issuing waste discharge requirements (WDRs) or conditional waivers of WDRs (Orders) to growers. These Orders require water quality monitoring of receiving waters and corrective actions when impairments are found.

The NPS Policy provides for agricultural dischargers to act individually or collectively in coalition groups. The Coachella Valley Irrigated Lands Coalition (CVILC) was established in 2013 by CVWD with local growers/operators to help irrigated agriculture meet the requirements of the Colorado River Basin RWQCB's Irrigated Lands Regulatory Program (ILRP) in the Coachella Valley. The CVILC is a membership-based coalition that implements programs to help farmers reduce their impacts. Programs include best management practices (BMPs), outreach and education (e.g., workshops, information fliers in CVWD billings), and monitoring of water quality as required by the RWQCB. The

CVILC hosts a webpage, https://www.cvilc.org/, to facilitate membership and provide information on the program.

To comply with the terms of the WDR and ensure attainment of water quality objectives, the CVILC developed a Compliance Program in which members are required to complete documentation of management practices annually through Farm Plans and Irrigation and Nitrogen Management Plan Summary Reports (INMP SRs), among other activities. The CVILC also developed a Monitoring and Reporting Program and a Quality Assurance Project Plan.

Agricultural dischargers include entities who operate and maintain agricultural drains (e.g., CVWD) and property owners, renters/lessees, and operators/growers who discharge water, have potential to discharge water, propose to discharge water, or could directly or indirectly affect water quality. Under the General Order, all irrigated crop land and commercial pasture requires coverage under the ILRP. The Order does not require coverage for discharges from crops for personal use, golf courses, polo fields, or discharges originating on tribal/reservation lands.

Agricultural discharges in the Coachella Valley currently are regulated by the Colorado River Basin RWQCB Order R7-2020-0026, adopted on November 12, 2020. This WDR supersedes the previous 2014 Conditional Waiver. The 2020 Order (RWQCB, 2020) includes new provisions for the Farm Plan, Drinking Water Supply Well Monitoring, and Education Outreach requirements, among others. This 2020 Order expands the regulatory oversight to groundwater and potential leaching of nitrogen from crop applications of fertilizer, manure or compost.



CVWD samples the drain flows to the Salton Sea.

8.2 Groundwater Quality

The *2022 Alternative Plan Update* identified salinity (TDS), arsenic, perchlorate, hexavalent chromium (chromium-6), uranium, and nitrate as groundwater quality constituents of concern (COCs). In addition, a USGS study (USGS, 2023) found that 39 percent of the groundwater resources used by domestic wells in Coachella Valley contained arsenic, fluoride, or both constituents at concentrations greater than the Maximum Contaminant Levels (MCLs) established for public drinking-water systems. Uranium, chromium, nitrate, and perchlorate were detected at moderate concentrations below MCLs. Information regarding these constituents is compiled through the GSAs' regular groundwater quality monitoring programs and is maintained within the centralized Data Management System (DMS) (Section 10.1.4). These constituents are discussed further in Section 4.4, Groundwater Quality.

The GSAs also continue to track evolving regulations of emerging contaminants; current regulations are provided below for salinity, arsenic, perchlorate, (chromium-6), uranium, and nitrate. For each, the current drinking water standard or MCL is stated. PFAS are a new emerging issue which is also described below.

8.2.1 Salinity

Salinity is typically expressed in terms of TDS. There is no primary, health-based MCL for TDS. Instead, TDS is regulated through secondary drinking water quality standards that are based on consumer acceptance of taste and odor. As indicated in the 2015 SNMP, the California Code of Regulations Title 22 states that there is no fixed consumer acceptance level established for TDS, but there are three Consumer Acceptance Contaminant Level Ranges. Concentrations lower than the Recommended contaminant level (500 mg/L) are desirable for a higher degree of consumer acceptance; constituent concentrations ranging to the Upper contaminant level (1,000 mg/L) are acceptable if it is neither reasonable nor feasible to provide more suitable waters; and constituent concentrations ranging to the Short-Term contaminant level (1,500 mg/L) are acceptable only for existing community water systems on a temporary basis pending construction of treatment facilities or development of acceptable new water sources.

The sources and factors affecting the occurrence of salinity are documented in Section 4.4, Groundwater Quality. Salinity management, CV-SNMP progress, and related issues are described in Section 8.1, Water Quality Policies and Planning.

8.2.2 Arsenic

Arsenic was identified in the *2010 CVWMP Update* as an emerging issue. The primary MCL for arsenic before 2001 was 50 micrograms per liter (µg/L). Under the 1996 Amendments to the Safe Drinking Water Act, the USEPA was required to publish a revised standard for arsenic by January 2001. USEPA published a final MCL for arsenic of 10 µg/L in 2001, which became enforceable in 2006. California adopted the federal MCL effective November 28, 2008.

As discussed in Section 4.4.8, arsenic occurs naturally in groundwater and most of the Indio Subbasin is characterized by arsenic concentrations below the MCL. However, arsenic is commonly found in groundwater in the southern Subbasin at levels higher than current state and federal drinking water standards. All four GSAs provide drinking water supplies that meet all state and federal health standards as documented in their annual water quality consumer confidence reports (available on their respective websites).

CVWD currently operates three water quality treatment facilities in the East Valley to remove naturally occurring arsenic from drinking water before it is delivered to customers. In addition, CVWD is addressing safe drinking water needs through the DAC Infrastructure Task Force (see Section 8.5), which has developed a Domestic Water Supply Master Plan that prioritizes consolidation projects to connect failing water systems to CVWD.

8.2.3 Perchlorate

Perchlorate was identified in the *2010 CVWMP Update* as an emerging issue because of historical detections in Colorado River supply that originated from two manufacturing facilities and have since been cleaned up to below detection limits (see Chapter 4, *Current and Historical Groundwater Conditions*). Perchlorate is hazardous to human health, difficult to remove from water, and resistant to degradation in groundwater. The MCL has been set at 6 µg/L by the State of California, and all four GSAs provide drinking water supplies that meet applicable state and federal standards.

In 2015, the State's Office of Environmental Health Hazard Assessment (OEHHA) published an updated public health goal (PHG) of 1 part per billion (ppb; equivalent to µg/L) for perchlorate in drinking water (OEHHA, 2015). A public health goal is not an enforceable regulatory standard;

however, it is intended to provide scientific guidance to the SWRCB Division of Drinking Water (DDW) in reviewing the existing state drinking water standard. State law requires that each regulatory drinking water standard must be set as close to the corresponding PHG as is economically and technologically feasible. Accordingly, the SWRCB will use the PHG to inform its review of the current enforceable regulatory standard for the chemical. In addition, SWRCB recommended revision of the detection limit for purposes of reporting (DLR) for perchlorate (SWRCB, October 2020). The Perchlorate DLR rulemaking was approved, with the DLR decreasing from 4 µg/L to 2 µg/L as of July 1, 2021 and from 2 µg/L to 1 µg/L as of January 1, 2024. Even though most perchlorate detections in Subbasin groundwater are less than 2 ug/L and highly localized (see Section 4.4.12), the GSAs continue to monitor perchlorate and to track the review of the perchlorate PHG.

8.2.4 Chromium-6

Chromium-6 was identified in the *2010 CVWMP Update* as an emerging issue. Chromium occurs as trivalent chromium and as chromium-6; while trivalent chromium is non-toxic, chromium-6 has been linked to health effects. Chromium-6 has a complex regulatory history. In 2011, the OEHHA published a PHG of 0.02 ppb (or µg/L) for chromium-6 in drinking water. Subsequently in 2014, the State adopted the country's first chromium-6 drinking water standard or MCL. That MCL of 10 ppb was then rescinded in 2017 due to a ruling that the state "had failed to consider the economic feasibility of complying with the MCL." As of October 2024, California adopted a drinking water standard for chromium-6, with an MCL of 10 parts per billion (or 10 µg/L). The deadline for public water systems to meet the 10 ppb standard is based on their number of service connections, as follows:

- 10,000 or more connections: October 1, 2026
- 1,000 to 9,999 connections: October 1, 2027
- Fewer than 1,000 connections: October 1, 2028.

With the exception of DWA, all Indio Subbasin GSAs have detected chromium-6 exceedances in groundwater supply and are now working to achieve compliance, including required notifications of the public, exploration for funding, and planning for chromium-6 treatment.

Anticipating a potential MCL revision that could affect their groundwater supply, CWA and IWA sponsored a joint study that identified a recommended treatment technology (City of Coachella, 2016). IWA installed chromium-6 removal systems at three wells. As of 2025, IWA has been applying for state and federal grants to offset costs of upgrading treatment systems to reduce chromium-6 levels and meet the new state standards.

CWA operates six wells, and the available 2025 quarterly chromium-6 sampling results indicate that CWA needs to treat its supplies to meet the standards. Accordingly, CWA has been exploring the most economical way to treat its impacted wells and has applied for up to $84 million in state funding to build a treatment plant. CWA also is working to complete a Hexavalent Chromium Compliance Plan for submittal to the SWRCB. This plan includes treatment alternative analysis, pilot testing, permitting, and project design.

CVWD also investigated methods and conducted a successful pilot project to treat water for chromium-6. In October 2025, CVWD submitted a compliance and implementation plan, including a timeline, to the SWRCB-DDW for approval and is awaiting response. CVWD also provides required notifications to the public when the annual average of quarterly samples exceed the chromium-6 MCL of 10 ppb. As of November 2025 and January 2026, notices (in English and Spanish) have been

posted on the website and sent to the Cove Communities Water System (serving Rancho Mirage, Palm Desert, Thousand Palms, Indian Wells, La Quinta, Mecca, Bombay Beach, North Shore, Hot Mineral Spa, and portions of Cathedral City, Bermuda Dunes, Indio, Oasis, Thermal, Valerie Jean, and Riverside County) and to the ID-8 Water System (Sky Valley, Indio Hills, and portions of Desert Hot Springs). These will continue until the drinking water complies with the MCL.

DWA continues to monitor its groundwater quality and to provide information through its annual Water Quality Report, noting that its water supply has not exceeded the 10 ppb MCL for chromium-6 (DWA 2026).

8.2.5 Uranium

Uranium has a MCL of 20 picocuries per liter (pCi/L), or about 30 µg/L. It was identified in the *2010 CVWMP Update* as an emerging issue, reflecting insufficient information at the time regarding potential sources to the Indio Subbasin. However, data now available indicate local geologic sources including bedrock formations to the west and east of the northern Subbasin (see Chapter 4, *Current and Historical Groundwater Conditions*). DWA previously identified high concentrations of uranium as a potential constraint on groundwater supply (DWA, 2016), and has since managed operation of its wells to reduce uranium concentrations in delivered water. Uranium concentrations in DWA groundwater sources has been below MCLs (DWA 2026).

The GSAs monitor for uranium in both groundwater and Colorado River sources used for recharge. All four GSAs provide drinking water supplies that meet the state and federal standards.

8.2.6 Nitrate

Nitrate has a MCL of 45 mg/L, measured as nitrate. This is equivalent to 10 mg/L measured as nitrogen. It was identified in the *2010 CVWMP Update* as a nitrogen compound that is both a nutrient for plants and a human health issue. The sources and occurrence of nitrate are documented in Chapter 4, *Current and Historical Groundwater Conditions*, while nitrate occurrences in small water systems are summarized in Section 8.5, Small Water Systems, along with programs by the GSAs to address nitrate issues. Drinking water supplied by the GSAs meets drinking water standards, as documented in their annual water quality consumer confidence reports (available on their respective websites). As a nutrient, nitrate will be addressed through the CV-SNMP update process now underway (see Section 8.1.3).

8.2.7 PFAS

PFAS represent a large group of man-made chemicals. Exposure to PFAS is associated with reproductive, developmental, immunological, and renal health effects in humans. PFAS have been used since the 1940s in products including fire-fighting foam and polymers used in aircraft and electronics manufacturing, common household products such as nonstick cookware, paper packaging and wrappers for food, and stain- and water-repellent fabrics. PFAS contamination of groundwater often occurs near firefighting training facilities, wastewater discharge facilities, or landfills. These chemicals do not break down and accumulate in humans through various exposure pathways, including through ingestion of drinking water. In April 2024, the USEPA finalized the first-ever national drinking water legally enforceable levels, called maximum contaminant levels (MCLs) for six PFAS compounds: PFOA, PFOS, PFNA, PFHxS, and HFPO-DA (also known as "GenX Chemicals"), and PFAS mixtures.

Recognizing the threat of PFAS, in March 2024 the SWRCB issued Order 2024-0002-DDW, which required comprehensive monitoring. In April 2024, USEPA established a National Primary Drinking Water Regulation (NPDWR) for six PFAS compounds, enforcing MCLs for PFOA and PFOS at 4 parts per trillion (ppt) and at 10 ppt individually for PFHxS, HFPO-DA (GenX), and PFNA. A hazard index (HI) of 1 was also established for any mixture of PFHxS, PFNA, GenX, and PFBS. However, the rule was revised in May 2025, limiting the applicability of the rule to only PFOS and PFOA and requiring compliance by 2029. The rule was revised again in May 2026, upholding the limits for PFOA and PFOS, but moving the compliance deadline to 2031.

On October 29, 2025, California proposed revisions included the following:

Contaminant	Notification Level	Response Level
Perfluorohexanoic Acid (PFHxA)	1 ug/L	10 ug/L
Perfluorohexane Sulfonic Acid (PFHxS)	3 ng/L	10 ng/L
Perfluorooctanoic acid (PFOA)	4.0 ng/L	10 ng/L
Perfluorooctane sulfonic acid (PFOS)	4.0 ng/L	40 ng/L

CVWD owns and operates two public water systems, Improvement District No. 8 (ID-8) and Cove Communities. The ID-8 and Cove Communities water systems consist of four (4) and eighty-eight (88) active domestic wells, respectively. Recent monitoring at these wells, required by the DDW 2024 Order, has indicated that the raw water at five wells in the Cove Communities water system have been impacted by PFAS at concentrations that exceed one or more of DDW's notification levels, Consumer Confidence Report Detection Levels (CCRDLs), Notification Levels (NLs), and Response Levels (RLs), and exceed the EPA adopted MCLs for PFAS, specifically for PFOA, PFOS, and PFHxS. These wells include:

- Two wells (5673-1, 5667-1) exceed RLs and have been taken out of service by CVWD.
- Two wells (5624-1, 5659-1) exceed NLs, requiring reporting in the annual Consumer Confidence Report (CCR).
- One well (5625-2) exceeds CCR Detection Levels (DLs) and would exceed NLs under California's July 3, 2025, proposed revisions.

In October 2025, CVWD initiated an evaluation of treatment/non-treatment options and recommendations to address PFAS in the cluster of five wells. As of 2026, the ongoing evaluation is assessing the full extent of PFAS in shallow groundwater, assessing risk to CVWD production wells, investigating source areas, and evaluating engineered solutions (treatment or new well location recommendations) to maintain pumping capacity in CVWD's Valley Pressure Zone. With planned completion in 2027, the evaluation will include conceptual design, cost estimation, regulatory support, reporting, and implementation schedule.

8.3 Drain Flow Study

As presented in Chapter 2, *Plan Area*, and Chapter 3, *Hydrogeologic Conceptual Model*, an extensive agricultural drainage system (both subsurface tile drainage systems and surface drains) was installed in the East Valley to control high water table conditions, intercept poor quality shallow groundwater, and convey the water to the CVSC and Salton Sea. Drain flows are measured at 27 drains and the CVSC and have been simulated using the numerical model. Because drain flow has historically been considered an indicator of shallow groundwater conditions and contributes to

basin outflow, DWR requested that the GSAs evaluate whether a sustainable management criterion should be established for drain flow.

In its Staff Report for the *2022 Alternative Plan Update* (Recommended Action 6), DWR requested that the GSAs provide clarification of whether there is a minimum threshold associated with the amount of subsurface drain flow below which significant and unreasonable undesirable results would occur. Drain flow data have been used to evaluate groundwater outflow and to calibrate the Indio Subbasin numerical groundwater flow model, which includes simulation of drains. In addition, the *2010 CVWMP Update* summarized simulated drain flows based on modeling of future water management scenarios at the time. The *2010 CVWMP Update* assumed that larger drain flows are beneficial because they are a response to higher groundwater levels in the East Valley, which promote removal of salt present in shallow groundwater and thus are generally protective of the deep aquifer. Subsequently, the *2022 Alternative Plan Update* recommended a Drain Flow Study, acknowledging the DWR recommendation and recognizing that drain flows are an outflow from the water budget and a source of salt outflow.

CVWD conducted the Drain Flow Study (Todd, August 2023), which is enclosed as *East Coachella Valley Agricultural Drainage System Flow Study* in Appendix 4-A. This Drain Flow Study documents the drain system and identifies multiple sources of inflow to it. These include regulatory water flows (a necessary component of the irrigation pipeline system to ensure proper pressure and flow), treated point source wastewater flows, fish farm effluent, unauthorized discharges, stormwater runoff, irrigation water return flows, and shallow groundwater.

A water balance analysis in the Drain Flow Study demonstrates that agricultural return flow volumes can account for most of the drain flow volumes. As documented, drain flows have been decreasing since 1970, likely related to changes in agricultural irrigation practices rather than changes in the groundwater system. This is an important perspective, because it is unlikely that agricultural users will return to the less-water-conserving irrigation practices of the past. Accordingly, it is unlikely that the volume of drain flows will return (or should return) to 1980s volumes.

The Drain Flow Study provides a conceptual hydrogeologic model and analyzes groundwater levels spatially and vertically to show interactions with the drain system. This analysis reveals little to no vertical groundwater flow along the axis of the Valley (due to confining or semi-confining units), slight downward flow along the western and eastern edges (due to the lack of confining units), and a slight upward flow along the southern boundary with the Salton Sea.

Evaluation of water quality data identified geochemical signatures for surface water, drain water and groundwater, and revealed that drain water samples show similar geochemical signatures to Colorado River water, suggesting that most of the drain flow is related to agricultural return flows. Shallow groundwater quality samples show a range of signatures that indicate multiple factors, while deep groundwater samples present distinct geochemical signatures.

The Drain Flow Study concludes that drain outflow volumes to the Salton Sea would be an indirect and inaccurate measure of upward groundwater flow and thus represent an inadequate means of assessing groundwater sustainability. It also concludes that drain flow is not needed as a criterion for sustainable management. The drain flow volumes represent multiple sources and do not adequately indicate changes in water levels, water quality, or interconnected surface water. Instead, the Drain Flow Study documents that groundwater levels and quality are directly monitored and that the monitoring program is generating data that support groundwater management and protection of the deep zone. As discussed in Chapter 9, *Sustainable Management*, groundwater levels are already included in the Indio Subbasin's sustainable management criteria.

8.4 Salton Sea Restoration

The Salton Sea, a saline lake at the eastern end of Coachella Valley, is located along the Pacific Flyway migratory bird route and serves as important habitat for over 400 bird species including endangered and threatened species (U.S. Fish and Wildlife Service, 2020). Once known for its sport fishery and recreational uses, the Salton Sea has shrunk in size and deteriorated in water quality, leading to loss of the fishery and in recent years, mass die-offs of birds and fish, raising concerns about these beneficial uses.

The primary source of inflow for the Salton Sea is agricultural drainage from the Imperial and Coachella Valleys plus inflow from the New River, Alamo River, and CVSC. The Salton Sea does not have a natural outlet, so evaporation is the sole outflow, and any influent salts are concentrated. Moreover, the sea has reduced in volume, leading to more concentration. Consequently, salinity levels have increased over the past several decades. Salinity levels collected at four sampling locations in the Salton Sea as of November 2024 ranged from 68,000 to 86,000 mg/l, roughly double the salinity of ocean water. With its current trajectory, the Salton Sea could become hypersaline with elimination of fish that serve as an important food source for migratory birds (Salton Sea Authority, 2016). Decreased inflows over the past several decades have caused the Salton Sea's surface elevation and area to decline, which has exposed more of the playa lakebed. The increasingly exposed playa generates dust that degrades air quality.

Indio Subbasin groundwater is connected to the Salton Sea, with potential for groundwater outflow to the sea and seawater inflow from the sea. The latter represents seawater intrusion from the Salton Sea, a significant source of potential groundwater quality degradation. The occurrence of outflows/inflows depends on respective groundwater and Salton Sea elevations, which can change through time and vary with location. Salton Sea levels and quality are tracked by USGS, while local groundwater levels and salinity also are monitored regularly (see Chapter 4, *Current and Historical Groundwater Conditions*). The potential for seawater intrusion into Subbasin aquifers has diminished as Subbasin groundwater levels have increased and as the Salton Sea levels have decreased and the sea has retreated. As discussed in Chapter 7, *Numerical Model and Plan Scenarios,* on simulated Salton Sea flows, numerical modeling indicates that groundwater outflow to the sea has exceeded inflow from the sea since 2015. Seawater intrusion is also discussed in Chapter 9, *Sustainable Management,* in terms of sustainable management as part of this *2027 Alternative Plan Update*.

Due to its ecological importance and changing condition, legislation has been passed on the State and Federal level to conduct in-depth studies and so support Salton Sea restoration. In 2016, a Memorandum of Understanding (MOU) was signed between the U.S. Department of the Interior and the California Natural Resources Agency (CNRA) to affirm that the State will take the lead role in Salton Sea management and facilitate coordination for the *Salton Sea Management Plan* (SSMP). The State's SSMP Team (including CNRA, California Department of Fish and Wildlife (CDFW), and DWR) developed a 10-Year Plan identifying a sequence of dust control and fish and wildlife habitat projects around the Salton Sea. The SSMP Team has worked with federal, state, and local agencies, including the Salton Sea Authority, CVWD, the Torres Martinez Desert Cahuilla Indian tribal government, multiple community organizations, and other interested parties. Progress on the 10-Year Plan is reported regularly in the CNRA's *Annual Report on the Salton Sea Management Program* (CNRA 2026).

In 2024, the SSMP finalized its Long-Range Plan. This plan provides critical information for the aquatic ecosystem restoration feasibility study that will identify long-range restoration alternatives

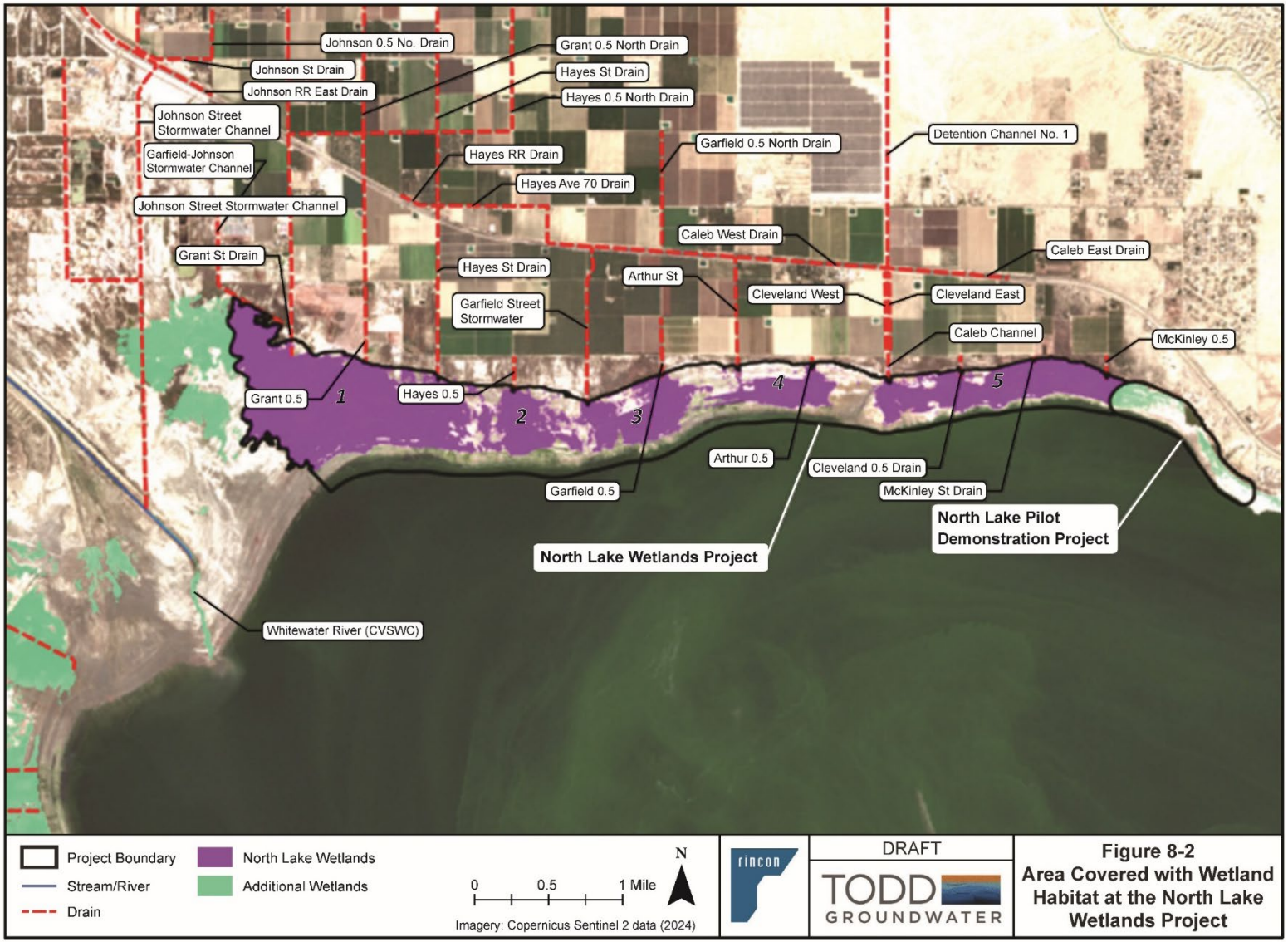
for analysis and will also develop alternatives for early implementation. Also in 2024, the SSMP Team completed multiple key planning and regulatory compliance documents, including an Environmental Assessment for National Environmental Policy Act (NEPA) compliance and implementing a Clean Water Act permitting structure for all Phase 1 projects. In 2024, important funding was secured from USBR, which committed $175 million to accelerate implementation of projects at the Salton Sea. Projects to drill supply wells, construct ponds, establish vegetation, and promote dust control are underway, as are additional studies and monitoring.

In 2025, the State began filling its first major habitat restoration project at the southwest end of the Salton Sea with water. This project, the Species Conservation Habitat (SCH) Project, is still in active construction and will cover approximately 9,500 acres at full buildout. On the north end of the Salton Sea, the Authority and Riverside County are collaborating on the North Lake Wetlands Project. As shown on Figure 8-2, this project focuses on maintaining existing wetlands, with planned expansion to include the North Lake Wetlands Project near the community of North Shore. In 2025, work continued on the North Lake Wetlands Project conceptual design with plans to secure a contractor in 2026.

The North Lake Wetlands Project is located along the Salton Sea shoreline east of the CVSC and west of the North Shore Beach and Yacht Club. The project covers approximately 2,284 acres with potential expansion up to 3,852 acres. The project aims to enhance and improve water use efficiency of agricultural drain water on exposed lakebed to stabilize and manage wetland habitat while avoiding and minimizing impacts on the existing biological resources at the site. The multi-benefit project will also provide dust suppression and additional shoreline bird habitat. Water use efficiency will be improved by utilizing relatively fresh drain water, which currently flows to the Sea, for use on both current and future exposed lakebed. Groundwater would be used to supplement drain water to help improve overall water quality and ensure sufficient baseflow is available. The project aligns with the goals outlined in the SSMP 10-year plan.

Project objectives and multiple benefits include the following: proactively mitigate dust emissions on identified priority exposed lakebed areas through surface roughening, irrigation of water efficient vegetation, as well as expanding the amount of saline shallow water dust control areas near the Sea shoreline; connect discharge from multiple drains for increased water availability and reliability for dust control and habitat; maintain existing wetlands, including habitat for Yuma Ridgway's rail and/or black rails, at either their current size and condition or equivalent value; halt the further expansion of these emergent wetlands by removing excess drain water (above consumptive use of the wetland) and using this water more efficiently on adjacent areas of the exposed lakebed. This water will be used to create more compatible and/or water efficient dust control and habitat over a significantly larger area.

Figure 8-2 Area Covered with Wetland Habitat at the North Lake Wetlands Project



8.5 Small Water Systems and Domestic Wells

Small water systems (SWSs), often serving disadvantaged communities (DACs), may face challenges in providing safe, accessible, and affordable water because they may not have adequate resources to support installation, maintenance, operation, and treatment costs. Households depending on private domestic wells face similar problems. These challenges can be exacerbated by climate change as discussed in Section 8.5.4 below.

SWSs serving DACs are primarily located in rural portions of the eastern and western unincorporated Coachella Valley. These SWSs are independent from municipal water systems and depend on local private wells for drinking water supply, as do many rural households. These water systems include both transient (e.g., campgrounds) and non-transient (e.g., schools, office buildings) non-community systems as well as community water systems, many of which in the Plan Area are mobile home parks. Most of the small systems have only one active well. To ensure safe groundwater quality and a reliable supply to these SWSs in its jurisdiction, CVWD initiated a program to extend water mains and consolidate them to CVWD's system on a priority basis (see Section 8.5.3). IWA and CWA also have implemented such consolidation projects.

8.5.1 Groundwater Supply Issues

Groundwater supply to small water systems and rural households in Indio Subbasin may face supply challenges related to system reliability, aging infrastructure, lack of funding and expertise for maintenance and operation, and population growth. Water systems with only one or two wells are more vulnerable to a water outage than a larger system. However, current groundwater level trends indicate recovery from historical groundwater-level lows and suggest a reduced risk of wells going dry. Adequate treatment and delivery of potable water depend more on SWS and domestic well operations and maintenance constraints than on regional groundwater levels.

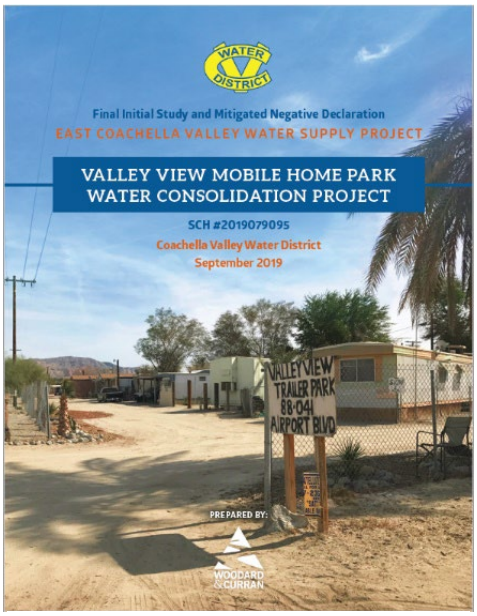
8.5.2 Groundwater Quality Issues

SWSs often do not have the infrastructure to remove contaminants from groundwater. Elevated concentrations of several contaminants have been identified in SWSs. While some SWSs have not reported groundwater quality test results for trace contaminants to DDW in the past 10 years, a total of 76 out of the 101 identified systems reported at least one water quality measurement since 2010.

Many SWSs are vulnerable to naturally-occurring contaminants like arsenic, fluoride, and chromium-6 (see Chapter 4, *Current and Historical Groundwater Conditions*, for information on groundwater quality in Indio Subbasin). For arsenic and chromium-6, chronic exposure to trace concentrations is harmful to human health, and water treatment to remove trace contaminant concentrations is not feasible for most small water systems.

8.5.3 Small Water System Consolidations

In response to these water supply and water quality challenges, the GSAs have completed and continue to work on consolidating communities that currently are not connected to a municipal water system and do not have a reliable water supply source.



The East Coachella Valley Water Supply Project prioritized small water system consolidations in the East Valley.

In 2018, CVWD initiated the Disadvantaged Communities Infrastructure Task Force (Task Force) and the East Coachella Valley Water Supply Project (ECVWSP) (CVWD, 2018) that assessed the cost and feasibility of connecting 83 small water systems in DACs. The connections were grouped into 43 projects. The timing of connection has largely depended on funding availability, with priority given to projects based on cost, permit status, critical need, and the number of systems that can be consolidated through a single project. The Task Force has secured a total of $100 million in grant funds for domestic water projects and reliable sewer services and is currently updating the ECVWSP to review and reprioritize future connections (see https://www.cvwd.org/365/Disadvantaged-Communities-Task-Force).

CVWD and its Task Force partners have developed a Domestic Water Supply Master Plan and a Sanitation Master Plan, which prioritize consolidation projects to connect failing water and sanitation systems to CVWD. As of 2025, the ECVWSP is advancing water consolidation projects in the East Coachella Valley, including planning and environmental work, and is pursuing funding to allow for the design and future consolidation of approximately 33 SWS into CVWD's potable water system.

In June 2025, CVWD announced completion of the Avenue 66 Transmission Main Project, also known as the Saint Anthony Mobile Home Park Water Consolidation project, which connects about 370 residents in three disadvantaged communities to the district's water system. The transmission main along Avenue 66 is the first of multiple infrastructure projects planned to bring safe drinking water to thousands of residents in the East Valley. The project received over $32 million in state funding, $23.4 million of which was a grant from the SAFER program.

The City of Indio is consolidating one small mutual water system in Riverside County that serves DACs (Carver Tract Water Systems). Additionally, IWA is also working with the SWRCB to consolidate Riverdale Estate located in the City of Indio.

8.5.4 Coachella Valley Regional Water Resilience Plan

While acknowledging a relatively extensive inventory of wells for the Indio Subbasin, the *2022 Alternative Plan Update* recognized that information on minimal pumpers was incomplete. Accordingly, CVWD initiated planning for an expanded well inventory as part of Monitoring Network Improvements (see Section 12.2.7). In 2023, CVWD partnered with the Torres Martinez Desert Cahuilla Indians (TMDCI) and Pueblo Unido Community Development Corporation (PUCDC) to secure a Regional Resilience Grant Program award from the California Governor's Office of Land Use

and Climate Innovation (LCI) to develop a *Coachella Valley Regional Water Resilience Plan* (CVRWRP; see https://www.cvwaterresilience.org/). The study area for the CVRWRP is the *Coachella Valley Integrated Regional Water Management Plan* region, which encompasses the entire watershed of the Coachella Valley (CVRWMG, 2018). The CVRWRP is focused on vulnerable communities and addresses the technical, regulatory, and ownership challenges related to climate risks, identifies and assesses climate vulnerabilities, and outlines practical and feasible water resilience actions. The CVRWRP completion date is January 2027 to allow for a Water Resiliency Implementation Pilot which will install seven point-of-entry water treatment systems in three mobile home parks with documented water quality challenges and replace failing equipment at a SWS serving the Tribal community.

The CVRWRP includes a Well Inventory to document the location and characteristics of private domestic and SWS supply wells. The Well Inventory included a systematic desktop analysis to identify likely well locations, a field survey to verify wells, and data compilation. The Well Inventory combined results from the desktop analysis and field survey to identify 1,184 domestic and small water system wells and to compile available information into the well inventory database. In addition, 333 locations have been identified as 'data gap locations.' These are rural residential locations (identified through aerial photo analysis) and mobile home parks where field verification was unsuccessful. These are conservatively assumed to contain wells and are maintained as a separate dataset. Including both confirmed wells and estimated data gap locations, approximately 1,500 sites in the study area are believed to rely on self-supplied groundwater. The Well Inventory also includes available information on well characteristics, such as well depth, construction year, and number of households served. Available data are limited for known wells, but suggest that most wells have a depth of 200 to 600 feet, were drilled more than 20 years ago, and serve an average of 11 households. As informed by the Well Inventory, vulnerabilities are increased by a lack of information on wells, including the age of wells, construction information, possible poor maintenance, and lack of water quality sampling.

A Vulnerability Assessment of domestic and SWS wells is part of the CVRWRP and uses data from the Well Inventory. The Vulnerability Assessment documents the distribution of domestic wells in several clusters across the multiple jurisdictions in the study area, including the eastern Coachella Valley, an agricultural area with lower income communities, limited municipal water and sewer system coverage, and lacking in localized flood control infrastructure. As part of the CVRWRP, extensive outreach was conducted at community events, including local festivals and tribal fiestas. Surveys (in English and Spanish) were distributed which included questions about domestic water supply sources, issues and concerns about water quality, impacts due to flooding, and priorities for addressing potential climate change impacts. As indicated by the surveys, key community concerns include water quality issues and unsafe drinking water, flooding impacts, and water shortages. Community priorities for actions to address concerns include water infrastructure upgrades, emergency drinking water programs, and source protection.

With information from the Well Inventory and Vulnerability Assessment, the CVRWRP helps the GSAs, community members, and potential funding entities to understand the region's climate risks and vulnerabilities, inform the design and implementation of effective water management strategies, support community engagement and capacity-building initiatives, and improve water resource resilience and quality of life.

8.6 Climate Change

Climate change has the potential to affect the availability of imported water supply from the Colorado River and SWP and to affect local water supply and water demand in the Plan Area. Since the *2010 CVWMP Update*, substantial climate modeling has yielded quantitative projections of climate change (including temperature increases and changes in precipitation on a regional scale) that are useful to water managers. The State of California has directed considerable effort toward assessing climate change and incorporating it into State and regional planning processes.

Since 2010, Indio Subbasin water agencies have included climate change in their 2020 and 2025 *Regional UWMPs*. In addition, the *2018 Coachella Valley IRWM & Stormwater Resource Plan Update* (CVRWMG, 2018) includes extensive discussion of the climate change legislative and policy context, effect of climate change on water supply and demand, and climate change mitigation and adaptation. While the focus of this section is climate change impacts on water supply and demand, it is also recognized that climate change will affect related issues such as stormwater and flood risk, surface water quality, and water-related environments. The CVRWRP, planned for completion in January 2027, is a direct response to climate change impacts on the Coachella Valley (see also Section 8.5.4). With a focus on vulnerable and disadvantaged communities, CVRWRP presents an assessment of climate risks, identifies and evaluates climate vulnerabilities, and outlines practical and feasible water resilience actions.

The CVRWRP process used information from Cal-Adapt (https://toolkit.climate.gov/tool/cal-adapt), which is a climate adaptation planning tool providing access to up-to-date information and data produced by the State of California's scientific and research community. Cal-Adapt synthesizes volumes of existing downscaled climate change scenarios and climate impact research and presents it to benefit local planning efforts. For the Inland Deserts region (Hopkins, 2018), the climate is becoming more extreme, with daily average high temperatures projected to increase by up to 8-14ºF by the end of the century. Rainfall rates are currently low (approximately 5 inches per year) and highly variable from year to year. This variability is projected to increase over the coming decades, with extreme drought and extreme wet events both becoming more common. In turn, increasing frequencies of these extreme events will increase the risk of flash flooding and wildfire, given the close relationship between precipitation variability and growth of invasive grasses that serve as the major fuel for wildfire in the region.

As part of this *2027 Alternative Plan Update*, water supply reliability of Colorado River and SWP Exchange water (including climate change effects) is discussed in Chapter 6, *Water Supply,* and two numerical modeling scenarios addressing climate change are described in Chapter 7, *Numerical Model and Plan Scenarios*.

The following sections provide brief updates on climate change effects relative to the Colorado River, SWP, and local water supply and demand. Recycled water supply is highly reliable and less affected by climate change.

8.6.1 Colorado River Basin

The *2010 CVWMP Update* summarized DWR and USBR studies available at the time, which provided mostly qualitative discussions of climate change impacts, including: a decrease in annual flow and increased variability (e.g., more frequent and more severe droughts), an increase in evaporative losses and reduced runoff, and earlier snowmelt and a greater proportion of runoff due to rainfall.

In 2012, USBR released the *2012 Colorado River Basin Water Supply and Demand Study* (Basin Study; USBR 2012). The *Basin Study* evaluated Colorado River Basin water supply and demand projections (with specific attention to projected climate change through 2060) and evaluated strategies to meet the supply and demand gap. The Basin Study indicated that climate change will reduce system runoff from the Colorado River primarily because of warming and loss of snowpack. Over the next 50 years, Upper Colorado River streamflow is projected to decrease by approximately 9 percent, along with a projected increase in both drought frequency and duration as compared to the observed historical record. Droughts lasting 5 or more years are projected to occur 50 percent of the time over the next 50 years.

In 2019, in response to historical drought and low storage levels in Lakes Powell and Mead, federal legislators passed the Colorado River Drought Contingency Plan Authorization Act, which implements two Drought Contingency Plans, one each for the upper and lower basins (also see Chapter 6, *Water Supply*). The *Upper Basin DCP* involves management of upper basin reservoirs, water demand management, and weather modification to augment precipitation. The *Lower Basin DCP* sets rules for scaling back water use based on Lake Mead storage conditions. Each of the lower basin states (and California contractors including CVWD) made storage commitments to keep Lake Mead above critically low levels. USBR released interim guidelines for lower basin shortages, which have been conservatively used in the 2027 *Alternative Plan*'s scenario of anticipated reductions in Colorado River supplies due to climate change.

As directed by the federal SECURE Water Act, USBR prepared the 2021 West-Wide Climate and Hydrology Assessment (USBR, March 2021). This technical document summarizes climate change analyses using statistically downscaled projections from the Coupled Model Intercomparison Project Phase 5 (CMIP5) climate model to estimate changes in temperature, precipitation, snowpack, and streamflow across the West. It includes analysis of multiple hydroclimate projections in the eight major Reclamation river basins, including the Colorado Basin and the Sacramento-San Joaquin Basins. Overall, the West-Wide Assessment finds that temperatures are expected to increase across the West while precipitation changes are variable. With warmer temperatures, more precipitation will fall as rain and snow will melt sooner, reducing snowpack in the future that can impact streamflow timing.

For the West as a whole, the key findings include:

- Future projections show temperatures will continue to increase.
- Average annual precipitation is projected to increase in the north, particularly in the Columbia and Missouri River Basins, and decline in the south.
- Snow storage, as measured by snow water equivalents (the amount of water in snowpack) is projected to decline, with only a few locations showing some increases.
- Climate model projections indicate an increase in average drought duration and an increase in the variability of drought duration for most of the Western United States in the future.
- Climate models also project future increases in average drought severity and in the variability of drought severity for most of the Western United States.

For the Colorado Basin, analysis of the hydroclimate projections (from 1950 to 2100) indicates the following:

- Total annual precipitation throughout the basin is shown to be largely constant over time.
- The mean annual temperature throughout the basin shows an increase over time.

- The median April 1st snow water equivalent (SWE) shows a decrease over time.
- The median annual runoff shows a decrease over time.
- The December-through-March runoff volume shows an increase over time, and the April-through-July runoff shows a decrease over time.

USBR also has implemented the 2021 SECURE Report Web Portal (see https://experience.arcgis.com/experience/7461ca68b2da4620863ff27d65b8cf14/) to provide a user-friendly, web-based format for delivery of information in the report.

8.6.2 State Water Project

The *2010 CVWMP Update* summarized DWR analyses based on various global climate models that predicted a warming trend for California, a reduction in exports from the Sacramento-San Joaquin Delta, a decrease in reservoir carryover storage, and a change in the timing of Sierra Nevada runoff due to snowpack changes. All of these were considered to reduce SWP reliability.

The *2018 IRWM & Storm Water Resources Plan Update* (*IRWM Plan*) presents extensive discussion of the effect of climate change on SWP water supplies, noting that water delivered to State Water Contractors will depend on the amount of rainfall, snowpack, runoff, water storage, pumping capacity from the Delta, and water demand. Temperature increases are expected to modify rainfall and runoff, which may in turn affect SWP operations. As indicated in the *IRWM Plan*, changes in the regional and seasonal distribution of precipitation and effects on Sierra snowpack are most problematic; increased temperatures may reduce the snowpack at a faster rate, thereby releasing snowmelt water earlier and faster than anticipated and thereby reducing capabilities to capture and store runoff. Water demands in and near the water source could increase, diminishing water availability and reliability to SWP contractors downstream. The reliability of SWP water supply is expected to be reduced for the range of future climate projections studied.

Notably for SGMA planning, in July 2018 DWR published its Guidance Document, *Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development* (DWR, 2018). This document provides GSAs with information regarding DWR climate change datasets and related tools as technical assistance to develop projected water budgets. DWR provides four projected climate conditions and desktop tools that can be used by GSAs to process climate change datasets for their water budget studies or to incorporate into a groundwater/surface water model.

In 2022, DWR developed a *Climate Action Plan* to guide its programs, projects, and activities in response to a changing climate. The Plan involves development of the Greenhouse Gas Emissions Reduction Plan to mitigate greenhouse gas (GHG) from DWR activities, standardization of DWR's climate change analysis tools, and assessment of DWR's vulnerabilities to climate change.

Aligned with the *Climate Action Plan* is DWR's August 2025 *State Water Project Adaptation Strategy* (DWR, 2025). https://cawaterlibrary.net/document/state-water-project-adaptation-strategy/ This report outlines DWR's strategy to assess, prioritize, and implement adaptation measures that will allow the SWP to function under future climate conditions. The strategy evaluates 17 actions, concluding that the most important actions include the following, especially when combined with other strategies:

- A first-priority measure is continued maintenance and additional restoration of the infrastructure system, including repair of the subsidence-damaged sections of the California Aqueduct.

- Forecast-Informed Reservoir Operations (FIRO); FIRO delivers relatively small amounts of water that have low costs and few if any drawbacks.
- The Delta Conveyance Project is identified as the single most effective strategy on its own, and it amplifies the benefits of other strategies.
- Additional south-of-Delta storage, especially when paired with DCP, can help improve drought resilience.

As documented in Section 11.4.2.1, continued participation in the Delta Conveyance Facility is included as PMA 5 as a means to restore SWP reliability and increase water deliveries to CVWD and DWA.

As described in Chapter 7, *Numerical Model and Plan Scenarios*, climate change effects on SWP supply have been evaluated accounting for the recent history of SWP allocations (including drought periods). Climate change (including effects not only on SWP but also Colorado River supplies) is addressed in four projected scenarios for numerical modeling with comparison to a baseline scenario.

8.6.3 Plan Area Supplies and Demands

Projected water demands are described in detail in Chapter 5, *Demand Projections,* while Chapter 6, *Water Supply*, describes available and future water supplies including climate change. DWR's *2018 Guidance Document* (DWR, 2018) provides some summary information on projected climate changes for the Colorado River hydrologic region in California (including Indio Subbasin). Average temperature increases are 2.6 and 5.7 degrees Fahrenheit for 2030 and 2070, respectively, and average precipitation changes are decreases of 1.3 percent and 2.9 percent, respectively, for 2030 and 2070 (DWR, 2018, Figures A-13 and A-14).

Increased temperatures in the Plan Area would increase water demands for crop and landscape irrigation, municipal water use, and evaporative losses from canals and open reservoirs. Increasing temperatures could also change the distribution and form of precipitation from snow at higher elevations to rain, shifting the timing of runoff earlier in the year. Decreased precipitation would result in decreased runoff and availability of local surface water for diversion. In addition, climate change may result in greater seasonal and annual variability of local precipitation, including higher peak stormwater events that strain the capacity of diversion and recharge facilities. As described in Chapter 7, *Numerical Model and Plan Scenarios*, potential climate change effects on local surface water hydrology have been assessed using local, recent hydrologic and drought data and the numerical groundwater flow model.

Climate change could also lead to shifts in population, industry, and agricultural patterns, which would in turn affect water demands.

8.7 State Water Conservation

In 2009, the State Legislature enacted Senate Bill X7-7 (SBX7-7), the Water Conservation Act of 2009, which requires water suppliers to increase their water use efficiency. The legislation amended the Water Code to encourage both urban and agricultural water providers to implement conservation strategies, monitor water usage, and report data to DWR. Implementation of water conservation by urban water suppliers has been reported primarily through UWMPs and by agricultural water suppliers through Agricultural Water Management Plans (AWMPs).

For the 2025 *Regional UWMP*, six water suppliers (CVWD, CWA, DWA, IWA, MSWD, and Myoma Dunes Mutual Water Company) collaborated to prepare a regional demand and supply analysis (Todd Groundwater and Rincon Consultants, 2026). As documented in the Regional UWMP, all six suppliers achieved and in fact exceeded the per capita water use reduction of 20 percent by 2020. Chapter 11, *Projects and Management Actions*, provides a detailed overview of the agencies' urban water conservation programs.

CVWD has a long history of agricultural water conservation programs. As a signatory to the QSA, CVWD is currently exempt from the portion of SBx7-7 that requires agricultural water suppliers to develop an agricultural water management plan and implement efficient water management practices. Under the QSA, CVWD implemented an Extra-ordinary Conservation Program including scientific irrigation scheduling, salinity management, salinity field mapping, conversion of irrigation systems to micro-irrigation, distribution uniformity evaluations, grower training and meetings and engineering evaluations.

In 2018, the California Legislature enacted Assembly Bill 1668 and Senate Bill 606, which establish a new regulatory framework for managing urban water use in California (SWRCB, August 2023). On July 3, 2024, the SWRCB adopted the *Making Conservation a California Way of Life* regulation, that requires suppliers to annually calculate water efficiency objectives for urban water uses: residential indoor water use, residential outdoor water use, real water loss and commercial, industrial and institutional landscapes with dedicated irrigation meters. Each efficiency budget is calculated using a statewide efficiency standard and local service area characteristics such as population, climate, and landscape area.

The new regulation went into effect on January 1, 2025, with state enforcement beginning in 2027. With the new law, each urban supplier will need to calculate its urban water use objective for the previous year. Each year, the objective will be based on dynamic data such as weather and population. Additionally, the regulation has variances that agencies can apply for that will provide a reduction to the overall conservation number. Variances include, for example, seasonal populations, evaporative coolers, new development, and trees (DWA, 2024). Beginning January 1, 2027, each urban water supplier must demonstrate compliance with its urban water use objective (ACWA, July 2024). In addition, water suppliers will need to report on the implementation of new performance measures for CII water use. The legislation also made important changes to existing urban and agricultural water management planning, with enhanced drought preparedness and water shortage contingency planning for urban water suppliers, SWSs and rural communities.

Urban water conservation is being enhanced by local agencies to provide water supplies efficiently and to prepare for water shortages, including drought. While providing these important benefits, it also is recognized that water conservation has broader water management implications including reduction of wastewater flows, decreased availability of recycled water, and potential increases in wastewater salinity.

8.8 Subsidence

Land subsidence is documented in Chapter 4, *Current and Historical Groundwater Conditions*. Subsidence was discussed in the *2010 CVWMP Update* as an emerging issue, having been recognized in the 1990s as occurring with increased pumping in the East Valley since the 1970s. In 1996, the USGS in cooperation with CVWD established a geodetic network of ground surface monuments to monitor elevation changes. Results of the monitoring program published in 2007 (Sneed and Brandt, 2007) documented the occurrence of subsidence—and some uplift—and

indicated causes such as tectonic activity, groundwater pumping, and associated groundwater level declines.

CVWD and USGS have continued the monitoring and analysis program. As documented in a *2020 USGS Scientific Investigations Report* (Sneed, et al., 2020) and summarized in Chapter 4, *Current and Historical Groundwater Conditions*, as much as 2 feet of subsidence occurred in the Indio Subbasin from 1995 to 2010. From 2010 to 2020, groundwater levels stabilized or partially recovered in response to the implementation of source substitution, conservation, and groundwater replenishment programs included in the *2010 CVWMP Update*. Elsewhere, up to 1 inch of uplift has been measured from 2011 to 2020 in the Palm Springs area, corresponding to higher groundwater levels in response to upgradient WWR-GRF recharge. In the Thermal area, the ground surface has also rebounded about 2 inches over the same period, returning to elevations observed in 2001. Land subsidence stopped in many areas and even rebounded.

The Indio Subbasin GSAs plan to continue monitoring water levels and subsidence to track the effects of management actions on land subsidence. The GSAs and the USGS have established a partnership and a continuing subsidence monitoring program to collect and evaluate data between 2015 and 2023 with a report anticipated to be published by the USGS in late 2026.

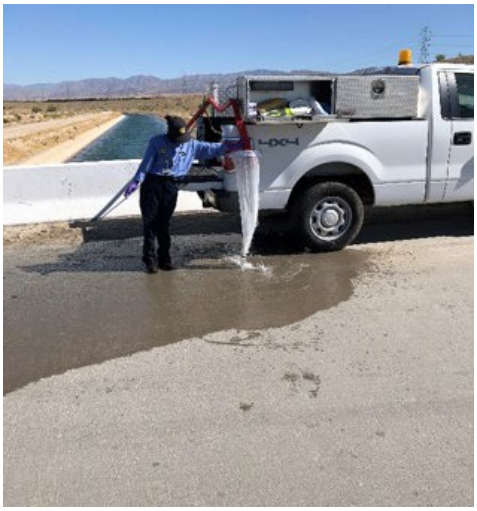
Sustainable management criteria for subsidence are discussed in Chapter 9, *Sustainable Management*, continued monitoring of groundwater levels and subsidence is discussed in Chapter 10, *Monitoring Program*, and relevant projects and management actions are presented in Chapter 11, *Projects and Management Actions*.

8.9 Other Issues

8.9.1 Invasive Species

The *2010 CVWMP Update* identified an invasive species, Quagga Mussels, which have been found in the Colorado River system and pose a threat of infestation to canal and channel facilities. CVWD has successfully prevented infestation through chlorination and maintenance of turbulence in its conveyance system.

In 2024, potentially pipe-clogging Golden Mussels were first detected in the Sacramento-San Joaquin Delta and subsequently as far south as Riverside County Boyd, 2026), but not in the Colorado River basin. However, local water managers are concerned because the golden mussel is much hardier and can survive in aquatic environments with more divergent calcium, pH, temperature and salinity levels than its relatives. Mussels can spread between waterways in a free-floating immature stage, when they can survive and go undetected with minimal water. The state's multiagency 2025 Golden Mussel Framework (CDFW, April 2025) provides numerous recommendations to assess and manage the problem. These include increased inspections of watercraft, which should be cleaned, drained and dry before entering a waterway and after pulling them out. Monitoring continues to detect any problems so that they can be addressed.



CVWD monitors for Quagga Mussels in the Coachella Canal and Lake Cahuilla.

9 Sustainable Management

In 2022, the Indio Subbasin Groundwater Sustainability Agencies (GSAs) submitted the *2022 Alternative Plan Update* to the Department of Water Resources (DWR) (approved in July 2024) that presented the ongoing management of the Indio Subbasin. As a requirement for the Sustainable Groundwater Management Act (SGMA), an update to its Alternative Plan is required every 5 years. The *2022 Alternative Plan Update* included discussion of goals and objectives, groundwater conditions, emerging issues, water supply and demand, and projects and management actions, among other topics. These goals and objectives have continued to guide water management in the Indio Subbasin as demonstrated in the annual reports and in this 2027 *Alternative Plan Update*.

DWR approved the Alternative Plan (and updates) as functionally equivalent to a Groundwater Sustainability Plan (GSP) and provided recommendations to the Indio Subbasin GSAs (DWR, 2024). This chapter discusses sustainability consistent with the groundwater management objectives of the GSAs and—recognizing the benefits of the SGMA approach in defining terms, establishing procedures, and setting objective metrics for sustainability—is responsive to the specific DWR recommendations that address sustainability and DWR's ongoing evaluation.

9.1 Sustainability Goal and Approach

The *2002 Coachella Valley Water Management Plan* (*2002 CVWMP*) (Coachella Valley Water District [CVWD], 2002) and the *Coachella Valley Water Management Plan 2010 Update* (*2010 CVWMP Update*) (CVWD, 2012) developed an overarching goal for the Valley "to reliably meet current and future water demands in a cost-effective and sustainable manner." This *2027 Alternative Plan Update* continues to be guided by this overall goal, which extends beyond groundwater sustainability to include all available water supplies for Indio Subbasin and water demand management as integral to an overall balance of water supply and demand.

The goal of this *2027 Alternative Plan Update* addresses long-term groundwater sustainability:

- To maintain a locally managed, economically viable, sustainable groundwater resource for existing and future beneficial uses in the Indio Subbasin by managing groundwater to avoid the occurrence of undesirable results.

The seven objectives which guide this *2027 Alternative Plan Update* are as follows:

- Meet current and future municipal water demands with a 10-percent supply buffer
- Avoid chronic groundwater overdraft
- Manage and protect water quality
- Collaborate with tribes, state and federal agencies on shared objectives
- Manage future costs
- Minimize adverse environmental impacts
- Reduce vulnerability to climate change and drought impacts.

This *2027 Alternative Plan Update* continues to incorporate the comprehensive approach to local groundwater management that was established in prior water management plans. While acknowledged as functionally equivalent to a GSP, it utilizes sustainability indicators and criteria to

manage groundwater for all beneficial uses and users. This *2027 Alternative Plan Update* is also responsive to the 2024 DWR Periodic Review Recommended Corrective Actions, which are recognized as supporting DWR in its evaluation of Alternative Plan implementation. As indicated in Chapter 1, *Introduction*, the DWR *Staff Report* provided Recommended Corrective Actions 1 through 3, which are reproduced below and addressed in this chapter (and elsewhere in the plan as appropriate).

9.1.1 Response to DWR Periodic Review of Alternative Groundwater Sustainability Plan

On June 27, 2024, the DWR released its formal *Periodic Review of Alternative Groundwater Sustainability Plan* (DWR, 2024) following its periodic review of the *2022 Alternative Plan Update*. DWR officially approved the *2022 Alternative Plan Update*, concluding that the plan substantially complies with GSP Regulations and SGMA, and remains sufficient to achieve and maintain the Subbasin's long-term sustainability goals.

The 2024 DWR Periodic Review confirmed that the Indio Subbasin continues to operate sustainably, noting that no minimum thresholds were exceeded and no interim milestones were missed during the evaluation period. Furthermore, DWR validated that the GSAs had successfully addressed or made substantial progress on the previous Recommended Actions issued in the *2019 Alternative Assessment Staff Report* (DWR, 2019).

While confirming the Subbasin's approved status, DWR identified specific areas where the *2022 Alternative Plan Update* should be strengthened to facilitate future evaluations. These new directives, which were included in the June 2024 Periodic Review and categorized as Recommended Corrective Actions, are addressed within this *2027 Alternative Plan Update*:

- **Recommended Corrective Action 1 (from 2024 Staff Report)**. Staff recommended that the GSAs improve lateral coordination with adjacent basins to resolve and clarify any discrepancies regarding water budgets, hydrogeologic conceptual models, principal aquifer designations, and monitoring networks along shared boundaries.
- **Recommended Corrective Action 2 (from 2024 Staff Report)**. Staff recommended that the GSAs ensure complete alignment between the monitoring network details described in the text of the Alternative Plan and the digital data reported to the online SGMA Portal Monitoring Network Module (MNM).
- **Recommended Corrective Action 3 (from 2024 Staff Report)**. Staff recommended that the GSAs persist with activities related to Recommended Actions 4, 4a and 6 from the 2019 DWR Staff Report.
  - ***Recommended Action 4 (from 2019 Staff Report)**. Staff recommend that the Agencies incorporate an approved Salt and Nutrient Management Plan (SNMP) into future iterations of the Alternative.*
  - ***Recommended Action 4a (from 2019 Staff Report)**. Staff recommend that the Agencies continue efforts to study the rate and level of increased salt contents in groundwater due to the importation of Colorado River water.*
  - ***Recommended Action 6 (from 2019 Staff Report)**. Staff recommend that the Agencies clarify whether there is a minimum threshold associated with the amount of flow in the subsurface drains, below which significant and unreasonable undesirable results would occur, and what that quantified minimum threshold is, if applicable, and the implementation*

horizon for when the goal for the amount of subsurface flow will be achieved, so as to avoid undesirable results.

This *2027 Alternative Plan Update* is directly responsive to these 2024 DWR findings, presenting the refined technical analyses, updated administrative tracking, and enhanced inter-basin coordination necessary to maintain ongoing SGMA compliance.

DWR also informed the Indio Subbasin GSAs that they are required to submit their second periodic evaluation of the Indio Subbasin Alternative Plan no later than December 29, 2026.

9.1.1.1 Recommended Corrective Action 1 Response – Interbasin Coordination

The Indio Subbasin GSAs continually coordinate among themselves; with GSAs in the neighboring San Gorgonio and Mission Creek subbasins; with land use planning, well permitting and regulatory agencies; and with partner agencies such as the Metropolitan Water District of Southern California (with whom they exchange SWP water supplies).

Mission Creek Subbasin

Subsurface inflow to the Indio Subbasin occurs from the Mission Creek Subbasin across the Banning Fault. CVWD and DWA have service area in both subbasins and are actively involved in coordinating the *Alternative Plan Update* preparation.

Indio and Mission Creek Subbasins continue to coordinate on the groundwater model development and updates. Local adjustments for fault conductance and inflow rates from the Mission Creek Subbasin were made to ensure consistency in interbasin flow. Future climate change scenarios used the same climate projections to further coordinate the groundwater models. Communication continues as both Subbasins prepare the 2027 *Alternative Plan Update*.

San Gorgonio Pass Subbasin

Recommended Corrective Action 1 mandates that the Indio GSAs coordinate with neighboring basins toward mutual sustainability and resolve discrepancies regarding water budgets and HCMs. In response, the Indio and San Gorgonio Pass (SGP) GSAs and their technical consultants completed a collaborative flow reconciliation study in November 2025. This study is outlined in Section 3.6, Indio and San Gorgonio Pass Subbasin Boundary Flow Reconciliation, and included in Appendix 3-A.

The primary historical discrepancy stemmed from how the subbasins' respective numerical models simulated underflow across their shared boundary:

- The *2022 Alternative Plan Update* utilized a specified flux boundary that assumed a constant, long-term average influx of approximately 8,200 AFY from the SGP Subbasin.
- Conversely, the *2022 SGP GSP* calculated a much higher dynamic outflow to Indio, averaging 25,000 AFY.

To reconcile these differences, the technical teams reviewed newly available geological data, including Airborne Electromagnetic (AEM) data, oilfield records, and lithological logs from four sets of nested USGS monitoring wells installed near the boundary.

The data identified crystalline bedrock at a depth of 900 feet below ground surface, which revealed that the alluvial aquifer at the narrowest section of the pass is at least 900 feet thick, nearly triple

the depth previously inferred from regional-scale gravity models. Using this revised aquifer geometry alongside multi-depth water level measurements collected between 2019 and 2025, independent analytical flow estimates based on Darcy's Law were performed.

The findings and technical alignments established in Appendix 3-A fulfill DWR directives by providing a clear, evidence-based pathway for model harmonization:

- The Indio GSAs leveraged this joint data to expand the Indio MODFLOW model domain northwestward by 10 rows (approximately 8,000 to 9,000 feet) to terminate exactly at the designated subbasin boundary, as described in Chapter 7, *Numerical Model and Plan Scenarios*. This eliminates past spatial alignment errors where underflows were evaluated at different geographic lines.
- To manage long-term water budgets and transient localized flow reductions, the Indio and SGP GSAs have established an active data-sharing pipeline. Indio GSAs will provide updated artificial replenishment data from the Whitewater River Groundwater Replenishment Facility (WWR-GRF) to help SGP refine its general head boundary conditions, while SGP GSAs have provided simulated boundary fluxes to keep both management frameworks coordinated.

9.1.1.2 Recommended Corrective Action 2 Response – SGMA Monitoring Network

To address Corrective Action 2, CVWD prepared the CVWD Monitoring Audit (June 2025). In terms of network health, the audit confirms that CVWD's dense network of over 300 wells surpasses the minimum density benchmarks outlined in DWR Best Management Practices. This robust coverage allows CVWD to identify redundant wells for elimination and streamline operations. The Key Well network, documented in the *2022 Alternative Plan Update*, continues to be monitored and all water level measurements are uploaded to the SGMA portal and reported in Annual Reports. Since the network was developed, two wells have become inaccessible. The Monitoring Audit resolved immediate data gaps by recommending replacements for two critical, recently inaccessible Key Wells, designated as KW-002R2 and KW-031R. The SGMA portal is kept up to date with changes to the Key Well network. The ground surface elevation of four Key Wells were updated based on survey data. In addition, the CV-SNMP monitoring network (see Chapter 2, *Plan Area*) has also been added to the SGMA portal as Existing Sites.

9.1.1.3 Recommended Corrective Action 3 Response – SNMP Progress

To satisfy DWR Recommended Corrective Action 3, the Indio GSAs have actively integrated basin-wide water quality management with sustainability planning. This is primarily achieved through the comprehensive update of the *Coachella Valley Salt and Nutrient Management Plan* (CV-SNMP), ensuring full compliance with the State Water Resources Control Board (SWRCB) Recycled Water Policy.

The CV-SNMP update is a collaborative effort by the CV-SNMP partners, consisting of the Coachella Valley Water District (CVWD), Coachella Sanitary District and Coachella Water Authority (CWA), City of Palm Springs, Desert Water Agency (DWA), Indio Water Authority (IWA), Mission Springs Water District (MSWD), Myoma Dunes Mutual Water Company, and Valley Sanitary District (VSD), and working in direct coordination with the Colorado River Basin Regional Water Quality Control Board (RWQCB).

While the CV-SNMP is ongoing, the GSAs have been transitioning from the planning phases outlined in the *2022 Alternative Plan Update* to active implementation. The following four Projects and Management Actions (PMAs) from the *2022 Alternative Plan Update* demonstrate the systematic resolution of water quality monitoring and modeling deficiencies:

- PMA 27 - Implement CV-SNMP Groundwater Monitoring Program Workplan: In partnership with the CV-SNMP partners, the GSAs are actively executing the expanded groundwater monitoring program outlined in the Workplan approved by the RWQCB in February 2021. The submittal of the fourth annual progress report and dataset in March 2025 officially initiated the 2024–2026 triennial monitoring cycle. Furthermore, to strengthen the monitoring network, CVWD and DWA each have leveraged DWR's Technical Support Services (TSS) program since 2023 to construct four and two new water quality monitoring wells in 2024 and 2025, respectively.
- PMA 28 - Implement CV-SNMP Development Workplan: Following the RWQCB approval of the CV-SNMP Development Workplan in October 2021, the GSAs and partnering agencies initiated a phased scope of work to update the plan in accordance with the state's Recycled Water Policy. Implementation has advanced through a series of foundational milestones, including the publication of Task Memorandum 1 (TM#1: Mass Loading) in April 2024, followed by TM#2 (Current Groundwater Quality) and TM#4 (Forecasting Technical Approach) in January 2025. Most recently, the agencies finalized TM#3 (Draft Management Zones and Beneficial Use Metrics) in September 2025. Technical efforts for Water Year 2025–2026 are focused on TM#5 to develop nitrate and TDS forecasting tools and evaluate the baseline scenario, and on TM#6 to forecast nitrate and TDS for SNMP scenarios. CV-SNMP deliverables are available at: https://www.cvsnmp.com/resources/.
- PMA 29 - Colorado River Basin Salinity Control Forum: As part of long-term basin-wide salinity management, CVWD and DWA continue to actively support and participate in the Colorado River Basin Salinity Control Forum. This cooperative federal, state, and local initiative focuses on projects designed to remove salt tonnage from the system. These efforts achieve salinity reductions primarily by mitigating salt contributions to the Colorado River from existing sources and minimizing future, human-caused increases in the regional salt load.
- PMA 30 - Source Water Protection: To ensure that existing and future wells do not compromise the usability of local groundwater resources, the GSAs maintain robust well management programs. As part of these efforts, CVWD continues to administer its Leaking Artesian Well Rebate Program, which focuses on educating and collaborating with well owners to properly control artesian flows. For example, as part of ongoing implementation during this update period, CVWD processed applications to repair three wells and destroy two wells exhibiting uncontrolled flows, supported by typical annual funding allocations such as a $50,000 budget in Fiscal Year 2025 specifically for leaking artesian well repairs and destruction.

Additional details regarding the regulatory framework and basin-wide policies governing these efforts are available in Section 8, *Regulatory and Policy Issues*. Ultimately, these ongoing source-protection programs, monitoring networks, and technical task memorandums will culminate in the final CV-SNMP update, which is scheduled for completion in 2027.

9.2 Sustainability Indicators and Criteria

SGMA provides a consistent, state-wide definition of sustainable management as the use and management of groundwater in a manner that can be maintained without causing *undesirable results*, which are defined as significant and unreasonable effects caused by groundwater conditions occurring throughout a basin:

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply
- Significant and unreasonable reduction of groundwater storage
- Significant and unreasonable seawater intrusion
- Significant and unreasonable land subsidence that substantially interferes with surface land uses
- Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water

The above indicators provide a framework for addressing the multi-faceted and complex nature of groundwater sustainability. SGMA also provides the following criteria for quantitative measures that support demonstration of sustainability:

- **Minimum Threshold** (MT[1]) – numeric value used to define undesirable results for each sustainability indicator
- **Measurable Objective** (MO) – specific, quantifiable goal to track the performance of sustainable management
- **Interim Milestone** – target value representing measurable groundwater conditions, in increments of 5 years

While providing consistent definitions and criteria, SGMA allows multiple pathways to meet the local needs of each basin. These include not only development of each of these sustainable management criteria, but also use of the groundwater level sustainability indicator as a proxy, identification of additional indicators as decided by local GSAs for a basin, and identification of indicators that are not applicable to the basin. Moreover, it is understood that continued data collection and an improved understanding of basin conditions in the future may lead to changes in the sustainable management criteria through adaptive management.

Sustainability is discussed here with reference to the sustainability goal and objectives that have been defined for water resources management of the Coachella Valley overall and for the Indio Subbasin specifically. Sustainability indicators are presented in the context of management through the Alternative Plan—which is the approved functional equivalent of a GSP—and the Recommended Corrective Actions provided by DWR in its *Coachella Valley – Indio Subbasin - Periodic Review of Alternative Groundwater Sustainability Plan* (2024 Staff Report) (DWR, 2024) (see Chapter 1, *Introduction*).

[1] The abbreviations for Minimum Threshold (MT) and Measurable Objective (MO) are provided because these terms are used often; however, the full unabbreviated term is used when helpful for clarity or when included in a quotation.

9.3 Quantitative Criteria for Groundwater Levels

Quantitative minimum thresholds for groundwater levels are provided in this section, recognizing that chronic lowering of groundwater levels can indicate significant and unreasonable depletion of supply, causing undesirable results to domestic, agricultural, municipal, and other beneficial uses of groundwater if continued over the planning and implementation horizon. As a clarification, drought-related groundwater level declines are not considered chronic if groundwater recharge and discharge are managed such that groundwater levels recover during non-drought periods.

Declining groundwater levels directly relate to other potential undesirable effects (for example, groundwater storage, land subsidence, interconnected surface water, and seawater intrusion); these are described in subsequent sections. Effects on groundwater users are described here.

Groundwater elevation trends in Indio Subbasin are documented in Chapter 4, *Current and Historical Groundwater Conditions.* Hydrographs are presented for 68 wells across the Subbasin. The Indio Subbasin is no longer characterized by overdraft with widespread chronic groundwater level declines. However, the hydrographs (e.g., Figure 4-3 through 4-5) show declines that persisted until the late 2000s, and as shown in Figure 4-9, groundwater in storage in the Indio Subbasin was at its minimum in 2009. The groundwater level declines were halted with the combined effects of groundwater replenishment, source substitution for groundwater (e.g., imported surface water and recycled water), and conservation. Since that time, groundwater levels have risen or at least stabilized throughout the Subbasin.

9.3.1 Description of Undesirable Results

Potential undesirable results that may occur due to chronic groundwater level declines include subsidence, dewatering of domestic wells, and potential seawater intrusion from the Salton Sea.

Subsidence

Land subsidence is the differential lowering of the ground surface, which can damage structures and facilities. This may be caused by regional tectonism or by declines in groundwater elevations due to pumping. The latter process is relevant to Subbasin management and the Alternative Plan. As groundwater elevations decline in the subsurface, dewatering and compaction of predominantly fine-grained deposits (such as clay and silt) can cause the overlying ground surface to subside. Land subsidence, resulting from aquifer system compaction and groundwater level declines, has been a concern in the Coachella Valley since the mid-1990s and has been investigated since 1996 through an on-going cooperative program between CVWD and the United States Geological Survey (USGS) (Sneed and Brandt, 2020). Chapter 4, *Current and Historical Groundwater Conditions* details the historical and potential for subsidence in the Subbasin.

Domestic Wells

Chronic groundwater level declines are widely recognized to cause undesirable effects in production wells. Relatively shallow wells are more susceptible than deep wells. Private domestic wells may be relatively shallow and thus susceptible to declining groundwater levels. In addition, a private well may be more susceptible to undesirable results because of well construction or maintenance problems. A private well may also represent the sole source of drinking water supply for one or more households.

The following is a generalized description of the undesirable results associated with chronic groundwater level decline; in other words, what can happen in a production well with declining groundwater levels. As groundwater levels decline in a well, a sequence of increasingly severe undesirable results occurs. These include an increase in pumping costs and a decrease in pump output (e.g., flow in gallons per minute). With further declines, the pump may break suction, which means that the water level in the well has dropped to the level of the pump intake. Well operators can lower the pump inside the well, but this can cost thousands of dollars. Chronically declining water levels will eventually drop below the top of the well screen. This exposes the screen to air, which can produce two adverse effects. In the first, water entering the well at the top of the screen will cascade down the inside of the well, entraining air; this air entrainment can result in cavitation damage to the pump. The other potential adverse effect is accelerated corrosion of the well screen. Corrosion eventually creates a risk of well screen collapse, which would likely render the well unusable. If water levels decline by more than about half of the total thickness of the aquifer (or total length of well screen), water might not be able to flow into the well at the desired rate regardless of the capacity or depth setting of the pump. This might occur where the thickness of basin fill materials is relatively thin. While describing a progression of potential adverse effects, at some point the well no longer fulfills its water supply purpose and is considered to have "gone dry." For the purposes of this discussion, a well going dry means that the entire screen length (to the bottom of the deepest screen) is unsaturated.

Seawater Intrusion – Salton Sea

The Indio Subbasin is located over 60 miles from the Pacific Ocean and is not vulnerable to seawater intrusion in the traditional sense. However, it is potentially vulnerable to saltwater intrusion from the Salton Sea. Percolation of high TDS groundwater from the shallow aquifer may also be a source of degradation to the deep aquifer. High rates of production in the lower aquifer near the Salton Sea could pull in dense, saline water, and thus degrade groundwater quality in deep portions of the aquifer.

While increasing salinization of the Salton Sea suggests an increased potential for saltwater intrusion, the dropping Salton Sea levels and retreating shoreline suggest a groundwater gradient from the Subbasin toward the sea and therefore less potential for intrusion from the sea. However, local groundwater gradients can change based on changes in groundwater pumping, recharge, and density differences between groundwater and Salton Sea water. Chapter 4, *Current and Historical Groundwater Conditions* details the historical and potential for seawater intrusion in the Subbasin.

9.3.2 Potential Causes and Effects of Undesirable Results

The Indio Subbasin currently is characterized by stable or increasing groundwater levels, but chronic groundwater declines have occurred, most recently until about 2009. No reports are known of wells adversely affected by groundwater levels at that time although other impacts of groundwater level decline (e.g., subsidence or water quality changes) were recognized and addressed. Similarly, groundwater levels typically are affected by drought. Effects on groundwater levels of the most recent drought were variable across the Subbasin and resulted in some decreased groundwater storage from 2012 to 2016, but the GSAs and DWR have received no reports of well problems with groundwater level declines.

Nonetheless, undesirable results of chronic groundwater level declines could potentially occur. Causes of declines could include severe and prolonged drought, climate change (locally and/or in imported water source areas), or long-term imbalance of demand over supply. Water demands may exceed supply if a reduction of imported water supply occurs. Accordingly, the GSAs have defined sustainability criteria as summarized here.



The GSAs have been working to reverse groundwater overdraft through imported water replenishment.

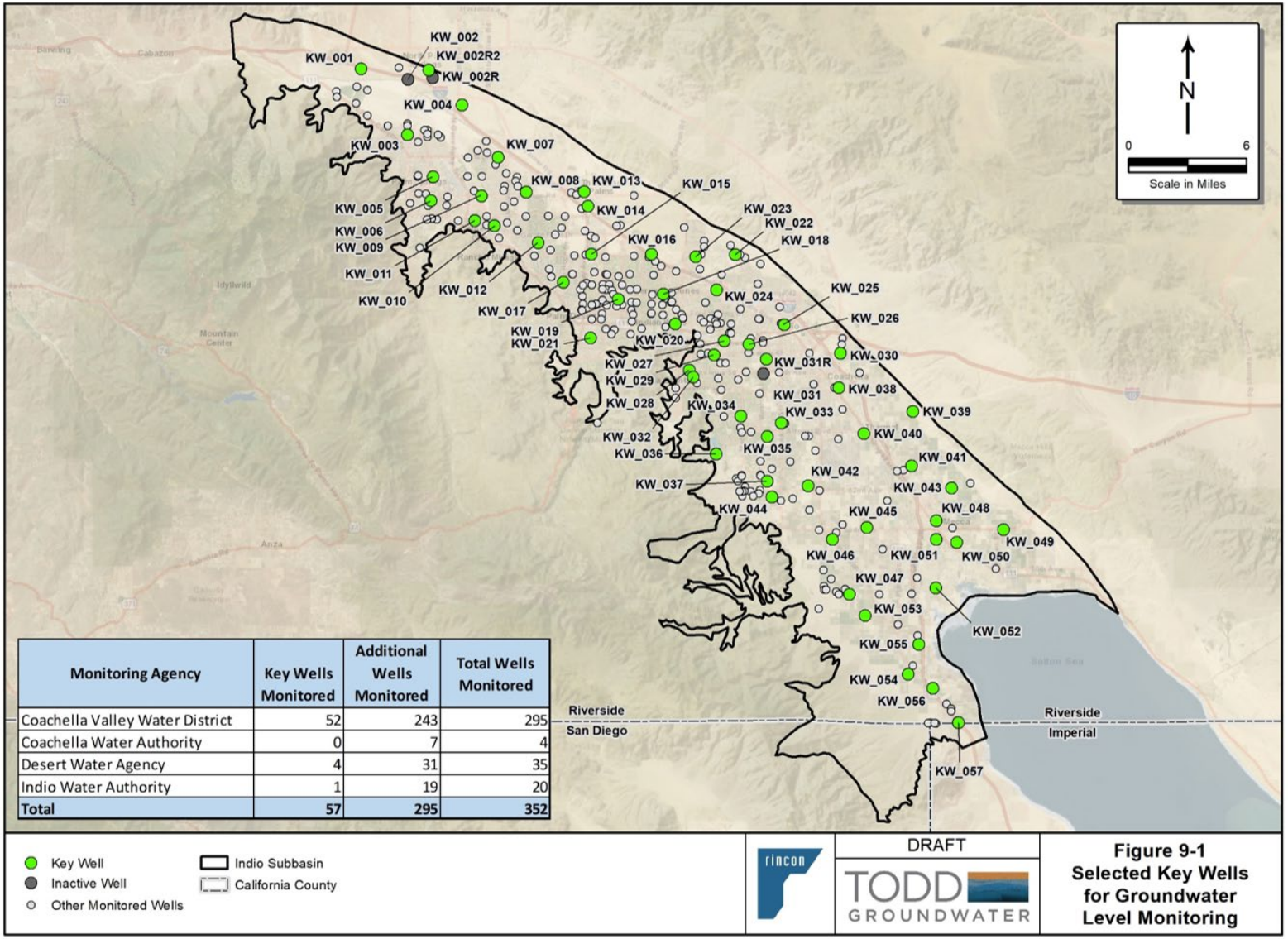
Some of the potential causes of groundwater level changes, including declines, are within GSA responsibility; most notably, a GSA is responsible for groundwater basin management without causing undesirable results such as chronic groundwater level declines. SGMA also requires that a GSA address significant and unreasonable effects caused by groundwater conditions *throughout the basin.* This indicates that a GSA is not solely responsible for local or well-specific problems and furthermore that responsibility is shared with a well owner. A reasonable expectation exists that a well owner would construct, maintain, and operate the well to provide its expected yield over the well's life span, given historical groundwater levels (including droughts) and with some anticipation that neighbors also might construct wells (consistent with land use and well permitting policies).

Groundwater level declines across broad areas of the Indio Subbasin could have deleterious impacts on subsidence, individual wells and well yields, and seawater intrusion.

9.3.2.1 Selection of Key Wells

Selected Key Wells, first identified in the *2022 Alternative Plan Update*, are shown in Table 9-1 and Figure 9-1. These wells are representative of local groundwater elevation conditions and are appropriate for inclusion in the Key Well groundwater elevation monitoring network (a subset of the overall monitoring program). These wells will be used for well-by-well definition of sustainability criteria (such as undesirable results and minimum thresholds). Two wells were replaced, KW-002 and KW-031, as they are no longer accessible. Future periodic evaluations of this Alternative Plan will include review and any needed refinement of this Key Well network.

Figure 9-1 Selected Key Wells for Groundwater Level Monitoring



Monitoring Agency	Key Wells Monitored	Additional Wells Monitored	Total Wells Monitored
Coachella Valley Water District	52	243	295
Coachella Water Authority	0	7	4
Desert Water Agency	4	31	35
Indio Water Authority	1	19	20
Total	**57**	**295**	**352**

The selection process began with a database of 757 wells that have water level measurements compiled by the GSAs. The selection of Key Wells from this set was based on a quantitative approach that considered wells with long records characteristic of an area and distribution of wells across Indio Subbasin. In brief, all available groundwater elevation data were plotted as hydrographs and well locations were plotted on a basin-scale map. The five criteria include the following:

1. **Available Construction Information** – Wells should have construction information including at least total depth.
2. **Current Monitoring** – Wells need to have been monitored recently to ensure continued access (all selected wells were measured in 2025).
3. **Long Record** – Wells should have a long period of record to reflect changing conditions in the Subbasin. Wells were evaluated with consideration of length of monitoring record and the number of years since 1990 (the beginning year of the *2010 CVWMP Update* model) with consistent monitoring. This period includes overdraft and recovery. Wells were scored based on the number of years with more than two water level monitoring events.
4. **Spatial Distribution** – Wells were prioritized to provide distribution across the Subbasin (evaluated for no more than one well per township range section) and to select at least one well in each GSA jurisdiction. Wells were given a higher ranking if no other monitoring wells were located in the same township range section (TRS) and a lower ranking if there were several wells in the section. Only the highest scoring well in a TRS was selected. If multiple wells had the same score, the well with the longest record was selected. In addition, areas with clusters of wells were identified and only the highest scoring well was selected.
5. **Location near Production Wells** – Wells were rated higher in sections that had more production wells. Conversely, wells were rated lower if few or no pumping wells existed in the TRS. Because the purpose of the MTs is to protect current and future beneficial uses including pumping, the key wells need to reflect pumping locations. However, if a large area of the Subbasin did not have an adequately rated well, the best well in that area is proposed.

After all wells with water level monitoring were scored and ranked, the wells were plotted and vetted against additional considerations. These considerations are more qualitative but help refine the selection of higher ranked wells. These considerations include:

- **Small Water Systems** – Wells in and around small community water systems are considered in order to be protective of pumping.
- **GSA represented** – All four of the GSA jurisdiction areas should be represented.
- **All Subareas represented** – insofar as possible at least one well was included per Subarea.
- **Depth of well** – The depth of Key Wells should be representative of the static regional levels. Wells less than 300 feet were not selected unless they were needed for areal distribution or provided a very long and complete record.
- **Location relative to active recharge** – Selection of key wells should not be unduly influenced by the Groundwater Replenishment Facilities (GRFs). Accordingly, monitoring wells for a GRF or on GRF property were not included. The key wells were selected to monitor regional trends and not local operational effects of these facilities.
- **SNMP** – Wells in the CV-SNMP workplan were considered to provide some overlap of the two programs while recognizing that these are for SNMP objectives.

- **Representative but not redundant** – Hydrographs were visually identified for similar trends in nearby wells to avoid redundancy.

9.3.3 Sustainability Criteria for Groundwater Levels

In the *2022 Alternative Plan Update*, the MTs were set at the recent historical low level. This general approach to defining sustainability criteria was based on recognition of the following: 1) that historical low groundwater levels have occurred relatively recently in the Indio Subbasin and 2) there has been a lack of reported problems. Accordingly, it can be assumed that maintaining groundwater elevations at or above minimum historical values should not cause undesirable results. This has been substantiated by a review of available information on the location and depths of wells serving small water systems (SWS), which indicated that historical groundwater low levels were above the shallowest well depths.

This approach is protective of existing production wells and conservative. In fact, it is possible that groundwater levels could be locally lower than the historical minimum to increase operational flexibility without resulting in undesirable effects.

9.3.3.1 Considerations for Updating the Minimum Threshold

In May 2025, a draft settlement agreement among CVWD, DWA, the Agua Caliente Band of Cahuilla Indians (Tribe), and the United States provided a framework for the Tribe, CVWD, and DWA to cooperatively manage groundwater underlying the Agua Caliente Indian Reservation through a Memorandum of Cooperation. The Agreement remains draft until signed by the federal government. This Agreement is relevant to ongoing groundwater sustainability planning in establishing a Technical Advisory Committee (TAC) that will guide the cooperative management in the Management Agreement Area (shown in Figure 9-2) and provide annual reporting. The agreement states that the parties will "seek to establish 2027 Minimum Thresholds for each Key Well. The 2027 Minimum Thresholds will be up to 10 feet below the 2022 Minimum Thresholds to provide flexibility for the Tribe to exercise the Tribal Water Right (Agua Caliente, 2025)".

Future water supply projections indicate more variability in anticipated imported water deliveries. This range in future conditions could indicate more water available for recharge in wet years but less water available in normal and dry years. Groundwater management in the Subbasin may need a greater range of operational flexibility to use more groundwater in normal and dry years and replenish the basin in wet years. Because the Agua Caliente settlement considered deeper MTs, the GSAs selected to assess all of the Key Wells to determine if the minimum threshold could be lowered without causing undesirable results. Where possible, the MT was lowered below historical lows, but in some areas MTs were capped at the historical low to prevent undesirable results. Figure 9-3 shows the Key Wells and indicates the wells that have lower MTs for operational flexibility (green), and those Key Well MTs that are capped because of potential undesirable effects from subsidence (yellow), impacts to SWS/domestic wells (blue), and seawater intrusion from the Salton Sea (red).

Risk of Subsidence

As noted in Section 4.3, some areas in the Indio Subbasin are at risk for subsidence. The 2020 USGS study has provided documentation that subsidence stopped or slowed after about 2010. This occurred with stabilizing and rising groundwater levels that followed the historical low groundwater levels and storage in about 2009. As discussed in the *2022 Alternative Plan Update*, historical low

Figure 9-2 Agua Caliente Management Area

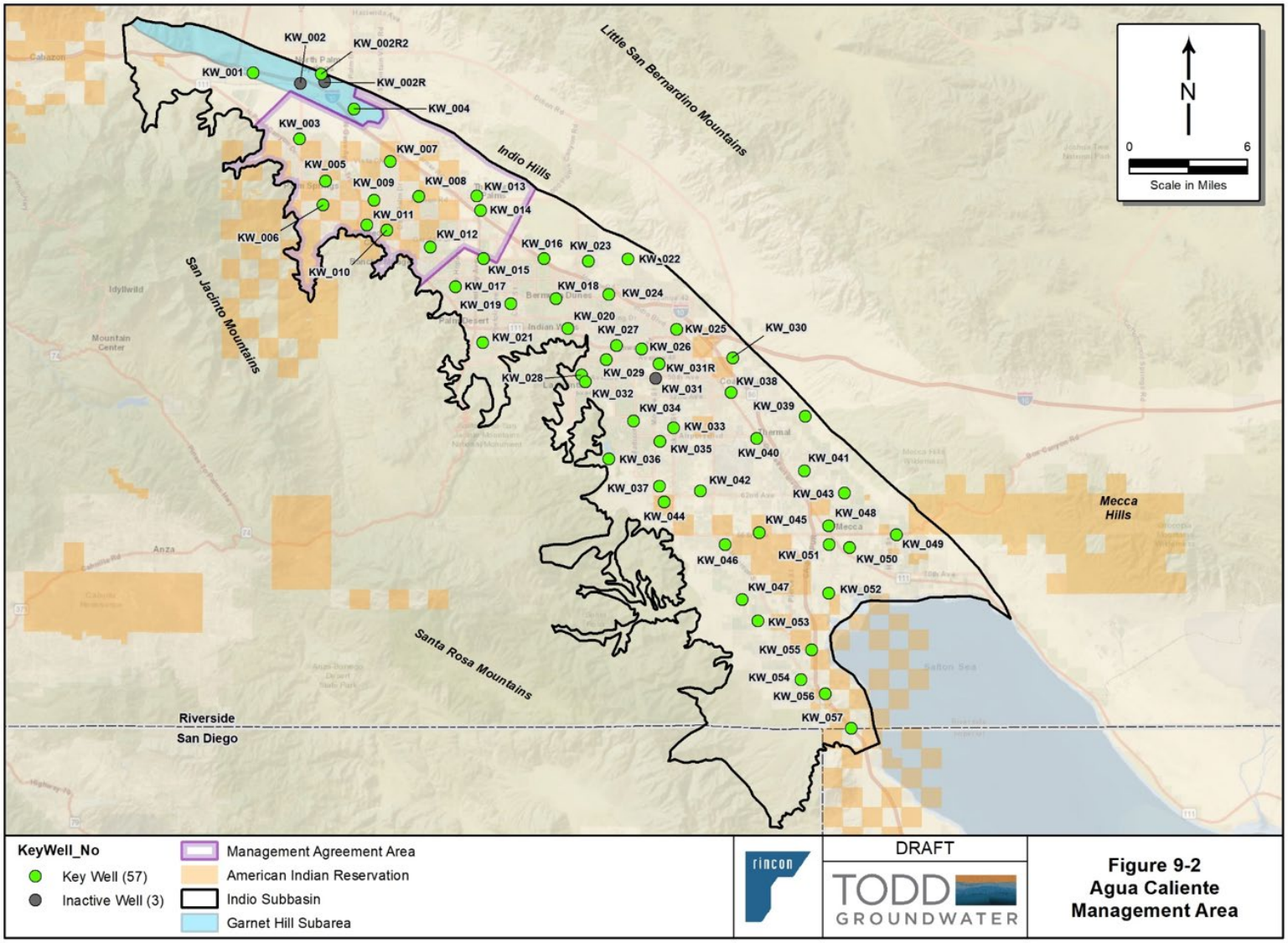
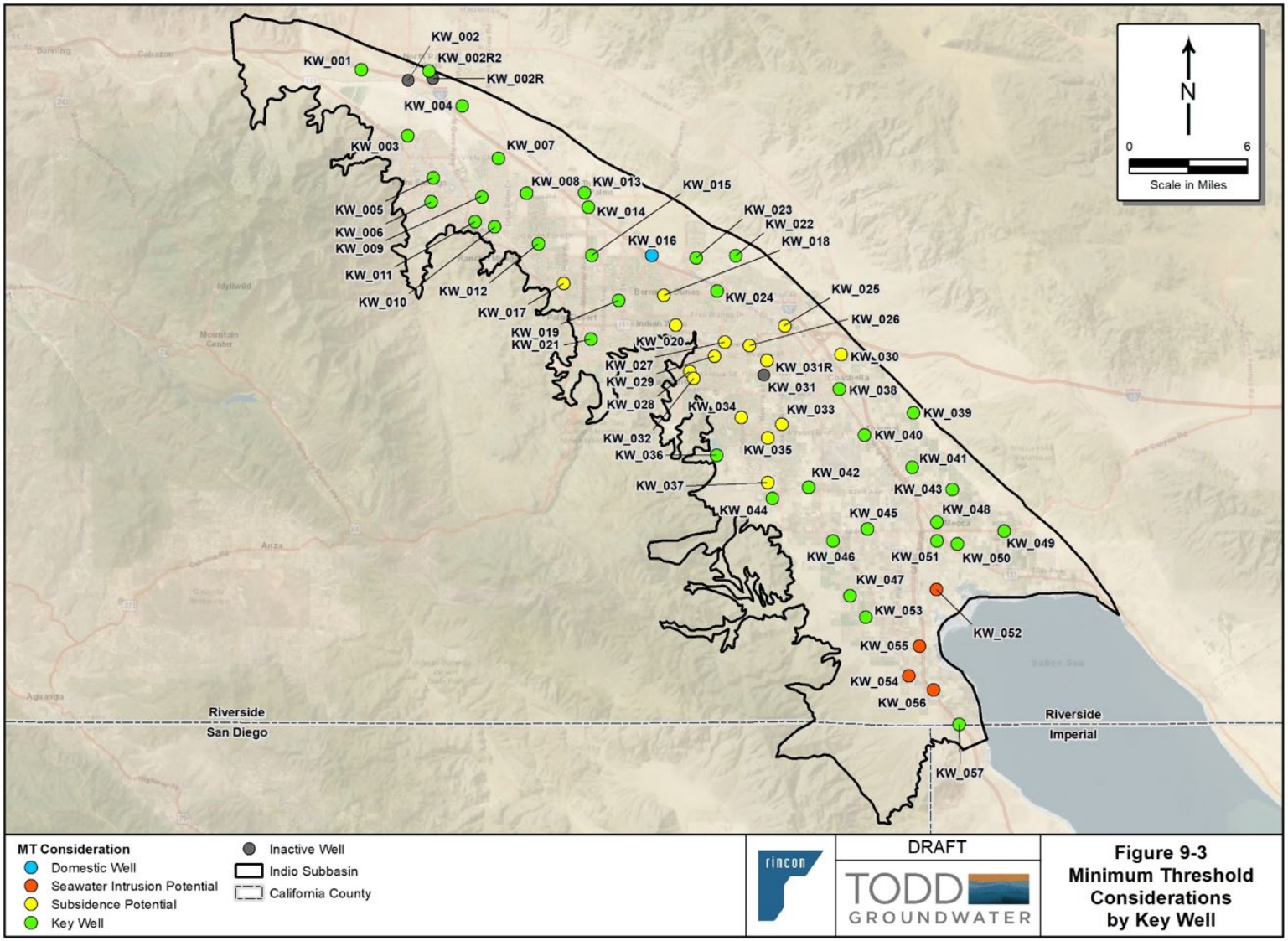


Figure 9-3 Minimum Threshold Considerations by Key Well



groundwater levels were selected as the conceptual basis for meaningful and protective MTs. Figure 4-12 highlights the areas that have observed some negative displacement over the past ten years and therefore have an elevated risk for subsidence. In these areas, a comprehensive analyses of SWS/domestic wells and of saltwater intrusion confirmed that the recommended MT should remain at historical lows (see Section 9.5). The fifteen Key Wells in this zone of moderate subsidence include KW-017, KW-018, KW-020, KW-025, KW-026, KW-027, KW-028, KW-029, KW-030, KW-031R, KW-032, KW-033, KW-034, KW-035, and KW-037.

Small Water Systems and Domestic Wells

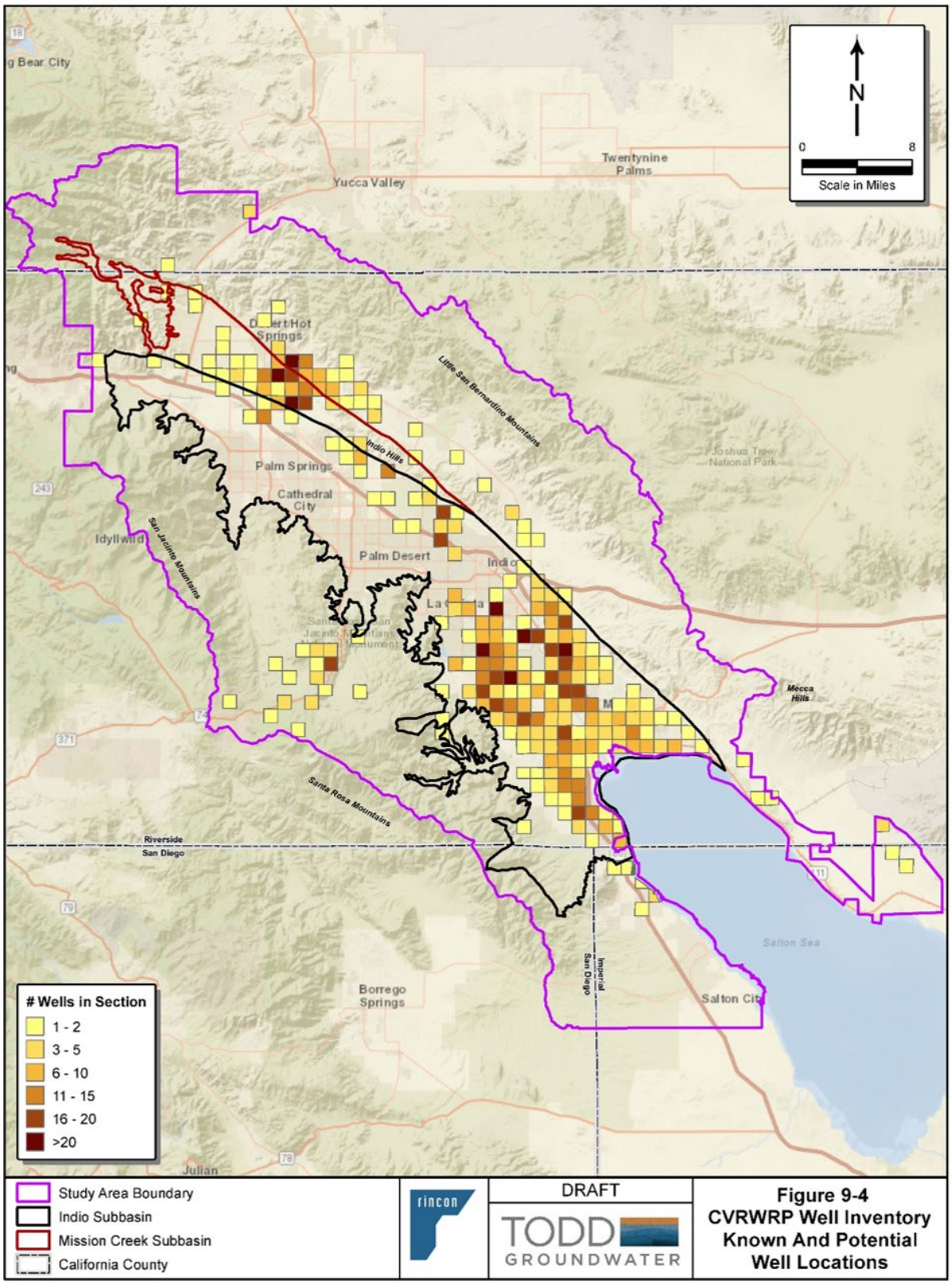
The *Coachella Valley Regional Water Resilience Plan (CVRWRP)*, to be completed in late 2026, is 1) gathering information on existing and potential risks to local communities due to climate change, 2) developing a Well Inventory of private domestic and SWS wells that could be adversely affected by climate change, and 3) developing a Plan that outlines practical and feasible actions to reduce those risks.

The Vulnerability Assessment, developed along with the CVRWRP, documents areas of vulnerable domestic wells. The report used a combination of desktop studies, existing sources, and field verification to develop a database of SWS and domestic well locations. These locations are confidential, but density of domestic wells is shown on Figure 9-4. Section 8.5, Small Water Systems, provides information on GSA programs to help provide SWS with reliable and safe water supplies. While many wells for SWS do not have known construction or depths, review of available information from 433 wells in the Vulnerability Assessment indicates a range of well depths from 100 to 920 feet. Wells with known well construction within three miles of each Key Well were compared to the proposed MTs (10 feet below the historical lows). This review identified four Key Wells where nearby domestic wells have shallow screens and may potentially be impacted if the MT were lowered: KW-002, KW-004, KW-016, and KW-054. As discussed below, one or more domestic wells within the radius of these wells are screened less than 200 feet below ground surface.

- Several shallow domestic wells are within 3 miles of KW-002R2 and KW-004, but these domestic wells are on the other side of the Banning Fault from the Key Wells. This fault separates Indio Subbasin from Mission Creek Subbasin and is a partial barrier to groundwater flow. Changes in groundwater levels or MTs at KW-002R2 or KW-004 are unlikely to have a significant impact to these wells on the other side of the fault.
- KW-016 is located in Palm Desert in an area near shallow domestic wells. Six out of seven domestic wells with known well construction in the area have a bottom screen depth ranging from 288 to 618 ft bgs. However, one well is reportedly screened from 200 to 300 feet bgs. Because impacts may occur to this well if the MT is lowered, the MT for KW-016 is capped at the historical low, -43.2 feet msl (197.9 ft bgs).

KW-054 is located near the Salton Sea, and the current MT is -256.5 feet msl (146.36 ft bgs). Fifteen out of sixteen domestic wells with known well construction in the area have a bottom screen depth ranging from 218 to 535 ft bgs. One domestic well is reportedly screened 65 to 85 ft bgs, but no well log was available from the DWR online Well Completion Report. Furthermore, water levels in KW-054 have been measured at depths of more than 85 feet bgs consistently since 1985. This suggests that this shallow domestic well may not be operational, may have an incorrectly reported screen interval, or produces water from a perched zone disconnected from the principal aquifer. As such, the revised MT for KW-054 is deemed sufficient to prevent negative impacts to domestic wells in

Figure 9-4 CVRWRP Well Inventory Known And Potential Well Locations



the area. However, because it is located near the Salton Sea there is an increased risk of sea water intrusion and is evaluated in the seawater intrusion section as well.

Evaluation of known depths for domestic and SWS wells within three miles of Key Wells indicates that the revised MTs for most Key Wells are above known depths for all SWS with available information and are protective. However, because KW-016 has nearby shallow wells, the MT will be kept at historical lows to ensure no impact to existing domestic wells.

Saltwater Intrusion

Saltwater intrusion from the Salton Sea has been emphasized in the Alternative Plan as a potentially substantial and irreversible consequence of overdraft, whereby reduced groundwater pressure in Subbasin aquifers would cause relatively dense saline water to intrude into the subbasin and displace freshwater. To minimize potential seawater intrusion, maintenance of groundwater elevations along the Salton Sea is critical to sustain groundwater outflow to the Salton Sea. The current elevation of the Salton Sea is about -240 feet msl. While current groundwater levels are above the Salton Sea elevation, seawater intrusion may be possible if water levels are permitted to be reduced below historical lows. Accordingly, the MTs will be capped at their respective historical lows for the Key Wells near the Salton Sea (KW-052, KW-054, KW-055, and KW-056).

Ground Surface Elevation

MTs for key wells were originally developed using the National Geodetic Vertical Datum (NGVD) NGVD29 used by CVWD and DWA. DWR requires that all elevation data must be submitted using the NAVD88 datum in the Monitoring Network Module (MNM) on the SGMA portal. For the *2022 Alternative Plan Update*, MTs were converted from NGVD29 to NAVD88 using an analytical correction. CVWD and DWA have since re-surveyed all Key Wells and updated the MNM with elevations surveyed in NAVD88. This slight change in ground surface elevation has resulted in a small change to the historical low elevations at some of these wells.

9.3.3.2 Identification of Minimum Threshold

Under current conditions, groundwater levels in all Key Wells are above the MTs and no undesirable results are known to occur. As documented above, MTs were set at historical lows in the *2022 Alternative Plan* and reassessed in this *2027 Alternative Plan Update* to allow for additional operational flexibility. In areas that are potentially at risk, the MT was kept at historical lows, and for all other areas, the MT was lowered 10 feet, consistent with the Settlement Agreement with Agua Caliente. The Revised MTs are shown on Table 9-1.

For the future, the GSAs will continue to cooperate with agencies responsible for well permitting to ensure that new wells are constructed with sufficient depth to accommodate groundwater level changes relative to the MTs.

Table 9-1 Key Well Network with Revised Minimum Threshold

Key Well Number	SWN	Well Name/Owner	2027 MT (ft msl)	Capped at Historical Lows?	Reasoning
KW_001	03S04E17K01S	Private	607.2	--	--
KW_002R2	MSWD MW1	MSWD	577.2	--	--
KW_003	03S04E34R01S	DWA Well 21	235.1	--	--
KW_004	03S05E30G01S	Private	372.3	--	--
KW_005	04S04E13C01S	DWA Well 23	176.5	--	--
KW_006	04S04E24D01S	DWA Well 24	156.7	--	--
KW_007	04S05E09B01S	CVWD Well 4562-1	143.8	--	--
KW_008	04S05E15R02S	Private	90.0	--	--
KW_009	04S05E17Q02S	DWA Well 31	126.5	--	--
KW_010	04S05E28F02S	CVWD Well 4519-1	97.9	--	--
KW_011	04S05E29F01S	Private	121.7	--	--
KW_012	04S05E35G03S	CVWD Well 4503-1	49.4	--	--
KW_013	04S06E18R01S	CVWD Well 4623-1	24.9	--	--
KW_014	04S06E20M02S	CVWD Well 4628-2	7.8	--	--
KW_015	04S06E32N02S	CVWD Well 4611-1	-12.5	--	--
KW_016	04S06E35P01S	Private	-43.2	Y	Domestic Wells
KW_017	05S05E12H02S	CVWD Well 5507-1	6.2	Y	Subsidence Potential
KW_018	05S06E12N01S	CVWD Well 5626-1	-61.8	Y	Subsidence Potential
KW_019	05S06E16A02S	CVWD Well 5620-1	-49.8	--	--
KW_020	05S06E24G01S	CVWD Well 5636-1	-83.2	Y	Subsidence Potential
KW_021	05S06E29C01S	CVWD Well 5643-1	-43.7	--	--
KW_022	05S07E04A01S	CVWD Well WRP-7 MW-1 Dave Price	-76.9	--	--
KW_023	05S07E06B04S	CVWD Well 5720-1	-85.0	--	--
KW_024	05S07E08Q01S	Private	-90.2	--	--
KW_025	05S07E24M04S	IWA Well 1C	-91.4	Y	Subsidence Potential
KW_026	05S07E27L01S	Private	-146.4	Y	Subsidence Potential
KW_027	05S07E28E01S	CVWD Well 5701-1	-92.7	Y	Subsidence Potential
KW_028	05S07E31P01S	CVWD Well 5706-1	-107.2	Y	Subsidence Potential
KW_029	05S07E32B01S	CVWD Well 5725-1	-152.6	Y	Subsidence Potential
KW_030	05S08E33D01S	CWA 10	-158.8	Y	Subsidence Potential
KW_031R	05S07E35F04S	Private	-156.4	Y	Subsidence Potential
KW_032	06S07E06B01S	CVWD Well 6701-1	-144.6	Y	Subsidence Potential
KW_033	06S07E13M02S	CVWD Well 6781-1	-89.6	Y	Subsidence Potential
KW_034	06S07E16A02S	CVWD Well 6723-1	-171.7	Y	Subsidence Potential
KW_035	06S07E23F01S	Private	-161.5	Y	Subsidence Potential
KW_036	06S07E29B01S	Private	-178.3	--	--
KW_037	06S07E35L02S	Private	-174.3	y	Subsidence Potential

Key Well Number	SWN	Well Name/Owner	2027 MT (ft msl)	Capped at Historical Lows?	Reasoning
KW_038	06S08E05R02S	CVWD Well 6858-1	-109.6	--	--
KW_039	06S08E12Q01S	Private	-145.5	--	--
KW_040	06S08E22D02S	CVWD Well 6803-1	-184.8	--	--
KW_041	06S08E25Q01S	Private	-196.5	--	--
KW_042	06S08E31P01S	Private	-192.2	--	--
KW_043	06S09E32Q01S	Private	-194.5	--	--
KW_044	07S07E02G02S	Private	-183.2	--	--
KW_045	07S08E10P01S	Private	-210.3	--	--
KW_046	07S08E17G01S	CVWD Well 7801-1	-204.7	--	--
KW_047	07S08E33B01S	Private	-215.4	--	--
KW_048	07S09E07J01S	CVWD Well 7993-1	-253.6	--	--
KW_049	07S09E14C01S	Private	-188.8	--	--
KW_050	07S09E16M03S	Private	-268.2	--	--
KW_051	07S09E18H01S	Private	-270.8	--	--
KW_052	07S09E30R01S	CVWD Bernadine	-209.7	Y	Seawater Intrusion Potential
KW_053	08S08E03L01S	Private	-227.8	--	--
KW_054	08S08E24L01S	Private	-256.5	Y	Seawater Intrusion Potential
KW_055	08S09E07N03S	CVWD Gracie	-249.1	Y	Seawater Intrusion Potential
KW_056	08S09E30A01S	Private	-263.3	Y	Seawater Intrusion Potential
KW_057	08S09E33N01S	Private	-269.6	--	--

9.3.3.3 Minimum Thresholds and Criteria for Undesirable Results

Undesirable results are based on exceedances of MT levels and must be defined not only in terms of how they occur (see Section 9.3.2, Potential Causes of Undesirable Results), but also when and where. By definition, undesirable results are not just drought-related, but chronic, and are not just local, but Subbasin-wide.

Regular groundwater level monitoring (at least three times per year) and annual reporting provides regular updates that allow response by the GSAs and local groundwater users. Management action response times vary. For example, it may take some time for increased replenishment at the GRFs to benefit water levels in the Subbasin. Due to some inevitable delays in results from management actions, an undesirable result is when water levels fall below MTs for five consecutive same-season events (e.g., five October monitoring events).

Local areas of groundwater level declines can occur due to conditions such as locally increased pumping. However, local declines do not necessarily indicate Subbasin-wide issues such as overdraft. Undesirable groundwater level declines of Subbasin-wide significance could occur due to influences such as severe and prolonged drought, climate change, reduction of imported water supply and increased groundwater pumping. While not likely to occur uniformly across the Indio

Subbasin, groundwater level declines could be fairly widespread under these conditions. Significant and undesirable results are defined as occurring when groundwater levels are below the MT for five consecutive same-season monitoring events in 25 percent of Key Wells.

To summarize for the Indio Subbasin:

> The **Minimum Threshold** for undesirable results relative to chronic lowering of groundwater levels is defined at each Key Well at the level to avoid impacts. Undesirable results are indicated when groundwater levels are below the MT for five consecutive same-season monitoring events, in 25 percent or more of the Key Wells in the Indio Subbasin.

9.3.3.4 Measurable Objectives and Interim Milestones

For groundwater levels, the MOs are defined here as an operating range of groundwater levels above the MT, allowing reasonable fluctuations with changing hydrologic and surface water supply conditions and with conjunctive management of surface water and groundwater. The groundwater level MTs represent the bottom of the operating range and are protective of groundwater users and beneficial uses. The top of the operating range is not specified because there is no particular high groundwater level to be a sustainability objective and groundwater levels in many areas are increasing. While unconfined groundwater levels across much of the Subbasin are below historical highs, other areas are characterized by artesian conditions or by use of drainage systems to control high groundwater levels.

> The **Measurable Objective** is to maintain groundwater levels above the groundwater level MTs (as quantified above), and to maintain groundwater levels within the operating range as defined in this section.

Groundwater conditions with respect to chronic groundwater level declines are already sustainable and there is no need to define interim milestones.

9.4 Quantitative Criteria for Groundwater Storage

Groundwater storage is the volume of water in the Subbasin. It provides a reserve for drought or water shortage. The minimum threshold for reduction of groundwater storage is the volume of groundwater that can be withdrawn from a basin or management area without leading to undesirable results. Undesirable results would involve insufficient stored groundwater to sustain beneficial uses through drought or shortage. The storage criteria are closely linked to groundwater levels. Unlike the other sustainability criteria, the reduction of groundwater storage criteria is not defined at individual monitoring sites, but is evaluated as a volume on a Subbasin-wide basis. The sustainability indicator for groundwater storage addresses the ability of the groundwater basin to support existing and planned beneficial uses of groundwater even during drought and water supply shortage.

9.4.1 Description, Causes, and Effects of Undesirable Results

As with declines in groundwater level, reduction of groundwater storage could be due to influences such as severe and prolonged drought (locally and/or in imported water source areas), climate change, or a longer-term imbalance of demand over supply. Storage is related to groundwater levels, thus, undesirable results associated with storage would likely be accompanied by one or more undesirable results associated with groundwater levels, including reduced well yields,

subsidence, seawater intrusion, and potential depletion of interconnected surface water. Reduction of groundwater storage could affect the ability of groundwater users to support beneficial uses through drought and shortage and have negative effects on the regional economy.

9.4.2 Sustainability Criteria for Groundwater Storage

The potential for reduction of groundwater storage exists for the Indio Subbasin and thus the GSAs have considered MTs to be defined as the maximum groundwater volume that can be withdrawn without leading to undesirable results. However, use of the groundwater level sustainability criteria (e.g., MTs and MOs) as a proxy for groundwater storage is acceptable provided that GSAs demonstrate a correlation between groundwater levels and storage. Groundwater levels and storage are directly related. This is demonstrated by comparison of groundwater level and storage trends, which reveal similar patterns of historical overdraft, recovery, and response to different water year types including drought (see Chapter 4, *Current and Historical Groundwater Conditions*). The relationship of levels and storage is reflected in the calibrated groundwater flow model (see Chapter 7, *Numerical Model and Plan Scenarios*) that has been used to simulate groundwater levels and storage under projected conditions.

Use of groundwater levels as proxy for storage is sufficiently protective to ensure prevention of significant and unreasonable results relating to storage depletion. In brief, groundwater level MTs have been defined to protect beneficial uses and are based on the following:

- A broad geographic distribution of Key Wells that are representative of basin production wells.
- MTs based on avoidance of undesirable results including impact to domestic wells, risk of subsidence, or change in outflow to the Salton Sea.
- Groundwater level MTs involve groundwater levels below the MT for five consecutive same-season monitoring events, in 25 percent or more of the Key Wells in the Indio Subbasin. Thus, GSAs are alerted to groundwater level change as it may occur across a broad area, and this perspective will be revealing about storage change as it occurs across the Subbasin.

Accordingly, the MT for storage for the Indio Subbasin is fulfilled by the MT for groundwater levels, modified as follows:

> The **Minimum Threshold** for undesirable results relative to chronic lowering groundwater levels and depletion of storage is defined at each Key Well at the level to avoid impacts. Undesirable results are indicated when groundwater levels are below the MT for five consecutive same-season monitoring events, in 25 percent or more of the Key Wells in the Indio Subbasin.

For groundwater storage, the MOs is fulfilled by the minimum threshold for groundwater levels, modified as follows:

> The **Measurable Objective** for groundwater storage is to maintain groundwater levels above the groundwater level MTs (as quantified above) and within the operating range as defined in this section.

Groundwater conditions with respect to groundwater levels and storage are sustainable and there is no need to define interim milestones.

9.5 Quantitative Criteria for Land Subsidence

Land subsidence, the differential lowering of the ground surface, can damage structures and hinder surface water drainage. Portions of the Indio Subbasin are susceptible to and have experienced historical subsidence due to groundwater withdrawals (see Chapter 4, *Current and Historical Groundwater Conditions*). In response to subsidence, CVWD and the USGS have collaborated on a series of investigations that documented the location and rate of subsidence, defined three areas of significant subsidence for study, and provided a correlation of subsidence to groundwater level declines. The most recent USGS study (Sneed and Brandt, 2020) documented stabilized or rising groundwater levels since 2010 that reflect the combined effect of various projects to increase recharge and reduce groundwater pumping. This study also documented that, although a few areas subsided from 2010 to 2017 (albeit at a slower rate), most areas stopped subsiding during this period and some even uplifted. A follow-up USGS subsidence study expanding on these findings is scheduled for publication shortly. As the USGS report was not available at the time of preparation of the draft *2027 Alternative Plan Update*, this update instead utilizes DWR InSAR subsidence data from TRE ALTAMIRA; a detailed analysis of these recent data is provided in Section 4.3.

9.5.1 Description, Causes, and Effects of Undesirable Results

The land subsidence experienced historically in Indio Subbasin has been caused by declines in groundwater elevations due to pumping exceeding recharge. Potential undesirable results of land subsidence include disruption of surface drainage, water supply conveyance, and flood control facilities where effective function is based on maintenance of a steady gradient over long distances; important such facilities include the Whitewater River/Coachella Valley Stormwater Channel (CVSC), Coachella Canal, and Mid Valley Pipeline (see Figure 2-5). In addition, subsidence can cause damage to infrastructure such as pipelines, airport runways, canals, railroads, roads, and highways; damage to structures such as housing, septic systems, distribution lines, and piping; and potential subsidence around production wells, disrupting wellhead facilities.

As discussed in Chapter 4, observed land surface displacement and the risk for subsidence varies across the basin. To define the SMCs meaningfully, the Subbasin has been divided into two categories: areas with low to no risk of subsidence and areas with moderate risk of subsidence. Areas with little or no risk of subsidence are reviewed, including evaluation of the existing groundwater levels sustainability criteria, and additional sustainability criteria to prevent subsidence are not defined. Areas with a moderate risk have experienced subsidence historically, and within the past ten years. For these areas, a ‘critical head analysis’ has been used to define groundwater levels as proxy MTs for subsidence. Figure 9-5 outlines these moderate risk areas in red, while all other areas are considered low risk.

Figure 9-5 Map of Cumulative Vertical Displacement

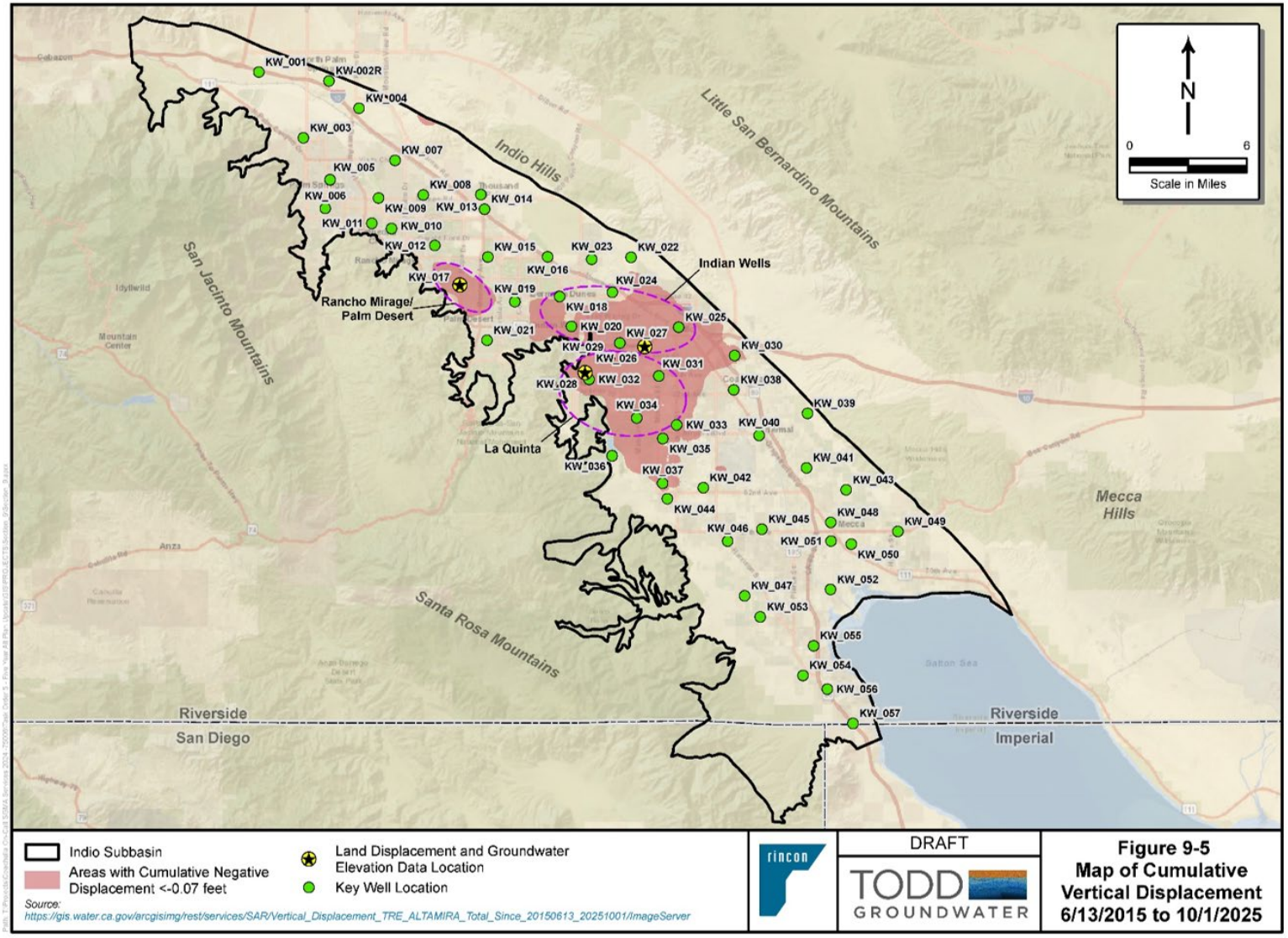
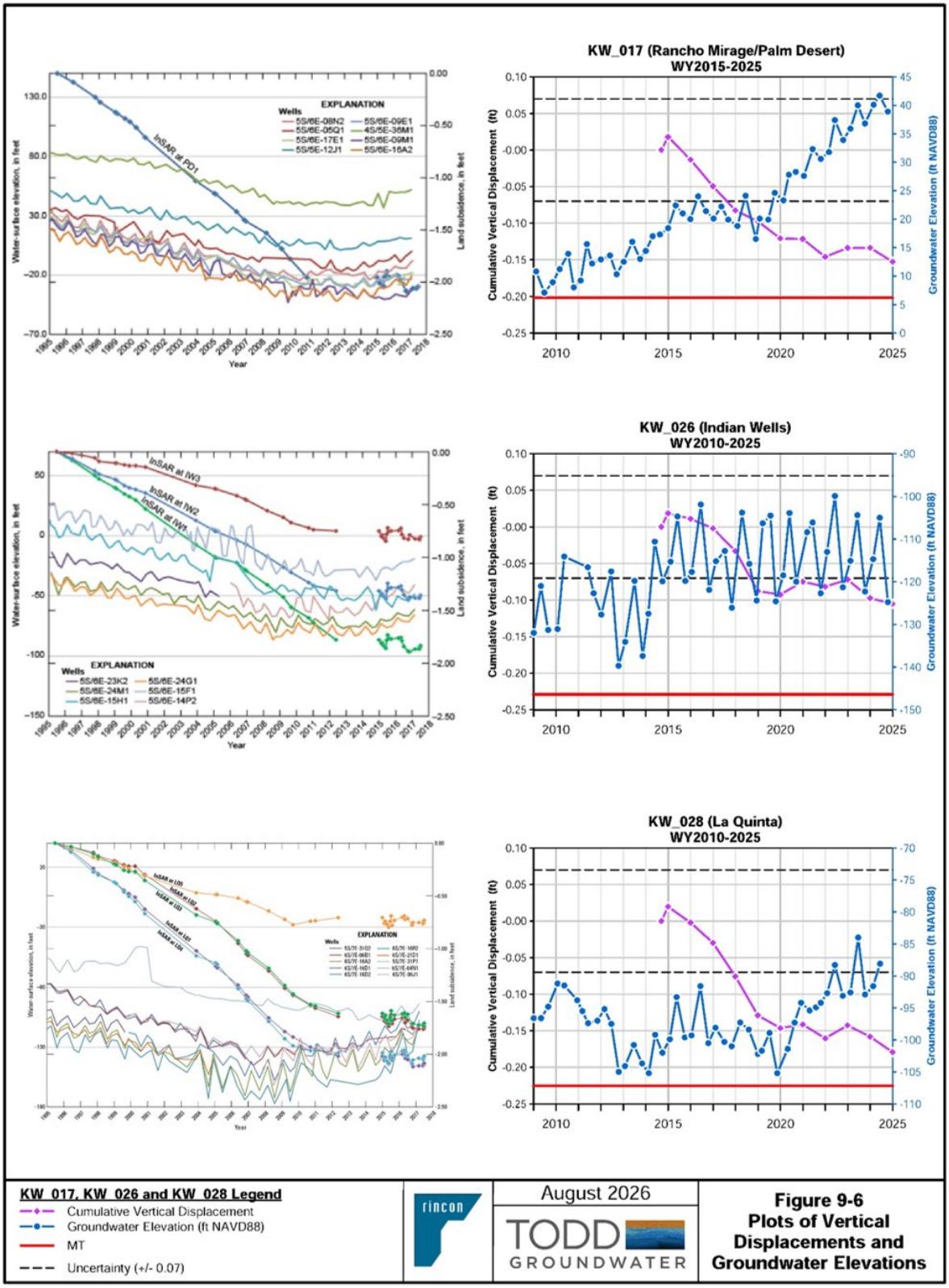


Figure 9-6 Critical Head Graphs



9.5.1.1 Low Risk of Subsidence

A low risk of subsidence has been designated for the Whitewater/ Agua Caliente area in the northwestern Subbasin which displayed little or no displacement or positive displacement (uplift) from WY2015 through WY2025. This regional neutral to positive displacement has persisted throughout a range of groundwater elevation trends, including static, slightly increasing, and large magnitude oscillations over interannual to decadal timescales (see Figure 4-3). The stratigraphic cross sections in the Agua Caliente area indicate stratigraphy dominated by coarse-grained sediments (see Figures 3-7 to 3-13), which therefore is likely to be highly resistant to subsidence (DWR, 2026). In combination, the stratigraphy and historical subsidence data indicate a low subsidence risk for this region. Given this low risk, subsidence SMCs will not be established for this region.

As discussed in Section 9.3.3, groundwater level MTs for these areas of low risk have been lowered to 10 feet below historical lows, consistent with the Agua Caliente Settlement Agreement. Given the low risk of subsidence and the need for operational flexibility, the adjusted MT is not expected to cause undesirable results.

As shown in Figure 9-5, other areas of the Subbasin are considered as low risk including the area southeast of the La Quinta moderate risk area and extending to the Salton Sea. Figure 4-10, the map of subsidence 2014-2017, indicates subsidence similar in magnitude to subsidence in the three USGS study areas. However, in its studies, USGS did not define this southeast area for study, noting that subsidence in the southeast area has been relatively localized and lesser magnitude over a longer study period of June 1995 – June 2017 (see Figure 5, Sneed and Brandt, 2020). The recent InSAR data in Figure 4-11, showing minimal subsidence or uplift for 2015-2025, is consistent with that observation and supports the designation of low subsidence risk.

It is noted that Figure 4-11 shows areas of no data in the southeast. USGS has noted that the quality of InSAR mapping is reduced in the southern Coachella Valley because of prevalent farming, where tilling and plowing cause relatively large and nonuniform groundwater surface changes (Sneed and Brandt, 2007). Given all the above, the southeastern area is designated as low risk and existing groundwater level criteria are deemed protective. It is also noted that MTs already are capped at their respective historical lows for five Key Wells at risk for saltwater intrusion from the Salton Sea. Additional SMCs to prevent subsidence are not defined.

Land displacement and associated groundwater level data will continue to be monitored, updated annually in the Annual Report, and evaluated for any indications of subsidence. Should subsidence be indicated based on updated and current land displacement data, subsidence criteria will be implemented and the subsidence risk category updated for this region or subsets of this region.

9.5.1.2 Moderate Risk of Subsidence

Figure 9-5 indicates areas of subsidence in the vicinity of Palm Desert, Indian Wells, and La Quinta. These areas of moderate risk generally correspond with areas of subsidence studies by the USGS (Sneed and Brandt, 2020; Sneed, et al., 2014; Sneed and Brandt, 2007). While the magnitudes of the negative displacements are relatively small across these areas, they exceed the reported uncertainty of InSAR data, evaluated as +/- 0.07 ft for data from the period of January 1, 2015 through October 1, 2025 (Towill, 2026). The stratigraphic cross sections for these three areas (see Figures 3-8, 3-9, 3-11, and 3-12) indicate multiple fine-grained layers and clay lenses of varying depths, extents, and thicknesses. This stratigraphy is consistent with susceptibility to subsidence (inelastic compaction) should groundwater levels decline significantly. SMCs for subsidence have been established for

these three areas to enable early detection, response, management, and protection against subsidence that can cause significant adverse impacts on beneficial uses and users.

Critical Head Analysis

In accordance with DWR's *Best Management Practices for Land Subsidence* (DWR, 2026) groundwater elevations and cumulative land displacements were compared to determine correlation, evaluate potential causality between groundwater levels and land displacement, and estimate critical heads. The critical head is the groundwater level below which permanent compaction, and therefore subsidence, begins (DWR, 2026, p. 4-8). Quantifying the critical head for an aquifer requires assessing the land displacement and groundwater levels at the same (i.e., collocated) sites.

For this analysis, critical heads were assessed by analyzing trends for WY2015 through WY2025 land displacements and collocated groundwater levels. Trends were analyzed for each moderate risk area at three Key Well sites that exhibit the maximum subsidence (Figure 9-5). Each of these Key Well sites was determined to have groundwater level observations of sufficient periods, frequencies, and reliability to support these comparisons. USGS subsidence and groundwater elevation data from 1995 through 2017 for the moderate subsidence risk areas were also reviewed (Sneed and Brandt, 2020). The combination of these USGS and DWR datasets allows for a complete assessment of long-term groundwater elevation and land displacement trends and their temporal correlations.

Figure 9-6 shows displacement and groundwater elevations for the moderate subsidence risk areas of Rancho Mirage/Palm Desert (upper), Indian Wells (middle), and La Quinta (lower). Historical land subsidence and groundwater elevation data are shown for 1995 through 2017 on the left plots (Sneed and Brandt, 2020). The plots on the right show recent WY2015 through WY2025 data at the Key Well sites exhibiting maximum negative displacements in each respective region.

Across all three moderate risk areas, the USGS data from 1995 through 2017 reveal a common trend of sustained groundwater table declines from 1995 through about 2010, accompanied by persistent land subsidence (Figure 9-6, left plots). The groundwater levels at all wells reach their lowest elevations between 2008 and 2015 and thereafter the groundwater levels increase. As indicated on the Figure 9-6 right plots, groundwater elevations continue to increase or stabilize through WY2025. After the groundwater level declines slow and then recover, the subsidence rates also decrease significantly at all sites, with minima around 2010 and subsequent stabilization.

Groundwater level and subsidence data for all three areas indicate a significant time lag of as much as five years between groundwater elevation and land displacement changes. For all three areas, the USGS report (Sneed and Brandt, 2020) determined 2010 to 2017 subsidence rates to be significantly less than the 1995 to 2010 rates, indicating a period of stabilization, potentially with some residual subsidence, starting in approximately 2010. The USGS data for 2015 through 2017 also reveal annual patterns of elastic compaction and rebound. Similarly, the DWR InSAR data for WY2015 through WY2025 indicate a continued, long-term stabilization process, when compared with the preceding subsidence patterns from 1995 through 2017. DWR InSAR data also show relatively small magnitude, higher-frequency displacements from WY2025 through WY2025, which likely indicate elastic compaction and ongoing rebound. These long-term patterns and short-term dynamics of elastic compaction and rebound highlight the importance of assessing groundwater elevation and displacement data regularly to improve understanding of subsidence vs. groundwater elevation dynamics and to define meaningful SMCs.

Given the reduction of subsidence following recovery of groundwater elevations to above historical lows, critical heads for these three areas were determined to be adequately approximated by the historical low groundwater elevations. Accordingly, groundwater level MTs for these moderate risk areas have been capped at historical lows, consistent with the critical head analysis and previous USGS reporting.

Land displacement data will continue to be monitored, updated annually in the SGMA Annual Report, and evaluated for any indications of subsidence. Should subsidence be indicated based on updated and current land displacement data, subsidence SMCs will be implemented and the subsidence risk category updated for this region or subsets of this region.

9.5.2 Sustainability Criteria for Land Subsidence

The MT for land subsidence is defined as the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Land subsidence in Indio Subbasin is clearly caused by groundwater level declines, and accordingly, the groundwater level sustainability criteria (MTs and MOs) can be used as a proxy for land subsidence.

The historical low groundwater levels and storage occurred in about 2009. Since that time groundwater levels have generally increased and subsidence has stopped or slowed, with some variability reflecting different groundwater level trends in specific areas and residual compaction. The *2010 CVWMP Update* indicated that groundwater levels should not be allowed to drop below 2005 levels. However, groundwater levels generally continue to decline below 2005 levels until about 2009, and a subsequent USGS study has shown that subsidence rates have slowed since about 2010 (Sneed, M. and Brandt, J. T., 2020). Accordingly, the historical low groundwater levels represent a demonstrable turning-point for subsidence.

Maintaining groundwater levels above historical lows levels generally is protective against subsidence. Given the mechanics of subsidence, it is unlikely that significant and unreasonable inelastic subsidence would occur with groundwater levels maintained above their historical low for each respective Key Well. Because the Whitewater/Agua Caliente area has no observed subsidence and low risk of subsidence based on stratigraphy, this area is likely to have a critical head below historical lows. Given the low risk of subsidence and the need for operational flexibility, the adjusted MT for this area is not expected to cause undesirable results.

Accordingly, the MT for land subsidence for the Indio Subbasin is fulfilled by the minimum threshold for groundwater levels, as a proxy for subsidence, modified as follows:

> The **Minimum Threshold** for defining undesirable results relative to subsidence is defined at each Key Well by their groundwater level MTs. Undesirable results are indicated when groundwater levels are below the MT for five consecutive same-season monitoring events in twenty-five percent or more of the Key Wells in the Indio Subbasin.

For subsidence, the MO is fulfilled by the minimum threshold for groundwater levels, modified as follows:

> The **Measurable Objective** for subsidence is to maintain groundwater levels above the groundwater level MTs (as quantified above), and to maintain groundwater levels within the operating range as defined in this section.

Groundwater conditions with respect to groundwater levels and subsidence are sustainable and there is no need to define interim milestones.

The GSAs will continue to monitor land displacement and potential risk to critical infrastructure. If additional risk of subsidence is observed, the GSAs will revisit their monitoring and SMCs.

9.6 Interconnected Surface Water and Groundwater-Dependent Ecosystems

As stated in Section 9.2, one of the SGMA undesirable results is depletion of interconnected surface water that has significant and unreasonable adverse impacts on beneficial uses of the surface water. Beneficial uses of surface water are various (recreation, water rights, etc.) but an often-important beneficial use is the existence of Groundwater Dependent Ecosystems (GDEs). GDEs are ecological communities (e.g., riparian vegetation or wetlands) or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface.

9.6.1 Background on Indio Subbasin GDEs

As summarized in the 2024 *DWR Periodic Review*, interconnected surface water is described in the *2027 Alternative Plan Update* as not being present in the West Valley because groundwater levels are generally much lower than the ground surface. This is substantiated by depth to groundwater mapping (Figure 4-6) that shows depth to groundwater exceeding 100 feet where groundwater level data are available. However, Figures 4-1 and 4-6 also indicate areas where groundwater level data generally are lacking, and these include western canyon areas where Probable GDEs have been identified (see Chapter 4, *Current and Historical Groundwater Conditions*). These Probable GDEs may be associated with surface runoff, snowmelt, or springs and seeps from upgradient sources.

In the East Valley, depths to regional groundwater generally exceed 20 feet, but a shallow semi-perched aquifer zone also is present (see delineated area on Figure 4-6). In areas with shallow, semi-perched groundwater, an agricultural tile drain system was installed in the 1950s through the mid-1970s that allows continued agriculture by providing drainage and salt management. In its *2019 Staff Report*, DWR staff noted that, "Department staff do not consider the subsurface drain and the conveyance of brackish water as a surface water system". As such, there are no SMCs defined for drain flow in this *2027 Alternative Plan Update*.

9.6.2 Identification of GDEs

Vegetation mapping is required to identify the presence of GDEs. The *2022 Alternative Plan Update* included a focused study of GDEs in Indio Subbasin. This study, *Indio Subbasin Groundwater Dependent Ecosystems Study,* prepared by a Professional Wetland Scientist, is presented in Appendix 4-C. While this study was not updated for the *2027 Alternative Plan*, the findings of the study remain valid. It included a systematic desktop assessment of the California Natural Communities Commonly Associated with Groundwater (NCCAG) database for the Indio Subbasin, a field assessment of 13 selected sites by the wetland scientist and CVWD environmental staff, and identification of probable GDEs, probable non-GDEs, and playa wetland communities. Described in more detail in Chapter 4, *Current and Historical Groundwater Conditions,* and mapped in Figure 4-24, these are defined as follows:

- **Probable GDEs** consist of areas with apparent dense riparian and wetland vegetative communities along mapped drainage systems with potential for deep-rooted phreatophytes, and/or visible, natural surface water flow. These are located along stream channels in upper

canyon locations that convey snowmelt, water from cold and hot springs, and mountain front inflow from the surrounding bedrock.

- **Probable Non-GDEs** are areas not correctly mapped in NCCAG including dry upland areas, cultivated and/or flooded agricultural land, obvious human-made ponds, lakes, and other features, channelized drains, and areas with no other indicators of groundwater near the surface, such as dry washes, arroyos, bajadas, and other ephemeral channels where water only flows in response to heavy precipitation events.
- **Playa Wetland Community** includes areas of wetland habitat along the Salton Sea exposed lakebed (playa) generally downstream of agricultural drains or the CVSC. The recession of the Salton Sea is exposing thousands of acres of playa each year and water from irrigation ditches and other drainages that previously flowed directly into the Sea now spreads out on the exposed Salton Sea playa where new vegetation and wetlands currently exist.

As described in the next sections, three upper canyon sites have been identified as including Probable GDEs that rely on various upgradient sources. While recognized as wetland habitat, the Playa Wetland Community habitats are sustained largely by agricultural drain flows and CVSC outflows.

9.6.2.1 Probable GDEs

Probable GDEs are located in the northwestern Indio Subbasin in three canyons along streams (Chino Canyon, Tahquitz, and Palm Canyon creeks). These streams convey mountain front runoff from snowmelt and mountain front recharge, namely subsurface inflow from fractured bedrock along the perimeter of the Indio Subbasin. This mountain front inflow is derived from recharge to mountain areas beyond the Indio Subbasin jurisdiction of the GSAs and sustains the upper canyon flows with runoff, snowmelt, springs (both cold and hot springs), and seeps.

Although flowing into the upper canyon reaches of the Subbasin (see Figure 4-24), the canyon flows are unlikely to be influenced by GSA management and groundwater pumping of the downstream regional groundwater table. This reflects several factors including topographic differences (the canyons are fifty to hundreds of feet higher than the main portion of the Subbasin), and distance upstream and away from active groundwater production areas (see Figure 2-13). While noting that the upper canyon areas with Probable GDEs do not have existing groundwater data, this is because of the lack of local wells and groundwater extraction.

9.6.2.2 Playa Wetland Communities

The Playa Wetland Communities are recognized in the *Coachella Valley Multiple Species Habitat Conservation Plan* (CVMSHCP) as containing sensitive natural communities and potentially containing desert pupfish habitat. These communities are located at the outlets of agricultural drains and the CVSC and are sustained largely by agricultural drain flows and stormwater channel outflows. As such, these are not associated with depletion of groundwater contributing to interconnected surface water. The agricultural drain system is artificial: designed, built, and maintained for the purpose of conveying agricultural return flows and controlling shallow groundwater levels and quality to allow continued agriculture. The CVSC also is an artificial channel designed and maintained to convey stormwater, drain flows, and other flows to the Salton Sea.

The Salton Sea elevation, however, has declined and its shoreline has retreated from the drain outlets and has exposed intervening playa with widths ranging from one quarter mile to more than

one mile depending on location. This is illustrated in Figure 9-7 by a series of aerial images for selected years from 1997 to 2025.

As illustrated in Figure 9-7, the Playa Wetland Communities have occurred and expanded as a relatively recent consequence of the shoreline retreat. While the drivers for the location and extent of the wetlands include the drainage outflows coupled with the Salton Sea recession, the relationship between areal extent of the playa wetlands, drain flows, Salton Sea recession, and other factors remain uncertain. The Playa Wetland Communities may continue to change over time affected by continuing Salton Sea recession and by future Salton Sea restoration activities, including the North Lake Wetlands Project described in Chapter 8, *Regulatory and Policy Issues*. The interconnection between these factors is uncertain, changing as the Salton Sea recedes, and dependent on other state and federal entities' management of the Salton Sea.

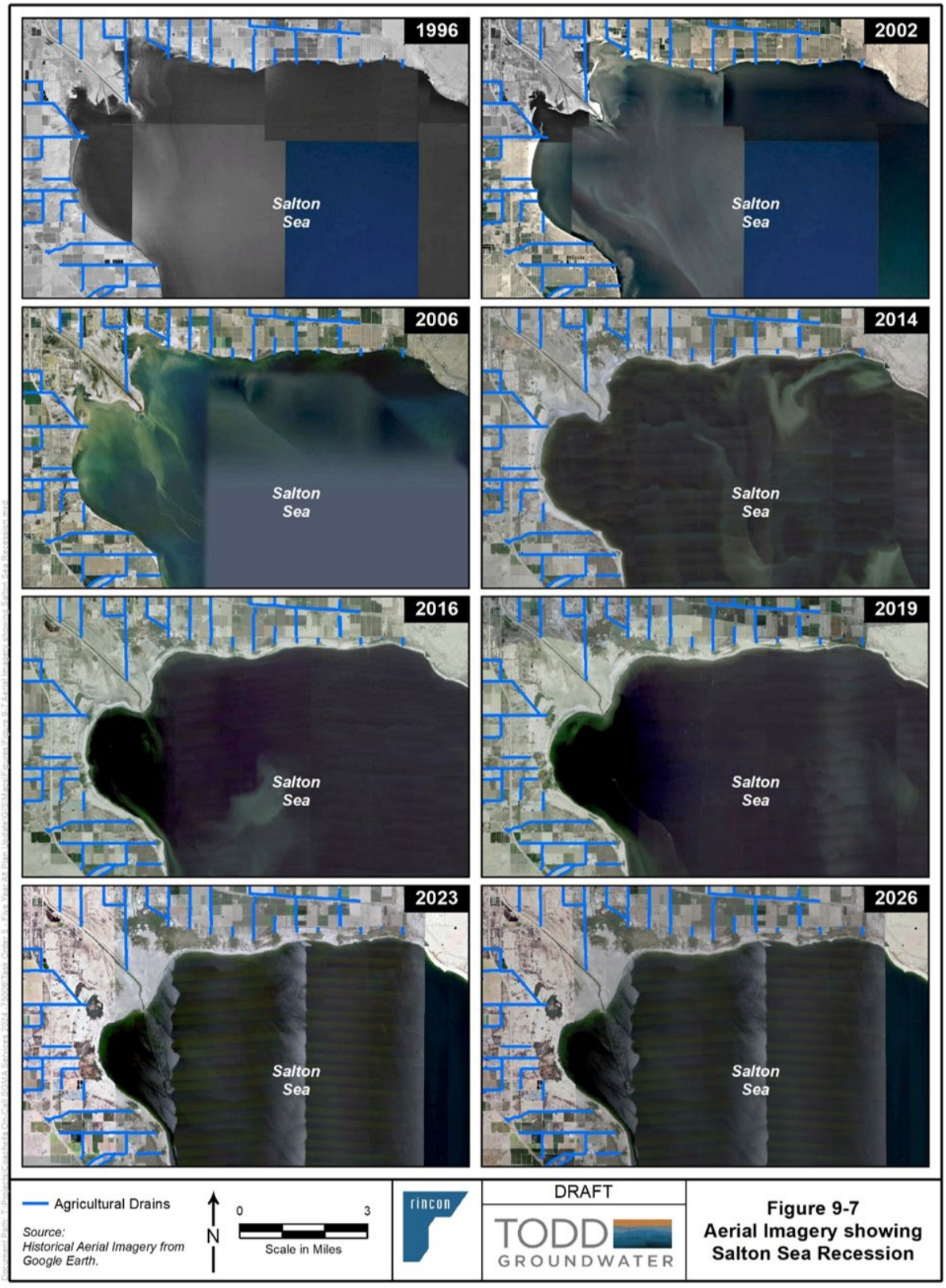
9.7 Water Quality

9.7.1 Constituents of Concern

The GSAs have identified specific water quality issues including salinity, arsenic, perchlorate, hexavalent chromium (chromium-6), uranium, nitrate, carcinogens, and PFAS (perfluoroalkyl and polyfluoroalkyl substances). Some of these were regarded as emerging issues, not having violated water quality standards. Previous water management plans did not establish specific water quality thresholds and goals. However, through the Alternative Plan process and implementation, the GSAs have continued to identify and track the occurrence of constituents of concern (COCs) with reference to established drinking water standards, have maintained an extensive water quality monitoring program, and have implemented applicable management responses. This is reflected in Chapter 8, *Regulatory and Policy Issues*, and in Chapter 4, *Current and Historical Groundwater Conditions*. Chapter 4 identifies current COCs to include salinity (total dissolved solids or TDS), nitrate, arsenic, chromium-6, uranium, fluoride, perchlorate, and DBCP. These are briefly described in Section 4.4 (along with any drinking water standards) and discussed in terms of occurrence in Indio Subbasin.

As documented in Chapter 4, *Current and Historical Groundwater Conditions,* this *2027 Alternative Plan Update* has included a substantial collection of water quality data into a database. This was followed by evaluation of the mapped extent of the four recommended COCs, but also TDS, nitrate, uranium, and perchlorate (see Figures 4-14 through 4-21) and time concentration plots that represent temporal trends in TDS and nitrate. In addition, Appendix 4-B*,* provides water quality cross sections for constituents with vertical differentiation (TDS, nitrate, arsenic, and chromium-6), developed for the *2022 Alternative Plan Update*.

Figure 9-7 Aerial Imagery showing Salton Sea Recession



9.7.2 Description, Causes, and Effects of Undesirable Results

As documented in Chapter 4, *Current and Historical Groundwater Conditions*, the GSAs have identified COCs including salinity, arsenic, perchlorate, chromium-6, uranium, nitrate, DBCP, perchlorate, and fluoride. Given that, the following brief summaries are provided. These summaries include the drinking water standard (Maximum Contaminant Level [MCL]), general cause of the COC occurrence, distribution in the Subbasin, and management response. The following COCs are linked to potential health effects, and all are being monitored. GSAs are addressing COC problems through efforts (such as the CVWD Disadvantaged Communities Infrastructure Task Force) to identify and consolidate small water systems with water quality and reliability issues. Chapter 4, *Current and Historical Groundwater Conditions,* and Chapter 8, *Regulatory and Policy Issues,* provide additional documentation and discussion.

- **Nitrate** has a primary drinking water MCL of 45 mg/L, measured as nitrate. Nitrate concentrations in Indio Subbasin groundwater are variable, reflecting multiple sources such as historical extent of mesquite forests; use of nitrogen-based fertilizers for agriculture, golf courses, and landscaping; septic tank percolation; and wastewater disposal through percolation. Large water systems selectively drill wells in areas with low nitrate concentrations and have deactivated historically affected wells. The GSAs are assisting SWS as noted above.
- **Arsenic** has a primary drinking water MCL of 10 micrograms per liter (µg/L). It is naturally occurring with high concentrations locally in the Indio Subbasin and at depth. Arsenic has been addressed in large public water systems by selectively drilling wells in areas or to depths with low arsenic concentrations, by decommissioning affected wells, or by providing water treatment to remove arsenic prior to delivery. Riverside County and the GSAs are assisting SWS affected by arsenic as noted above.
- **Chromium-6** in Indio Subbasin is naturally occurring with relatively higher concentrations in the Thousand Palms and central Thermal Subareas. The total chromium (hexavalent and trivalent) primary MCL is 50 µg/L, but an MCL of 10 µg/L for chromium-6 was set in 2014 and later rescinded. As discussed in Chapter 8, *Regulatory and Policy Issues,* the GSAs have anticipated a chromium-6 MCL that is lower than the total chromium MCL and have investigated possible water treatment options. Replenishment activities may reduce chromium-6 concentrations.
- **Uranium** has a primary MCL of 20 picocuries per liter (pCi/L), or about 30 µg/L. Uranium in Indio Subbasin is naturally occurring with high concentrations in the northwestern portion. However, concentrations greater than the MCL have been detected in only six shallow monitoring wells.
- **Fluoride** has a primary drinking water MCL of 2 mg/L. It is naturally occurring and found in high concentrations along the eastern side of the Indio Subbasin and northern boundary of the Salton Sea. Large water systems selectively drill wells in areas with low fluoride concentrations or provide treatment, and small water systems are assisted by the GSAs as noted above.
- **Perchlorate** has a primary MCL of 6 µg/L and has been detected locally in Indio Subbasin. It may be naturally occurring, but it is also associated with historical manufacturing contamination that affected the Colorado River and has since been mitigated to below detection levels. There have been only three detections basin-wide since 2022.
- **DBCP** is a pesticide with a primary MCL of 0.2 µg/L. While banned since 1979, it is persistent in groundwater. It has been detected in private irrigation wells in a localized area of central Thermal Subarea. CVWD has managed replenishment to avoid mobilizing DBCP.

Salinity (TDS) is addressed in a subsequent section. Unlike the COCs above, TDS is regulated by Secondary MCLs (or Consumer Acceptance Contaminant Level Ranges) that are set by the SWRCB based on aesthetic concerns such as taste, color, and odor.

While PFAS is not a GSA-defined COC, it is an emerging issue for the groundwater basin and discussed in Chapter 8.2. The GSAs continue to monitor groundwater for PFAS and have implemented projects to identify the source and possible treatment for PFAS in the groundwater basin.

9.7.3 Evaluation of Sustainability

The 2024 *DWR Periodic Review* "accepted the Subbasin's approach for managing and protecting water quality to comply with state and federal laws and regulations, rather than establishing specific water quality thresholds". Groundwater quality monitoring, data compilation, and data review will continue on an established regular basis (see Chapter 10, *Monitoring Program*) and will detect emerging issues or water quality problems. Future periodic evaluations will include comprehensive examination of water quality conditions relative to COCs such as listed above, given that groundwater quality conditions generally do not change rapidly. Groundwater quality conditions can be documented with maps and other graphics as warranted.

Additional efforts to define sustainability indicators or to set specific quantitative thresholds are not needed at this time for COCs such as those listed above. However, if a COC water quality condition develops or is recognized with significant and unreasonable results throughout the Subbasin and associated with Subbasin management activities, the ongoing monitoring allows detection, analysis, and reporting of the issue.

9.8 Water Quality Management

The *2027 Alternative Plan Update* has recognized salt addition from imported Colorado River water as a significant impact related to managing groundwater overdraft. Elimination of overdraft was identified in the *2002 CVWMP* and retained in the *2010 CVWMP Update* as a primary goal. This goal recognized the multiple adverse effects of overdraft including chronic groundwater level declines, storage depletion, irreversible subsidence, and seawater intrusion potentially resulting in permanent loss of freshwater storage. Importation of Colorado River water for irrigation and replenishment was recognized as critical for halting overdraft although it added salts. This *2027 Alternative Plan Update* and previous plans has included ongoing studies to assess the addition of salts and to identify reasonable PMAs.

As summarized in the 2024 *DWR Periodic Review*, the GSAs have demonstrated understanding of the water quality impacts associated with using Colorado River to replenish groundwater and have investigated various means to address such impacts, including preparation of a CV-SNMP. As a near-term path toward sustainability with regard to salt management, the *DWR Periodic Review* strongly encouraged the GSAs to further quantify the nature and scope of water quality issues associated with water importation, to establish reasonable and achievable standards, and to begin to adopt and implement PMAs to achieve sustainability with regard to groundwater quality.

Specifically, in Recommended Corrective Action 3, DWR staff recommend that the GSAs incorporate an approved SNMP into future iterations of the Alternative Plan and continue efforts to study the rate and level of increased salt contents in groundwater due to importation of Colorado River water. Progress on the CV-SNMP is discussed in more detail Section 9.8.2.

9.8.1 Description, Causes, and Effects of Undesirable Results

As discussed in Chapter 4, *Current and Historical Groundwater Conditions*, groundwater in the Indio Subbasin shows a wide range of salinity, measured in terms of TDS concentrations. TDS is regulated by Secondary MCLs (or Consumer Acceptance Contaminant Level Ranges) that are set by the SWRCB based on aesthetic concerns such as taste, color, and odor. Undesirable results of elevated TDS to drinking water systems can include damage to plumbing and appliances, increased treatment costs, use of bottled water, and increased sampling and monitoring. A recommended level is 500 mg/L, an upper level is 1,000 mg/L, and a short-term level is 1,500 mg/L.

The spatial distribution of TDS (see Figure 4-14) shows a general range of concentrations from less than 250 mg/L in the center of the Subbasin to more than 1,500 mg/L near the Salton Sea. Similarly, the water quality cross sections in Chapter 4, *Current and Historical Groundwater Conditions,* indicate that TDS concentrations generally are less than 500 mg/L with lowest concentrations in deep wells in the central Indio Subbasin. TDS concentrations in shallow zones typically are higher and more variable than in deeper zones.



CVWD monitors water quality in groundwater, surface water, and recycled water.

The spatial and vertical distribution of TDS in groundwater reflects multiple sources including deep infiltration of precipitation, percolation of precipitation runoff, recharge of imported Colorado River water, percolation of treated wastewater, seepage from septic systems, return flows from agricultural and landscape irrigation, and subsurface inflows from adjacent bedrock, other Subbasins (e.g., Desert Hot Springs Subbasin) and deep thermal sources (West Yost, 2021). Historical intrusion from the Salton Sea also has been indicated (see Section 9.10). In addition, the occurrence and distribution of TDS in the Indio Subbasin has been influenced by historical land uses and water/wastewater management practices.

Percolation through the soil and unsaturated zone involves complex processes that affect the volume, concentration, and specific constituents of TDS; these processes include evapotranspiration that concentrates salts in the root zone and geochemical transformations. Once in the groundwater system, the groundwater flow generally is from northwest to southeast (toward the Salton Sea). However, salt migration through the groundwater system (both vertical and horizontal) is driven by dynamics of groundwater recharge and discharge and thus influenced not only by recharge/percolation, but also by groundwater pumping and the presence of agricultural drain systems that intercept and discharge shallow groundwater. Such relationships are particularly important in the East Valley, where higher salinity occurs in perched and shallow zones. Under conditions of overdraft, lowered groundwater levels in the deep Principal aquifer can result in a downward groundwater flow gradient that could allow higher salinity water to migrate downward to affect deeper zones. Reversal of overdraft and restoration of upward gradients flushes the saline perched water into the agricultural drains and out of the system, thereby protecting deep groundwater quality.

Outflows of TDS from the groundwater systems are primarily through groundwater pumping, agricultural drain flows to the CVSC and Salton Sea, and subsurface outflow toward the Salton Sea.

9.8.2 Salt and Nutrient Management Plan

A SNMP was developed by the CVWD, DWA, and IWA and submitted to the Colorado River RWQCB in 2015. The 2015 Coachella Valley SNMP described hydrogeology, ambient groundwater quality, projected water quality, objectives, management strategies, and a monitoring plan. However, in a letter (RWQCB, February 19, 2020), the RWQCB provided comments and recommendations on the 2015 SNMP's compliance with the updated Recycled Water Policy (Colorado River Basin RWQCB, 2020).

The *Salt and Nutrient Management Plan for the Coachella Valley Groundwater Basin* (CV-SNMP) was restarted in 2020 by the CV-SNMP partners (water and wastewater agencies including CVWD, CWA and Coachella Sanitary District, DWA, IWA, Myoma Dunes Mutual Water Company, VSD, MSWD, and City of Palm Springs) working in cooperation with RWQCB staff. This has involved adoption of a *SNMP Development Workplan* to define the approach to be used to update the CV-SNMP in a manner that addresses management of salts and nutrients from all sources in order to protect beneficial uses, comply with the Recycled Water Policy (as revised in 2018, see Chapter 8, *Regulatory and Policy Issues*), and address the specific findings and recommendations previously provided by RWQCB staff. The *SNMP Development Workplan* includes a *Groundwater Monitoring Program Workplan* (West Yost, 2020) to define the updated SNMP monitoring network, including wells needed to address network gaps, which will be used to monitor the spatial and vertical distribution of salts and nutrients in the Basin.

Progress on the CV-SNMP is being reported in a series of technical memoranda (TM) with guidance from a CV-SNMP Stakeholder Group and Technical Advisory Committee. Stakeholder outreach includes provision of a webpage (https://www.cvsnmp.com/) and workshops. Implementation of the CV-SNMP was incorporated into the *2022 Alternative Plan Update* as PMAs 27 and 28, with progress reporting included in subsequent Annual Reports.

In WY2023, the CV-SNMP partners began implementing the SNMP Workplans with accomplishments including a data sharing MOU with the Agua Caliente Band of Cahuilla Indians for monitoring of three wells on Trust land. The CV-SNMP partners also established the CV-SNMP stakeholder group and Technical Advisory Committee and completed work on TM#1, which characterizes nitrate/TDS loading to the groundwater basin. In WY2024, the GSAs (with the other CV-SNMP partners), completed the first triennial monitoring cycle (2021-2024), and initiated monitoring for 2024-2026 triennial monitoring. The agencies have installed several new monitoring wells to fill data gaps.

Final Technical Memoranda published to date are available at:
https://www.cvsnmp.com/resources/.

- Final Task 1 – Characterize TDS/N Mass Loading to the Coachella Valley Groundwater Basin
- Final Task 2 – Characterize Current Groundwater Quality
- Final Task 3 – Delineate Draft Management Zones and Describe Metrics to Characterize Beneficial Use Protection
- Final Task 4 – Develop Technical Approach for Forecasting TDS/N Concentrations in Groundwater

Upcoming TMs will present a baseline scenario, summarize computer modeling scenarios for forecasting TDS/N, and characterize and compare costs of baseline and forecasting scenarios. The Final CV-SNMP will present the entire SNMP.

The CV-SNMP addresses the Coachella Valley Groundwater Basin (DWR Basin No. 7-021 excluding the San Gorgonio Pass Subbasin) and therefore includes the Indio Subbasin. The *Alternative Plan Update* can incorporate elements of an approved CV-SNMP relevant to the Indio Subbasin and within the context of the basin-wide SNMP. Progress on the implementation of the *SNMP Development Workplan* will be provided in the Annual Reports and the next Periodic Evaluation.

9.8.3 Continuing Studies of Salinity in Groundwater

Staff of both DWR and the Colorado River Basin RWQCB have recommended additional study of salinity in groundwater. The *2024 DWR Periodic Review* (Recommendation 3) calls for continuation of efforts to study the rate and level of increased salt contents in groundwater due to Colorado River importation.

Additional study of salinity in groundwater, including analysis of the rate and level of increased salt contents in groundwater due to Colorado River importation, will be achieved in large part by the CV-SNMP. Such analysis will be based on data collection to characterize TDS and nitrate loading, including not only quality data but also volumes of multiple sources such as subsurface inflow, replenishment (including the Colorado River sources), wastewater and recycled water, septic systems, and applied water. The analysis also will include characterization of current groundwater quality in all Subbasin areas/Subareas (with delineation of Management Zones), identification of areas of historical changes, and documentation of historical trends in TDS and nitrate loading. Overall, the analysis will satisfy the recommendation for more information on the rate and level of increased salt due to Colorado River importation.

More broadly, these analyses provide the necessary baseline for CV-SNMP forecasting of TDS and nitrate concentrations in groundwater. The forecasting (using enhanced modeling tools being developed as part of the CV-SNMP) will involve simulation of a baseline scenario and management scenarios. Subsequent selection of a preferred CV-SNMP scenario can be the basis for establishment of management zones (including consideration of vulnerable areas), description of groundwater beneficial uses for each management zone, recommendation of numeric TDS objectives for each management zone, identification of projects and management actions, and development of implementation measures and schedules to achieve sustainability with regard to groundwater quality.

In addition to the CV-SNMP, this *2027 Alternative Plan Update* continues the update of the data management system (developed for the *2022 Alternative Plan*), and continued implementation of data collection, analysis, and review of data gaps for water quality data. While not implemented solely to understand salinity, the update and refinement of the numerical groundwater flow model, assessment of the groundwater basin water budget, and quantification of water supplies and demands all contribute to understanding of the groundwater system, which is fundamental to studying salinity.

The assessment of the monitoring network for this Update has been coordinated with the development of the *CV-SNMP Development Workplan.* The CV-SNMP network is shown in Figure 2-12 and described in Chapter 10, *Monitoring Network.*

9.9 Drain Flow Evaluation

As presented in Chapter 2, *Plan Area,* and Chapter 3, *Hydrogeologic Conceptual Model,* an extensive agricultural drainage system (both subsurface tile drainage systems and surface drains) was installed in the East Valley to control high water table conditions, to intercept poor quality shallow groundwater, and to convey the water to the CVSC and Salton Sea. Drain flows are measured at 27 drains and the CVSC and also have been simulated using the numerical model.

In its *2024 DWR Periodic Review* (Recommended Action 3), DWR recommends clarification of whether there is a MT associated with the amount of subsurface drain flow below which significant and unreasonable undesirable results would occur, and what that quantified MT is, if applicable, and the implementation horizon for when the goal for the amount of subsurface flow will be achieved. As discussed in Section 8.3, CVWD conducted the Drain Flow Study (Todd, August 2023), which concluded that drain flow is not needed or warranted as a criterion for sustainable management.

The Drain Flow Study documents the drain system and identifies multiple sources of inflow to it. These include regulatory water flows (a necessary component of the irrigation pipeline system to ensure proper pressure and flow), treated point source wastewater flows, fish farm effluent, unauthorized discharges, stormwater runoff, irrigation water return flows, and shallow groundwater.

The Drain Flow Study provides a conceptual hydrogeologic model and analyzes groundwater levels spatially and vertically to show interactions with the drain system. This analysis reveals little to no vertical groundwater flow along the axis of the Valley (due to confining or semi-confining units), slight downward flow along the western and eastern edges (due to the lack of confining units), and a slight upward flow along the southern boundary with the Salton Sea. The Drain Flow Study concludes that drain outflow volumes to the Salton Sea would be an indirect and inaccurate measure of upward groundwater flow that is protective of deep groundwater quality and thus represent an inadequate means of assessing groundwater sustainability.



The Grant Street Drain is part of CVWD's agricultural drain system.

By way of background, downward migration of groundwater is a function not only of geology (i.e., the fine-grained aquitard in the East Valley; see Chapter 3, *Hydrogeologic Conceptual Model*), but largely of vertical hydraulic head differences. Available data indicate that high groundwater levels in the deep zones are generally protective of those deep zones. This is substantiated by the previous evaluation of TDS and nitrate concentrations with depth in East Valley cross sections (Appendix 4-B) that show low concentrations of TDS and nitrate at depth, despite decades of active irrigated agriculture, and higher concentrations in shallow zones. It is also supported by the TDS and nitrate time-concentration plots (e.g., Figure 4-22 and 4-23) that indicate relatively low concentrations in deep wells and less variability, indicating reduced exposure to shallow influences.

Building on past plans, and applying the concepts of SGMA, the GSAs have defined a specific, potential undesirable result, which is degradation of water quality in the deep Principal Aquifer due to downward migration of water with elevated TDS levels found in shallow groundwater zones. High groundwater levels in the deep zone have a direct relationship with good water quality at depth, and accordingly, the GSAs may consider groundwater levels as an appropriate proxy in the future.

According to SGMA, groundwater levels can serve as a useful proxy for a MT. However, the Drain Flow Study did not find strong correlation between the metric (groundwater levels) and the specific undesirable result being assessed (degradation of the deep Principal Aquifer). Groundwater levels should not serve as proxy for groundwater sustainability.

9.10 Seawater Intrusion

SGMA generally has perceived seawater intrusion relative to the Pacific Ocean and not an inland body such as the Salton Sea. The Salton Sea is distinguished by several aspects: salinity in excess of 69 parts per thousand (about twice the amount in the ocean), salinity that gradually is rising, surface water levels that are decreasing, and a shoreline that is retreating.

9.10.1 Background on Monitoring and Management for Seawater Intrusion

Seawater intrusion from the Salton Sea has been emphasized in the *2027 Alternative Plan Update* as a potentially substantial and irreversible consequence of overdraft, whereby reduced groundwater pressure in Subbasin aquifers would cause relatively dense saline water to intrude and displace freshwater. The *2002 CVWMP Update* noted the difficulties in reversing seawater intrusion and removing salts with the potential for permanent loss of freshwater storage. Thus, seawater intrusion is a consequence of overdraft with undesirable results including adverse effects on groundwater quality and associated loss of groundwater supply and loss of groundwater storage.

Recognizing these potential undesirable results in the context of overdraft in the East Valley, the Indio Subbasin GSAs have implemented PMAs to halt overdraft. These PMAs, including groundwater replenishment, source substitution, and conservation, have been successful in halting and reversing groundwater level declines, increasing groundwater storage, and restoring groundwater outflows to stop seawater intrusion.

CVWD installed nested monitoring wells in 1995 and 2002 near the Salton Sea to provide site-specific data to assess the risk of seawater intrusion (see list in Table 10-2). Monitoring of these wells for levels and quality (as part of the overall monitoring program) allows documentation of areal and vertical extent of seawater intrusion (if any in the vicinity of the wells) and tracking of trends that could provide early warning of seawater intrusion. Groundwater quality constituents including TDS and chloride are tracked in the nested monitoring wells. While TDS concentrations in one of the deepest zones (deeper than 1,430 feet below ground surface) are elevated and fluctuating (see Chapter 4, *Current and Historical Groundwater Conditions*), the nested monitoring wells have shown no evidence that seawater intrusion is occurring.

In addition, local groundwater management (see Chapter 4, *Current and Historical Groundwater Conditions*) has focused on minimizing potential seawater intrusion by increasing groundwater levels and restoring groundwater outflow to the Salton Sea. While protective groundwater elevations were not determined, the groundwater flow model was applied to evaluate seawater intrusion as a potential inflow to the Indio Subbasin groundwater. This approach has provided a

broad indicator of the risk of seawater intrusion. In addition, groundwater level MTs for Key Wells along the Salton Seas have been capped at historical lows to prevent changing the groundwater gradient to allow for saltwater inflow. There has been no observed salt intrusion at these levels, and they are assumed to be protective of the groundwater basin.

9.10.2 Water Balance and Inflow from Salton Sea

The undesirable results of Salton Sea intrusion have been long recognized in the Indio Subbasin as degradation of water quality and loss of freshwater storage. The water balance includes inflow from the Salton Sea because it includes all inflows and outflows to the Subbasin and then uses the groundwater flow model to compute water levels and change in storage. Accounting for all elements of the water balance is fundamental to understanding the local groundwater system. In other words, seawater intrusion is considered an inflow to the water balance, but is not considered a groundwater supply.

9.10.3 Groundwater Elevations and Salton Sea Inflow

With regard to Salton Sea inflow, the groundwater flow model (described in Chapter 7, *Numerical Model and Plan Scenarios*) has been used to simulate flow between the Indio Subbasin and the Salton Sea. For this evaluation, the *2022 Alternative Plan Update* model input data were updated through 2025, and some were modified including addition of Salton Sea bathymetry and use of Salton Sea elevations for 2010-2025 to account for Salton Sea level declines. As illustrated in Figure 7-20, inflows from Salton Sea have decreased since about 2005 and outflows to the sea have increased. Net groundwater outflow to the Salton Sea first occurred in 2019. This is consistent with generally increasing groundwater levels after about 2010.

Groundwater elevation contour maps are provided in the Annual Reports for WY2016 through WY2025, a period when groundwater outflows to the Salton Sea have exceeded inflows. For reference, the elevation of the Salton Sea has declined from about -235 to -240 feet msl over this period. Review of these maps (with a focus on the groundwater elevation contours closest to the Salton Sea) show the -200-foot contour crossing the shoreline in 2016-2017 and 2017-2018. In the successive two maps, the -200-foot contour is completely inland indicating that groundwater levels have risen. At the shoreline, current groundwater levels are mapped as about 40 feet above the current Salton Sea level. This differential would increase with Salton Sea level decline and with groundwater level rise.

Regular review of simulated groundwater elevations in the vicinity of the Salton Sea is warranted in addition to the data review and water budget modeling as part of the Annual Reports and Periodic Evaluations. The nested wells provide real data on local groundwater quality from discrete depth zones, any of which could potentially be affected by seawater intrusion. Complementary to the local, zone-specific data is the modeling assessment of outflows and inflows, which provides a broad indicator of net potential for seawater intrusion for the Subbasin.

Similarly, the simulated groundwater elevations can be used as a general indicator of the relative risk of seawater intrusion along the shoreline. Such use of simulated groundwater levels is not a substitute for analysis of measured groundwater levels. However, it can be a reasonable, cost-effective indicator given the low potential for seawater intrusion, as evidenced by the net outflow of groundwater from the Subbasin to the Salton Sea and the lack of data indicating seawater intrusion.

In addition, Salton Sea water levels are currently decreasing, and the shoreline is retreating. Accordingly, the risk of seawater intrusion is declining. Review of any groundwater levels relative to

the Salton Sea water levels will need to be monitored and evaluated regularly until the Salton Sea is stabilized.

10 Monitoring Program

The Indio Subbasin has been extensively monitored by the Groundwater Sustainability Agencies (GSAs) for decades. The GSAs have been guided by the primary objective to evaluate the effectiveness of water management programs and projects and to modify actions and plans based on factual data. This *2027 Alternative Plan Update* continues and builds on the existing monitoring programs as presented in previous CVWMP documents and summarized in the Bridge Document (Indio Subbasin GSAs, 2016; see also summary in Chapter 2, *Plan Area*).

This chapter includes descriptions of the monitoring network, methods and protocols for data collection, and development and maintenance of the data management system (DMS). The monitoring program has been assessed with reference to the sustainability goals and objectives, data gaps have been reviewed, and improvements have been identified for implementation.

10.1 Description of Monitoring Network

As summarized in the following sections, the Monitoring Network addresses groundwater levels, climate and hydrology, groundwater production, subsidence, water quality, and seawater intrusion.

Table 10-1 and the following text provide a summary of the monitoring network, which documents groundwater and related surface water and subsidence conditions, in terms of the type of measurement, monitoring site locations and spatial coverage, monitoring frequency, and involved agencies. In most cases, monitored data are compiled and summarized in Annual Reports; these data will also be used to update the Alternative Plan in five years.

Table 10-1 also documents additional data sources that provide important inputs to the water budget analysis and the numerical model update. These include managed water supplies and deliveries, such as imported water deliveries, groundwater replenishment volumes, municipal water use, wastewater percolation and water recycling. As shown, these are mostly metered, and the data are compiled monthly and documented in the Annual Report as part of the water budget analysis.



The GSAs monitor groundwater levels and quality.

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Table 10-1 Summary of the Monitoring Network

Monitored Variable	Type of Measurement	Locations	Data Interval	Data Collection Agency	Database Storage Agency	Notes
Groundwater Levels						
Groundwater levels	Depth to water, feet	Approx. 350 wells in Indio Subbasin	Triannual	All GSAs	Indio GSAs	Protocols detailed in Section 10.2.2
Climate and Hydrology						
Rainfall	Rain gauge, daily total, inches	12 Riverside County stations	Daily	Riverside County Flood Control and Water Conservation District	Riverside County Flood Control and Water Conservation District	Download from web annually for annual water budget and model update
Reference ET (ET_0)	Daily ETo, inches	4 CIMIS Stations,1 more expected late 2026	Daily	CA DWR, CIMIS program	CIMIS	Download from web
Stream flow	Daily average flow, cfs	15 active USGS gages	Daily/15 min interval	USGS	USGS	Download from web
Drain flows	cubic feet per second, cfs or total flow AF	27 sites	Monthly	CVWD	Indio GSAs	
Groundwater Production						
Agricultural	Metered monthly total pumping by well, if above threshold (above 25 AFY in CVWD and above 10 AFY in DWA)	Agricultural irrigation well locations	Monthly	CVWD, DWA	Indio GSAs	Pumping threshold is above 25 AFY in CVWD and above 10 AFY in DWA
Golf Course	Metered monthly total pumping by well if above threshold (above 25 AFY in CVWD and above 10 AFY in DWA)	Golf well locations	Monthly	CVWD, DWA	Indio GSAs	
Municipal	Metered monthly total pumping by well if above threshold (above 25 AFY in CVWD and above 10 AFY in DWA)	Municipal well locations	Monthly	Indio GSA	Indio GSAs	
Community Water Systems	Systems with pumping above threshold are metered (above 25 AFY in CVWD and above 10 AFY in DWA).	Community Water System wells with meters	Monthly	CVWD, DWA	Indio GSAs	
Other (e.g., private individual wells)	Metered groundwater use (above 25 AFY in CVWD and above 10 AFY in DWA)	Well locations	Monthly	CVWD, DWA	Indio GSAs	
Subsidence						
Subsidence	InSAR satellite mapping of ground displacement, and GSP Stations	California groundwater basins including Indio Subbasin	Displacement, 2015-Current, Most recent water year, Annual updated from DWR	DWR (InSAR)	DWR SGMA Data Portal	Download annually, InSAR raster data sets (see Section 4.3).
Subsidence	USGS	Coachella Valley	2015-2023	USGS	USGS	Published report to be provided by USGS anticipated shortly
Groundwater Quality						
Indio Groundwater Quality Monitoring Program including monitoring for CV-SNMP	Specific conductance, TDS, N, and general minerals	196 Existing wells in Indio Subbasin (97 deep, 88 shallow, and 11 perched)	Quarterly/ Triannual	All GSAs and CV-SNMP Agencies	Indio GSAs/GAMA	Additional constituents; COCs
Compliance Monitoring - RWQCB	Varies depending on discharge order	WWTP, WRP, other regulated facilities	Various	All GSAs	SWRCB Geotracker database	Download data annually from Geotracker
Municipal systems	Specific conductance, TDS, N, and general minerals; Title 22	Municipal supply wells	Monthly to Triannual	All GSAs	Indio GSAs	Water quality collected by GSAs and submitted to DDW
Rural ag/domestic wells; community water systems;	Specific conductance, N, and other constituents (depending on monitoring agency)	About 90 wells in Indio	Various	DDW, RWQCB, USGS, DWR, DPR	SWRCB GAMA database	Download data every three years from GAMA
Other Water Budget Elements						
Canal deliveries- All Uses	Metered water deliveries, AF	All points of delivery	Monthly	CVWD	Indio GSAs	
Surface Water Diversion	Volume diverted from tributary watersheds, AF	Whitewater River, Snow Creek, Falls Creek, and Chino Creek	Monthly	DWA	Indio GSAs	
Groundwater Replenishment	Reported as acre-feet per month	Whitewater, Thomas E Levy, Palm Desert GRFs	Monthly	CVWD, DWA	Indio GSAs	

Monitored Variable	Type of Measurement	Locations	Data Interval	Data Collection Agency	Database Storage Agency	Notes
Wastewater percolation ponds losses	WWTP effluent discharge, evaporation, percolation, AF	WWTPs	Monthly	CVWD, DWA	Indio GSAs	
Wastewater discharge to CVSC	AF	CVSC	Monthly	CVWD, VSD, CWA, and Kent Seatech	Indio GSAs	
Recycled water use	Recycled water delivery, AF	CVWD, DWA	Monthly	CVWD, DWA	Indio GSAs	
Municipal Water Use	Metered water use by use type (residential, commercial, industrial, etc.)	All water retailers	Monthly	All GSAs	Indio GSAs	
Crop Census	Land Use by crop type, acreage	CVWD	Trimester	CVWD	Indio GSAs	
Salton Sea Elevation	Water stage recorder	Salton Sea	Continuous/15 min reporting	USGS	USGS	

10.1.1 Groundwater Levels

As described in Chapter 2, *Plan Area*, the Indio Subbasin GSAs monitor groundwater levels in more than 350 wells as part of their respective groundwater level monitoring programs (Figure 2-11 shows the wells in the current monitoring network). As part of implementation, the GSAs upload water levels for the Key Wells (see Chapter 9, *Sustainable Management*) to the Department of Water Resources (DWR) Monitoring Network Module (MNM), and data will be publicly accessible.



Monitoring well located at PD-GRF.

10.1.1.1 Spatial and Vertical Coverage

Locations of all wells monitored for groundwater levels are shown in Figure 2-11, while Figure 9-1 shows the Key Wells used to monitor groundwater levels with respect to the Minimum Thresholds established by the GSAs (see Chapter 9, *Sustainable Management*). The 57 Key Wells for groundwater levels are also listed in Table 9-1 with the respective Minimum Thresholds. The methodology used to select the Key Wells is described in Chapter 9, *Sustainable Management*.

While the Key Wells are used for SGMA SMCs, the entire network of groundwater monitoring wells are used to monitor the basin and inform groundwater management. Wells in the Indio Subbasin groundwater level monitoring program have unique well information including a well identification number, an identified vertical reference point for measurements, and well completion report if available.

Well density has been a consideration in identifying new dedicated monitoring well sites and adding wells to the monitoring program. By way of comparison, DWR guidance (DWR, Dec 2016 BMP, Table 1) generally recommends between one to ten monitoring wells per 100 square miles. The Indio Subbasin program exceeds this guidance with an area of about 525 square miles and monitoring of more than 350 wells in 2025. More importantly, the Indio Subbasin monitoring program has been developed to account for the variable spatial factors listed above.

In the future, some wells may become unavailable for various reasons (e.g., loss of access). Consistent with ongoing practice, the GSAs will continue to assess the monitoring well network and find suitable replacements. Monitoring program improvements as part of the *2027 Alternative Plan Update* (coordinated with the *Coachella Valley Salt and Nutrient Management Plan* [CV-SNMP]) include identification of additional existing wells for monitoring across the Subbasin and will include installing new dedicated monitoring wells. Most wells with known construction have long screened intervals and many are screened at depths greater than 300 feet below ground surface. Information on vertical groundwater gradients is available from nested wells, from comparison of deep wells with nearby relatively shallow monitoring wells, and from observation of artesian conditions. Available data have allowed identification of perched, shallow, and deep aquifer zones in the East

Valley (see Chapter 3, *Hydrogeologic Conceptual Model*). Since the *2022 Alternative Plan Update*, 22 new wells have been drilled to expand the CV-SNMP network.

10.1.1.2 Monitoring Frequency

DWR BMP guidance and GSP Regulations call for static groundwater elevation measurements at least two times per year to represent seasonal low and seasonal high groundwater conditions. The GSAs in the Indio Subbasin generally provide groundwater level data at least three times a year (with more frequent monitoring at some locations), which is more frequent than recommended and has allowed tracking of seasonal and long-term trends.

10.1.1.3 Changes to the Networks

In June 2025, an audit was conducted of the CVWD water resources monitoring program. The purpose was to review, update and document the monitoring programs (levels and quality) and provide recommendations on the water level monitoring needed to continue cost-effective groundwater management in the Indio Subbasin (Todd Groundwater, 2025).

The audit found CVWD's water level network is consistent with applicable SGMA requirements and DWR BMPs and, in conjunction with other monitoring (e.g., by USGS), satisfies the needs for SGMA implementation, GRF monitoring, and other ongoing CVWD programs. The audit identified redundant coverage, and the water level network was reviewed to ensure that the highest priority wells are retained while redundant wells are considered for removal to maintain monitoring effectiveness. CVWD is considering these recommendations for future monitoring.

In 2024, DWA completed a benchmark survey for four of its monitoring wells to improve the accuracy of the ground surface elevation. These updated elevations are used to calculate groundwater elevation and have been updated in the SGMA portal.

10.1.2 Climate, Streamflow, and Drain Flow

As summarized in Chapter 2 *Plan Area,* and Table 10-1, the Indio Subbasin Monitoring Program provides information on climate (rainfall and evapotranspiration), streamflow, and drain flows.

10.1.2.1 Climate

Climate data (including temperature, evapotranspiration, and precipitation) are available from DWR's California Irrigation Management Information System (CIMIS) for four CIMIS stations (see Figure 2-9 for spatial distribution). Precipitation data are collected by the 12 Riverside County Flood Control and Water Conservation District precipitation monitoring stations, also shown in Figure 2-9. In addition, temperature and precipitation data are available from the National Oceanic and Atmospheric Administration (NOAA) station in Indio. As noted in Table 10-1, daily climate data are downloaded and compiled for the Annual Report. Data are used to support groundwater conditions characterization and evaluation of irrigation water demands (agricultural and golf course).

10.1.2.2 Streamflow

Streamflow is measured by the USGS at 15 locations within the Indio Subbasin, also shown in Figure 2-9. Surface water diversions by DWA from Snow, Falls, White Water, and Chino watersheds are measured by DWA. Daily streamflow data are downloaded and compiled annually as part of the Indio Subbasin Annual Reports.

10.1.2.3 Drain Flow

The Coachella Valley Stormwater Channel and associated drains (see Figure 2-5) receive intercepted shallow groundwater from agricultural fields and convey the flow to the Salton Sea. CVWD measures drain flows (volumetric meters or flow in cubic feet per second) on a monthly basis at as many as 27 drain sites (depending on occurrence of flow) plus monitoring of the CVSC. A USGS gage station measures flow in the lower CVSC near the Salton Sea (see Figure 2-9). The CVSC and portions of the drain system receive not only shallow groundwater but also flows of Coachella Canal water in excess of requested deliveries (regulatory water), treated wastewater, and fish farm effluent. The drain flow data are used in tracking groundwater outflow and in calibrating the numerical groundwater flow model.

10.1.3 Groundwater Production



CVWD and DWA have been monitoring (assessing) groundwater production since 1982.

CVWD and DWA have been monitoring (assessing) groundwater production in the Areas of Benefit (AOBs) making up the West Whitewater River Subbasin Management Area since 1982 and the East Whitewater River Subbasin AOB since 2005. As defined in the Water Code, Assessable Production excludes groundwater production from Minimal Pumpers, defined as those extracting 25 AFY or less within CVWD's AOBs and 10 AFY or less within DWA's AOB. While Water Code Section 31635.5 exempts Minimal Pumpers and production reporting requirements for CVWD, the GSAs may consider lowering the threshold for reporting groundwater production as provided by SGMA authorities (Water Code Section 10725.8) excepting de minimis extractors (extracting two AFY or less per year for domestic purposes).

Groundwater extractors with production above the thresholds of 25 AFY within CVWD's replenishment program areas and 10 AFY within DWA's replenishment program area are required to install a water use measuring device (i.e., a meter). CVWD encourages well owners to allow CVWD to read their meters directly through metering agreements. However, the groundwater producer can choose to self-report groundwater use totals, if needed. The CVWD groundwater production data set is audited two times a year and summarized as part of the SGMA *Annual Report* and the annual *Engineer's Report*. DWA also audits its groundwater production data as part of the *Annual Report* and their *Engineer's Report*.

Figure 2-13 illustrates the groundwater production across the Subbasin for Water Year (WY) 2024-2025. CVWD and DWA will continue to collect data for all groundwater wells with pumping above the applicable thresholds. As indicated in Chapter 12, *Plan Evaluation and Implementation*, the planned Subbasin Well Inventory project will identify and compile information about all production wells in the Subbasin. Resulting knowledge of existing wells will allow refinement of pumping estimates for wells that are not metered.

10.1.4 Subsidence

Land subsidence, resulting from groundwater level declines and aquifer system compaction, has been a concern in the Coachella Valley since the mid-1990s and has been investigated since 1996 through an on-going cooperative program between CVWD and the USGS (Sneed and Brandt, 2020). The USGS has applied satellite-based Global Positioning System (GPS) surveying techniques to determine the location, extent, and magnitude of the vertical land-surface changes in the Coachella Valley. These surveying techniques include GNSS-Inferred Positioning System and Orbit Analysis Simulation Software (GIPSY-OASIS) and interferometric synthetic aperture radar (InSAR) methods. In addition to areal mapping of vertical changes in land surface elevation, GPS measurements have also been taken at 24 geodetic monuments that have been paired with nearby water level monitoring wells to assess relationships between subsidence and groundwater level change. Results of USGS studies are summarized in Chapter 4, *Current and Historical Groundwater Conditions*.

The USGS has provided data and analyses through a series of published reports that have addressed conditions from 1993 to 2017 (e.g., Sneed and Brandt, 2014; Sneed and Brandt, 2020). The partnership with USGS is continuing. For the Indio Subbasin, the objectives of the study (October 1, 2021, through March 31, 2027) are to (1) detect and quantify land subsidence using GPS methods (2015–22) and InSAR methods (2017–23) and (2) evaluate the relation between changes in land-surface elevation and groundwater levels at selected sites during 2015–23. USGS also will analyze DWR-provided InSAR results to compute changes in land-surface elevation in the Indio Subbasin during 2017–23. The USGS study remains ongoing, with the report completion date extended to March 31, 2027. Through 2025, the major technical tasks have been completed, including GPS surveying, InSAR analysis, and evaluation of groundwater-level and land-subsidence relations in the Indio and Mission Creek Subbasins. Initial analyses in the Mission Creek Subbasin identified localized groundwater declines and less than 1 inch of observed subsidence in some areas between 2015 and 2021. Results from the GPS and InSAR analyses are being incorporated into the final USGS Scientific Investigations Report, which is currently in draft review.

In addition, DWR provides InSAR satellite-based data and GPS data to identify and assess land subsidence across many California groundwater basins, including the Indio Subbasin. The data are available through DWR's SGMA Data Portal (see Table 10-1). As available, these data will be downloaded and reviewed annually to detect significant changes in land surface elevation.

10.1.4.1 Spatial Coverage

The satellite-based mapping provided by USGS (for example, see Figure 4-10) provides Subbasin-wide information on subsidence. In addition, Figure 2-10 shows the current network of GPS stations in the valley used by USGS. InSAR mapping for the entire Indio Subbasin is also available for download from the DWR Sustainable Groundwater Management Act (SGMA) portal.

10.1.4.2 Monitoring Frequency

The Monitoring Program will involve annual download and review of InSAR data from the DWR SGMA portal with analysis for any signs (rate and extent) of significant cumulative subsidence.

10.1.5 Water Quality

Existing water quality monitoring programs for Indio Subbasin GSAs are summarized in Chapter 2, *Plan Area*, while Chapter 8, *Regulatory and Policy Issues,* includes discussion of various water quality

topics and regulatory-driven water quality monitoring programs. As indicated in Chapter 8, *Regulatory and Policy Issues*, surface water and groundwater quality monitoring programs are conducted by various agencies for multiple purposes. These address local surface water, imported water sources, groundwater, recycled water, wastewater discharges, and agricultural drain water with sampling and analysis for different physical parameters, inorganic and organic chemical constituents, and/or microbiological organisms. While being conducted beyond the scope of the *2027 Alternative Plan Update*, these programs represent sources of information to better understand groundwater quality conditions and trends in Indio Subbasin.

10.1.5.1 Water Quality Monitoring and Data Compilation

Multiple sources of water quality information are being compiled into the centralized DMS (See Chapter 12, *Plan Evaluation and Implementation*). As described in Chapter 4, *Current and Historical Groundwater Conditions*, this *2027 Alternative Plan Update* has included compilation into a single database of groundwater quality data from various sources including the USGS National Water Information System and the SWRCB website and from each GSA. The GSAs conduct groundwater quality monitoring, as summarized below:

- **CVWD**—CVWD monitors domestic wells to monitor recharge areas, conducts special studies to address a specific parameter (such as hexavalent chromium) or a specific area, and conducts Coachella Valley Salt and Nutrient Management Plan (CV-SNMP) monitoring
- **CWA**—CWA monitors its domestic wells and conducts CV-SNMP monitoring
- **DWA**—DWA monitors its domestic wells, monitors for State emerging contaminants (e.g., per- and polyfluoroalkyl substances [PFASs]), and conducts CV-SNMP monitoring
- **IWA**—IWA monitors its domestic wells and conducts CV-SNMP monitoring

Figure 2-12 shows the spatial distribution of the wells with available water quality data used in this *2027 Alternative Plan Update*. Chapter 4, *Current and Historical Groundwater Conditions,* provides the documentation and analysis of the groundwater quality data for multiple constituents of concern including salinity (total dissolved solids [TDS]), nitrate, arsenic, hexavalent chromium, uranium, fluoride, perchlorate, and dibromochloropropane (DBCP). This water quality data compilation included collection of water quality data not only for groundwater but also imported water sources, recycled water, and wastewater discharges for the period 1990 through 2025.

An additional source of relevant water quality data is from the agricultural drain system (see Figure 2-5) that intercepts shallow subsurface flow from agricultural fields in the East Valley. Drain flows are monitored for water quality at 27 drain outlets for general minerals and metals annually and for field pH, temperature, EC, and TDS semi-annually.

As discussed in Chapter 2, *Plan Area* and Chapter 8, *Regulatory and Policy Issues*, the SNMP for the Coachella Valley Groundwater Basin (CV-SNMP) was restarted in 2020. The CV-SNMP Groundwater Monitoring Workplan recommended a CV-SNMP monitoring network to include 187 existing wells with the suggested addition of 23 new wells. This *2027 Alternative Plan Update* includes a focused effort to install additional monitoring wells, including application to DWR's Technical Support Services (TSS) program for assistance in installing the monitoring wells.

The CV-SNMP agencies plan to monitor network wells at a minimum of once per 3 years, although many are monitored more frequently as part of other programs. The CV-SNMP Development Workplan suggests a focused analyte list including TDS, nitrate, major cations, major anions, and

total Alkalinity. CVWD and other GSAs also plan to add the identified constituents of concern (COCs) to this monitoring network to help meet the objectives of the Alternative Plan.

Implementation of the CV-SNMP continues through the coordinated efforts of the CV-SNMP Agencies. Since approval of the Groundwater Monitoring Program Workplan in 2021, the agencies have expanded groundwater-quality monitoring and submitted annual progress reports to the Regional Water Quality Control Board, with the fourth report submitted in March 2025. Through partnership with DWR's Technical Support Services program, CVWD and DWA have constructed six new groundwater-quality monitoring wells since 2023. In addition, implementation of the CV-SNMP Development Workplan is ongoing, with several technical memoranda completed between 2024 and 2025 to support characterization of groundwater quality, salt and nutrient loading, management zones, and forecasting approaches. Development of forecasting tools and evaluation of baseline conditions is ongoing, with completion of the updated CV-SNMP anticipated in 2027.

10.1.5.2 Spatial and Vertical Coverage

Figure 2-12 shows the spatial distribution of wells used in this *2027 Alternative Plan Update* for groundwater quality characterization and mapping. The existing water quality monitoring programs provide adequate spatial coverage. The planned CV-SNMP monitoring network will provide very good coverage for TDS and nitrate monitoring, with potential extension to other constituents of interest.

Water quality concentrations vary with depth depending on constituent. As shown in Chapter 4, *Current and Historical Groundwater Conditions*, general variations can be documented but depth-specific data generally are limited due to current lack of shallow wells. The construction details for some wells are unknown, and most wells with known construction data are screened at depths greater than 300 feet. Exceptions include the monitoring wells that have been sited and designed to monitor GRFs and WRPs, and the two sets of nested wells near the Salton Sea. Planned monitoring network improvements as part of the CV-SNMP include installation of 6 new monitoring wells in the perched aquifer and 17 new wells in the shallow aquifer.

The scientific rationale for selection of wells used in this *2027 Alternative Plan Update* has included:

- Areal distribution across Indio Subbasin
- Length, completeness, and reliability of historical record
- Regular access to the well for sampling
- Well depth, with specific information on well construction preferred

The water quality program relies heavily on existing municipal wells and existing monitoring programs. Dedicated monitoring wells could be designed to meet requirements and address gaps not only in the water level monitoring program, but also the water quality monitoring program.

10.1.5.3 Temporal Coverage and Monitoring Frequency

Groundwater quality data in the database compiled for the *2027 Alternative Plan Update* extend back to 1971. Wells are sampled with a range of frequencies; community water systems and municipal wells are generally sampled triennially for general constituents, but as often as annually for nitrate and quarterly for total coliform bacteria. Agricultural drains are sampled annually or at a higher frequency. The GSAs audit their groundwater quality monitoring programs to ensure that monitoring frequency is adequate.

10.1.6 Seawater Intrusion

The general monitoring of groundwater levels and quality is relevant to monitoring the potential for saline water intrusion from the Salton Sea. As described in Chapter 4, *Current and Historical Groundwater Conditions*, saline water intrusion is monitored specifically through two sets of dedicated nested monitoring wells, as summarized below in Table 10-2.

Locations of these CVWD monitoring wells are shown on Figure 2-12**.** One set of four wells is located about 2.1 miles north of the Salton Sea and the other set of four wells is about one mile west of the Salton Sea and north of Oasis. These are monitored for changes in groundwater levels and quality, both of which can be used as potential indicators of saline intrusion.

In addition, the groundwater flow model has been used to simulate flow between the Indio Subbasin and the Salton Sea. The relationship of simulated and observed groundwater elevations to the changing level of the Salton Sea is discussed in Chapter 7, *Numerical Model and Plan Scenarios*, and Chapter 9, *Sustainable Management*.

Table 10-2 Summary of Salton Sea Nested Monitoring Wells

				Depth of Well Perforations, feet bgs	
SWN	Nickname	Latitude	Longitude	Top	Bottom
07S09E30R04S	CVWD Ruth	33.52633	-116.08	350	390
07S09E30R03S	CVWD Peggy	33.52633	-116.08	730	770
07S09E30R02S	CVWD Sherrie	33.52633	-116.08	1,220	1,260
07S09E30R01S	CVWD Bernadine	33.52633	-116.08	1,430	1,470
08S09E07N01S	CVWD Dave	33.48447	-116.095	420	480
08S09E07N02S	CVWD Rosie	33.48447	-116.095	720	780
08S09E07N03S	CVWD Gracie	33.48447	-116.095	1,034	1,094
08S09E07N04S	CVWD Richard	33.48447	-116.095	1,315	1,375

10.2 Field Methods for Monitoring Well Data

10.2.1 Protocols for Data Collection and Monitoring

This section focuses on groundwater level monitoring and groundwater quality sampling by Indio Subbasin GSAs. Other data (e.g., climate, streamflow, subsidence) are measured mostly by other agencies (e.g., USGS). Groundwater production is metered, as described in Section 10.1.3.

This section describes general procedures for documenting wells in the monitoring program and for collecting consistent high-quality groundwater elevation and groundwater quality data. In general, the methods for establishing location coordinates (and reference point elevations for elevation monitoring) follow the data and reporting standards described in the SGMA Regulations (Section 352.4), CVWD Monitoring Plans, and the guidelines presented by USGS Groundwater Technical Procedures. These procedures are summarized below.

Background data for each monitoring well is required for its inclusion in the monitoring program. These data are generally available for wells in the network described on Table 10-1. As part of Annual Report preparation, location and elevation data are acquired where missing, revised if conditions at a monitored well change, and added when new wells are brought into the program. The methods for acquiring these data follow:

- Location coordinates will be surveyed with a survey grade GPS. The coordinates will be in Latitude/Longitude decimal degrees and reference datum noted.
- Reference point elevations will also be surveyed with a survey grade GPS with elevation accuracy of approximately 0.5 feet. During surveying, the elevations of the reference point and ground surface near the well will be measured to the nearest 0.5 foot. All elevation measurements will reference NAVD88 vertical datum. This will involve some re-surveying of well reference points that are based on an earlier datum.

10.2.2 Field Methods for Groundwater Elevation Monitoring

Reference points and ground surface elevations are documented as described above prior to groundwater elevation monitoring in the field. Field methods for collection of depth-to-water measurements are described below:

1. Measurements in all wells will be collected within a consistent period.
2. Active production wells should be turned off prior to collecting a depth to water measurement.
3. Each agency should follow their standard operating procedure and ensure the well has been off for an adequate period before a static measurement is taken (24 hours, when possible).
4. To verify that the wells are ready for measurement, GSA staff will coordinate with well operators and/or owners as necessary.
5. Coordination with well operators/owners should occur approximately three days prior to the expected measurement date. For municipal wells, less lead time may be needed.
6. Depth-to-groundwater measurements are collected by either electric sounding tape (Solinst or Powers type sounders) or by steel tape methods. These depth-to-water measurement methods are described in DWR's *Groundwater Elevation Monitoring Guidelines* (DWR, 2010). Depth to groundwater will be measured and reported in feet to at least 0.1 foot.

10.2.3 Field Methods for Groundwater Quality Monitoring

Groundwater sampling is conducted by trained professionals from the GSAs. Sampling follows standard monitoring well sampling guidelines such as those presented in the National Field Manual for the Collection of Water-Quality Data (USGS, 2015) and/or EPA Groundwater Sampling Operating procedure (SESDPROC-301-R4, 2017).



CVWD collects water quality data at wells and distribution system sites.

Generally, the wells have been pumped prior to sample collection, or are purged. Purging is conducted until field instruments indicate that water quality parameters (pH, specific conductance, and temperature) have stabilized, and turbidity measurements are below five Nephelometric Turbidity Unit (NTUs). Wells are typically purged a minimum volume equal to three times the well casing and parameters are monitored until stable conditions are reached. The pumping or purging demonstrates that the sample collected is representative of formation water and not stagnant water in the well casing or well filter pack. For groundwater, field temperature and conductivity are recorded while the well is being purged to ensure that physical parameters have stabilized before collecting a sample. All groundwater samples are collected in laboratory-supplied, pre-labeled containers and include prescribed preservatives.

All field measurements, if collected, are recorded in a field logbook or worksheets, and the sample containers are labeled correctly and recorded on the chain-of-custody form. The applicable chain-of-custody sections are completed and forwarded with the samples to the laboratory. Upon receipt of the samples at the laboratory, laboratory personnel complete the chain-of-custody and a copy of the chain of custody is given back to the sampler.



Water quality samples are analyzed in a certified laboratory.

QA/QC assessment of field sampling includes use of field blanks when required for specific parameters. Field blanks identify sample contamination that is associated with the field environment and sample handling. These samples are prepared in the field by filling the appropriate sample containers with the distilled water used for cleaning and decontamination of all field equipment. One field blank per sampling event is collected.

Samples are analyzed in a certified laboratory that has a documented analytical QA/QC program including procedures to reduce variability and errors, identify and correct measurement problems, and provide a statistical measure of data quality. The laboratory conducts all QA/QC procedures in accordance with its QA/QC program. All QA/QC data are reported in the laboratory analytical report, including: the method, equipment, and

analytical detection limits, the recovery rates, an explanation for any recovery rates that are outside of method specific limits, the results of equipment and method blanks, the results of spiked and surrogate samples, the frequency of quality control analysis, and the name of the person(s) performing the analyses. Sample results are reported unadjusted for blank results or spike recovery.

10.3 Data Management System (DMS)

Indio GSAs have been collecting and compiling groundwater data annually including water levels, water quality, and water use for the Annual Report. These data, and other data from the GSAs and other sources, are being compiled in relational databases, which comprise an Access database, GIS geodatabase, and Excel workbooks. These have capabilities for queries to quickly check and summarize data. As part of the *2027 Alternative Plan Update*, the data management system has been redesigned to be practicable, usable, intuitive, and cost effective. The relational database includes easy-to-update tables and reports that assist in data analysis and sustainability goals. These tables include groundwater elevations, water quality, groundwater pumping, direct deliveries of imported water, and well locations. The geodatabase contains spatial files including jurisdictional areas, basin boundaries, monitoring locations, crop censuses, groundwater contours (elevation and quality), geology, and hydrologic features.

The DMS is updated annually as part of the annual report. In addition, a full review and update has been conducted during the *2027 Alternative Plan Update*.

10.4 Assessment and Improvement of Monitoring Program

The Bridge Document summarized the status of previously recommended monitoring and reporting improvements and also presented monitoring data gaps. These are summarized below along with brief updates.

- Surface water flow data to estimate potential yield from stormwater capture projects. Stormwater capture, as a category of projects, is currently deferred. This reflects that significant local runoff already is captured cost-effectively at existing facilities (e.g., WWR-GRF, debris basins, West Valley unlined channels) or is integrated into flood control projects.
- Uniform reporting of urban water use by user class to track water conservation efforts. While uniformity among agencies may not be generally feasible, CVWD has improved its reporting by meter class (user type) and continues to make improvements as needed. Other GSAs also continue to maintain and replace meters, as needed.
- Groundwater production data for wells in the East Valley, especially agricultural wells. CVWD has addressed groundwater production reporting for entities producing more than 25 AFY.
- Lack of a centralized groundwater database that allows all water agencies to share data. At this time, development of the DMS is underway and is a major focus. As summarized in Section 10.3, data on groundwater levels, water quality, and wells are being compiled and entered into the DMS.
- Non-uniform coverage of water quality data. Coverage of water quality data is being addressed through various efforts, such as the compilation of water quality data, data analysis and documentation of groundwater quality in Chapter 4, *Current and Historical Groundwater Conditions*. As described in Section 10.1.5.1, a major effort is development of the CV-SNMP

Monitoring Workplan to include 187 existing wells with planned installation of 23 new monitoring wells. As part of this *2027 Alternative Plan Update*, the GSAs are moving ahead with options to fund the new monitoring wells, including application to DWR's Technical Support Services program.

Other monitoring improvements are part of *Alternative Plan Update* implementation and will be reviewed and updated for each five-year assessment.

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11 Projects and Management Actions

Maintaining sustainability in the Indio Subbasin will require implementation of projects and management actions to offset forecasted increases in water demands. Water management elements included in this *Alternative Plan Update* to help maintain sustainability consist of water conservation measures, acquisition of additional water sources, source substitution and replenishment programs, water quality improvements, and other studies and programs.

11.1 Project Selection and Implementation

The Groundwater Sustainability Agencies (GSAs) have evaluated a range of potential projects and management actions (PMAs) to help maintain sustainability. This section summarizes the process used to select the PMAs for inclusion in this *Alternative Plan Update*, as well as the entities responsible for implementing these activities.

11.1.1 Adaptive Management

The preceding chapters of this *Alternative Plan Update* have documented the success of the Coachella Valley's water management strategies. Expectations for population growth have changed since the *Coachella Valley Water Management Plan 2010 Update (2010 CVWMP Update)* (CVWD, 2012) and resulted in a corresponding reduction in the projected urban development of agricultural and vacant land. At the same time, the reliability of imported water supply from the State Water Project (SWP) has declined due to a combination of drought, climate change, and legal and environmental restrictions in the Sacramento-San Joaquin Delta (Delta). In addition, recent planning efforts, including the *2025 Coachella Valley Regional Urban Water Management Plan* (RUWMP), identify an increasing reliance on recycled water, including expansion of existing treatment facilities and distribution systems. Coordination of existing and future projects introduces additional complexities related to implementation timing, treatment capacity, funding availability, and operational integration.

Given such uncertainty, the GSAs need flexibility in determining the timing, scale, and sequencing of PMAs in order to maintain sustainability. This *2027 Alternative Plan Update* incorporates a flexible and adaptive approach to water resources management that will support the GSAs in optimizing the implementation strategy.

The Plan Scenarios evaluated in Chapter 7, *Numerical Model and Plan Scenarios,* simulate a range of potential conditions to ensure that forecasted demands can be met, while sustainably managing groundwater resources. In each of the Plan Scenarios, a different suite of projected water supplies and PMAs is identified. These scenarios reflect variability in key uncertainties, including recycled water project implementation and imported supply availability. The actual selection of PMAs for implementation by the Subbasin GSAs throughout the planning horizon will depend on how the various demand and supply uncertainties identified in this Plan play out. The selection and implementation of PMAs will be adaptively managed by the GSAs.

The process is cyclical and depends on the outcomes of the Plan implementation activities outlined in Chapter 12, *Plan Evaluation and Implementation*. These Plan implementation activities include ongoing monitoring, annual reporting on the state of the Subbasin, and 5-year updates including application of the numerical model to evaluate potential future scenarios. Adaptive management

involves five steps: monitoring, reporting, evaluating, adjusting, and implementing (see Figure 11-1 below).

The Plan implementation actions – primarily ongoing monitoring and reporting through the Annual Reports – work to direct the GSAs selection and implementation of PMAs, based on the monitoring outcomes as compared with this Plan's thresholds. This adaptive management approach also allows the GSAs to adapt to changing conditions and to redefine, delay or defer PMAs if no longer needed. This flexibility is particularly important for phased infrastructure projects and conceptual recycled water projects, where implementation may be adjusted based on demand conditions, wastewater flow availability, or funding constraints.

Figure 11-1 Adaptive Management Cycle for PMA Implementation



Following is a description of each step in the adaptive management cycle:

1. **Step 1: Monitoring**. The GSAs will continue their ongoing monitoring programs as outlined in Chapter 10, *Monitoring Program,* to assess groundwater levels; climate, streamflow, and drain flow; groundwater production; subsidence; water quality; and seawater intrusion.
2. **Step 2: Reporting**. The GSAs will use the monitoring data to track and report conditions for the applicable sustainability indicators discussed in Chapter 9, *Sustainable Management*. If the monitoring results indicate adverse trends, exceedances of established planning thresholds, or conditions that could affect progress toward sustainability, the GSAs will move to Step 3.
3. **Step 3: Evaluating**. If monitoring results indicate declining conditions or movement toward minimum thresholds, the GSAs will conduct an evaluation to determine whether it is a locally driven change in conditions, such as a change in local land use or pumping patterns, or whether it represents a long-term, regional change in conditions. The evaluation will include steps such as analyzing pumping, well logs, land use changes, well permit records, imported water

deliveries, or climate/precipitation data to determine if any recent changes occurred that may have affected monitoring results.

4. **Step 4: Adjusting**. To address a long-term regional trend that may cause undesirable results, the GSAs may need to adjust the PMAs that are being implemented to manage the Subbasin. Each of the GSAs will select the PMAs within their respective jurisdiction. Regional PMAs may be developed and implemented through interagency coordination mechanisms, including the MOU, as applicable. Adjustments may include modifying project phasing, accelerating or deferring infrastructure projects, adjusting assumed yields, or expanding demand management and substitution programs. Any changes to projects, programs, and activities would then be captured within the 5-Year Plan Update described in Chapter 12, *Plan Evaluation and Implementation*.
5. **Step 5**: **Implementing**. Following selection of proposed or refined PMAs that respond to identified trends, monitoring and management practices will be implemented to reflect the new activities.
6. **Return to Step 1: Monitoring.** Ongoing monitoring data will then be used to assess the results of PMA implementation and if/how conditions change. If monitoring indicates that conditions have stabilized and remained above established minimum thresholds, implementation of the PMAs will be deemed successful. If the exceedance is not addressed, the GSAs will identify and implement additional PMAs to avoid undesirable results.

11.1.2 Project Identification

A variety of PMAs are planned to be implemented over the planning horizon (to 2050) to achieve sustainability in the Subbasin. Projects have been identified by the GSAs through an ongoing, iterative process involving review of prior planning documents, coordination with the GSAs, the general public, and interested stakeholders. The GSAs began by reviewing and updating the projects identified in the *2010 CVWMP Update* and *2022 Alternative Plan Update* to determine which had been successfully implemented and could be removed, which could be carried out in the planning horizon, and which projects to redefine or defer. This process incorporated review of additional planning sources, including the *2025 Coachella Valley Regional Urban Water Management Plan* (RUWMP) and annual reporting documents. Additional refinements were made by the GSAs, who provided updated information on project implementation status, timing, and projected yields. Project information was compiled into a draft list that was discussed and presented during the SGMA Tribal Workgroup and Public Workshop held on September 17, 2026. This project list was created based on priorities identified by the GSAs and stakeholders. While the order of PMAs has been retained from the *2022 Alternative Plan*, note that the numbering has been revised as PMAs are added, redefined, or removed. Since the *2022 Alternative Plan*, one PMA (PMA 2: Turf Irrigation Reduction) has been added, one PMA (PMA 18: EVRA Recycled Water Delivery, formerly PMA 9: EVRA Potable Reuse) has been revised, two PMAs (Mid-Canal Storage Project, formerly PMA 11, and TEL-GRF Expansion Project, formerly PMA 21) have been completed, and one PMA (Lake Perris Dam Seepage Recover Project, formerly PMA 6) has been removed.

11.1.3 Project Implementation

The PMAs contained herein will be administered by the GSA project proponents. The GSAs may elect to implement projects individually or jointly with one or more GSAs and/or other project partners, as appropriate. The GSAs will individually consider the demand forecast in Chapter 5, *Demand Projections*; the overall Subbasin water budgets in Chapter 7, *Numerical Model and Plan*

Scenarios; and the needs of the different management areas described in Chapter 2, *Plan Area*. The Annual Reports outlined in Chapter 12, *Plan Evaluation and Implementation,* will allow the GSAs to evaluate their cumulative progress toward maintaining, protecting, and improving Subbasin conditions.

11.2 List of Projects and Management Actions

The GSAs reviewed and refined the PMAs in the *2022 Alternative Plan Update* and incorporated additional PMAs developed through more recent planning efforts to support long-term Subbasin sustainability and achievement of Plan objectives. The *Alternative Plan Update* includes a comprehensive list of PMAs representing a wide variety of activities by the GSAs. Projects are classified into four categories based on project benefits: water conservation, water supply development, source substitution and replenishment, and water quality protection. Deferred projects, listed in Section 11.7, are those that do not meet the Subbasin's immediate needs or are currently infeasible and may be revisited in the future. Removed projects, listed in Section 11.8, are projects that are deemed no longer feasible and are unlikely to be revisited in the future. The categorized projects are shown in Figure 11-2. This PMAs list includes both planned and conceptual projects, as well as phased infrastructure projects that may be implemented over time. Planned projects are those that are in the planning or design stages and will be implemented soon or as funding becomes available. Conceptual projects are in the planning, design, and funding stages and will be implemented later in the planning horizon. Where project details such as implementation timing, yield, or phasing remain uncertain, reasonable assumptions have been developed for planning and modeling purposes and will be refined through ongoing coordination and the adaptive management process. Table 11-1 provides a comparison between the PMAS identified in the *2022 Alternative Plan Update* and the updated list included in this *2027 Alternative Plan Update* following refinement during the adaptive management process.

The following sections provide project descriptions for the PMAs included in the *2027 Alternative Plan Update* grouped by project category.

Figure 11-2 Categorized Projects and Management Actions

Water Conservation	Water Supply Development	Source Substitution & Replenishment	Water Quality Protection
▪ PMA 1: Urban Water Conservation ▪ PMA 2: Turf Irrigation Reduction ▪ PMA 3: Golf Water Conservation ▪ PMA 4: Agricultural Water Conservation	▪ PMA 5: Increased Surface Water Diversion ▪ PMA 6: Delta Conveyance Facility ▪ PMA 7: Sites Reservoir ▪ PMA 8: Future Supplemental Water Acquisitions	▪ PMA 9: Mid-Valley Pipeline Direct Customers ▪ PMA 10: East Golf Expansion ▪ PMA 11: Oasis Distribution System ▪ PMA 12: WRP-10 Recycled Water Delivery ▪ PMA 13: WRP-7 Tertiary Expansion ▪ PMA 14: Canal Water Pump Station Upgrade ▪ PMA 15: WRP-7 Recycled Water Delivery ▪ PMA 16: WRP-4 Tertiary Expansion and Delivery ▪ PMA 17: DWA WRP Recycled Water Delivery ▪ PMA 18: EVRA Recycled Water Delivery ▪ PMA 19: PD-GRF Phase 2 Expansion ▪ PMA 20: WWR-GRF Operation	▪ PMA 21: Eliminate Wastewater Percolation ▪ PMA 22: Wellhead Treatment ▪ PMA 23: Small Water System Consolidations ▪ PMA 24: Septic to Sewer Conversions ▪ PMA 25: Implement CV- SNMP Groundwater Monitoring Program Workplan ▪ PMA 26: Implement CV- SNMP Development Workplan ▪ PMA 27: Colorado River Salinity Forum ▪ PMA 28: Source Water Protection

Table 11-1 2022 and 2027 Alternative Plan Update PMA Comparison

2027 Alternative Plan Update PMA List	2022 Alternative Plan Update PMA List
Conservation	
PMA 1: Urban Water Conservation	PMA 1: Urban Water Conservation
PMA 2: Turf Irrigation Reduction	PMA 2: Golf Water Conservation
PMA 3: Golf Water Conservation	PMA 3: Agricultural Water Conservation
PMA 4: Agricultural Water Conservation	
Water Supply Development	
PMA 5: Increased Surface Water Diversion	PMA 4: Increased Surface Water Diversion
PMA 6: Delta Conveyance Facility	PMA 5: Delta Conveyance Facility
PMA 7: Sites Reservoir	PMA 6: Lake Perris Dam Seepage Recovery Project
PMA 8: Future Supplemental Water Acquisitions	PMA 7: Sites Reservoir
	PMA 8: Future Supplemental Water Acquisitions
Source Substitution and Replenishment	
PMA 9: Mid-Valley Pipeline (Canal Only Customers)	PMA 9: EVRA Potable Reuse
PMA 10: East Golf Expansion	PMA 10: Mid-Valley Pipeline (Canal Only Customers)
PMA 11: Oasis Distribution System	PMA 11: Mid-Canal Storage Project
PMA 12: WRP-10 Recycled Water Delivery	PMA 12: East Golf Expansion
PMA 13: WRP-7 Tertiary Expansion	PMA 13: Oasis Distribution System
PMA 14: Canal Water Pump Station Upgrade	PMA 14: WRP-10 Recycled Water Delivery
PMA 15: WRP-7 Recycled Water Delivery	PMA 15: WRP-7 Tertiary Expansion
PMA 16: WRP-4 Tertiary Expansion & Delivery	PMA 16: Canal Water Pump Station Upgrade
PMA 17: DWA WRP Recycled Water Delivery	PMA 17: WRP-7 Recycled Water Delivery
PMA 18: EVRA Recycled Water Delivery	PMA 18: WRP-4 Tertiary Expansion & Delivery
PMA 19 PD-GRF Expansion	PMA 19: DWA WRP Recycled Water Delivery
PMA 20: WWR-GRF Operation	PMA 20: PD-GRF Expansion
	PMA 21: TEL-GRF Expansion Project
	PMA 22: WWR-GRF Operation
Water Quality Protection	
PMA 21: Eliminate Wastewater Percolation	PMA 23: Eliminate Wastewater Percolation
PMA 22: Wellhead Treatment	PMA 24: Wellhead Treatment
PMA 23: Small Water System Consolidations	PMA 25: Small Water System Consolidations
PMA 24: Septic to Sewer Conversions	PMA 26: Septic to Sewer Conversions
PMA 25: Implement CV-SNMP Groundwater Monitoring Program Workplan	PMA 27: Implement CV-SNMP Groundwater Monitoring Program Workplan
PMA 26: Implement CV-SNMP Development Workplan	PMA 28: Implement CV-SNMP Development Workplan
PMA 27: Colorado River Basin Salinity Control Forum	PMA 29: Colorado River Basin Salinity Control Forum
PMA 28: Source Water Protection	PMA 30: Source Water Protection

11.3 Water Conservation

Water conservation is a foundational component of overall water resources management in the Indio Subbasin and is an important strategy for reducing groundwater demand and preserving long-term water supply reliability. As a desert community reliant upon imported water supplies, the Coachella Valley has and will continue to use its water resources efficiently. The GSAs continue to expand and strengthen water conservation programs not only through the *Alternative Plan Update*, but also through other efforts such as the Coachella Valley Regional Water Management Group (CVRWMG) and the *2025 Coachella Valley Regional Urban Water Management Plan* (*2025 RUWMP*) (CVWD, et al., 2026a), which incorporates updated demand management measures, long-term water use efficiency strategies, and conservation assumptions that inform future water demand projections. Water conservation is also a requirement of the California Water Code (CWC) and legislation such as the Water Conservation Act of 2009 (Senate Bill [SB]x7-7) and the 2018 Making Conservation a California Way of Life legislation (AB 1668 and SB 606). These laws require urban and agricultural water suppliers to improve water use efficiency, establish water use targets or objectives, and implement demand management measures over time.

This section summarizes water conservation policies and the existing urban, agricultural, and golf course water conservation activities in the Coachella Valley, as well as potential water conservation implementation strategies. Consistent with Plan objectives, the *Alternative Plan Update* incorporates water conservation measures that achieve water use reductions consistent with applicable State law while maintaining reliable water service for municipal, agricultural, and commercial users

11.3.1 California Water Conservation Laws and Policies

Urban water use is expected to grow significantly in the future as development occurs. CVWD, DWA, CWA, and IWA are implementing several on-going water conservation programs for both large landscape customers and residential customers. They are also working with local governments and developers to reduce water use in new developments and are partnering with large water users, such as schools, to improve water efficiency and reduce groundwater pumping. California law also establishes multiple policies regarding water conservation. Legislation and policies driving these urban conservation measures are detailed below.

- **Water Conservation in Landscaping Act**. The Water Conservation in Landscaping Act of 2006 (Assembly Bill 1881, Laird) required cities and counties to adopt water conservation ordinances by January 1, 2010. In accordance with the law, the California Department of Water Resources (DWR) prepared an updated Model Water Efficient Landscape Ordinance (MWELO). MWELO requirements establish water budgets, irrigation efficiency standards, and design criteria for new and rehabilitated landscapes, and require local agencies to adopt and enforce ordinances that are at least as effective as the State model. For all cities and counties that do not adopt their own conservation ordinances, DWR's updated MWELO would apply within their jurisdiction by January 1, 2010.
- **California Urban Water Conservation Council Memorandum of Understanding (MOU)/California Water Efficiency Partnership**. In addition to state law requirements, water agencies and public interest groups formed the California Urban Water Conservation Council (CUWCC) in 1991 (CUWCC, 1991). As the State's water conservation landscape began to change in response to the State's historic drought, the CUWCC voted to allow the organization to end and be replaced with the California Water Efficiency Partnership (CalWEP) in 2017. CalWEP set

forth eight long-term objectives in its *Strategic Plan* (most recently updated in 2021) to provide leadership and expertise on California water issues, challenges, and opportunities within a collaborative network (CalWEP, 2021).

- **Water Conservation Act (SBx7-7)**. The Water Conservation Act was passed in 2009, and the final 20x2020 Water Conservation Plan was released in February 2010 (SWRCB, 2010). As part of the comprehensive Water Conservation Act of 2009, SBx7-7 mandates California urban water agencies achieve a 10 percent reduction in urban per capita water demand statewide by 2015 and a 20 percent reduction by 2020. Water use reductions are compared on a per capita basis to a 10-year baseline period. As reported in the *2020 RUWMP*, the RUWMP participating agencies met the target water use reduction by 2020 (CVWD et al., 2021).
- **Making Conservation a California Way of Life Legislation**. As the effects of climate change become more apparent and in response to the State's historic 2012-2016 drought, the State recognized that more stringent water conservation legislation needed to be implemented. California signed the Water Conservation Legislation into law in 2018, effectively reorganizing and strengthening the conservation and reporting requirements for the drought emergency, mandating water-use reductions, and making "water conservation a way of life" on a permanent basis. Together, Assembly Bill 1668 (Friedman) and SB 606 (Hertzberg) lay out a new long-term water conservation framework, which involves developing new standards for indoor residential water use, outdoor residential water use, commercial, industrial, and institutional (CII) water use for landscape irrigation, and water loss. Urban water suppliers will be required to stay within annual water use objectives, as determined by the State. Implementation of this legislation has progressed significantly, with the State Water Resources Control Board (SWRCB) adopting the "Making Conservation a California Way of Life" regulation in July 2024, with the regulation becoming effective January 1, 2025. Under this framework, urban retail water suppliers must calculate and meet individualized "urban water use objectives" (UWUOs) based on efficiency standards for indoor use, outdoor use, CII irrigation, and water loss, and must report annually to demonstrate compliance. The legislation also includes provisions related to drought planning, small water supplier risk assessment, and incentives for recycled water use, thereby integrating conservation into long-term water supply planning.
- **California's Non-Functional Turf Ban (Assembly Bill 1572)**

  California's Non-Functional Turf Ban (AB 1572) prohibits the irrigation of non-functional turf with potable water. The ban will take effect in 2027, 2028, 2029, and 2031 for local government properties, all other institutional properties and commercial and industrial properties, common areas of homeowners' association properties and local government, public agency, and public water system properties located in disadvantaged communities, respectively. Additionally, the bill requires public water systems to revise regulations, ordinances, or policies by January 1, 2027, and to communicate those changes to customers.

The following sections describe existing urban, agricultural and golf course water conservation activities, as well as potential water conservation implementation strategies consistent with legislation and policies, driving the conservation measures. A new PMA has been added, emphasizing Turf Irrigation Reduction (PMA 2).

PMA 1: Urban Water Conservation

For the past three decades, the local water purveyors have placed a significant focus on urban water conservation to address the increasing water demands due to statewide drought conditions and

uncertainty related to imported water availability. Local urban water conservation programs began as early as 1988. The Indio Subbasin GSAs have managed a suite of conservation programs and activities designed to increase efficiency, reduce future water demand, and support fulfillment of the requirements of the statewide Water Conservation Act. CVWD, DWA, CWA, and IWA have implemented ongoing programs for both large landscape customers and residential customers for achieving increased water conservation in the Coachella Valley.

The Regional Water Conservation Program (Regional Program) has been a cornerstone of water conservation in the Coachella Valley. Implemented in 2015 by the CVRWMG, this multifaceted Regional Program has achieved a significant level of conservation through a suite of programs and activities designed to increase efficiency, reduce future water demand, and assist the Coachella Valley in meeting regulatory requirements. The Regional Program had an emphasis on coordination and collaboration between the member agencies of the CVRWMG. Together, under the Regional Program, the agencies developed and branded “CV Water Counts” (https://cvwatercounts.com/) to conduct education and outreach related to water conservation. The CV Water Counts website has informative links with educational resources, information on rebates for water saving devices, and upcoming water related events in the area. The CV Water Counts program uses surveyed data from Coachella Valley residents to guide its water conservation messaging to achieve maximum local impact. Part of the regional program also includes a “Water Counts Academy,” which affords local residents an opportunity to learn more about water in our community.

The GSAs are committed to implementing State policies and mandates related to water conservation, as described above. To comply with conservation regulations and address supply shortfalls during dry conditions, the GSAs are committed to implementing the conservation programs that are in place (see sections below), including CV Water Counts. Table 11-2 provides a summary of the demand management programs highlighted in the agencies’ 2025 RUWMP and identified by the GSAs, and the estimated annual increase in water savings from these programs. The GSAs will also continue to seek grant funding to support ongoing delivery and expansion of their conservation programs. The GSAs continue to monitor and evaluate the effectiveness of their urban water conservation programs through the UWMPs, prepared at five-year intervals. Conservation efforts will continue to be enhanced through regionally coordinated policy and regulatory measures.

Table 11-2 Conservation Program Summary

Water Provider	Average Annual Installations 2021-2025	Estimated Water Savings Per Unit	Estimated Annual Water Savings (Gallons/Year)
Coachella Valley Water District			
Landscape Plan Check	506	N/A[1]	N/A
Residential Smart Controller Rebates	177	7,600[2]	1,345,200
Large Landscape Smart Controller Rebates	133	7,600[2]	1,010,800
Water Waste Investigations	447	N/A[1]	N/A
Toilet Rebates	405	1,615[3]	654,075
Total Yearly Savings			**3,010,075**
Coachella Water Authority			
Residential Plumbing Retrofit	20	N/A[1]	N/A
Smart Controller Rebate Program	2	7,600[2]	15,200
Residential ULFT Replacement Program	3	1,615[3]	4,845
Total Yearly Savings			**20,045**
Desert Water Agency			
Residential Smart Controller Rebates	179	7,600[2]	1,360,400
Toilet Rebates	1,078	1,615[3]	1,740,970
Efficient Rotating Nozzles	5,294	1,700[4]	8,999,800
Clothing Washer Rebates	173	27,766[3]	4,803,518
Water Waste Investigations	157	N/A[1]	N/A
Total Yearly Savings			**16,904,688**
Indio Water Authority			
Residential Smart Controller Rebates	12	7,600[2]	91,200
Toilet Rebates	49	1,615[3]	79,135
Clothing Washer Rebates	19	27,766[3]	527,554
Total Yearly Savings			**697,889**
Plan Area Total Yearly Savings			**20,632,697**

[1]Landscape Plan Checks and Water Waste Investigations are difficult to quantify water savings due to the variable results in savings by individual check and investigation.

[2]Source: EPA. WaterSense Performance Overview: Weather-Based Irrigation Controllers. 2022.

[3]Savings for Toilet and Clothing Washer rebates are calculated by multiplying estimated savings per person from Chapter 5 Demand Projections by average persons per household in the plan area

[4]Source: Dukes. Sprinkler Nozzle Testing Report. 2023

As part of the *2025 RUWMP,* the GSAs each developed and adopted a Water Shortage Contingency Plan (WSCP; see Appendices to the Final RUWMP: https://www.cvrwmg.org/uwmp/) and assessed planned WSCP actions in the context of a 5-year drought risk assessment (CVWD et al., 2026). Each WSCP included six shortage response levels and associated actions, which were consistent among the agencies, as shown in Table 11-3. Each level represents an anticipated reduction in the supplies that would normally be available, and the GSAs may activate shortage levels across entire service areas or within certain areas that are impacted by an event. The levels involve voluntary and mandatory conservation measures and restrictions, depending on the causes, severity, and

anticipated duration of the water supply shortage. These response actions have been used effectively in the past and could be implemented as part of the GSAs' adaptive management strategy. Each agency's WSCP contains a detailed list of demand reduction actions that could be implemented as needed.

Table 11-3 Water Shortage Contingency Plan Levels

Shortage Level	Percentage Shortage Range	Description	Shortage Response Actions
1	Less than 10%	Normal water supplies	Mandatory prohibitions defined by the State, ongoing rebate programs
2	Up to 20%	Slightly limited water supplies	Outdoor water use restrictions on time of day, increased water waste patrols
3	Up to 30%	Moderately limited water supplies	Outdoor water use restrictions on days per week, restrictions on filling swimming pools
4	Up to 40%	Limited water supplies	Limits on new landscaping, expanded public information campaign
5	Up to 50%	Significantly limited water supplies	Limits on watering of parks or school grounds
6	Greater than 50%	Severe shortage or catastrophic incident	No potable water use for outdoor purposes

Source: 2025 RUWMP, WSCP Attachments (CVWD et al., 2026a)

The following sections provide a summary of the range of domestic water conservation projects and programs that CVWD, DWA, CWA, and IWA are currently implementing in the Coachella Valley. As total demand increases and MWELO is applied to new growth, the volume of water conserved will increase, representing the equivalent of a substantial source of supply. Additional savings from urban water conservation will ultimately depend on the public's willingness to participate in the conservation programs and saturation.

Coachella Valley Water District

CVWD currently offers a variety of water-efficiency programs through its annual budget. CVWD also researches new incentives based on changing customer needs. Outreach and education, including K-12 schools, is also a large part of CVWD's efforts to spread the "Conservation as a Way of Life" message to its customers. CVWD has a large section on its website (https:/www.cvwd.org/conservation) devoted to water conservation and education. CVWD continues to offer to its customers a variety of indoor incentives (including Indoor Water Conservation Kit, Residential High Efficiency Toilet Rebates, Residential Efficient Washing Machine Rebates, Residential Hot Water Recirculation Pump Rebates, and Commercial Water Efficient Toilet Rebates) and landscape/outdoor incentives (including Residential Landscape Rebates, Residential Smart Irrigation Controller Installations, Residential Rotary Nozzle Rebates, Homeowners' Association (HOA) & Commercial Landscape Rebates, HOA & Commercial Smart Irrigation Controller Rebates, HOA & Commercial Rotary Nozzle Rebates, HOA & Commercial Irrigation Upgrade Rebates, and Landscape Workshops).

CVWD's Landscape and Irrigation System Design Ordinance No. 1302.6 (Landscape Ordinance), last updated in December 2025, establishes annual maximum water allowances for new and rehabilitated landscape sites that are served domestic water. The allowances are based on landscaped area, plant water use zone, low-moderate landscape plant water use rates, and high

irrigation system application efficiency. In implementing the Landscape Ordinance, CVWD conducts plan checks and inspections.

CVWD uses water budget based tiered rates. Conservation pricing provides incentives to customers to reduce average or peak use, or both. CVWD uses water commodity rates for its domestic water, non-potable (including Canal and recycled) water, and groundwater replenishment services. Every residential customer is given a personalized water budget based on the number of people living in the home, the size of the home's landscaped area (budgeting more water to those with larger landscapes), and daily weather (budgeting more water during hotter months). Every landscape meter is given a personalized water budget based on the landscaped area served. Every commercial property is given a personalized water budget based on the demand the entity places on the sanitation system and may include an allotment for landscape area served. Customers pay the tier rate for all water used within that tier. In 2021, CVWD updated water rate studies for its domestic water, Canal water, and replenishment assessment charges. In 2026, CVWD is currently in the process of developing an updated water rate study.

CVWD's water loss program evaluates both apparent and real water loss. The programs and practices used to constitute water loss reduction efforts include Production Well Meter Testing; Customer Meter Testing, Leak Detection, and Repair; District Site Use Water Meters; Meter Reading; and Billing Reports.

CVWD's Large Landscape Irrigation Audit Program assists users in maximizing the efficient operation of their irrigation system by measuring performance, generating irrigation schedules, and recommending improvement actions. Audit sites are chosen based on excessive water consumption, or in response to a request for audit services. The large landscape audit program operates continuously and completes approximately 20 landscape audits per year. The success of this program will be measured by the annual water reduction achieved by large water users participating in the program.



Example of desert landscaping to reduce irrigation demands

CVWD hosts a Landscaper Certification Program (LCP) for professional landscapers that focuses on water use efficiency. CVWD partnered with College of the Desert (COD) (a local community college with an established Landscape Management Program), Coachella Valley Association of Governments (CVAG), and the cities, county, and neighboring water districts to implement the course and establish certification criteria for incorporation into each city's business license qualification requirements. CVWD developed the curriculum of the LCP using existing staff that hold licenses and certifications in irrigation efficiency, plant water use, horticultural practices, arboriculture, and landscape/golf course irrigation auditing. CVWD's landscaping guide, Lush & Efficient: Landscape Gardening in the Coachella Valley, provides guidelines on which plants work best in the hot, arid climate.

CVWD also hosts a Qualified Water Efficient Landscaper (QWEL) certification class each year. The QWEL certification program was created by the Sonoma County Water Agency in partnership with the North Coast Chapter of the California Landscape Contractors Association and is nationally

recognized by the U.S. Environmental Protection Agency (EPA) WaterSense program for Irrigation System Audits. The QWEL professional certification program provides landscape professionals with 20 hours of education on local water supply, sustainable landscaping, soils, water budgeting and water management, irrigation system components and maintenance, irrigation system audits, and scheduling and controller programming (QWEL, 2018). Upon completion of the course, an exam is given and participants complete an irrigation system audit. Once all components have been successfully completed, certification is earned.

Coachella Water Authority

CWA is currently offering a variety of rebate programs for indoor and outdoor water use. CWA continues to build its conservation efforts with the development of a website (https://www.conservecoachella.com/) dedicated to water conservation. CWA currently offers to its customers Conservation Programs for CII Accounts, Large Landscape Conservation Programs and Incentives, Residential Ultra Low Flow Toilet (ULFT) Replacement Programs, Residential Plumbing Retrofit, and Water Survey Programs for Single- and Multi-Family Residential Customers (CVWD et al, 2026).

The City of Coachella has a prohibition for wasting water in Municipal Code Section 13.03.044, along with a tiered rate structure for water service within its service area. CWA's water rates include a variable commodity charge (monthly charge based on the amount of water used or consumed by the customer in hundreds of cubic feet [HCF]) and a fixed metered account charge (basic monthly rate by meter size). The rates have been designed to recover the full cost of water service in the commodity charge, while discouraging wasteful water use, and will continue to be implemented into the future. Tiered rates are designed to incentivize customers to be proactive in reducing water use.



Example of landscape remodel from CWA's turf rebate program.

Desert Water Agency

DWA continues to increase its investment in outreach related to water conservation. DWA has a large section on its website featuring conservation information and program links (www.dwa.org/save), and hosts regular informational sessions, classroom curriculum, and advertising on conservation topics. To date, these investments account for significant water demand reduction within the community.

DWA's current conservation programs include a variety of landscape/outdoor incentives (Smart Irrigation Controller Program, Grass Removal Program, Efficient Nozzle Program) and indoor incentives (Residential Washing Machine Incentives, Residential Toilet Program, Commercial Toilet Program), Conservation Coupon Program, Hospitality Conservation Program, and free conservation kits for DWA customers. The agency is also developing an Advanced Metering Infrastructure network to give staff and customers access to near real-time water use information.

DWA offers large-landscape customers water use evaluations and will perform them for residential customers upon request. Customers receive a report documenting system deficiencies and outlining water-saving recommendations.

DWA hosts landscaper workshops and webinars that focus on efficient water management. A list of landscape professionals who have attended past events is posted on the DWA website.

DWA is working to reduce its own water losses through regular testing of production well meters, leak detection, leak repair, water main replacement, proactive service line replacement, customer meter testing and updated procedures.

In September 2026, DWA passed Ordinance No. 82 enacting its Water Shortage Contingency Plan. The Ordinance outlines water use restrictions to be implemented during various shortage scenarios. Ordinance 83 Water Waste Penalties and Enforcement was passed by DWA in September 2026.

Indio Water Authority

IWA continues to promote water conservation using different outlets such as social media, speaking engagements, City events, bill inserts/messaging and the City of Indio newsletter. IWA promotes water use efficiency via the agency's website (www.indiowater.org) which features conservation tips, watering guides, and links to rebates and incentives. IWA currently offers rebates and incentives for turf replacement, clothes washer and toilet replacements, smart controller installation, and irrigation upgrades. Additionally, IWA offers an online customer engagement tool where water customers can view water usage, set water use allowance notifications, and be notified of possible leaks on their property. IWA also promptly responds to water waste incidents that are reported via the State water waster portal and to IWA conservation staff.

As part of the 2025 RUWMP, IWA (along with other participating agencies) updated its Water Shortage Contingency Plan to reflect additional tiers/stages and aligned its water use restrictions as a region to better streamline communication and outreach efforts in promoting conservation.



IWA's turf rebate program encourages water use efficiency.

Previously in 2016, the City of Indio passed Ordinance No. 1684 to adopt water use efficient landscape development standards (i.e., MWELO), which applies to new development projects with an aggregate landscape equal to or greater than 500 square feet, and renovated landscape projects with an aggregate landscape area equal or greater than 2,500 square feet. IWA also completes an audited water loss report and reviews for water system distribution leaks as outlined in SB 606 to further curtail inefficient water use.

PMA 2: Turf Irrigation Reduction

Turf irrigation reduction is a major avenue of conservation within the Indio subbasin, especially in affluent areas with larger landscapes. Turf irrigation can be reduced by replacing turf with desert

friendly landscaping. Turf irrigation reduction is implemented with a combination of incentives via rebates and ordinances.

Turf Rebates

All four Agencies offer rebates to their customers for converting their outdoor turf areas to desert-friendly landscaping, which requires less irrigation. CVWD has offered a landscape conversion rebate since 2007. For residential properties, the rebate consists of $2 per square foot of landscaping or turf, up to $20,000 per project. For homeowners' associations and commercial properties, the rebate consists of $2 per square foot of landscaping or turf, up to $50,000 per project. Since 2010, 6,727 residential and 1,863 commercial/HOA rebates have been issued, amounting to a total of 27,168,547 square feet of turf conversion. CVWD performed a study of smart controllers using actual customers after having converted their landscaping and found that, on average, water savings amounted to 36% as a result of landscape conversion.

The City of Coachella Utilities Department offers a turf removal rebate program for residents. The program aims to provide examples of water-wise planting alternatives to turf in parkways and front yards. Residents who chose to replace their grass with desert-friendly landscaping can get a rebate of $3 per square foot up to $3,000 rebate.

Since 2022, DWA has approved rebates for 799 grass removal projects for homeowners' associations, businesses, and residents. The program continues to evolve as demands and community expectations shift. Two key examples are allowing backyard and private areas to be converted through the program, as well as allowing replacements with artificial turf. DWA currently offers a turf rebate of $2 per square foot, and the City of Palm Springs offers its residents a $1 match per square foot, resulting in up to $3 per square foot for Palm Springs customers.

IWA offers landscape conversion rebates for both residential and commercial properties. For residential properties, the rebate consists of $2 per square foot of landscaping or turf, up to $20,000 per project. Approved residential conversions that plant one new native tree for every 250 square feet converted are offered $3 per square foot of landscaping or turf, up to $30,000 per project. For commercial properties, the rebate consists of $2 per square foot of landscaping or turf, up to $60,000 per project. Turf conversions larger than 2,500 square feet are subject to additional requirements and review by Indio and the City of Indio Community Development Department. Under this rebate program, Indio converted 41,481 square feet of landscape in 2024 and 11,426 square feet in 2025.

Non-Functional Turf Ban

California's Non-Functional Turf Ban (AB 1572) prohibits the irrigation of non-functional turf with potable water. The ban will take effect in 2027, 2028, 2029, and 2031 for local government properties, all other institutional properties and commercial and industrial properties, common areas of homeowners' association properties and local government, public agency, and public water system properties located in disadvantaged communities, respectively. Additionally, the bill requires public water systems to revise regulations, ordinances, or policies by January 1, 2027, and to communicate those changes to customers.

DWA's Ordinance No. 80 implements the non-functional turf ban in its service area and requires entities to identify areas of non-functional turf six months prior to their respective compliance deadlines. The ordinance includes inspections to ensure compliance and up to $2,000 in fines per violation for non-compliance.

PMA 3: Golf Water Conservation

Golf water conservation has been implemented by CVWD since development of the *2002 CVWMP* and recognition that demand management was essential to balancing the Indio Subbasin. The CVWD Landscape Ordinance (Ordinance No. 1302.6), last updated December 2025, establishes uniform landscaping standards throughout the Coachella Valley. The Ordinance specifies the maximum allowable turf area and associated water demands for new golf courses, and other landscaping must use low water-using plant materials (CVWD, 2019). The Ordinance is one of the few ordinances in the State to establish turf limitations for new golf courses. In addition, CVWD has identified various methods for existing golf courses to further enhance water savings. CVWD is committed to working with new and existing golf courses to reduce water demands through programs such as irrigation system audits, scheduling irrigation with the best available science, plan checking, inspecting new golf courses for plan check compliance, and monitoring maximum water allowance compliance.

In December 2013, CVWD collaborated with the local chapter of the Golf Course Superintendents Association to create a Golf and Water Task Force. The initial objective of the Task Force was to discuss water supply issues and explore ways in which CVWD could help the 106 golf courses in its service area to reduce water use. The benefit of the collaboration has exceeded the initial goal. In 2014, the golf course representatives on the Task Force were integral in helping develop a turf rebate program that would meet the unique needs of the region's golf courses. They also identified other rebate and incentive opportunities that staff might not have considered without the valuable feedback. CVWD launched the golf course rebate program in 2015, after securing a State grant. The golf course representatives helped promote the program and in 3 years (2015-2017), 31 courses participated in the program with 8 courses participating twice. The conversions equate to 161 acres of turf removed with an estimated water savings of 956 AFY. The Task Force also adopted individual water budgets for each golf course in the service area as a tool for understanding the correct amount of water needed. In 2026, CVWD, in collaboration with the Task Force, completed a land use classification mapping of all golf courses to update water budget calculations and create a tool to regularly provide courses with information regarding their water use. The golf course representatives have been key liaisons for educating all courses about using the budgets and encouraging water conservation among all golf courses. They have also provided feedback about possible rate increases, which has had a strong influence on staff and the Board of Directors. Perhaps the most beneficial product of the Task Force is establishment of an open line of communication including invitations to speak about drought and other water issues at regional golf industry events (CVWD et al., 2021). CVWD is committed to continued participation in the Task Force. The GSAs will also continue to seek grant funding to support ongoing delivery and expansion of conservation programs focused on golf courses, including those identified by the Task Force.

One of the primary tools that CVWD applies to reduce the impact of golf courses on the Indio Subbasin is the non-potable water program. CVWD currently has 55 golf courses connected to the Mid-Valley Pipeline, the Coachella Canal, or the blended delivery systems from WRP-7 and WRP-10. The conversion of golf courses from private production wells to non-potable water reduces groundwater pumping volumes and maximizes delivery of the region's imported supplies. CVWD is committed to its ongoing non-potable water expansion.

DWA has six golf courses within its boundaries in the Planning Area. Recycled water is available to and has historically been used at four courses, but is currently only accepted at two. The other two

courses are far from DWA's recycled water infrastructure and haven't been deemed cost effective to connect.

PMA 4: Agricultural Water Conservation

CVWD has implemented agricultural water conservation efforts since preparation of the *2002 CVWMP*. Following the *2010 CVWMP Update*, a variety of agricultural conservation programs have been implemented, including grower education and training, scientific irrigation scheduling, irrigation upgrades/retrofits, and engineering evaluations. Programs with voluntary grower participation, such as the Extraordinary Conservation Measures programs, have been effective in increasing water use efficiency. The Extraordinary Conservation Measures programs were a series of voluntary agricultural conservation measures designed to compensate United States Bureau of Reclamation (USBR) for the accidental overuse of the Colorado River supplies. Through voluntary agricultural conservation, CVWD was able to pay back the overrun (73,200 acre-feet [AF]) by 2009. Between 2015 and 2018, an additional 71 acres of agricultural land were converted from flood/furrow to drip irrigation which resulted in an estimated water savings of 252 AFY (CVWD, 2021).

CVWD established the Agricultural Water Advisory Group (AWAG) in December 2015 to collaborate with other organizations and educate Valley residents about the agricultural industry's stewardship of water in the Coachella Valley. The AWAG as determined by members to discuss water issues, legislative updates, grant funding opportunities, best management practices (BMPs), and information to assist farmers. This ensures collaboration with entities such as the Natural Resources Conservation Service (NRCS), the United State Department of Agriculture (USDA), and the Agricultural Commissioner's Office (CVWD, 2021). CVWD is committed to continued participation in the AWAG. The GSAs will also continue to seek grant funding to support ongoing delivery and expansion of agricultural conservation programs, including those identified by AWAG.

An agricultural resource page is available on CVWD's website (www.cvwd.org/434/Agriculture) providing links to various organizations, articles, meeting and training dates, and any available grant information.

11.4 Water Supply Development

CVWD and DWA continue their efforts to obtain additional water supplies to meet projected water demands, increase the reliability of water supply, and avoid undesirable results associated with chronic groundwater level declines (including storage depletion, subsidence, and seawater intrusion). Sources of additional water include Colorado River water, SWP water, recycled water, exchanges, entitlements and transfers, and other water development projects. Former PMA 9: EVRA Potable Reuse has been moved to Section 11.5 and redefined as PMA 18: EVRA Recycled Water Delivery following a study that found the feasibility of potable reuse for groundwater replenishment at the site was limited.

11.4.1 Surface Water

PMA 5: Increased Surface Water Diversion

DWA's surface water rights for Chino Creek, Snow Creek, Falls Creek, and Whitewater canyon flows total 13,309 AFY. However, in different water year types, DWA has not always captured all the surface water it has had the right to divert from those sources. DWA plans to maximize diversion of

available surface water supplies, subject to hydrologic conditions, water availability, and operational constraints and deliver that diverted surface water to the Whitewater River Groundwater Replenishment Facility (WWR-GRF) for replenishment into the Indio Subbasin and subsequent extraction for use in DWA' domestic water supply system.

11.4.2 State Water Project

The State Water Project (SWP) is the nation's largest state-owned and operated power generator and water storage and delivery system designed to deliver up to 4.18 million acre-feet per year (AFY) of water to 29 SWP Contractors (Contractors) throughout California.

CVWD and DWA are two Contractors who have Water Supply Contracts with DWR for a base allocation of SWP, commonly known as Table A, which is determined annually by DWR. CVWD and DWA's current contractual maximum Table A allocations are 138,350 AFY and 55,750 AFA, respectively.

CVWD and DWA do not have a physical connection to the SWP system to deliver water directly to their service areas and rely on exchange of their SWP supplies for an equal amount of Colorado River water. The exchanged water is delivered via the Colorado River Aqueduct by The Metropolitan Water District of Southern California (MWD).

In recent years, the annual SWP reliability has decreased significantly, to about 45% of the maximum Table A. To protect the local water supplies, CVWD and DWA's Boards approved participation in two large projects – the Delta Conveyance and Sites Reservoir Projects, which are described in more details below. These additional water supplies will support CVWD and DWA's existing groundwater replenishment programs, as well as the overall groundwater sustainability in Coachella Valley.

PMA 6: Delta Conveyance Project

The proposed Delta Conveyance Project (DCP) will be constructed and managed by the DWR and will modify the SWP by adding new infrastructure in the Sacramento-San Joaquin Delta. The DCP will help the SWP capture, move, and store water between wet and dry conditions that have become our new normal as the state's climate changes. The DCP is a crucial part of the state's Water Resilience Portfolio and protects the state against future water supply losses caused by climate-driven weather extremes, sea level rise, and earthquakes.

As of late 2026, the DCP is in an advanced planning and permitting stage, with key environmental reviews completed, geotechnical work underway, and an updated cost estimate on track for mid-2027.

CVWD and DWA's Boards have approved participation in the DCP at a level of 3.78 percent and 1.52 percent, respectively.

PMA 7: Sites Reservoir Project

The Sites Reservoir Project is a reservoir that will capture and store up to 1.5 million AF of excess water from snowmelt and winter runoff from the Sacramento River for use during dry periods. The Sites Reservoir is in the Sacramento Valley and is considered "off-stream," meaning that it will not dam or impede the Sacramento River or other stream. The Sites Reservoir will operate in conjunction with other California reservoirs to increase water supply reliability and resiliency. The water storage capacity in Northern California is expected to increase by up to 15 percent because of

project implementation. Water supply and storage capacity will be made available to water purveyors throughout California who want to purchase water supply from the Sites Reservoir Project. The project has made significant advancements through the planning and permitting stages. In recent years, the Sites Project Authority has submitted applications for Water Rights, Clean Water Act, Incidental Take Permit, Biological Assessment and the Section 106 Programmatic Agreement, and developed the Mitigation Acquisition Master Plan; subsequently determining overall project schedule and strategy. In November 2023, the Final EIR was certified, and the Project was approved, which was then supported by Governor Newsom under SB 149.

Since approval, the Sites Project has been awarded over $230 million in federal grant funding from the WIIN Act, over $185 million in federal funding from the Department of the Interior, and over $218 million in State funding through Proposition 1. The Sites Project Authority continues efforts of planning and coordination of engineering activities, environmental permitting, modelling, and community outreach and engagement. Following the first land purchase in late 2024, Sites Project Authority made its first request for reservoir development and construction quote.

Since execution of the 2019 agreement, during the planning and permitting process, CVWD and DWA entered into an agreement with the Sites Project Authority to support the next phase of planning for the Sites Reservoir (Sites Project Authority 2019; 2020). CVWD and DWA are participating members at 62,340 AF and 40,521 AF of reservoir capacity, respectively. Participation at this level will result in approximately 6,200 – 6,900 AFY and 4,000 – 4,500 AFY long term average deliveries, respectively, beginning in 2035, including assumed conveyance losses. In September 2026, the Sites Authority Board and Reservoir Committee adopted the Resolution to Offer Capacity, marking the beginning of the investor commitment period where CVWD and DWA will evaluate and confirm their respective participation and funding levels for the upcoming construction phase of the project. The Sites Reservoir Project (Sites Project) is an off-stream reservoir, designed to capture winter runoff from uncontrolled streams below the existing reservoirs in the Sacramento Valley. As of late 2026, the Sites Project is in a planning and permitting phase, with the final State Water Board permit scheduled for review on November 4, 2026, and construction targeted to begin in 2027.

CVWD and DWA Boards authorized participation in the Sites Project at a level of 4.42 percent and 2.90 percent of total reservoir storage.

PMA 8: Future Supplemental Water Acquisitions

As described in Chapter 6, *Water Supply*, CVWD has various agreements with Rosedale Rio-Bravo, Glorious Lands Company, and MWD to deliver supplemental water to the Indio Subbasin.

Annual SWP deliveries vary widely depending on hydrologic and climate conditions, and SWP reliability has declined over time as environmental, regulatory, and climate changes constrain available supplies (see Chapter 4, *Water Supply*). As opportunities arise, CVWD and DWA will continue to make water purchases from programs such as SWP Article 21 and Yuba Accord Dry Year Program. CVWD and DWA intend to continue regular recharge activities in all three GRFs to maintain sustainable groundwater levels.

11.5 Source Substitution and Replenishment

Source substitution is the delivery of an alternate source of water—which includes recycled water or non-potable Canal water in the Coachella Valley—to users that currently pump groundwater. The substitution with an alternate water source reduces groundwater extraction and allows the management of groundwater in storage, particularly in areas of the mid-Valley area where groundwater levels are lower. The following discussion of source substitution PMAs is presented by water source and by location within the Coachella Valley.



Construction of the Mid-Valley Pipeline in 2009 to deliver Canal water to the Mid-Valley area

11.5.1 Colorado River Water – Non-Potable Water (NPW) Deliveries

Historically, Colorado River water (Canal water) was used almost exclusively for agricultural irrigation, with golf course irrigation beginning in 1986. Direct use of Colorado River water now includes agriculture, duck clubs and fish farms, golf courses, and construction water. This *Alternative Plan Update* assumes continuation of direct delivery to existing Canal water users.

PMA 9: Mid-Valley Pipeline

The Mid-Valley Pipeline (MVP) is a distribution network designed to transport Coachella Canal water to the Mid-Valley region, supplementing CVWD's recycled water supply for golf course and open-space irrigation. Completed in 2009, the initial phase of the MVP spans from the Coachella Canal in Indio to Water Reclamation Plant 10 (WRP-10). As of 2025, six golf courses are connected directly to the MVP upstream of WRP-10, receiving canal water exclusively. At WRP-10, canal water is blended with recycled water to serve large irrigation customers. Currently, 19 golf courses alongside other municipal users, such as schools and homeowners' associations, in the West Valley are connected to the WRP-10 system, receiving this blended supply. Recycled water deliveries are maximized, with canal water utilized to supplement peak demand periods. While no further MVP expansions are currently planned due to infrastructure costs, future expansion opportunities will continue to be evaluated through the adaptive management process.

PMA 10: East Golf Expansion

The East Valley NPW system serves 30 golf course customers, delivering an average of 18,243 acre-feet per year (AFY) between 2020 and 2024. Of these 30 golf courses, four are integrated into the Water Reclamation Plant 7 (WRP-7) recycled water system, where they receive a blended supply of recycled water and canal water (See, PMA 15: WRP-7 Recycled Water Delivery for details).

The East Golf Expansion project proposes connecting four additional golf customers in the East Valley to the Coachella Canal. These additional connections to the East Golf Expansion system are estimated to eliminate approximately 3,330 AFY of groundwater pumping. Two golf courses were connected to the non-potable system in 2025, and the remaining two golf courses are estimated to be connected to the system by 2027.

PMA 11: Oasis Distribution System



The Oasis Distribution System would further expand the Canal water delivery system to the Oasis Area.

The Oasis Distribution System is an in-lieu source substitution project that expands the Canal water delivery system to the Oasis Area. This allows for the utilization of additional Colorado River allocations under the Quantification Settlement Agreement (QSA). The project substitutes groundwater production with Canal water for agricultural irrigation and other non-potable landscape irrigation. The Oasis Area is located near the northwest margin of the Salton Sea, south of Avenue 66, west of Harrison Street, and north of Avenue 86. System improvements required to convey water to this area include construction of gravity and pressurized pipelines, surface reservoirs, pump stations, and related modification and connections to the existing irrigation system (CVWD, 2014). Phase 1 of the project has been completed with the construction of two reservoirs to provide additional storage and operation improvements and flexibility. Phase 2 includes land acquisition and construction for four reservoirs, five pump stations, and approximately 18 miles of distribution pipeline and an expansion of the irrigation distribution system to serve an additional 4,520 acres. Phase 2 of the project is currently under construction, and customers are being connected to the system. The project currently provides 12,000 AFY of water to the Oasis Area. CVWD anticipates construction to be completed in 2030.

Projected expansion would gradually meet existing and potential future pumping demands as follows:

- 12,000 AF existing offset,
- 16,500 AFY in 2027,
- 21,000 AFY in 2028,
- 23,500 AFY in 2029, and
- 27,000 AFY from 2030-2045.

11.5.2 Direct Deliveries – Recycled Water

Currently, recycled water production exceeds existing demand during the winter months, and the remaining recycled water is disposed of through onsite percolation basins. CVWD has committed to maximizing recycled water use by continuing to expand the NPW system and adding new NPW customers to eliminate land disposal and reduce nitrate load to the groundwater basin. This *Alternative Plan Update* assumes continued delivery of recycled water from WRP-7, WRP-10, and DWA WRP, along with NPW expansion consistent with growth of municipal demands and associated increases in wastewater flows and recycled water availability. CVWD has plans to begin tertiary treatment and recycled water deliveries from WRP-4 as well, which is described below.

PMA 12: WRP-10 Recycled Water Delivery

The WRP-10 distribution system delivers non-potable water to existing customers throughout Indian Wells, Palm Desert, and portions of Rancho Mirage. There are currently 22 customers served by a blend of Canal water and recycled water.



CVWD is planning to connect 29 additional customers to the WRP-10 recycled water distribution system.

CVWD has completed several NPW system expansion projects in the last 5 years. The Fiscal Year 2017-2018 NPW improvements project includes design and construction of approximately 8.5 miles of new NPW pipeline for seven new NPW connections: Oasis Country Club, Woodhaven Country Club, Palm Desert Resort Country Club, Bermuda Dunes Country Club, Marriott Shadow Ridge, Marriott Desert Springs, and Emerald Desert RV Resort, as well as construction of a new T-1 pump station with a rated capacity of 24,750 gpm for low- and high-pressure customers. The total new NPW demands for the FY 2017-2018 NPW customers is 6,810 AFY. The T1 pump station was placed in service in January 2026. Oasis Country Club, Woodhaven Country Club, Palm Desert Resort Country Club, and Bermuda Dunes Country Club connections were placed in service in May 2026. CVWD is planning to connect Marriott Shadow Ridge, Marriott Desert Springs, and Emerald Desert NPW connections by the end of the year 2030.

The Fiscal Year 2020-2021 projects includes design and construction of approximately 11.3 miles of new NPW pipeline for ten new connections, including Suncrest Country Club, Sunnylands (also known as Annenberg), Rancho Mirage Country Club, Tamarisk Country Club, Jack Ivey Country Club, Tri Palm Country Club, Southwest Church, Indian Wells Tennis Garden, Cotino (also known as Crystal Lagoon), and Palm Royale Country Club for a total new NPW demand of 5,620 AFY. The project also includes construction of a new 36-inch diameter pipeline for upsizing low-pressure capacity from WRP 10 to Cook St and Riviera Rd. Suncrest Country Club, Annenberg, Tamarisk Country Club, Jack Ivey Country Club, Palm Royale Country Club, Southwest Church, and Cotino NPW connections are planned to be placed in service in summer 2027. CVWD is planning to connect Rancho Mirage Country Club, Tri Palm Country Club, and Indian Wells Tennis Garden NPW connections by the end of the year 2030.

In addition, CVWD is planning to connect three additional large landscape and golf course customers to receive an additional 2,431 AFY from WRP-10 within the next five years. The project design is currently 90% complete. CVWD anticipates finalizing the project design and bidding the project for construction in summer 2027, with an estimated NPW delivery in the year 2030.

The expansion project will increase recycled water deliveries consistent with growth of municipal demands and associated wastewater flow up to the current WRP-10 tertiary treatment capacity of 16,800 AFY. The next phase of the project will include construction of conveyance pipelines to the Springs Country Club, Desert Island Country Club, and a future Rancho Portola golf course. It is estimated that Desert Island and Springs Country Club will be connected for NPW delivery by the end of 2030.

PMA 13: WRP-7 Tertiary Expansion

WRP-7 provides service to portions of Cathedral City, Rancho Mirage, Palm Desert, Bermuda Dunes, Thousand Palms, and some unincorporated areas of Riverside County. It currently has a secondary treatment permit capacity of 5.0 mgd and a tertiary treatment capacity of 2.5 mgd (2,800 AFY). The recycled water produced at WRP-7 meets Title 22 requirements and is used for irrigation. The NPW is either stored in an onsite covered storage reservoir or pumped offsite to an open reservoir near the Del Webb Sun City Golf Course.

CVWD currently operates the WRP 7 facility under Waste Discharge Requirements Order R7-2022-0009 (Board Order), adopted on February 8, 2022. Special Provision G.1 of the Board Order requires CVWD to either submit a work plan proposing an effluent limit of 10 mg/L or less for total nitrogen in treated wastewater discharged to the percolation ponds or submit a work plan describing its strategy to eliminate discharges to the disposal ponds.

To comply with this requirement, on October 30, 2024, CVWD submitted a work plan proposing to achieve a total nitrogen effluent limit of 10 mg/L. The Water Board approved the work plan on February 7, 2025. The work plan also identified the Non-Potable Water (NPW) System Expansion Project as a key component for meeting the alternative compliance conditions specified in Special Provision G.1.

The WRP 7 tertiary Expansion Project is critical to achieving CVWD's long-term water sustainability goals while also providing an alternative pathway to regulatory compliance. The project will expand tertiary treatment capacity at WRP-7 by 3 MGD, increasing recycled water production from the current 2 MGD (2,240 AFY) to 5.5 MGD (6,150 AFY). In addition, the project will increase storage capacity from the existing 1 MG to 6 MG and will line an existing percolation pond to provide an additional 12 MG of storage. Upon completion, the facility will have a total storage capacity of 18 MG. The project will also increase the NPW pump station capacity from the current 4,600 gpm to 10,400 gpm. Construction of the project is anticipated to begin in summer 2027, with project completion expected in summer 2030.

PMA 14: Canal Water Pump Station Upgrade

The MP 113.2 (MP 113.2) Pump Station is located at Madison and Avenue 40 on the southwest corner next to the Coachella Canal in Indio. The Canal Water Pump Station Upgrade would upgrade the MP 113.2 Canal water pump station capacity in order to convey Colorado River supply for blending with WRP-7 recycled water. This project will increase the pump station capacity from the current 2,800 gpm to a total capacity of 7,600 gpm. This project will be designed and constructed with WRP 7 Tertiary Expansion project (PMA 13).

PMA 15: WRP-7 Recycled Water Delivery

WRP-7, located west of Interstate 10, currently serves three golf courses with a blend of recycled water and Canal water from the Coachella Canal. WRP-7 has a current tertiary capacity of 2,800 AFY and delivered an average of3,478 AFY from 2021 to 2025. This project will establish four recycled water connections to add a total estimated flow of 1,864 AFY by 2030. The project design is currently 90% complete. CVWD anticipates finalizing the project design and bidding the project for construction in summer 2027, with an estimated NPW delivery in the year 2030.



Golf courses in the mid-Valley area use recycled water for irrigation.

CVWD may also increase recycled water deliveries in the WRP-7 tributary area as the surrounding areas within WRP-7's proximity are developed, resulting in the availability of increased wastewater flows. Opportunities for expansion include growth to the west of WRP-7 within proximity to the existing WRP-7 customers, as well as increased deliveries to existing customers.

PMA 16: WRP-4 Tertiary Expansion & Delivery

CVWD's WRP-4, located in Thermal, provides service to the cities of La Quinta, Mecca, and portions of Palm Desert, and Thousand Palms. Under current operations, the secondary system treats about 2.0 mgd average daily flow and does not have tertiary treatment capacity. The treatment system produces secondary effluent which is discharged to the Coachella Valley Storm Channel (CVSC) under a National Pollutant Discharge Elimination System (NPDES) permit, which has a maximum month average daily effluent flow of 9.9 mgd. The project is intended to conserve groundwater by providing agricultural and landscape irrigation customers with an alternative recycled water supply.

CVWD's tertiary treatment expansion at WRP-4 will be implemented in three phases. To avoid potential future restrictions on the minimum amount of treated wastewater that may be required to be discharged to the CVSC, Phase 1 is expected to start construction in 2027 providing recycled water by summer 2031.

The Phase 1 project will design and construct a 1 MGD tertiary treatment facility and a distribution pipeline to deliver a blend of recycled water and canal water to three large agricultural customers south of WRP 4. The project design includes a new filter feed pump station, cloth disk filters, ultraviolet disinfection system, a recycled water wet well, and a new recycled water pump station. The project will also require new Waste Discharge Requirements (WDRs) with Colorado River RWQCB and a permit amendment for the NPDES permit #CA0104973. To support project implementation, CVWD was awarded $39 million in federal grants in 2025. Once construction is completed, Phase I will deliver a blend of recycled and Canal water from WRP-4 to local agricultural customers, projecting to offset as much as 1,120 AFY of groundwater pumping.

The Phase 2 project would expand the tertiary treatment capacity to 2.5 MGD and construct additional distribution pipelines to connect new customers in the immediate vicinity of WRP 4 and is expected to be completed by the end of year 2035, subject to the availability of grant funds.

CVWD will monitor the recycled water consumption and demand following Phase 2 completion, to determine the feasibility of connecting new recycled water users. It is anticipated that Phase 3 project will be constructed by 2045, subject to the availability of grant funds.

Design is underway for the Phase 1 WRP-4 tertiary expansion, with construction anticipated in 2027 to 2031. CVWD is currently working on the Wastewater Change Petition process with SWRCB and the NPDES/WDRs permitting process with the Colorado River RWQCB. The outcomes of the Change Petition will determine the final construction timeline and recycled water delivery volumes for the WRP-4 expansion. Because Phases 2-4 are dependent on funding availability and allowable recycled water volumes under the Change Petition, only Phase 1 WRP-4 deliveries have been included in the water budget modeling.

PMA 17: DWA WRP Recycled Water Delivery

The DWA WRP project will increase deliveries of recycled water in DWA's service area as new customers are identified and consistent with wastewater flow growth up to the 11,200 AFY of existing tertiary capacity. No additional DWA WRP connections are currently planned because of infrastructure costs; however, future opportunities will continue to be evaluated.

PMA 18: EVRA Recycled Water Delivery

In 2013, IWA and Valley Sanitary District (VSD) formed a Joint Powers Agreement for the East Valley Reclamation Authority (EVRA), with the main objective to augment local water resources through beneficial water reuse. In 2024, EVRA evaluated the feasibility using treated wastewater from the existing VSD WRF for non-potable and/or potable reuse (EVRA, 2024). The study found that the feasibility of potable reuse for groundwater replenishment was limited due to an aquitard underlying the VSD WRF. Ultimately a phased approach beginning with tertiary-treated recycled water deliveries was selected, with four golf courses recommended for NPW delivery in a phased approach beginning in 2035.

In Phase 1, EVRA plans to add tertiary treatment to the VSD WRF to allow for recycled water deliveries. By 2035, the plant will be capable of producing up to 1,120 AFY of recycled water suitable for beneficial use. While deliveries will likely be initially constrained by recycled water demand and delivery infrastructure, the full 1,120 AFY of available recycled water is anticipated to be in reuse by 2050.

11.5.3 Groundwater Replenishment

Three replenishment facilities are currently operated in the Indio Subbasin (see Figure 2-5): WWR-GRF, Palm Desert GRF (PD-GRF), and Thomas E. Levy GRF (TEL-GRF). Groundwater replenishment is an important component of Indio Subbasin management. With surface spreading, water is placed in shallow ponds where it is allowed to percolate into the underlying aquifers. Surface spreading requires large areas of open land for construction of ponds and the absence of significant confining clay layers that would prevent the water from reaching the aquifers. Since 1973, CVWD and DWA have replenished the western portion of the Subbasin at the WWR-GRF with over 4.5 million AF of SWP Exchange water and at the PD-GRF with a total of 71,551 AF since starting operations in 2019. CVWD has replenished the eastern portion of the Subbasin at TEL-GRF with about 522,617 AF since full-scale operations commenced in 2009.

PMA 19: PD-GRF Expansion



The PD-GRF Expansion will expand direct replenishment capacity at PD-GRF.

The PD-GRF Expansion will expand direct replenishment capacity at the PD-GRF by 2028. Phase I, which involved repurposing and improving existing percolation ponds located north of WRP-10, was completed and began operations in early 2019. Phase II involves constructing three detention basins within the Whitewater River Stormwater Channel (WRSC) to the south of the facility, as well as extending the existing MVP within the northern bank of the stormwater channel. The EIR for Phase II was approved by CVWD's Board of Directors in 2018. Project design was completed in 2025, and construction of Phase II is anticipated to begin in 2026. This *Alternative Plan Update* assumes the PD-GRF will increase recharge capacity by 15,000 AFY to a total capacity of 25,000 AFY starting in 2028. Increased replenishment at the PD-GRF will directly improve groundwater levels in the mid-Valley portion of the Subbasin.

PMA 20: WWR-GRF Operation

The WWR-GRF has a recharge capacity of more than 300,000 AFY. The available capacity is valuable for conjunctive use operations by CVWD and DWA, as well as MWD through the Advance Delivery Agreement.

CVWD and DWA intend to replenish as much SWP Table A water or other imported water at WWR-GRF as is available annually. The highest replenishment volume received to the facility was in 2017 at 385,994 AF. The SWP Exchange supply is projected to supply on average about 76,700-82,000 AFY for the WWR-GRF (see discussion in Chapter 6, *Water Supply,* for SWP reliability assumptions). This *Alternative Plan Update* assumes the reliability of Table A deliveries of 39 to 43 percent and diversions to WWR-GRF of 90 to 92 percent (with the remaining portion sent to MC-GRF in Mission Creek Subbasin). CVWD also currently replenishes a portion of its Colorado River supply at WWR-GRF (ranging from 35,000 to 50,000 AFY), based on its *2019 Exchange Agreement* with MWD, until that water is needed in the East Valley. If additional SWP exchange water can be acquired and/or SWP reliability improved through the DCP, average annual replenishment could increase to 119,500 AFY. Further, advance deliveries from MWD may increase individual year deliveries beyond anticipated annual averages.

11.6 Water Quality Protection

Groundwater quality is an important issue in the Subbasin. The Indio Subbasin has variable concentrations of water quality constituents as documented in Chapter 4, *Current and Historical Groundwater Conditions*. Some constituents, including arsenic and hexavalent chromium, occur naturally in portions of the aquifer system. Sources of loading for TDS and Nitrate include subsurface inflow, watershed runoff, artificial recharge, wastewater percolation, septic seepage, and return flows (CV-SNMP Agencies, 2021). The GSAs conduct ongoing water quality monitoring to

understand water quality conditions. Below are the PMAs related to water quality that will help protect the groundwater basin for beneficial uses and users and avoid undesirable results.

11.6.1 Water Quality Programs and Policies

As described in Chapter 8, *Regulatory and Policy Issues*, drinking, surface, and groundwater quality is regulated by the SWRCB and its RWQCBs. The following water quality policies and programs are applicable to the Indio Subbasin:

- **Drinking Water Regulations**. The SWRCB Division of Drinking Water (DDW) regulates public water systems, oversees water recycling projects, permits water treatment devices, and supports and promotes water system security. Drinking water regulations are contained in Title 17 and Title 22 of the California Code of Regulations. Each of the GSAs in the Indio Subbasin maintains drinking water quality in compliance with DDW regulations. Note that private domestic wells are not regulated by DDW; private domestic wells and State Small Water Systems (between 5 and 14 connections) are regulated by Riverside County Department of Environmental Health (DEH).
- **Surface and Groundwater Regulations**. The Colorado River RWQCB regulates surface and groundwater within the Colorado River Basin, which includes the Indio Subbasin. The RWQCB guides water quality protection with its *Water Quality Control Plan for the Colorado River Basin Region* (Colorado River RWQCB, amended 2019), in addition to adopting and enforcing waste discharge and surface water discharge permits. Each of the GSAs in the Indio Subbasin complies with RWQCB regulations in implementation of its projects and programs.
- **Colorado River Salinity Forum**. The Colorado River Basin Salinity Control Act was passed by Congress in 1974 to address the growing salinity problem which would require cost-effective salinity control measures on the river. The Salinity Forum is a seven-state approach to lowering salinity levels by conducting triennial reviews of water quality along the river and reporting on progress achieved. Over the last 30 years, the salinity concentrations in the Colorado River have had an overall, long-term downward trend, because of the programs. Weighted average annual salinity concentrations are at or below the numeric criteria, while the Colorado River Basin States continue to develop their compact-apportioned water supply through projects and programs to meet water supply needs. The Program has successfully controlled over 1.346 million tons of salt annually and anticipates salt reduction of 1.39 million tons per year by 2029.
- **Coachella Valley Salt and Nutrient Management Plan (CV-SNMP).** To address rising salinity in groundwater, the SWRCB adopted a Recycled Water Policy in February 2009, amended in 2018, which requires the development of Salt and Nutrient Management Plans (SNMPs) for groundwater basins throughout California. The plans require basin wide management of salts and nutrients from all sources in a manner that protects groundwater quality and beneficial uses. In 2015, CVWD, DWA, and IWA produced the Coachella Valley Salt and Nutrient Management Plan (CV-SNMP) (CVWD, et al., 2015). Subsequently, the Colorado River RWQCB evaluated the plan and concluded that the 2015 CV-SNMP did not fully satisfy Recycled Water Policy requirements and provided a series of recommendations (Colorado River Basin RWQCB, 2020). In April 2021, an expanded SNMP agency group, which includes all water and wastewater agencies in the Coachella Valley, submitted a Development Workplan to address RWQCB comments with an updated CV-SNMP. This Workplan includes a detailed scope of work to update the CV-SNMP and included a new monitoring program as well. The Colorado River RWQCB approved the CV-SNMP Development Workplan and associated CV-SNMP Groundwater Monitoring Workplan in early 2021 (see also Chapter 8, Regulatory and Policy Issues) and

implementation is ongoing. Additional information on the two Workplans can be found below in Section 11.6.2.1 and 11.6.2.2.

- **Disadvantaged Communities Infrastructure Task Force.** CVWD established the Disadvantaged Communities Infrastructure (DACI) Task Force to collaborate with other entities and community members to achieve safe and affordable drinking water, wastewater, and flood control services in historically disadvantaged Coachella Valley areas. The DACI Task Force meets bi-monthly to discuss the various consolidation and infrastructure projects that are underway. CVWD, in collaboration with the DACI Task Force, completed domestic water and sanitation consolidation master plans in 2018 to prioritize the systems that are to be consolidated. The Task Force has secured grant funds, which are being used to advance water consolidation projects in the East Coachella Valley (see also Section 8.5.3 and PMA 23). In addition, CVWD has partnered with the Torres Martinez Desert Cahuilla Indians and Pueblo Unido Community Development Corporation and secured a grant award to develop a Coachella Valley Regional Water Resilience Plan (CVRWRP). The CVRWRP, to be completed by 2027, is focused on vulnerable communities. It addresses challenges related to climate risks, and supports actions to promote water resiliency, including provision of on-site water treatment.

PMA 21: Eliminate Wastewater Percolation

Currently, CVWD's WRP-7 and WRP-10, Palm Springs' WWTP/DWA's WRP, and MSWD's Nancy Wright Regional WRP all discharge to percolation ponds within the Indio Subbasin. Over the last decade, non-potable water deliveries (described under Section 11.5 above) in the Indio Subbasin have expanded dramatically and reduced wastewater percolation. The GSAs are continuing to reduce percolation of wastewater into the Indio Subbasin by continuing to implement source substitution efforts. The GSAs continue to work with the Colorado River RWQCB to acquire permits for recycling of municipal wastewater, which will both protect groundwater quality and deliver a reliable new water supply to local customers.

PMA 22: Wellhead Treatment

The Wellhead Treatment project will assess the need to expand groundwater treatment facilities to treat additional wells in the future for arsenic, nitrate, chromium-6, or other constituents of concern.

Elevated concentrations of nitrate exist in some western areas of the Indio Subbasin (see Chapter 4, *Current and Historical Groundwater Conditions*), reflecting natural and human-induced sources. Generally, wells with high nitrate concentrations are relatively shallow, and deeper groundwater tends to be higher quality. Naturally elevated arsenic concentrations in groundwater also have been found in the East Valley, northwest of the Salton Sea (see Chapter 4, *Current and Historical Groundwater Conditions*) with indications of higher concentrations at depth. Chromium-6 has been detected at elevated concentrations in the mid-to-southeastern portion of the Indio Subbasin (see Chapter 4, *Current and Historical Groundwater Conditions*). Chromium-6 appears to be naturally occurring, with lower concentrations in shallow groundwater and decreasing concentrations in areas where Colorado River water is used to replenish groundwater.

Wellhead treatment technology can be designed to remove selected constituents (such as nitrate, arsenic, and chromium-6) in drinking water wells that exceed the maximum contaminant levels (MCLs). The GSAs are seeking grant funding for and have installed or are planning for chromium-6 treatment (see Chapter 8, *Regulatory and Policy Issues*). The GSAs are continuing to monitor the development of new MCLs and to report on groundwater quality. In addition, the GSAs have been

seeking grant funding to consolidate small water systems with recurring violations (see below) and will evaluate the feasibility of installing wellhead treatment on GSA wells to ensure delivered drinking water meets state and federal MCLs established to protect public health.

PMA 23: Small Water System Consolidations

Small water systems, often serving disadvantaged communities (DACs), may face challenges in providing safe, accessible, and affordable water because they may not have adequate resources to support maintenance, operation, and treatment costs. Primarily within the East Valley, the GSAs are working to extend public water and sewer service to mobile home park communities with deficient infrastructure and poor water quality. In 2018, CVWD completed the East Coachella Valley Water Supply Project (ECVWSP), a master planning effort to identify and prioritize small water systems within the East Valley that could benefit from consolidation with its public water system. The master planning effort involved representatives from SWRCB, DEH, and multiple non-profits through the DACI Task Force. Over 80 small water systems currently relying on private groundwater wells and septic systems were identified. The ECVWSP grouped the systems into approximately 40 water consolidation projects based on proximity to each other and to CVWD's existing facilities. In 2026, CVWD began working on an ECVWSP update by identifying and ranking eligible small water systems for consolidation.

In 2025, CVWD completed the Avenue 66 Transmission Main and Water Consolidation project. This project now provides the critical backbone infrastructure to immediately connect three mobile home parks to CVWD's domestic water system, as well as up to 35 future connections. The Avenue 66 project included the installation of approximately 26,723 linear feet of 30-inch-diameter water transmission main pipe along Avenue 66 and approximately 4,463 linear feet of 12-inch-diameter water transmission main along Lincoln Street, in the unincorporated area of Riverside County. Saint Anthony, Seferino Huerta, and Manuela Garcia are the three mobile home parks being connected. The Avenue 66 transmission main also provides a reliable water supply to CVWD's domestic water system, which serves the communities of Mecca, North Shore, and Bombay Beach.

The ECVWSP identified additional water consolidation projects, which CVWD will continue to implement as funding becomes available in the future. Design for the Valley View Water Consolidation project has been approved by SWRCB and is moving into construction. Design for the Valley View Sewer Consolidation project is waiting on SWRCB approval. The Highway 86 Transmission Main project is moving into the design phase. The Avenue 66 Trunk Sewer project is delayed and waiting on a tribal easement. Current project funding includes a $23.4 million grant from SWRCB, a $7 million grant from DWR, appropriated through the Budget Act of 2021 and supported by former Assemblymember Eduardo Garcia, $1.2 million from Proposition 1 Round 1 Integrated Regional Water Management (IRWM) implementation grant, and $165,665 from a Disadvantaged Community Involvement grant.

IWA is consolidating one small mutual water system (Carver Tract Water Systems) and is working with the SWRCB to consolidate Riverdale Estate located in the City of Indio.

CWA is also working to consolidate multiple mobile home parks within its service area to address water quality deficiencies identified by DEH. CWA completed consolidation of the Castro Mobile Home Park in 2025 and the consolidation of additional two small mutual water systems (Mesquite and Shady Lanes Mobile Home Park) in early 2026.

PMA 24: Septic to Sewer Conversions

Septic systems are a significant, documented source of nitrate to the groundwater basin. The Colorado River RWQCB has adopted septic tank prohibitions in areas where high septic tank density has caused water quality degradation. Conversion from septic systems to sewer can offset a large proportion of this existing nitrate source to the basin. CVWD is pursuing a number of septic to sewer conversions to improve groundwater quality and sanitation within small communities in the East Valley. In 2018, CVWD completed the ECVWSP to identify and prioritize parcels with septic systems within the East Valley that could benefit from consolidation with its public sanitation system. The master planning effort involved representatives from SWRCB, DEH, and multiple non-profits through the DACI Task Force. Nearly 90 individual septic systems were identified, ranked, and prioritized for consolidation. The effort screened the priority systems to 55 and then grouped those into 18 sanitation consolidation projects based on proximity and potential to develop a backbone system in the East Valley.

Several of the top five ranked consolidation projects in the master planning process – El Mesquite, Sunbird, Airport Blvd, Monroe Street, and Avenue 66 – are currently in the preliminary design, environmental compliance, and funding phases. Construction for those projects is anticipated to begin within the next five years. CVWD will continue to implement consolidations as funding becomes available in the future.

DWA is partnering with the City of Cathedral City on a septic-to-sewer project for the Lakeview Villas community. The Project is currently in the design phase, with design anticipated to be completed in 2027. Construction is expected to begin in 2028. The Project received funding through the CWSRF for design, and funding is being sought for the construction phase.

11.6.2 Coachella Valley Salt and Nutrient Management Plan (CV-SNMP)

The CV-SNMP is being developed by the CV-SNMP partners (CVWD, Coachella Sanitary District, City of Palm Springs, CWA, DWA, IWA, Mission Springs Water District, Myoma Dunes Mutual Water Company, and VSD) in accordance with the *Recycled Water Policy* and consistent with this *2027 Alternative Plan Update*. This chapter contains two PMAs to support the CV-SNMP. As summarized below, these PMAs are to implement the *CV-SNMP Groundwater Monitoring Program Workplan* and the *CV-SNMP Development Workplan*.

PMA 25: Implement CV-SNMP Groundwater Monitoring Program

The GSAs, along with the other CV-SNMP partners, are implementing the *CV-SNMP Groundwater Monitoring Program* according to the *Monitoring Workplan* approved by the RWQCB in 2021. This workplan outlines the expanded groundwater monitoring program to document concentrations of TDS and N in groundwater. The Monitoring Program covers all Subbasins within the Coachella Valley Groundwater Basin except for the San Gorgonio Pass Subbasin; includes sampling from the deep, shallow, and perched zones of the aquifer; focuses on critical areas near large WRPs, GRFs, and other potential sources of loading; and emphasizes areas near production wells. The CV-SNMP Monitoring Program is coordinated with the SGMA Alternative Plan Monitoring Program and establishes the monitoring network, sampling frequency, and reporting for the CV-SNMP. Monitoring data are reported to the GAMA system. It also has identified gaps to be filled in the CV-SNMP monitoring network.

Implementation of the CV-SNMP Groundwater Monitoring Program started in 2021 with initiation of the first triennial monitoring cycle. To fill identified monitoring gaps, sixteen monitoring wells were installed from 2022 through 2025. In addition, in WY 2023, the CV-SNMP partners completed an MOU with the Agua Caliente Band of Cahuilla Indians for sharing of water level and water quality data from three monitored wells on Trust land. In WY 2024, the GSAs (with the other CV-SNMP partners) completed the first triennial monitoring cycle (2021-2023) and initiated monitoring for 2024-2026 triennial monitoring. In 2024 and 2025, DWA constructed two new water quality monitoring wells in partnership with DWR's TSS program.

Monitoring of the CV-SNMP network wells is ongoing. Since the start of the Monitoring Program, the CV-SNMP agencies have completed five annual monitoring progress reports and two triennial monitoring cycles. The CV-SNMP partners continue to monitor and deliver annual progress reports to the RWQCB.

PMA 26: Implement CV-SNMP Development Workplan

The GSAs, along with the other CV-SNMP partners, are implementing the *CV-SNMP Development Workplan* submitted to the RWQCB in April 2021 and approved in September 2021. The Development Workplan outlines a scope of work for updating the CV-SNMP in accordance with the *Recycled Water Policy*. The Development Workplan establishes a collaborative approach for evaluating and managing salts and nutrients from all sources throughout the Coachella Valley Groundwater Basin, including importation of Colorado River water, in order to protect beneficial uses. Implementation of the Workplan includes characterizing current groundwater quality and loading, developing N/TDS forecasting methodologies, completing forecasting for multiple scenarios, selecting a preferred scenario, establishing management zones, and recommending TDS objectives.

The Workplan also has established a CV-SNMP stakeholder group and Technical Advisory Committee (TAC). The TAC has met regularly with CV-SNMP agency representatives and RWQCB staff to review technical work products and provide input on key assumptions, modeling approaches, and management strategies. In support of implementation, the TAC has published a series of Technical Memoranda (TMs) that have been released for public review and comment, including:

- Final Task 1 – Characterize TDS/N Mass Loading to the Coachella Valley Groundwater Basin
- Final Task 2 – Characterize Current Groundwater Quality
- Final Task 3 – Delineate Draft Management Zones and Describe Metrics to Characterize Beneficial Use Protection
- Final Task 4 – Develop Technical Approach for Forecasting TDS/N Concentrations in Groundwater

Three upcoming TMs will summarize computer modeling scenarios for forecasting TDS/N, and characterize and compare costs of baseline and forecasting scenarios:

- Task 5: Construct TDS/N Forecasting Tools and Evaluate the Baseline.
- Task 6: Forecast of TDS/N Concentrations, and
- Task 7: Characterize and Compare Costs.

The Final CV-SNMP will present the entire SNMP; completion of the SNMP is scheduled for 2027.

To support these efforts, the Agencies secured a $200,000 USBR WaterSMART Applied Science grant to help develop the MSCB fate and transport model. The Agencies have expanded stakeholder engagement through development of a project website and public workshops. The Agencies will continue to support implementation of the CV-SNMP Development Workplan.

PMA 27: Colorado River Basin Salinity Control Forum

The Salinity Forum, which is a cooperative effort involving federal, state, and local agencies, includes projects that remove salt tonnage. This will be accomplished principally by reducing the salt contributions to the Colorado River from existing sources and minimizing future increases in salt load caused by human activities. CVWD and DWA will continue to support and participate in Salinity Forum efforts, including construction of salinity control measures (for example, prevention of inflow to the river from saline springs), advancement of policies for effluent limitation (for example, policies addressing discharges from fish hatcheries), and implementation of non-point source management plans (for example, improved irrigation practices).

PMA 28: Source Water Protection

Well management programs are required to ensure that existing and future wells do not impact the usability of the groundwater resource. Specific programs applicable to the Coachella Valley are well construction/destruction/abandonment policies, artesian well management, and well capping:

- **Well Construction, Destruction, and Abandonment**. Improperly constructed wells can result in poor yield and contaminated groundwater by establishing a pathway for pollutants to enter a well, allowing migration between aquifers of water with varying quality, or enabling the unauthorized disposal of waste into the well. Inactive or improperly abandoned wells present a physical danger and can allow groundwater pollution. Existing well construction, destruction and abandonment policies will be strengthened and implemented in cooperation with Riverside County DEH.
- **Leaking Artesian Well Rebate Program**. Historically, artesian groundwater conditions existed in much of the East Valley. Artesian flows occurred in decreasing amounts until the early 1990s (CVWD, 2010). As water management actions in the Indio Subbasin restore water levels, artesian conditions may reoccur. However, most wells are not properly equipped to deal with artesian pressure. CVWD will continue to implement the Leaking Artesian Well Rebate Program to educate and work with well owners to properly control artesian wells to avoid unnecessary waste of water and the potential for property damage.

11.7 Completed Projects

The PMAs in this section were completed within the last five years and have been removed from the active PMAs list.

PMA: Mid-Canal Storage Project

Additional storage near the middle of the existing Coachella Branch of the All-American Canal (Coachella Canal) spreads out large flow changes over several hours and reduces peak flows through the Canal. Mid-system storage attenuates large flow changes that might otherwise exceed existing drawdown criteria or exceed capacity near the Canal's downstream end.

To this end, CVWD increased water storage through the creation of an inline reservoir along the Coachella Canal. The Mid-Canal Storage Project was completed in 2024 and has increased storage by 728 acre-feet (AF) by removing the existing embankment between the current lined canal with the original earthen canal section to form a single wide trapezoidal reservoir section. The materials removed were used to construct more gradual canal side slopes (from 1.5:1 to 3:1) and raise the invert two feet higher. This additional storage will allow CVWD to manage common, but unpredictable, events by providing for capture during excess water events for use during deficit water events. During drought periods, the additional backup supply will improve efficient use of water and limit waste.

PMA: TEL-GRF Expansion

Construction of the full-scale TEL-GRF was completed in mid-2009. This facility is located on the east side of the Subbasin in La Quinta and has an estimated average recharge design capacity of 40,000 AFY. Currently, the capacity is limited by hydraulic and water delivery constraints within the Canal water distribution system to a long-term average of about 37,000 AFY. CVWD conducted a study in 2017 to evaluate the feasibility of increasing groundwater replenishment with Colorado River water at the TEL-GRF. The study recommended additional monitoring to better characterize hydrogeological conditions, and six monitoring wells were installed in 2019 (CVWD, 2020a). Based on the results of the additional monitoring, TEL-GRF recharge was increased incrementally to 40,000 AFY in 2025. Groundwater levels have increased following the TEL-GRF expansion, with artesian conditions observed near the facility.

11.8 Deferred Projects

The PMAs contained in this section have been determined by the GSAs as currently unfeasible or unnecessary at this time given Indio Subbasin conditions; however, they are retained here for future reference in case Indio Subbasin conditions change and additional management strategies are needed or if projects become feasible in the future. The *2010 CVWMP Update* includes more detailed description of these projects. The deferred projects include the following:

- **Intentionally Created Surplus Program**. The potential may exist to develop additional supply under the Intentionally Created Surplus (ICS) program. The ICS program was created by the *Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead* in December 2007 (USBR, 2007). CVWD is currently not participating in the ICS program.
- **Yuma Desalter Saved Water**. The Yuma Desalter was constructed by USBR in 1992 to treat saline agricultural return flows from the Wellton-Mohawk Irrigation and Drainage District. The plant has been maintained since construction but only operated three times since then. Given that the Yuma Desalter has not been operated in the past 10 years, this project has been deferred.
- **Development of Fargo Canyon Subarea Supplies**. Growth in Indio Subbasin areas northeast of the San Andreas fault will create additional demands for both potable and non-potable water. CVWD and the cities of Coachella and Indio would need to investigate groundwater resources in the Fargo Canyon Subarea of the Desert Hot Springs Subbasin to determine the available supply and suitability for meeting demands in the area.
- **Stormwater Capture**. Stormwater capture has been identified as a potential method to augment local water supplies. Short duration, high intensity storms inducing large flows make it

cost prohibitive for long term capture. The cities and unincorporated communities within the Plan Area – through the *Municipal Separate Storm Sewer System (MS4)* permit – require local runoff induced by increased impervious area related to new developments to include stormwater capture and recharge infrastructure. The potential yield of these smaller systems is not known at this time. Consequently, stormwater capture is categorized as deferred but may be considered in conjunction with other projects that construct stormwater and flood control facilities.

- **Storage Opportunities with Imperial Irrigation District (IID)**. As part of the QSA, CVWD and IID have signed an agreement that allows IID to store surplus Colorado River water in the Coachella Valley. This program would benefit Coachella Valley by providing higher levels of groundwater storage while IID water is stored in the Valley. However, IID does not actively use the Indio Subbasin for conjunctive use.
- **Urban Water Treatment**. The use of Canal water for potable uses would require treatment to meet drinking water regulations. In 2008, CVWD completed a pilot treatability study for Canal water (Malcolm-Pirnie, 2008) which investigated three alternative treatment approaches for meeting the Surface Water Treatment Rule and providing RO to reduce the salinity of Colorado River water delivered for urban use. This project has been categorized as deferred because direct treatment and use of Canal water is not planned by CVWD.
- **Colorado River Desalination**. This project proposes to construct three or more separate RO treatment facilities, one at each recharge location, to remove the salt and other minerals from Colorado River water and to recharge the treated water into the Subbasin. However, this project has been categorized as a deferred project because the size, complexity, and intermittent operation of required treatment facilities would be cost prohibitive, exceed available renewable energy supplies, and would require a feasible plan for brine disposal.
- **Construction of SWP Extension**. This project includes direct delivery of SWP through the construction of an SWP extension of the California Aqueduct. A direct connection to the terminus of the East Branch of the California Aqueduct in Cherry Valley would require at least 23-miles of conveyance pipeline. This project has been categorized as a deferred project because construction of such a pipeline (or aqueduct) is an expensive alternative to the existing exchange agreement with MWD and could adversely impact this agreement resulting in significant reductions in SWP supplies. Additionally, project permitting and approvals present uncertainty, and there would be a significant environmental impact. In addition, direct importation of SWP water would most likely result in the loss of approximately 100,000 AFY of Colorado River water that results from the exchange of SWP water for QSA water from MWD.
- **Drain Water Desalination**. Drain water desalination was recommended for irrigation purposes and considered a maximum of 100,000 AFY to be delivered to the Canal water distribution system. CVWD has concluded drain water desalination is not needed at this time to meet projected demands and is therefore categorized as a deferred project.
- **Ocean Water Desalination**. Coastal communities in Southern California are developing and implementing ocean water desalination. Though opportunities to work with coastal communities to develop ocean water desalination may arise in the future, ocean water desalination has been categorized as a deferred project as it is more expensive than other sources of water, is energy intensive, and requires multiple agreements to implement.

11.9 Removed Projects

PMA Lake Perris Dam Seepage Recovery Project

The Lake Perris Dam Seepage Recovery Project was originally developed by DWR to collect and distribute SWP water seeping under the Lake Perris Dam for delivery to MWD in addition to its current allocated Table A water. The project consists of installing an integrated recovery well system downgradient from the face of the Lake Perris Dam that would include up to six (6) new seepage recovery wells and a conveyance pipeline connecting the wells to MWD's CRA. In 2021, DWR and MWD completed environmental reviews, prompting CVWD and DWA to participate in the project and commit to provide funding for the environmental analysis, planning, and preliminary design of the project. Subsequently, geotechnical investigations and groundwater modeling were completed. As these technical studies progressed, project findings revealed conditions that diverged from the original assumptions and underlying the project's scope, resulting in a reassessment of project feasibility and implementation considerations.

Arising scope complications, along with evolving regulatory considerations related to emerging contaminants, introduced further concern to implementation of the project. Based on these factors, MWD determined that it would not continue its participation in the Lake Perris Dam Seepage Recovery Project. After communication between MWD and both agencies, and reviewing technical findings and project considerations, staff from both DWA and CVWD agreed with MWD's assessment and supported the decision to discontinue the project.

11.10 PMA Implementation

The sections above provide a menu of potential PMAs that could be selected and implemented by the GSAs, depending on the outcomes of the monitoring programs and adaptive management process. Table 11-4 includes the implementation actions necessary to move these projects and programs forward to ensure Indio Subbasin sustainability.

11.10.1 Funding Opportunities

Outside grants should be sought to reduce the cost of implementation to participating agencies and the communities. Financing options under consideration include grants and loans for projects and management actions and other planning/feasibility analysis needed to support Plan implementation. Funding through grants or loans has varying levels of certainty and may be available for some implementation activities. The potential sources of grants and loans include:

- **Sustainable Groundwater Management (SGM) Grant Program** administered by DWR. DWR continues to administer grant funding to support GSAs and eligible entities implementing GSAs and Alternative Plans. Proposition 4 authorized approximately $386 million statewide for groundwater sustainability, groundwater storage, groundwater banking, and SGMA implementation activities. Draft guidelines were released in August 2026 with the anticipation of the concept proposals due mid-2027. Eligible projects include recharge and conjunctive use projects, subsidence management actions, activities addressing DWR Recommended Corrective Actions, agricultural land adaptation projects, conveyance improvements, groundwater storage projects, and other implementation measures.
- **Technical Support Services for GSPs** administered by DWR. Technical Support Services provides direct technical assistance to GSAs to support SGP implementation. Available services may

include monitoring well installation, geologic and geophysical logging, groundwater quality sampling, telemetry installation, groundwater level monitoring, modeling support, mapping, and related technical investigations.

- **Clean Water State Revolving Fund** and **Drinking Water State Revolving Fund** loan programs administered by SWRCB. The SWRCB administers low-interest financing programs for drinking water, wastewater, recycled water, groundwater recharge, treatment facilities, conveyance infrastructure, and related water supply reliability improvements. Financing is generally available year-round through a continuous application process, subject to SRF requirements and annual funding availability.
- **Water Recycling Funding Program,** Planning and Construction Grants from SWRCB. The program provides grants and low-interest financing for recycled water facilities, groundwater recharge, indirect potable reuse, surface water augmentation, distribution systems, treatment facilities, and storage infrastructure. Proposition 4 funding has added new funding opportunities for recycled water construction projects and large-scale recycled water programs. Groundwater recharge using recycled water may be particularly relevant when identified in the Alternative Plan as a groundwater sustainability action.
- **Infrastructure State Revolving Fund Loan Program** administered by the California Infrastructure and Economic Development Bank (I-Bank), which are low interest loans of up to $25 million per applicant and considered on a rolling basis. Eligible water-related projects may include water supply reliability, recycled water, conveyance improvements, treatment facilities, and other public infrastructure investments. Loans are generally available on a rolling basis.
- **Title XVI Water Recycling and Reclamation** and associated Water Infrastructure Improvements for the Nation Program administered by USBR. The USBR provides funding for construction of water recycling and reuse projects through the Title XVI Program. Projects must be supported by an approved Title XVI Feasibility Study and are generally eligible for federal cost-share funding subject to annual appropriations and program limits. Feasibility Study Grants are also granted by USBR to evaluate water recycling and reclamation opportunities. Eligible studies may include engineering, environmental, institutional, economic, and feasibility analyses required to advance future recycled water projects toward implementation.
- **Watershed Resilience Program (WRP) Planning+ and Conservation Implementation** grants administered by DWR. The Coachella Valley IRWM Region can pursue grant funding through DWR's Watershed Resilience Program (WRP) through their Proposition 4 Planning + grant solicitation anticipated in 2027. The Coachella Valley IRWM Region will need to request planning funding to revise the IRWMP to meet the new WRP requirements. The eligible projects for the WRP program may include watershed resilience, regional water management, climate adaptation, groundwater recharge, water supply reliability, ecosystem enhancement, and multi-benefit projects. The Conservation Implementation eligible projects may include watershed restoration, nature-based solutions, floodplain reconnection, and climate resilience strategies.
- **Multibenefit Land Repurposing Program (MLRP)** administered by the Department of Conservation (DOC). For areas facing agricultural transition, groundwater overdraft, or land fallowing, the MLRP can support alternative land uses that reduce groundwater demand while providing habitat, flood, recharge, or community benefits. This program often complements SGMA implementation efforts and should be considered. Draft Guidelines for the $200 million in Proposition 4 MLRP are expected in 2026 with grant solicitations in 2027. The MLRP projects can include, but are not limited to, agricultural land retirement and transition, groundwater recharge basins, habitat restoration, floodplain restoration, grazing conversion, solar-integrated

recharge projects, wildlife corridors, pollinator habitat, and community open space and climate resilience projects.

Table 11-4 *Alternative Plan Update* Implementation Actions

Activity Name	Project Proponent(s)	Activity Name	Activity Description
Water Conservation			
PMA 1: Urban Water Conservation	CVWD, DWA, IWA, CWA	Outreach/Education and CV Water Counts	Continue to implement public information programs, including CV Water Counts. Educate the public on conservation programs being planned and/or implemented, as well as educational tips that customers can use to lower their water usage. Includes publications, demonstration gardens, workshops, community events, website, social media, and a school education program.
	CVWD, DWA, IWA, CWA	Water Shortage Contingency Plan (WSCP)	Implement WSCP as needed in response to drought conditions. Implement supply augmentation, demand reduction, and operational changes as needed to meet declared shortage level.
	CVWD, DWA, IWA, CWA	Grant Funding	Pursue grant funding to fund urban water conservation programs at a higher level, as needed.
	CVWD, DWA, IWA, CWA	Update and Implement Water Rates	Update Replenishment Assessment Charge and all water and sewer rates as necessary per cost of service studies. Consider tiered rates. Implement updated rates.
	CVWD, DWA, IWA, CWA	Leak Detection/Water Loss	Continue to implement water loss reduction programs and practices.
	CVWD, DWA, IWA, CWA	Implement Landscape Ordinance	Continue to implement MWELO, including plan checks.
	CVWD, DWA	Water Audits	Continue to implement Large Landscape Irrigation Audit Program to assist users in maximizing the efficient operation of their irrigation system by measuring performance, generating irrigation schedules and recommending improvement actions.
	CVWD, DWA	Professional Landscaper Training	Continue to host an LCP for professional landscapers that focuses on water use efficiency.
	CVWD, DWA	Water Waste Program/Patrols	Actively patrol the service area for water waste violations. Unresolved issues result in increasing fines to customers.
	CVWD, DWA, IWA, CWA	Indoor Rebates	Implement indoor rebate programs, designed to assist homeowners and commercial customers who want to reduce their water usage by upgrading or replacing devices, or installing new technology to improve efficiency.

Activity Name	Project Proponent(s)	Activity Name	Activity Description
	CVWD, DWA, IWA, CWA	Landscape/Outdoor Rebates	Implement landscape/outdoors rebates, designed to assist homeowners, HOA, and commercial customers who want to reduce their outdoor water usage by converting their lawn to desert-friendly landscaping, installing smart irrigation controllers, or improving the efficiency of their systems. Reducing outdoor usage is the best way to meet a monthly water budget.
PMA 2: Turf Irrigation Reduction	CVWD, DWA, IWA, CWA	Non-Functional Turf Ban	Restrict the use of potable water for irrigation of ornamental turf in public agency, CII, and HOA common areas via ordinance.
	CVWD, DWA, IWA, CWA	Turf Conversion Rebates	Implement landscape/outdoors rebates, designed to assist homeowners, HOA, and commercial customers who want to reduce their outdoor water usage by converting their lawn to desert-friendly landscaping
	CVWD, DWA, IWA, CWA	Grant Funding	Secure grant funding as available for non-domestic turf removal rebates.
PMA 3: Golf Water Conservation	CVWD	Golf & Water Task Force Meetings	Continue to meet bi-monthly, or as needed, with Golf & Water Task Force to discuss conservation programs that support golf courses.
	CVWD	Model Golf Course Water Budgets	Continue to create model water budgets for area golf courses and provide that information to the courses. While the courses are not billed according to those budgets (see water budget based tiered rates below), they can use the budget as a tool to determine their efficiency rates.
	CVWD	Golf Course Education Programs	Develop golf course incentive programs that provide education for golf course managers on water use efficiency.
	CVWD, DWA	Grant Funding	Secure grant funding as available to create incentive programs for water use efficiency such as lake liner programs, irrigation efficiency programs, or turf removal rebates.
	CVWD	Conservation Study	Complete a Conservation Study to better quantify potential savings from implementing current or proposed golf conservation programs, relative cost on an AF basis, and potential for future savings as needed.

Activity Name	Project Proponent(s)	Activity Name	Activity Description
PMA 4: Agricultural Water Conservation	CVWD	AWAG Meetings	Continue to meet bi-annually with AWAG to discuss any updates that impact the agricultural community and receive input from local farmers.
	CVWD	Agricultural Efficiency	Work with other agencies and organizations through AWAG to identify projects and programs that could assist farmers, including small farmers, on improving water use efficiency.
	CVWD	Agricultural Resource Page	Maintain agriculture page on CVWD website with links to resources such as agricultural articles, grants and rebates, meetings and groups, education, and trainings.
	CVWD	Grant Funding	Secure grant funding to create incentive programs for water use efficiency such as flood-to-drip rebates, soil sensor programs, or irrigation fixture upgrades.
	CVWD	Conservation Study	Complete a Conservation Study to better quantify potential savings from implementing current or AWAG identified programs, relative cost on an AF basis, and potential for future savings as needed.
Water Supply Development			
PMA 5: Increased Surface Water Diversion	DWA	Surface Water Diversions	Increase surface water diversions for replenishment at WWR- GRF for use in its domestic water supply system.
PMA 6: Delta Conveyance Facility	CVWD, DWA	DCP Deliveries	Continue participation in DCP, anticipated to increase Table A and Article 21 deliveries by 20,800 with completion anticipated by 2047.
PMA 7: Sites Reservoir	CVWD, DWA	Sites Reservoir	Continue participation in Sites Reservoir, which captures and stores stormwater flows from the Sacramento River for release in dry years. Deliveries at 11,500 AFY (participation amount with assumed 30% conveyance loss) beginning in 2035.
PMA 8: Future Supplemental Water Acquisitions	CVWD, DWA	Supplemental Water	Enter into new agreements for Supplemental water, as available from SWP or Colorado River.
Source Substitution and Replenishment			
PMA 9: Mid-Valley Pipeline (Canal Only Customers)	CVWD	Mid-Valley Pipeline Golf Course Connections	Evaluate future opportunities for expansion of Mid-Valley Pipeline deliveries through adaptive management process.
PMA 10: East Golf Expansion	CVWD	East Golf Expansion	Deliver Canal water to 2 additional golf courses in East Valley by 2027.
PMA 11: Oasis Distribution System	CVWD	Oasis Distribution System	Continue to expand the Canal water delivery system to the Oasis area, with 15,000 AFY of additional supply by 2045. Substitute groundwater production with Canal water for agricultural irrigation and other non-potable landscape irrigation.
PMA 12: WRP-10 Recycled Water Delivery	CVWD	Non-Potable Water Golf Course Connections/Construction	Add non-potable connections to the Cotino by Disney Community, Tamarisk Country Club, Sunnylands, Suncrest Country Club, Jack Ivey Ranch, Palm Royale Country Club, and Southwest Church, beginning in 2027 with completion by 2035.

Activity Name	Project Proponent(s)	Activity Name	Activity Description
PMA 13: WRP-7 Tertiary Expansion	CVWD	WRP-7 Tertiary Treatment Expansion and MP113.2 Pump Station Upgrade/Construction.	Construct an expansion of the tertiary system by 3 mgd for a total capacity of 5.5 mgd, add a 5-million-gallon tertiary water storage bladder, repurpose a land disposal pond to accept secondary effluent for pretreatment, and upgrade the capacity of the MP 113.2 canal water pump station. The project will expand non-potable water landscape irrigation to area golf courses.
PMA 14: Canal Water Pump Station Upgrade	CVWD	Canal Water Pump Station Upgrade	Design and construct upgrade to MP 113.2 Canal Water Pump Station to convey Canal water for blending with WRP-7 recycled water. Construction completion is anticipated by Summer 2030..
PMA 15: WRP-7 Recycled Water Delivery	CVWD	Non-Potable Water Golf Course Connections/ Design & Construction	Design and construct non-potable water connections to Talavera Residential Community, Young's Family Farms, and Shadow Hills High School, and Shadow Hills North Golf Course. The project will expand non-potable water landscape irrigation to area golf courses. Completion is anticipated by 2029.
PMA 16: WRP-4 Tertiary Expansion & Delivery	CVWD	Phase 1Tertiary Expansion and New Customer Connections/Construction	Construct an expansion of the tertiary system for 1 mgd of total treatment capacity. The project will expand non-potable water to area irrigation customers.
	CVWD	Phase 2 Tertiary Expansion and New Customer Connections/Construction	Construct an expansion of the tertiary system for 2.5 mgd of total treatment capacity. The project will expand non-potable water to area irrigation customers.
	CVWD	Phase 3 Tertiary Expansion and New Customer Connections/Construction	Construct an expansion of the tertiary system for 10 mgd of total treatment capacity. The project will expand non-potable water to area irrigation customers.
	CVWD	Phase 4 Tertiary Expansion and New Customer Connections/Construction	Construct an expansion of the tertiary system for 20 mgd of total treatment capacity. The project will expand non-potable water to area irrigation customers..
PMA 17: DWA WRP Recycled Water Delivery	DWA	DWA WRP Recycled Water	Increase deliveries of recycled water in DWA's service area consistent with existing customer demands, wastewater flow growth and new cost-effective connections.
PMA 18: EVRA Recycled Water Delivery	IWA	VSD WRF Tertiary Treatment and New Customer Connections/Construction	Add tertiary treatment to the VSD WRF to allow for recycled water deliveries to four golf courses beginning in 2035.

Activity Name	Project Proponent(s)	Activity Name	Activity Description
PMA 19: PD-GRF Expansion	CVWD	Palm Desert Groundwater Facility - Phase II	Construct three groundwater replenishment basins to receive Colorado River water within the Whitewater River Stormwater Channel. A groundwater replenishment facility will serve to help mitigate historical groundwater level declines within the West Whitewater River Sub-basin Area. Approximately an additional 15,000 AFY of Colorado River water will be delivered via the adjacent Mid-Valley Pipeline, for a total replenishment in the near vicinity of 25,000 AFY.
PMA 20: WWR-GRF Operation	CVWD, DWA	Maximize WWR-GRF Replenishment	Continued operation of WWR-GRF at maximum available replenishment water. If additional SWP exchange water can be acquired, increase replenishment.
Water Quality Protection			
PMA 21: Eliminate Wastewater Percolation	CVWD, CWA, DWA	Eliminate Wastewater Percolation	Eliminate wastewater percolation. Recycle water that would have been percolated to be protective of water quality.
PMA 22: Wellhead Treatment	CVWD, DWA, IWA, CWA	Wellhead Treatment	Assess the need to expand groundwater treatment facilities to treat additional wells in the future for arsenic, nitrate, chromium-6, or other constituents.
	CVWD, IWA, CWA	Chromium-6 Wellhead Treatment	Seek grant funding and plan for chromium-6 treatment.
PMA 23: Small Water System Consolidations	CVWD, DWA, IWA, CWA	Small Water System Consolidations	Extend urban water service to small water systems (e.g., mobile home/RV park communities) with deficient infrastructure and poor water quality. Implement consolidations as grant funding becomes available.
	CWA	Mesquite and Shady Lanes Mobile Home Park Consolidation Project	Complete consolidation of Mesquite Mutual Water Company and Shady Lanes Mobile Home Park to serve the Mesquite and Shady Lanes areas with clean, safe, drinking water.
	CVWD	Valley View Water Consolidation Project	Design and construct a new domestic water pipeline along Airport Blvd and adjacent roadways to serve the Valley View area with clean, safe drinking water.
	IWA	Carver Tract Water Systems and Riverdale Estate	Complete consolidation of Carver Tract Water Systems and Riverdale Estate to provide these areas with clean, safe, drinking water.
PMA 24: Septic to Sewer Conversions	CVWD, DWA, IWA, CWA	Septic to Sewer Conservations	Seek USDA, CWSRF, and WIIN grant funding support to design and construct septic-to-centralized sewer systems and expand service to DACs. Implement conversions as grant funding becomes available.
	CVWD	Monroe Trunk Sewer	Seek grant funding to design and construct a new sewer pipeline along Monroe Street from Avenue 62 to Avenue 64 to expand CVWD's service area to the tribal residential neighborhood within the intersection of Avenue 64 and Monroe.
	CVWD	Avenue 66 Trunk Sewer	Seek grant funding to design and construct a new sewer pipeline along Avenue 66 and Harrison to expand CVWD's service area to the Torres-Martinez Coachella center, Sunbird Mobile Home Park, and residential neighborhood within Middleton Road.

Activity Name	Project Proponent(s)	Activity Name	Activity Description
	CVWD	Airport Blvd Sewer Consolidation Project	Seek grant funding to design and construct a new sewer collection system (gravity sewer pipelines and lift stations), along Desert Cactus Dr, Ave 57th, Fillmore St and Airport Blvd.
PMA 25: Implement CV-SNMP Groundwater Monitoring Program Workplan	CVWD, DWA, IWA, CWA	Implement CV-SNMP Workplans	Implement the CV-SNMP Groundwater Monitoring Program Workplan approved by the RWQCB to expand and improve the region's groundwater monitoring system for water quality.
PMA 26: Implement CV-SNMP Development Workplan	CVWD, DWA, IWA, CWA	Implement CV-SNMP Workplans	Develop a compliant CV-SNMP per the SNMP Development Workplan submitted to the RWQCB. The final CV-SNMP is anticipated to be finalized by 2027.
PMA 27: Colorado River Basin Salinity Control Forum	CVWD, DWA	Colorado River Salinity Forum	Support implementation of Colorado River Salinity Forum projects through participation and comments on Forum activities.
PMA 28: Source Water Protection	CVWD, DWA	Abandoned well management program	Continue cooperating with Riverside County DEH to identify and cap/destroy unused wells.
	CVWD	Leaking artesian well rebate program	Continue implementing CVWD's leaking artesian well rebate program.
	CVWD	Well management rebate programs	Continue to secure grant funding when available to supplement leaking artesian well rebate program and fund proper abandonment/destruction of unused wells.

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12 Plan Evaluation and Implementation

This *Alternative Plan Update* describes the planning process for the Groundwater Sustainability Agencies (GSAs) in achieving a reliable and sustainable water supply. This chapter provides an evaluation of how implementation of this Plan will achieve the dual goals of meeting projected demands and maintaining groundwater sustainability. This chapter also outlines the *Alternative Plan Update* implementation activities necessary to support those goals.

12.1 Plan Evaluation

This *Alternative Plan Update* includes analysis of the range of uncertainties facing the GSAs in planning for a balance of future water demands and supplies. Chapter 5, *Demand Projections,* and Chapter 6, *Water Supply,* both address potential future conditions that are outside of the GSAs' control, including increased municipal or agricultural demands, climate change, and regulatory changes. The planning process considered those uncertainties in the development of the six Plan scenarios in Chapter 7, *Numerical Model and Plan Scenarios*, which analyzed a range of potential future conditions given those uncertainties. Chapter 11, *Projects and Management Actions,* then lays out an adaptive management process by which the GSAs can identify and select projects and management actions (PMAs) for implementation based on Indio Subbasin conditions. The PMAs are packaged in the Plan scenarios, and as described in Chapter 7, *Numerical Model and Plan Scenarios*, the scenarios associated with the Near Term and Future Projects indicate that the GSAs can maintain the Subbasin water balance despite climate change. Indio Subbasin conditions will be evaluated using the monitoring data as outlined in Chapter 10, *Monitoring Program,* and as compared to the sustainability objectives and thresholds established in Chapter 9, *Sustainable Management*. Each of these components of the planning process is essential to a water management plan that meets projected demands and maintains groundwater sustainability.

12.1.1 GSA Priorities

Consistent with the development and approach of this *Alternative Plan Update* (see Chapter 1, *Introduction*) and guided by the sustainability goal and objectives (see Chapter 9, *Sustainable Management*), the GSAs have collaboratively defined priorities for the PMAs. While overdraft has been reversed in terms of chronic groundwater level declines, storage depletion, subsidence, and seawater intrusion, the GSAs still face uncertainties in terms of forecasted demands and water supply availability.

Accordingly, this Periodic Evaluation has focused on securing water reliability and resilience, namely the ability to provide consistent water supply and to respond to changing future conditions. Water supply reliability in the Indio Subbasin is the GSAs' ability to consistently provide adequate water supply to meet projected demands while sustainably managing the Subbasin.

Chapter 6, *Water Supply,* describes *c*urrently available and projected future water supplies, but does not quantify future groundwater supplies, which will be the result of conjunctive use of groundwater storage and supplies with other water supplies. The role of groundwater is quantified using the numerical model as described in Chapter 7, *Numerical Model and Plan Scenarios.* In brief, the projected local surface water and imported supplies alone are not fully adequate to meet the anticipated demands in Chapter 5, *Demand Projections*, but the scenarios simulated with the model

demonstrate that with available groundwater supplies the Indio Subbasin can reliably and sustainably meet future demands under a range of conditions. Historical data included in Chapter 4, *Current and Historical Groundwater Conditions,* demonstrate that the management activities under the *Coachella Valley Water Management Plan 2010 Update* (*2010 CVWMP Update*) (Coachella Valley Water District [CVWD], 2012) have eliminated groundwater overdraft, stopped subsidence, and reversed seawater intrusion. To maintain water reliability and resilience through the planning horizon, the GSAs established the following priorities (in no particular order) for use in selection of PMAs:

- Fully use available Colorado River water supplies
- Support improvement of the long-term reliability of SWP supplies, including participation in the Delta Conveyance Project (DCP)
- Continue developing recycled water as a reliable local water supply
- Implement source substitution and replenishment in response to changing conditions and for maintenance of long-term groundwater supply reliability
- Increase water-use efficiency across all sectors
- Participate in development of the Coachella Valley Salt and Nutrient Management Plan (CV-SNMP) to address salt and nutrient management in the Indio Subbasin.

The project list is provided in Chapter 11, *Projects and Management Actions,* along with implementation actions associated with each PMA. Using an adaptive management process, the GSAs can adjust project implementation if monitoring shows that water demands and supplies are higher or lower than projected or if tracking of groundwater levels indicates that undesirable results (including storage depletion and subsidence) could occur in the foreseeable future. Projects listed as "deferred" in Chapter 11, *Projects and Management Actions,* are not currently needed to achieve Indio Subbasin sustainability within the planning horizon but are retained as possible PMAs for future implementation as needed.

12.1.2 Water Supply Evaluation

This *2027 Alternative Plan Update* continues the provision from the *2010 CVWMP Update* of a supply buffer on both municipal and agricultural demands. A 10 percent supply buffer was applied to projected municipal demands. This supply buffer ensures that the GSAs are planning for adequate supplies to meet anticipated growth over the coming 25 years and any additional demands from unanticipated development or changes in water use trends. Table 12-1 shows forecasted demands through 2050 both with and without this supply buffer.

Table 12-1 Demand Forecast with Supply Buffer (AFY)

	5-Yr Average (2020-2024)	2025	2030	2035	2040	2045	2050
Demand Forecast							
Municipal	181,842	181,842	183,569	189,890	195,639	201,775	207,915
Agricultural	267,655	267,655	264,131	260,024	255,917	251,810	247,702
Golf	108,203	108,203	112,947	112,947	112,947	112,947	112,947
Other	10,236	10,236	10,236	10,236	10,236	10,236	10,236
Total without Supply Buffer	**567,936**	**567,936**	**570,883**	**573,097**	**574,739**	**576,768**	**578,800**
Demands Forecast with Supply Buffer							
Municipal with Supply Buffer	201,601[1]	201,601	203,500	210,454	216,777	223,527	230,280
Agricultural	267,655	267,655	264,131	260,024	255,917	251,810	247,702
Golf	108,203	108,203	112,947	112,947	112,947	112,947	112,947
Other	10,236	10,236	10,236	10,236	10,236	10,236	10,236
Total Demands with Supply Buffer	**587,695**	**587,695**	**590,814**	**593,661**	**595,877**	**598,520**	**601,165**

[1]Actual municipal 5-year average with hypothetical 10 percent municipal supply buffer added.

The potential local and imported supplies described below are based on the information presented in Chapter 6, *Water Supply*.

12.1.2.1 Local Supplies

Table 12-2 provides a summary of the local water supplies in addition to imported supplies, net return flows, and total demands in the Indio Subbasin shown as 50-year average (2026 – 2075) under each of the six Plan scenarios. These include surface water diversions, local watershed runoff that naturally infiltrates, recycled water, and net groundwater inflows from uses and other sources that replenish the Subbasin, less outflows. Chapter 6, *Water Supply,* quantifies the surface water, watershed runoff, and recycled water that is available to the GSAs (refer to Table 6-16). Return flows are groundwater inflows and were calculated during development of the Plan scenarios summarized in Chapter 7, *Numerical Model and Plan Scenarios* (refer to Table 7-12). Note that net groundwater inflows are listed at the bottom, separate from local supplies. While net inflows contribute to the available groundwater supply, they are calculated as part of the model simulations.

12.1.2.2 Imported Supplies

The imported water supplies in the Indio Subbasin consist of Colorado River water, SWP exchange supplies, and other imported water sources (e.g., Rosedale Rio-Bravo transfer). Chapter 6, *Water Supply,* quantifies the total imported water supply available from all three sources (refer to Table 6-16). Chapter 7, *Numerical Model and Plan Scenarios* (Section 7.5), explains where those supplies were directed under the Plan scenarios, either for direct delivery or replenishment. Table 12-2 provides a summary of the imported supplies, in addition to local supplies, net return flows, and total demands, shown as 50-year average (2026 – 2075) under each of the Plan scenarios.

Table 12-2 Comparison of Planned Supplies Under Plan Scenarios, 50-Year Average (2026-2075) (AFY)

	Baseline		Near Term		Future Projects	
Supply	**Moderate Climate Change Conditions**	**Severe Climate Change Conditions**	**Moderate Climate Change Conditions**	**Severe Climate Change Conditions**	**Moderate Climate Change Conditions**	**Severe Climate Change Conditions**
Colorado River	400,334	400,334	400,334	400,334	400,334	400,334
SWP Exchange Water	86,738	78,975	86,738	78,975	100,571	88,814
Recycled Water	10,066	10,066	18,302	18,302	19,080	19,080
Wastewater Percolation	16,041	13,936	8,500	8,500	8,206	8,206
Surface Water Diversion	3,614	1,758	3,614	1,758	3,614	1,758
Surface Water Natural Infiltration	32,995	13,955	32,995	13,955	32,995	13,955
Total Local and Imported Supplies	**549,788**	**519,024**	**550,483**	**521,824**	**564,800**	**532,147**
Net Return Flow	143,575	143,575	143,575	143,575	143,575	143,575
Total Supplies with Net Returns from Use	**693,363**	**662,599**	**694,058**	**665,399**	**708,375**	**675,722**
Total Demands with Supply Buffer	**598,185**	**598,185**	**598,185**	**598,185**	**598,185**	**598,185**

As shown in Table 12-2, the GSAs forecast available supplies across six future conditions scenarios developed for this *2027 Alternative Plan Update*. These include three different supply scenarios: a Baseline scenario, Near-Term scenario, and Future Projects scenario that address potential changes in implementation of water management projects such as source substitution and new water supply projects. These three scenarios were evaluated under two different climate change conditions: moderate climate change conditions using the RCP 4.5 climate forecast, and severe climate change conditions using the RCP 8.5 climate forecast. In total, six future conditions scenarios were modeled to allow for an assessment of a range of possible future groundwater outcomes. These results are further described in Chapter 7, *Numerical Model and Plan Scenarios.*

As shown in this *2027 Alternative Plan Update*, the local surface water and imported water sources in the GSAs' current water supply portfolio are adequate to meet projected demands. A comparison of the projected water demands (refer to Table 12-2) with the available water supplies identified in Chapter 6, *Water Supply,* is presented in Table 12-2, Figure 12-1, and Figure 12-2. The figure shows available water supplies, as modeled in Chapter 7, *Numerical Model and Plan Scenarios,* averaged across the 2026 through 2075 planning horizon. The average 2026-2075 demand in Table 12-2 conservatively adjusted with a 10 percent buffer added to municipal demands, is 598,185 AFY. All six Plan scenarios in Table 12-2 have adequate supply to meet that demand. Additionally, as demonstrated in in Chapter 7, *Numerical Model and Plan Scenarios,* five of the six Plan scenarios are projected to either increase or result in no net change in groundwater storage over the planning horizon. Only the Baseline scenario under severe climate conditions showed any net decrease over the 50-year period. This highlights the importance of implementing the PMAs identified in Chapter 11, *Projects and Management Actions,* to ensure Subbasin sustainability into the future. Additionally, should some type of extended shortage, drought, or emergency occur, the PMAs include water management tools available to the GSAs, such as more aggressive implementation of water conservation programs and Water Shortage Contingency Plans, to address supply gaps. To ensure water supply reliability and resilience through the planning horizon, the GSAs are committed to the suite of additional supply and source substitution projects identified in Chapter 11, *Projects and Management Actions*.

The GSAs manage their portfolio of local and imported water supplies conjunctively with groundwater supplies, providing replenishment and utilizing the storage capacity of the Indio Subbasin. The modeling described in Chapter 7, *Numerical Model and Plan Scenarios,* demonstrates that with consideration of groundwater inflows and outflows, the GSAs can manage the amount of forecasted groundwater production from the Indio Subbasin while maintaining sustainability and avoiding undesirable results associated with chronic groundwater level declines (as well as storage depletion, subsidence, and seawater intrusion). Figure 12-3 shows that the simulated groundwater balance generally includes more inflows than outflows in the with-project Plan scenarios. With the groundwater budget factored in, along with active conservation programming, the GSAs will be able to meet forecasted demands with the supply buffer and contribute to increases in Indio Subbasin storage.

In the six Plan scenarios that simulated varying project implementation, results show a net increase in storage at the end of the 25-year planning horizon and continuing stability through the end of the modeling timeframe. Through implementation of this *2027 Alternative Plan Update,* the Indio GSAs will be able to meet projected pumping demands and maintain Indio Subbasin sustainability with regard to water levels and storage under the range of potential futures established through the Plan scenarios. The six scenarios demonstrate that continued imported water replenishment and expansion of non-potable connections is essential to maintaining a balanced basin. The simulated

hydrographs and storage are projected to be higher than historical lows and to increase over the planning horizon. To address uncertainties in water supply or demand, this *2027 Alternative Plan Update* identifies a range of PMAs that can be implemented by the GSAs. Under this *2027 Alternative Plan Update*, conservation continues to be implemented, available Canal water is fully utilized, SWP supplies are acquired, when possible, recycled and non-potable water is expanded throughout the Mid-Valley, and domestic water and sewer consolidations protect the groundwater supplies of disadvantaged communities. This flexible approach allows for future implementation of more aggressive conservation or deferred projects to offset supply gaps that might arise.

Figure 12-1 Comparison of Planned Supplies and Demands Under Moderate Climate Change Conditions

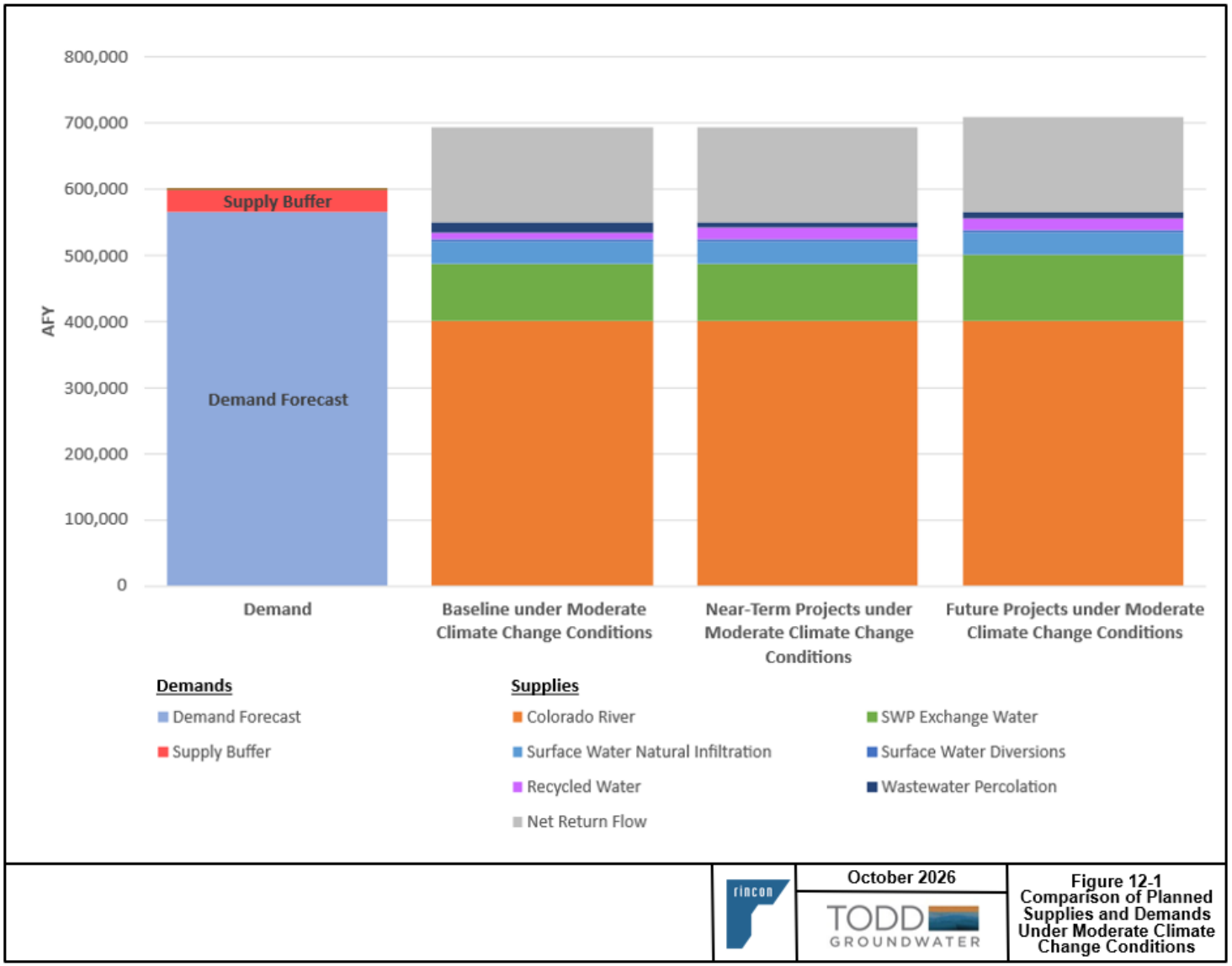


Figure 12-2 Comparison of Planned Supplies and Demands Under Severe Climate Change Conditions

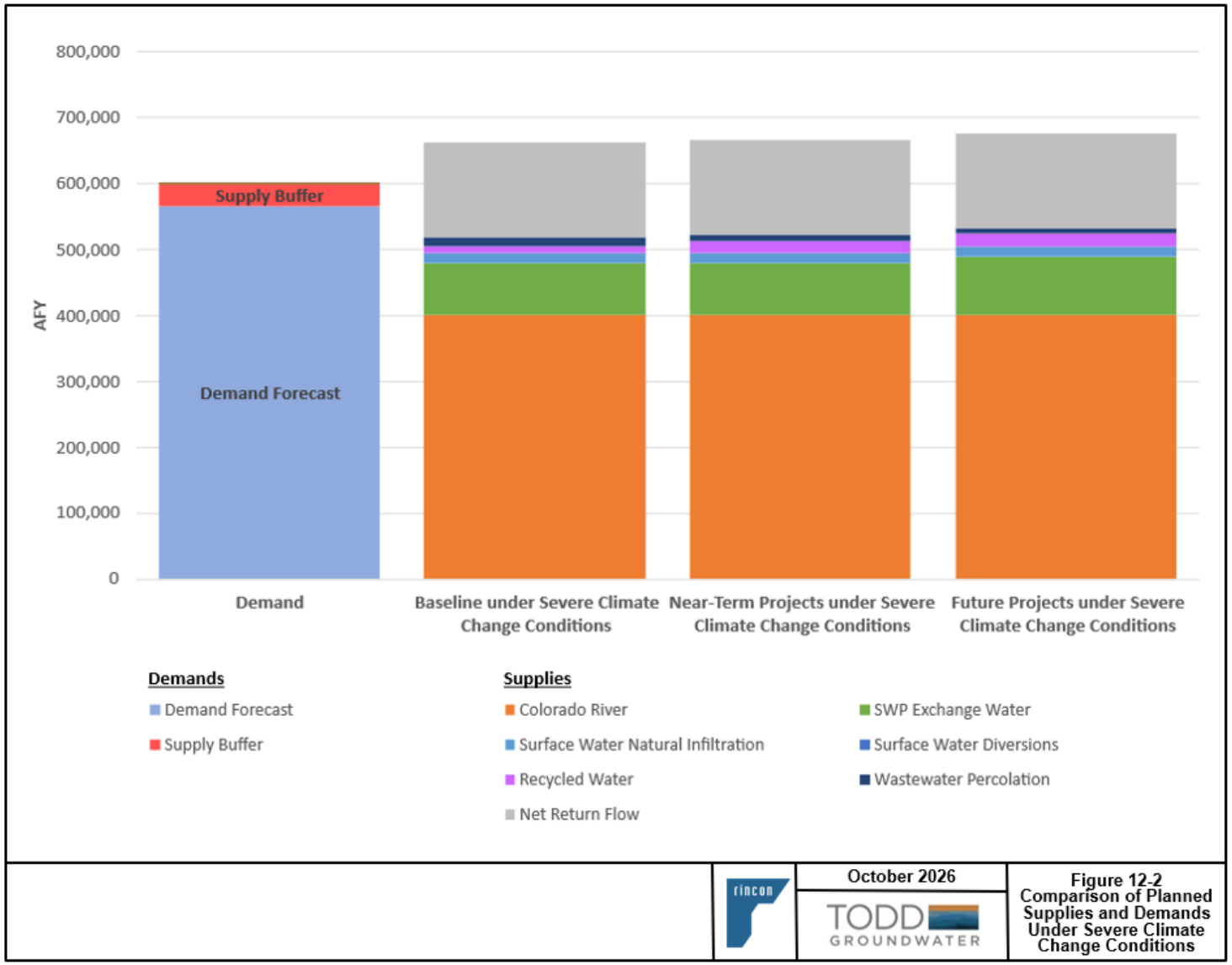
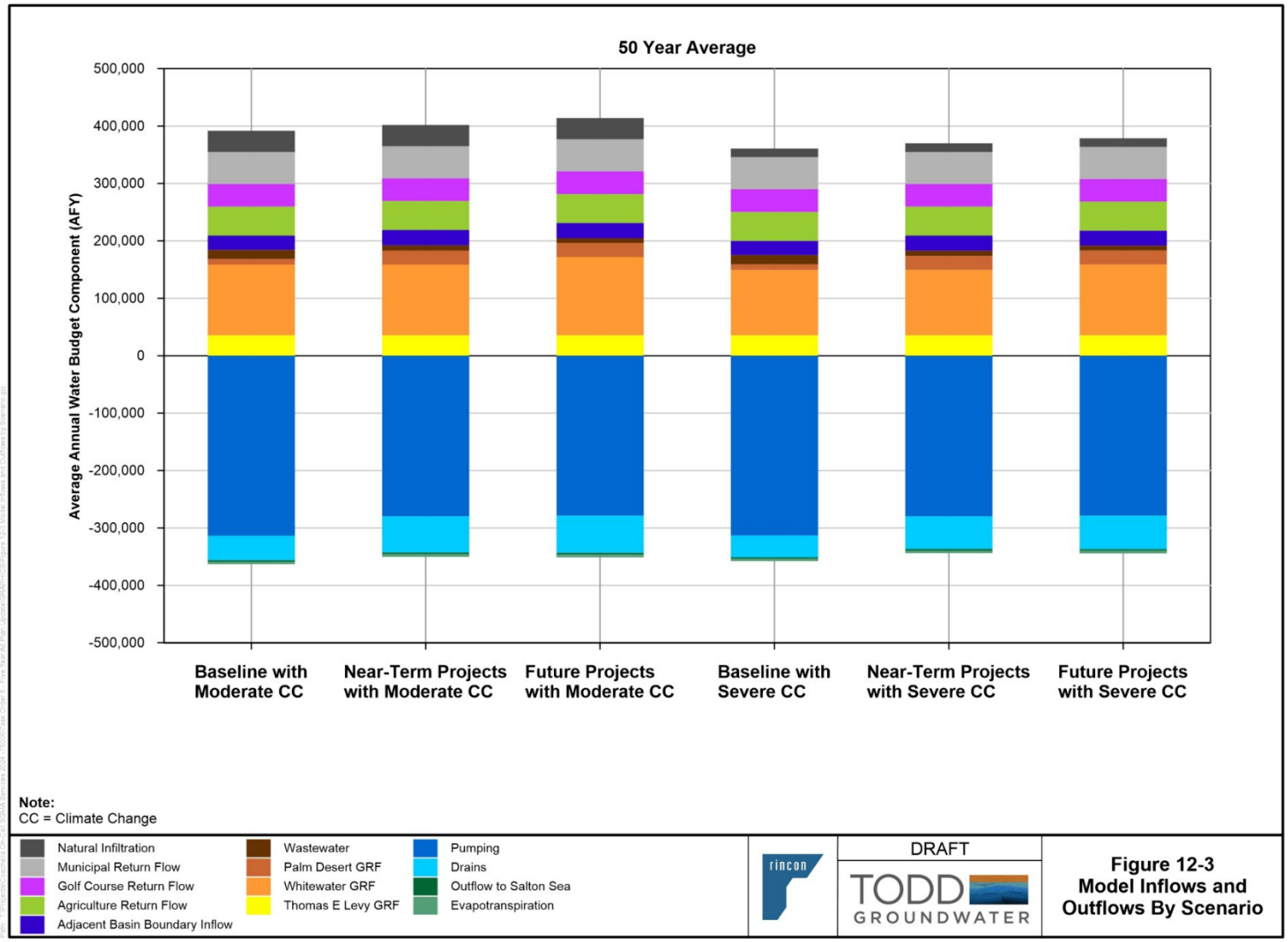


Figure 12-3 Model Inflows and Outflows by Scenario

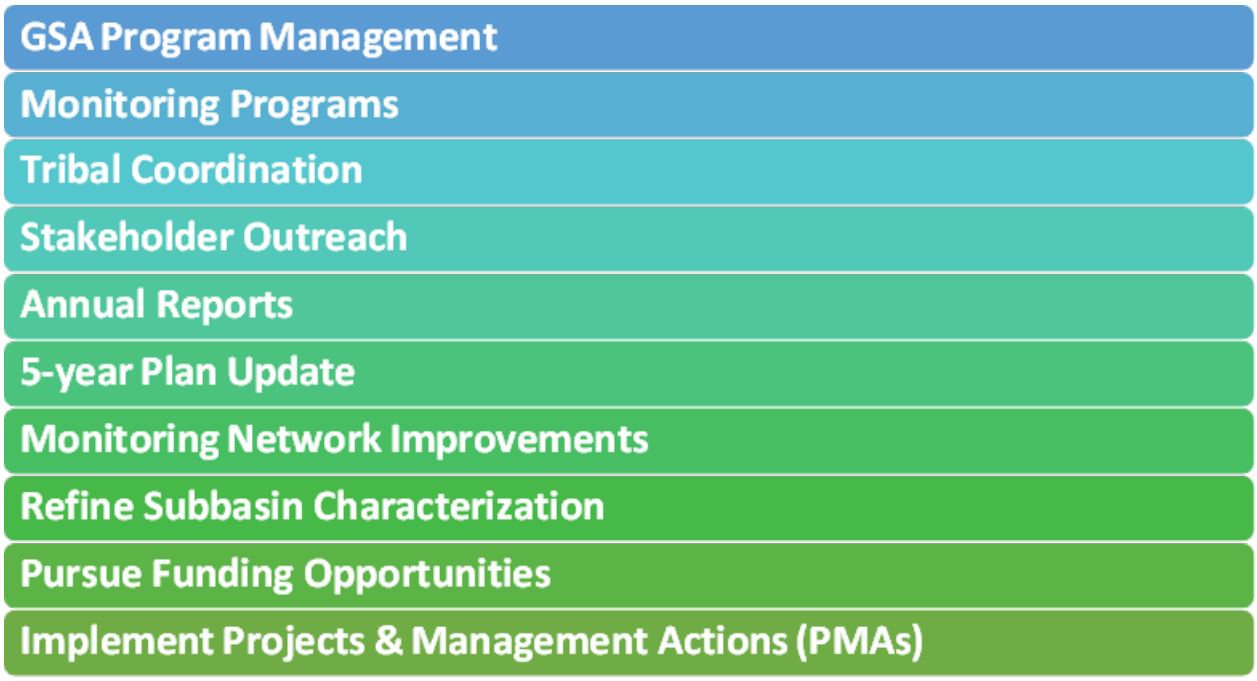


This *2027 Alternative Plan Update* demonstrates that the GSAs can meet the established Plan goal "*to reliably meet current and future water demands in a cost-effective and sustainable manner".* In addition to meeting forecasted demands with the supply buffer, the GSAs will continue to recover from and avoid chronic groundwater overdraft, manage and protect water quality, and reduce vulnerability to climate change and drought, all within an adaptive management framework that allows for ongoing collaboration with stakeholders and tribes, cost control, and minimization of environmental impacts.

12.2 Plan Implementation

The Indio GSAs are working collaboratively to implement the Alternative Plan and ensure the sustainability of the Indio Subbasin. This includes implementing projects and management actions described in Section 11, *Projects and Management Actions*, as well as ongoing Plan implementation and administrative activities. As shown in Figure 12-4, Alternative Plan implementation includes the program management, tribal coordination, public outreach, ongoing data collection and monitoring, and funding activities necessary to implement this Plan.

Figure 12-4 Alternative Plan Implementation



This section describes the above items, including contents of required Annual Reports and Plan Updates that will be provided to DWR. This section also identifies the specific actions to move the proposed projects and management actions forward.

12.2.1 GSA Program Management

Each of the four GSAs is administered independently with oversight of individual agency projects and programs, as well as coordination among the GSAs. GSA program management primarily consists of general program administration, coordination between the GSAs and California Department of Water Resources (DWR), and oversight of ongoing GSA monitoring and reporting.

Representatives from the four GSAs meet periodically at the staff level for information sharing and to coordinate activities. Staff-level meetings are not noticed or open to the public. Governance occurs independently via each of the four GSA governing boards and councils, whose meetings are publicly noticed. Tribal and stakeholder engagement is described under Sections 12.2.3 and 12.2.4 below, respectively. See Appendix 1-B for a summary of outreach and engagement activities conducted for the *2027 Alternative Plan Update.*

GSA administration includes coordination of Plan implementation activities, regular email communications to update GSA members on ongoing Indio Subbasin activities, administration of projects implemented by the GSA, and general oversight and coordination. This includes coordination of technical activities associated with Plan implementation, including monitoring network improvements. Other administrative actions involve tracking and evaluating Plan implementation and sustainability conditions, as well as assessing the benefit to the Indio Subbasin. GSA program management also includes grant applications and administration for potential funding sources. Administrative activities include oversight of consultants or contractors that may be retained by the GSAs in support of Plan implementation, including Plan updates, annual reporting, and monitoring.

GSA staff meetings are anticipated to be held annually, at a minimum, to discuss Annual Report data collection and findings, implementation of projects and management actions, and other topics necessary to implement this *2027 Alternative Plan Update*. All oversight and administration activities are assumed to occur as needed and on an ongoing basis.

12.2.2 Monitoring Programs

Chapter 10, *Monitoring Program,* identifies monitoring programs and provides procedures for tracking sustainability progress. Monitoring programs are a critical element of Plan implementation. The monitoring programs described in Chapter 10, *Monitoring Program,* will allow the GSAs to track conditions within the Indio Subbasin and adjust implementation of the management strategies described in Chapter 11, *Projects and Management Actions*. This *2027 Alternative Plan Update* has identified monitoring networks and protocols for groundwater levels, climate and hydrologic conditions, groundwater production, subsidence, water quality, and seawater intrusion. Monitoring network data will be collected for the following purposes:

- Characterize Indio Subbasin conditions
- Identify groundwater level, storage, and quality trends
- Determine if additional management activities are necessary
- Determine whether undesirable results are occurring

The following monitoring programs will be implemented to support ongoing groundwater management and to support Sustainable Groundwater Management Act (SGMA) compliance in the Indio Subbasin:

- **Groundwater Levels**. Groundwater levels are monitored at least three times per year in approximately 350 wells by the Indio Subbasin GSAs as part of their respective groundwater level monitoring programs. As part of Plan implementation, water levels will be uploaded to the DWR Monitoring Well Module and data will be publicly accessible.
- **Climate, Streamflow, and Drain Flow.** Climate data (including temperature, evapotranspiration, and precipitation) are available from DWR's California Irrigation Management Information System (CIMIS) for four active CIMIS stations. Precipitation data are collected at 12 Riverside

County Flood Control and Water Conservation District precipitation monitoring stations. Temperature and precipitation data are also available from the National Oceanic and Atmospheric Administration (NOAA) station in Indio. Streamflow is measured by the United States Geological Survey (USGS) at 15 locations within the Indio Subbasin. CVWD measures drain flows at 27 drain sites on a monthly basis.

- **Groundwater Production.** The GSAs, specifically CVWD and Desert Water Agency (DWA), have been monitoring (assessing) groundwater production in the West Areas of Benefit (AOBs) since 1982 and the East AOB since 2005. CVWD and DWA groundwater production data set is audited two times a year and summarized as part of the SGMA Annual Report and the annual Engineer's Report. The GSAs also submit validated Water Loss Audits annually. These audits inventory all sources of production and are publicly available.
- **Subsidence**. Land subsidence has been investigated since 1996 through an on-going cooperative program between CVWD and the USGS. The USGS has applied satellite-based Global Positioning System (GPS) surveying techniques to determine the location, extent, and magnitude of the vertical land-surface changes in the Coachella Valley. GPS measurements have also been taken at 24 geodetic monuments that have been paired with nearby water level monitoring wells to assess relationships between subsidence and groundwater level changes. In addition, DWR provides interferometric synthetic aperture radar (InSAR) satellite-based data and GPS data to identify and assess land subsidence across many California groundwater basins, including the Indio Subbasin. In its cooperative study with the GSAs, USGS also will analyze DWR-provided InSAR results with findings anticipated to be published shortly.
- **Water Quality**. The GSAs monitor and report the quality of their water sources to the California State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW). These data are publicly available on the SWRCB's Groundwater Ambient Monitoring and Assessment Program (GAMA) website. CVWD also collects water quality data for other programs such as monitoring of the GRFs. Groundwater quality data are additionally available from various other sources, including the USGS National Water Information System. The development of the CV-SNMP monitoring program will be a robust new source of compiled water quality data, with water quality monitoring at 187 existing wells and the planned installation of 23 new monitoring wells, six of which have already been constructed.
- **Seawater Intrusion**. Saline water intrusion is monitored specifically through two sets of dedicated nested monitoring wells operated by CVWD. One set of four wells is located about 2.1 miles north of the Salton Sea and the other set is about one mile west of the Salton Sea and north of Oasis.

Monitoring data for the representative well network, as described in Chapter 10, *Monitoring Program,* will be managed and reported to DWR and stakeholders in the Annual Reports described in Section 12.8. The monitoring networks build on the foundation of existing monitoring programs and develop further monitoring to continue the characterization of the Indio Subbasin. The monitoring program will be coordinated with DWR's SGMA Portal, Monitoring Well Module, and partner agencies such as USGS.

12.2.2.1 Data Management System

The GSAs have been collecting and compiling groundwater data annually including water levels, water quality, and water use. For this *2027 Alternative Plan Update* and subsequent Annual Reports, these data, and other data from the GSAs and other sources, are being compiled in relational databases, which comprise an Access database, GIS geodatabase, and Excel workbooks. As part of

the *2027 Alternative Plan Update*, the DMS has been redesigned to be practicable, usable, intuitive, and cost effective. These tables include groundwater elevations, water quality, groundwater pumping, direct deliveries of imported water, and well locations. The geodatabase contains spatial files including jurisdictional areas, basin boundaries, monitoring locations, crop censuses, groundwater contours (elevation and quality), geology, and hydrologic features. The regional DMS is updated annually as part of the Annual Report. In addition, a full review and update has been conducted during the 5-year Plan Update.

Additionally, DWR has built a DMS through its SGMA Portal (see: https://sgma.water.ca.gov/portal/) for submittal and viewing of Annual Report data by GSAs throughout the State. The GSAs, stakeholders, and interested parties will rely on that database to make data from Key Wells widely available.

12.2.3 Tribal Coordination

Throughout the *2027 Alternative Plan Update* process, the GSAs have engaged with the Indio Subbasin tribal governments, namely the Agua Caliente Band of Cahuilla Indians, the Augustine Band of Cahuilla Indians, the Cabazon Band of Mission Indians, the Torres Martinez Desert Cahuilla Indians, and the Twenty-Nine Palms Band of Mission Indians, each of which have provided representatives to the SGMA Tribal Workgroup meetings. The SGMA Tribal Workgroup, established in 2017, has been active for nearly 10 years through submittal and DWR approval of the *2017 Alternative Plan,* the *2022 Alternative Plan Update,* and the *2027 Alternative Plan Update* process. During the *2027 Alternative Plan Update*, the SGMA Tribal Workgroup continued to discuss major water-related concerns facing the tribes and ensuring regional water management efforts, such as the long-term implementation of the *2027 Alternative Plan Update*, are responsive to those needs. During these meetings, the GSAs presented work in progress and requested data from the tribes to support the planning process (e.g., land use plans, water demands).

The GSAs will continue to engage with the tribes through quarterly SGMA Tribal Workgroup meetings. At the Workgroup meetings, the GSAs will present monitoring data, Annual Report findings, and status of project implementation to support Indio Subbasin sustainability.

12.2.4 Stakeholder Outreach

The GSAs have conducted stakeholder outreach to identify and obtain input from groups that may be otherwise limited from participating in the *2027 Alternative Plan Update* process and implementation. The GSAs have used a variety of outreach methods to coordinate among local stakeholders and communicate SGMA-related information to interested parties during Plan development. The GSAs plan to continue collaboration and public outreach during Plan implementation. This will include providing opportunities for stakeholder participation at public workshops, providing access to Plan information through email announcements and online (see project website: www.IndioSubbasinSGMA.org), releasing Annual Reports that evaluate the Plan's progress toward implementation, and continued coordination with entities representing diverse communities in the Indio Subbasin.

12.2.4.1 Stakeholder Workshops

During the *2027 Alternative Plan Update*, the GSAs hosted four public workshops to share information, present work in progress, and request feedback from stakeholders.

The GSAs will continue to host stakeholder workshops to ensure open participation in Plan implementation by members of the public and interested parties and to receive stakeholder input. Stakeholder workshops are anticipated to be held annually to present the findings of the Annual Reports, including reporting on monitoring data and compliance with sustainability criteria established in this *2027 Alternative Plan Update*. The Indio Subbasin website will be updated as needed to feature meeting agendas and materials, so that stakeholders have access to past and current materials related to Plan implementation.

Additionally, the GSAs will continue to report out to their Boards of Directors annually, at a minimum, for review and discussion of the Annual Reports. Board meetings are publicly noticed and open to all stakeholders to participate.

12.2.4.2 Outreach and Website Maintenance

The GSAs have used an email list to communicate with stakeholders and interested parties (see overview in *Section 1, Introduction*). Announcements related to Plan implementation – such as availability of new data, release of Annual Reports, and scheduling of public workshops – have been and will continue to be distributed via email. Prior to stakeholder workshops or meetings, email announcements are circulated with access to meeting materials via the website. Emails are also distributed as specific deliverables are finalized, when opportunities are available for stakeholder input, or when items of interest to the stakeholder group arise, such as relevant funding opportunities.

The Indio Subbasin website will be updated as needed to feature meeting agendas and materials, Annual Reports, and other program information as applicable.

12.2.5 Annual Reports

Annual Reports have been submitted by April 1 of each year since 2018, following the Alternative Plan adoption. As summarized below, Annual Reports provide general information, documentation of Subbasin conditions, and description of plan implementation progress.

12.2.5.1 General Information

The Annual Reports include an Executive Summary that highlights key contents and findings. The Introduction presents the organization of the Annual Report, a summary of the *Alternative Plan* process, and a map and overview of the Subbasin.

12.2.5.2 Subbasin Conditions

The Subbasin setting section provides updated context on climate, the Coachella Valley Groundwater Basin, and the Indio Subbasin. Additional sections summarize current hydrologic and groundwater conditions and monitoring program results with evaluation of how conditions have changed in the Indio Subbasin over the previous year and comparison of groundwater data for the year to historical groundwater data. Reporting will include comparison of groundwater conditions to any minimum thresholds established by the GSAs, with discussion of adaptive management, as needed. Sections of the Annual Report document groundwater elevation data, groundwater extractions, surface water conditions (including local surface water, imported water deliveries, and recycled water), total water use, and change in groundwater storage. Annual reports present selected hydrographs of groundwater elevation data, groundwater level contour maps,

groundwater level change maps, and graphs documenting pumping and other elements of the water budget, and cumulative change in groundwater storage.

12.2.5.3 Plan Implementation Progress

Plan implementation progress is described in the Annual Reports, including projects and management actions, acquisition of additional water supplies, source substitution, groundwater recharge, and water quality improvements. Status of the monitoring program is also summarized.

12.2.6 5-year Plan Update

The GSAs have committed to update of the *Alternative Plan* every 5 years to assess progress toward meeting sustainability, incorporate changes in conditions including water demand and supply availability, evaluate PMAs, and evaluate projected groundwater conditions using the numerical model.

12.2.6.1 Alternative Plan Update

The GSAs will evaluate the *Alternative Plan Update* every five years. At that time, the GSAs will report on whether any *Alternative Plan Update* sustainability criteria (e.g., minimum thresholds or measurable objectives established by the GSAs) should be revised, based on any significant changes and outcomes of the monitoring programs. The 5-year Update will include the following:

- **Sustainable Management**—Description of the current Subbasin conditions with reference to Alternative Plan objectives and any sustainability indicators established by the GSAs. New information and significant changes will be identified and discussed.
- **Plan Implementation Progress**—Description of implementation activities, update of the implementation schedule, and adjustments to projects and management actions.
- **Update of Alternative Plan Elements**—Update of Alternative Plan elements (such as Plan Area, Hydrogeologic Conceptual Model, Groundwater Conditions, Sustainable Management) to reflect increased understanding available from ongoing monitoring, new information, and significant changes.
- **Monitoring Network Update**—Reporting on the status of the Plan's monitoring programs and discussion of progress made in filling data gaps.
- **Regulatory or Policy Issues**—Summary of new regulatory or policy issues relevant to water resources management of the Indio Subbasin.
- **Plan Amendments**—Identification of any amendments made to the Alternative Plan and discussion of potential future amendments if identified.
- **Coordination**—Summary of coordination among GSAs within or outside of the Indio Subbasin and collaboration with land use agencies.

12.2.6.2 Indio Subbasin Groundwater Model Update

The Indio Subbasin groundwater model will be updated annually to evaluate annual change in groundwater storage and comprehensively reviewed and updated every five years based on additional information provided by GSAs. This will include extending the historical model time series to the update year and updating all inputs. Areas of higher uncertainty, such as agricultural demands and imported water reliability will be refined using additional information made available through the monitoring program and implemented projects. Additional drain flow information will

be used to achieve better calibration. Once the model has been updated and re-calibrated, the future scenarios will be designed and simulated. Associated water budget and model outputs will be evaluated considering project implementation.

12.2.7 Monitoring Network Improvements

The groundwater monitoring networks have abundant historical data that meet or exceed data density requirements outlined in DWR's *Monitoring Networks and Identification of Data Gaps, Best Management Practices for Sustainable Management of Groundwater* (DWR, 2016) in the deeper zones. The GSAs are pursuing additional dedicated shallow monitoring wells to help monitor shallow and perched areas of the Subbasin for both water levels and water quality.

12.2.7.1 Groundwater Monitoring Improvements

To better understand the basin in general and vertical gradients specifically, the GSAs are implementing groundwater monitoring improvements. The GSAs will regularly assess the monitoring network and install additional and/or replacement monitoring wells. This effort is being coordinated with the Coachella Valley SNMP monitoring networks to achieve the overall goal of groundwater quality protection.

12.2.7.2 Subbasin Well Inventory

Unlike many other groundwater basins in California, the Indio Subbasin has an extensive well inventory that has been compiled by CVWD and DWA to implement the Replenishment Assessment Charge (RAC) Programs for assessable groundwater production. CVWD levies and collects the RAC from groundwater producers that benefit from the Groundwater Replenishment Programs (GRPs) and extract more than 25 acre-feet per year (AFY) within the CVWD's West Whitewater River Subbasin Area of Benefit (AOB) and East Whitewater River Subbasin AOB in the Indio Subbasin. DWA levies and collects the RAC from groundwater producers that benefit from the GRPs and extract more than 10 AFY within DWA's West Whitewater River Subbasin AOB. However, there is incomplete data on minimal pumpers who do not meet these criteria. It is unclear how many wells producing less than the RAC criteria exist, and approximations of unreported production are best estimates.

To address this data gap CVWD, in partnership with the Torres Martinez Desert Cahuilla Indians and Pueblo Unido Community Development Corporation, developed the Domestic and Small Water System Well Inventory and Vulnerability Assessment Report (Well Inventory) (CVRWRP, 2026). The Well Inventory was created with support from CWA, DWA, IWA, MSWD, Leadership Counsel for Justice and Accountability, and Valley Sanitation District and it identifies. It compiled information from local agency well records, the RAC program, Riverside County permitting data, Tribal well records, and field verification efforts. The study identified approximately 1,184 known domestic and small water system wells and estimated that there are nearly 1,500 locations across the Coachella Valley that rely on self-supplied groundwater. In addition, field surveys were conducted at more than 100 locations to verify well locations, collect construction information, and document operational concerns and vulnerabilities

Compilation of the Well Inventory included the following:

- Review and organization of the DMS to incorporate well inventory component
- Collection of water well drillers reports with well construction information

- Coordination with well owners to identify wells and obtain relevant information on location, construction, use, status, and monitoring, if any
- Field visits to verify well location, use, and status
- Data entry of Well Inventory information into the DMS.

Ultimately the Well Inventory improves the understanding of pumping trends from private well users and provides information regarding well locations, construction reports, areas of water quality and water level vulnerability. The GSAs will use this information to support the consolidation of small water systems, identify and pursue funding and engagement opportunities, assist with climate planning, and other efforts to protect users of domestic and small water systems.

12.2.7.3 Expand Groundwater Production Reporting

SGMA (Section 10725.8) authorizes GSAs to require that the use of every groundwater extraction facility (production well) be measured with a water-measuring device (meter) with the exception of de minimis extractors (domestic users extracting 2 AFY or less). CVWD and DWA already require metering and extraction reporting by groundwater produces using more than 25 and 10 AFY, respectively, based on their respective water management authorities. CVWD and DWA separately author an *Engineer's Report on Water Supply and Replenishment Assessment* annually to assess the groundwater supply conditions and the need for continued replenishment within their AOBs, to provide a description of the current GRF operations, and to recommend adjustments to the RAC that is levied on groundwater production (see CVWDs website: https://cvwd.org/Archive.aspx?AMID=43 and DWA's website: https://dwa.org/about-us/documents/library/).

The GSAs may consider expansion of groundwater extraction reporting to include groundwater pumpers that produce less than the current assessment threshold but more than the de minimis threshold established by SGMA. CVWD may evaluate the feasibility of a groundwater management fee to support expanded groundwater extraction reporting and other SGMA implementation activities. The other GSAs may similarly consider reporting requirements and associated fees within their respective service areas.

12.2.8 Refine Subbasin Characterization

Means to improve understanding of the Indio Subbasin have been identified in this *2027 Alternative Plan Update,* which the GSAs will explore over the coming five years. Refining the Indio Subbasin characterization in these areas will improve the GSAs ability to manage the Indio Subbasin.

12.2.8.1 Subsidence Study

CVWD has on ongoing partnership with USGS. CVWD is collaborating with USGS and the other GSAs on the current study (July 1, 2021, through June 30, 2025), whose objectives are to (1) detect and quantify land subsidence using GPS methods (2015–22) and InSAR methods (2017–23), (2) evaluate the relation between changes in land-surface elevation and groundwater levels at selected sites during 2015–23, and (3) provide technical assistance to CVWD and their contractors in the potential development of subsidence simulation capabilities for the existing numerical groundwater flow model. USGS also will analyze DWR-provided InSAR results to compute changes in land-surface elevation in the Indio Subbasin during 2017–23. Findings will be published in a report anticipated in late 2026.

12.2.9 Pursue Funding Opportunities

The development of this *2027 Alternative Plan Update* was funded, in part, through a Proposition 68 Sustainable Groundwater Management Grant. Costs of overall Plan implementation are expected to be shared by the GSAs through the 2018 MOU, a second Supplement to the 2016 MOU, that establishes cost- share agreements, individual agency contributions, and/or new cost-sharing agreements yet to be developed (see Appendix 1-C). However, there will be a need to seek funding opportunities to support Plan projects and management actions and ongoing implementation.

12.2.9.1 Pursue Grant Programs

Outside grants will be sought to reduce the cost of implementation to participating agencies and the communities of the Indio Subbasin. Financing options under consideration include loans and grants for projects and management actions, as well as monitoring network improvements and other planning/feasibility analysis needed to support Plan implementation. Funding through grants or loans has varying levels of certainty and may be available for some implementation activities (including capital projects). Table 12-3 lists examples of potential funding options.

Table 12-3 Potential Funding Sources for 2027 Alternative Plan Implementation

Funding Source	Description
Sustainable Groundwater Management (SGM) Grant Program administered by DWR	With the passage of Propositions 1 , DWR established the SGM Grant Program to fund the development and implementation of GSPs. Proposition 1 and 68 planning funds allocated over $139 million for competitive grants, in three rounds of grant solicitations, to fund planning projects to develop, revised, and update the GSPs. Proposition 68 implementation funding and the Budget Acts of 2021 and 2022 provided another $317 million for projects that assisted in the implementation of GSPs and addressed the Recommended Corrected Actions. Proposition 4 will provide over $380 million for projects that include groundwater recharge and conjunctive use, groundwater banking, subsidence mitigation, conveyance improvements, ag land adaptation, and actions to address DWRs RCSs.
Technical Support Services (TSS) for Groundwater Sustainability Plans administered by DWR	DWR's TSS program supports GSAs as they develop and implement their GSPs. TSS's goal is to provide education, data, and tools to GSAs at both regional and statewide scales to build the capacity needed to achieve sustainability. TSS provides field activities (monitoring well installation, geologic logging, etc.), modeling, and mapping.
Clean Water State Revolving Fund (CWSRF) Loan Program administered by SWRCB	Historically, the SWRCB has had $200 to $300 million available annually for low-interest loans (typically ½ of the General Obligation Bond Rate) for water recycling, wastewater treatment, and sewer collection projects. During recent years, available funding has become limited due to high demand. Success in securing a low-interest loan depends on the demand of the CWSRF Program and available funding. Applications are accepted on a continuous basis. SWRCB prepares a fundable list for each fiscal year. In order to receive funding, a project must be on the fundable list.

Funding Source	Description
Water Recycling Funding Program (WRFP) – Planning and Construction Grants from SWRCB	WRFP grants were most recently funded by Proposition 1, as well as the general CWSRF Program. Planning grants (for facilities planning) are available and can fund 50% of eligible costs, up to $75,000. Construction grants have been periodically exhausted but are typically restored with water bond funding. Low-interest loans through the CWSRF program are available and while limited, recycled water projects receive priority over wastewater projects (which are also eligible under CWSRF, the umbrella program for the WRFP).
Drinking Water State Revolving Fund Loan Program administered by the SWRCB Division of Drinking Water	Approximately $100 to $200 million is available on an annual basis for drinking water projects. Low-interest loans are available for project proponents should they decide to seek financing. Funding has become more limited; however, applicants are encouraged to apply. Applications are accepted on a continuous basis. SWRCB prepares a fundable list for each fiscal year. In order to receive funding, a project must be on the fundable list.
Infrastructure State Revolving Fund Loan Program administered by the California Infrastructure and Economic Development Bank (I-Bank)	Low-interest loans are available from I-Bank for infrastructure projects (such as water distribution). Maximum loan amount is $25 million per applicant. Applications are accepted on a continuous basis.
Title XVI Water Recycling and Reclamation / Water Infrastructure Improvements for the Nation (WIIN) Program – Construction Grants administered by the United States Bureau of Reclamation (USBR)	Grants up to 25% of project costs or $20 million, whichever is less, are available from USBR for water recycling projects. A Title XVI Feasibility Study must be submitted to and approved by USBR to be eligible. USBR solicits grants annually.
WaterSMART Title XVI Water Recycling and Reclamation Program – Feasibility Study Grants administered by USBR	Grants up to $150,000 have been available in the past for preparation of Title XVI Feasibility Studies. It is possible future rounds may be administered.
Revenue Bonds	Revenue bonds can be issued to pay for capital costs of projects allowing for repayment of debt service over 20- to 30-year timeframe. Depends on the bond market and the existing debt of project proponents.
Integrated Regional Water Management (IRWM) implementation grants administered by DWR	The Coachella Valley IRWM Region can pursue grant funding through the IRWM Implementation Grant Program. The Coachella Valley IRWM Region falls within the Colorado River Funding Area (Funding Area). The Colorado River Funding Area was allocated $22.5 million in funding through Proposition 1. Of that, roughly $7.9 million was awarded to the Funding Area during the Round 1 solicitation. The remaining funding is anticipated to be distributed during the Round 2 solicitation, which is expected in late 2021.
Proposition 68 grant programs administered by various state agencies	Grant programs funded through Proposition 68, which was passed by California voters in 2018, and administered by various state agencies are expected to be applicable to fund SGMA implementation activities. These grant programs are expected to be competitive, where $74 million has been set aside for Groundwater Sustainability statewide.

12.2.9.2 Consider Groundwater Management Fee

Implementation of this *2027 Alternative Plan Update* is anticipated to be based on contributions from the GSAs and available grant programs. However, additional funding may be required to sustainably manage the Indio Subbasin. SGMA (Section 10725.8) authorizes GSAs to collect a groundwater management fee in order to effectively manage the groundwater balance. CVWD may evaluate the feasibility of a groundwater management fee to support expanded groundwater extraction reporting and other SGMA implementation activities. The other GSAs may similarly consider reporting requirements and associated fees within their respective service areas. This would provide an additional source of revenue for Plan implementation and improve assessment of groundwater extraction from the Indio Subbasin.

Ultimately, it will be up to the individual GSAs to determine how they meet their financial goals for Plan implementation. If grants or loans are secured for project implementation, potential pumping fees and assessments may be adjusted to align with the operating costs of ongoing implementation activities.

12.2.9.3 Implement PMAs

Chapter 11, *Projects and Management Actions,* includes projects and programs that have been identified to protect and improve groundwater levels and quality. Some of the PMAs are ongoing programs, some are in the planning and design phases, and others are still conceptual. Based on the outcomes of the monitoring programs described in Section 12.2.7 and analyzed in the Annual Reports described in Section 12.2.5, the GSAs will adaptively manage the Indio Subbasin. PMAs will be moved forward as needed to maintain the Indio Subbasin in sustainable conditions, able to meet Plan Area water demands, and groundwater levels and quality that avoid undesirable results. Table 11-5 in Chapter 11, *Projects and Management Actions,* includes the implementation actions necessary to move these projects and programs forward to ensure Indio Subbasin sustainability. With implementation of these PMAs as outlined in this *Alternative Plan Update*, the GSAs are anticipated to meet their water management goals and comply effectively with SGMA.

12.3 Implementation Timeline

Table 12-4 presents the implementation timeline for this Plan through the next five years when the next *Alternative Plan Update* is due to DWR. Included in the schedule are activities necessary for ongoing Plan monitoring and updates, as well as tentative schedules for anticipated projects and management actions. Additional details about the activities included in the implementation timeline have been described throughout this Plan.

GSA operations and Plan implementation will incur costs, which will require funding by the GSAs. The activities associated with Subbasin-wide management and Plan implementation will be borne by the four GSAs. Some activities (such as the Annual Reports and 5-Year Plan Updates) will be funded under the cost- sharing arrangement established by the Memorandum of Understanding (MOU) signed in 2016, along with multiple supplements (see Appendix 1-C). Other management activities will be funded by individual GSAs or through other cost-sharing agreements or amendment to the MOU. Projects will be administered by the GSA project proponents. GSAs may elect to implement projects individually or jointly with one or more GSAs.

Table 12-4 *Alternative Plan Update* Implementation Timeline

Activity	Timeline
GSA Program Management	
Oversight and Coordination	Ongoing
GSA Meetings	Annually, or as needed
Monitoring Programs	
Groundwater Level Monitoring	Ongoing
Climate, Streamflow, and Drain Flow Monitoring	Ongoing
Groundwater Production Monitoring	Ongoing
Subsidence Monitoring	Ongoing
Water Quality Monitoring	Ongoing
Seawater Intrusion Monitoring	Ongoing
Applied Recharge Monitoring	Ongoing
Data Management System (DMS)	Ongoing
Tribal Coordination	
SGMA Tribal Workgroup	Quarterly
Stakeholder Outreach	
Stakeholder Workshops	Annually, or as needed
Outreach and Website Maintenance	Ongoing
Annual Reports	
Submit Annual Reports	Annually
5-Year Plan Update	
Alternative Plan Update	Submit by January 1, 2032
Groundwater Model Updates	2030-2031
Monitoring Network Improvements	
Groundwater Monitoring Improvements	Ongoing
Expand Groundwater Production Reporting	Ongoing
Refine Subbasin Characterization	
Subsidence Study	2022 – 2026
Pursue Funding Opportunities	
Pursue Grant Programs	As funding is available
Evaluate Groundwater Management Fee	Ongoing
Implement Projects and Management Actions (PMAs)	
PMA 1: Urban Water Conservation	Ongoing
PMA 2: Turf Irrigation Reduction	Ongoing
PMA 3: Golf Water Conservation	Ongoing
PMA 4: Agricultural Water Conservation	Ongoing
PMA 5: Increased Surface Water Diversion	Ongoing
PMA 6: Delta Conveyance Facility	Planning underway
PMA 7: Sites Reservoir	Planning underway
PMA 8: Future Supplemental Water Acquisitions	As available
PMA 9: Mid-Valley Pipeline (Canal Only Customers)	Ongoing

Activity	Timeline
PMA 10: East Golf Expansion	Construction underway
PMA 11: Oasis Distribution System	Construction underway
PMA 12: WRP-10 Recycled Water Delivery	Construction underway
PMA 13: WRP-7 Tertiary Expansion	Planning underway
PMA 14: Canal Water Pump Station Upgrade	Planning and design underway
PMA 15: WRP-7 Recycled Water Delivery	Planning underway
PMA 16: WRP-4 Tertiary Expansion & Delivery	Planning and design underway
PMA 17: DWA WRP Recycled Water Delivery	Ongoing
PMA 18: EVRA Recycled Water Delivery	Planning underway
PMA 19 PD-GRF Expansion	Planning and design underway
PMA 20: WWR-GRF Operation	Ongoing
PMA 21: Eliminate Wastewater Percolation	Ongoing
PMA 22: Wellhead Treatment	Ongoing
PMA 23: Small Water System Consolidations	Ongoing
PMA 24: Septic to Sewer Conversions	Ongoing
PMA 25: Implement CV-SNMP Groundwater Monitoring Program Workplan	Ongoing
PMA 26: Implement CV-SNMP Development Workplan	Ongoing
PMA 27: Colorado River Basin Salinity Control Forum	Ongoing
PMA 28: Source Water Protection	Ongoing

12.4 Summary

The overarching goal of the *Alternative Plan Update* is to reliably meet current and future water demands in a cost-effective and sustainable manner. Implementation of the original *2002 Coachella Valley Final Water Management Plan* (*CVWMP)* (CVWD, 2002) and subsequent plans have achieved that overarching goal with the recognition that water management and development of PMAs is an ongoing adaptive process.

With the passage of SGMA in 2014, the GSAs are addressing the sustainability indicators established in the legislation. This *Alternative Plan Update* incorporates a goal specifically for groundwater sustainability, which is to maintain a locally managed, economically viable, sustainable groundwater resource for existing and future beneficial uses in the Indio Subbasin by managing groundwater to avoid the occurrence of undesirable results. This *Alternative Plan Update* establishes the groundwater conditions and hydrogeological conceptual model for the Indio Subbasin, forecasts water demands through the planning horizon, describes water supplies available to the GSAs, defines sustainable management for this region, presents water management projects and programs to ensure Subbasin sustainability, and models the simulated conditions that will result from implementation of those project portfolios. This planning process has demonstrated that with the proposed projects identified in this Plan, and despite anticipated climate changes, the Indio Subbasin GSAs are able to meet forecasted demands under a variety of conditions and maintain the Indio Subbasin in balance, even increasing groundwater storage over time. Subsidence and saltwater intrusion have been stopped and are not anticipated to occur during Plan implementation.

As documented in this *Alternative Plan Update*, the water supply of the Indio Subbasin is managed sustainably by the Indio Subbasin GSAs, with ongoing and adaptive management into the foreseeable future. This *Alternative Plan Update* has been developed in collaboration with the CV-SNMP and the two plans will continue to be coordinated. The GSAs have succeeded in reversing historical groundwater trends and are currently – and plan to continue – managing the Indio Subbasin sustainably. This Plan demonstrates that the GSAs have the necessary tools to support effective water management in the region.

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13 References

ES Executive Summary

Coachella Valley Water District (CVWD). 2002. *Coachella Valley Final Water Management Plan.* September 2002. Prepared by MWH and WaterConsult. Available: https://cvwd.org/ArchiveCenter/ViewFile/Item/358.

_____.2012. *Coachella Valley Water Management Plan 2010 Update*. January. Coachella, California. Final. Prepared by MWH. Available: https://cvwd.org/ArchiveCenter/ViewFile/Item/317.

Indio Subbasin GSAs (CVWD, Coachella Water Authority [CWA], Desert Water Agency [DWA], and Indio Water Authority [IWA]). 2016. *SGMA Alternative Groundwater Sustainability Plan Bridge Document for the Indio Subbasin.* December 2016. Prepared by Stantec. Available: file:///C:/Users/rprickett/Downloads/20161228%20SGMA%20Bridge%20Document%20-%20Indio%20-%20Final.pdf.

Sneed, M., and Brandt, J. 2020. *Detection and Measurement of Land Subsidence and Uplift Using Global Positioning System Surveys and Interferometric Synthetic Aperture Radar, Coachella Valley, California*, 2010–17, USGS Scientific Investigations Report 2020-5093, 74p., https://doi.org/10.3133/sir20205093

1 Introduction

Coachella Valley Association of Governments (CVAG). 2016*. Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP).*

Coachella Valley Regional Water Management Group (CVRWMG). 2018. *2018 Coachella Valley Integrated Regional Water Management & Stormwater Resources (IRWM/SWR) Plan Update.* December 2018. Prepared by Woodard & Curran. Available: https://www.cvrwmg.org/irwm/irwm-plan/.

Coachella Valley Water District (CVWD). 2002. *Coachella Valley Final Water Management Plan.* September 2002. Prepared by MWH and WaterConsult. Available: https://cvwd.org/ArchiveCenter/ViewFile/Item/358.

_____.2012a. *Coachella Valley Water Management Plan 2010 Update*. January. Coachella, California. Final. Prepared by MWH. Available: https://cvwd.org/ArchiveCenter/ViewFile/Item/317.

_____.2012b. *Subsequent Program EIR for the 2010 Update*.

CVWD, Desert Water Agency (DWA), and Indio Water Authority (IWA). 2015. *Coachella Valley Salt and Nutrient Management Plan*. June 2015. Prepared by MWH.

CVWD, DWA, and Mission Springs Water District (MSWD). 2013. *Mission Creek/Garnet Hill Water Management Plan*. January 2013. Prepared by MWH. Available: https://www.cvwd.org/DocumentCenter/View/1149/Mission-Creek-Garnet-Hill-WMP-Final-Report-Sections-PDF?bidId=.

CVWD, Coachella Water Authority (CWA), DWA, Indio Water Authority (IWA), MSWD, and Myoma Dunes Municipal Water Company (MDMWC). 2021. *2020 Coachella Valley Regional Urban Water Management Plan*. Prepared by Water Systems Consulting.

_____. 2026. *2025 Coachella Valley Regional Urban Water Management Plan*. Prepared by Rincon Consultants.

Coachella Valley Salt and Nutrient Monitoring Plan (SNMP) Agencies. 2020. *Groundwater Monitoring Program Workplan, Coachella Valley Salt and Nutrient Management Plan Update.* December 23. Prepared by West Yost.

_____. 2021. *Workplan to Develop the Coachella Valley Salt and Nutrient Management Plan.* Prepared by West Yost.

Colorado River RWQCB. 2020. *Letter from Paula Rasmussen, Executive Officer to Steve Bigley, Mark S. Krause, and Trish Rhay. Subject: Coachella Valley Salt and Nutrient Management Plan,* February 19, 2020.

Department of Water Resources (DWR). 2019. *Alternative Assessment Staff Report* for the Indio Subbasin

Indio Subbasin GSAs (CVWD, CWA, DWA, and IWA). 2016. *SGMA Alternative Groundwater Sustainability Plan Bridge Document for the Indio Subbasin.* December 2016. Prepared by MWH/Stantec.

Mission Creek Management Committee (CVWD, DWA, and MSWD). 2016. *SGMA Alternative Groundwater Sustainability Plan Bridge Document for the Mission Creek Subbasin*. Prepared by MWH/Stantec.

Todd Groundwater. 2023. *East Coachella Valley Agricultural Drainage System Flow Study* (Final report). Prepared for the Indio Subbasin Groundwater Sustainability Agencies, Coachella Valley Water District, Coachella Water Authority, Desert Water Agency, and Indio Water Authority. August 2023.

2 Plan Area

County of Riverside. 2021. *Ordinance No. 682 (as amended through 682.6): An ordinance regulating the construction, reconstruction, abandonment, and destruction of wells*. https://rivcocob.org/sites/g/files/aldnop311/files/migrated/wp-content-uploads-2021-08-682.6.pdf

Coachella Valley Regional Water Management Group (CVRWMG). 2018. *2018 Coachella Valley Integrated Regional Water Management & Stormwater Resources (IRWM/SWR) Plan Update. December 2018.* Available: https://www.cvrwmg.org/irwm/irwm-plan/.

Coachella Valley Water District (CVWD). 2012. *Coachella Valley Water Management Plan 2010 Update. January. Coachella, California. Final.* Prepared by MWH. Available: https://cvwd.org/ArchiveCenter/ViewFile/Item/317.

CVWD, Desert Water Agency (DWA), and Mission Springs Water District (MSWD). 2013. *Mission Creek/Garnet Hill Water Management Plan.* January 2013. Prepared by MWH. Available: https://www.cvwd.org/DocumentCenter/View/1149/Mission- Creek-Garnet-Hill-WMP-Final-Report-Sections-PDF?bidId=.

Colorado River Funding Area Partners. 2020*. 2020 Colorado River Funding Area Water Needs Assessment.* July 2020. Prepared by Woodard & Curran. Available: http://www.cvrwmg.org/resources/library/

Department of Water Resources (DWR). 2023. DAC Mapping Tool. Available: https://gis.water.ca.gov/app/dacs/

_____. 2025. California's Groundwater: Bulletin 118—Update 2025. October. Sacramento, California. Available: https://cawaterlibrary.net/document/ bulletin-118-californias-groundwater-2003/.

Indio Subbasin GSAs (CVWD, CWA, DWA, and Indio Water Authority [IWA]). 2016. *SGMA Alternative Groundwater Sustainability Plan Bridge Document for the Indio Subbasin.* December 2016. Prepared by Stantec. Available: file:///C:/Users/rprickett/Downloads/20161228%20SGMA%20Bridge%20Document%20-%20Indio%20-%20Final.pdf.

_____. 2026. *Indio Subbasin Annual Report for Water Year 2024-2025.* Prepared by Todd Groundwater. Available: https://sgma.water.ca.gov/portal/service/alternativedocument/download/2104

Lewis, P. G. T., Chiu, W. A., Nasser, E., Proville, J., Barone, A., Danforth, C., Kim, B., Prozzi, J., & Craft, E. 2023. *Characterizing Vulnerabilities to Climate Change Across the United States*. *Environment International, 172*, 107772. https://doi.org/10.1016/j.envint.2023.107772

Mission Creek GSAs. 2021. *Mission Creek Subbasin Alternative Plan Update.* Final. Available: http://www.missioncreeksubbasinsgma.org/wp-content/uploads/2022/03/Vol_I_MCSB_AltPlanUpdate_Report_Final_112321rev.pdf

Stetson Engineers. (2026, March). *TAC annual report for water year 2024–2025* [Technical report].

U.S. Geological Survey (USGS). 2020. *Detection and measurement of land subsidence and uplift using Global Positioning System surveys and interferometric synthetic aperture radar, Coachella Valley, California,* 2010–17. U.S. Geological Survey Scientific Investigations Report 2020–5093. Authors: Sneed, M., and Brandt, J.T. Available: https://doi.org/10.3133/sir20205093.

3 Hydrogeologic Conceptual Model

Coachella Valley Water District (CVWD), Desert Water Agency (DWA), and Mission Springs Water District (MSWD). 2013. *Mission Creek/Garnet Hill Water Management Plan*. January 2013. Prepared by MWH. Available: http://www.cvwd.org/DocumentCenter/View/1149/Mission-Creek-Garnet-Hill-WMP-Final-Report-Sections-PDF?bidId=.

DWR. 1964. *California Department of Water Resources Bulletin 108—Coachella Valley Investigation*. July. Sacramento, California. Available: https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=8773.

_____. 1979. *Coachella Valley Area Well Standards Investigation: Los Angeles.* California Department of Water Resources, Southern District.

_____. 2025. California's Groundwater: Bulletin 118—Update 2025. October. Sacramento, California. Available: https://cawaterlibrary.net/document/ bulletin-118-californias-groundwater-2003/.

Indio Subbasin GSAs (CVWD, Coachella Water Authority [CWA], DWA, and Indio Water Authority [IWA]. 2026. *Indio Subbasin Annual Report for Water Year 2024-2025.* Prepared by Todd Groundwater. Available: https://sgma.water.ca.gov/portal/service/alternativedocument/download/2104

4 Current and Historical Groundwater Conditions

California Natural Resources Agency. (2026, March). *Annual report on the Salton Sea Program*. https://saltonsea.ca.gov/

Central Arizona Project, 2026, 2020 through 2025 Annual Reports, Accessed from https://aquaportal.cap-az.com/Data/Dashboard/10 in August 2026

Coachella Valley Association of Governments (CVAG). 2007, amended 2016. *Coachella Valley Multiple Species Habitat Conservation Plan.* Prepared on behalf of Riverside County, the cities of Cathedral City, Coachella, Desert Hot Springs, Indian Wells, Indio, La Quinta, Palm Desert, Palm Springs, Rancho Mirage, as well as Coachella Valley Water District, Mission Springs Water District, Imperial Irrigation District, California State Parks, Coachella Valley Mountains Conservancy, and Caltrans. Available: https://www.cvmshcp.org/index.htm.

CVWD. 2002. *Coachella Valley Final Water Management Plan*. September 2002, prepared by MWH and WaterConsult. Available: https://www.cvwd.org/ArchiveCenter/ViewFile/Item/358

County of Riverside. 2020. *Eastern Coachella Valley Area Plan*, August 4, 2020. https://planning.rctlma.org/Portals/14/genplan/2021/ECVAP_5521.pdf

DWR (1964). Coachella Valley Investigation, California Department of Water Resources Bulletin 108. Central Arizona Project (CAP). 2015. 2014 Annual Water Quality Report, August 2015.

Galloway, D.L., Jones, D.R. and Ingebritsen, S.E. (eds.) (1999) *Land Subsidence in the United States*. U.S. Geological Survey Circular 1182. Reston, VA: U.S. Geological Survey. doi:10.3133/cir1182. https://pubs.usgs.gov/publication/cir1182

Galloway, D.L. and Burbey, T.J. (2011) 'Review: Regional land subsidence accompanying groundwater extraction', *Hydrogeology Journal*, 19(8), pp. 1459–1486. doi:10.1007/s10040-011-0775-5. https://www.researchgate.net/publication/251399629_Review_Regional_land_subsidence_accompanying_groundwater_extraction

Hausladen, D. M., Alexander-Ozinskas, A., McClain, C., & Fendorf, S. (2018). *Hexavalent chromium sources and distribution in California groundwater.* Environmental science & technology, 52(15), 8242-8251. https://pubs.acs.org/doi/abs/10.1021/acs.est.7b06627

Huberty, M. R., Pillsbury, A. F., and Sokoloff, V. P., 1948, *Hydrologic studies in Coachella Valley, California.* University of California Agricultural Experiment Station, Berkeley, California.

Jurgens, B. C., Fram, M. S., Belitz, K., Burow, K. R., & Landon, M. K. 2010. *Effects of Groundwater Development on Uranium: Central Valley, California, USA*. Groundwater, 48(6), 913-928. https://ngwa.onlinelibrary.wiley.com/doi/abs/10.1111/j.1745-6584.2009.00635.

McClain, C. N., Fendorf, S., Johnson, S. T., Menendez, A., & Maher, K. 2019. *Lithologic and Redox Controls on Hexavalent Chromium in Vadose Zone Sediments of California's Central Valley.* Geochimica et Cosmochimica Acta, 265, 478-494.

McMahon, P. B., Brown, C. J., Johnson, T. D., Belitz, K., & Lindsey, B. D. 2020. *Fluoride Occurrence in United States Groundwater.* Science of The Total Environment, 139217. https://www.sciencedirect.com/science/article/abs/pii/S0048969720327340

Metropolitan Water District of Southern California (MWD) 2020. *Annual Report for the Fiscal Year July 1, 2019 to June 30, 2020.*

Salton Sea Authority. 2020. 2020 *Annual Report on the Salton Sea Management Program*. https://saltonsea.ca.gov/wp-content/uploads/2020/02/2020-Annual-Report_2-21-20-v3.pdf

Sneed, M., and Brandt, J. 2020. *Detection and Measurement of Land Subsidence and Uplift Using Global Positioning System Surveys and Interferometric Synthetic Aperture Radar, Coachella Valley, California*, 2010–17, USGS Scientific Investigations Report 2020-5093, 74p., https://doi.org/10.3133/sir20205093

Todd Groundwater. 2019. TM1 - *Data Review, Modeling and Monitoring Plan, Evaluation of the Influence of Wastewater Reclamation Plant 10 (WRP 10) on Groundwater TDS and Nitrate Concentrations.* April 2019.

United States Geological Survey (USGS). 2014. High Levels of Natural Perchlorate in a Desert Ecosystem.

West Yost Associates. 2024. *Task 2 - Characterize current groundwater quality* (Technical Memorandum). CV-SNMP Technical Advisory Committee.

Woodard & Curran. 2021. *Indio Subbasin groundwater dependent ecosystems study* (Technical memorandum prepared for Coachella Valley Water District). June, 2021.

5 Demand Projections

California Department of Finance (DOF). 2026. *E-5 Population and Housing Estimates for Cities, Counties and the State, 2011–2020*. May. Sacramento, California. Available: http://www.dof.ca.gov/Forecasting/Demographics/Estimates/E-5/.

California Natural Resources Agency. 2023. *Agricultural Water Use Estimates for California, 2016–2020* [Dataset]. California Natural Resources Agency Open Data Portal.

Coachella Valley Regional Water Management Group (CVRWMG). (2024). *Regional Water Conservation Study: Final Report*.

Coachella Valley Water District (CVWD). 2002. *Coachella Valley Final Water Management Plan.* September 2002, prepared by MWH and WaterConsult. Available: https://www.cvwd.org/ArchiveCenter/ViewFile/Item/358

_____. 2012. *Coachella Valley Water Management Plan 2010 Update*. January. Coachella, California. Final. Prepared by MWH. Available: https://cvwd.org/ArchiveCenter/ViewFile/Item/317. CVWD. 2019a. *2019 Crop Report*. Available: http://cvwd.org/ArchiveCenter/ViewFile/Item/864. CVWD. 2019b. Ordinance 1302.4, *An Ordinance of the Coachella Valley Water District Establishing Landscape and Irrigation System Design Criteria*. February. Coachella, California. Adopted by the

_____. 2019. *Ordinance 1302.4, An Ordinance of the Coachella Valley Water District Establishing Landscape and Irrigation System Design Criteria*. February. Coachella, California. Adopted by the Coachella Valley Water District Board of Directors February 12, 2019. Available: https://www.cvwd.org/DocumentCenter/View/93/Landscape-Ordinance-13024-PDF?bidId=

County of Riverside Agricultural Commissioner. 2024. *2024 Crop and Livestock Report*. County of Riverside Agricultural Commissioner's Office

Department of Water Resources (DWR). 2015. Website: Model Water Efficient Landscape Ordinance (MWELO). Available: https://govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=IBBB0A9505B6E11EC9451000D3A7C4BC3&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)

_____. 2017. *Draft Guidance Document for the Sustainable Management of Groundwater, Engagement with Tribal Governments*. June. Sacramento California. Available: https://cawaterlibrary.net/document/guidance-document-for-the-sustainable-management-of- groundwater-engagement-with-tribal-governments-june-2017-draft/.

DWR and State Water Resources Control Board (SWRCB). 2018. *Making Conservation a California Way of Life: Primer of 2018 Legislation on Water Conservation and Drought Planning Senate Bill 606 (Hertzberg) and Assembly Bill 1668 (Friedman)*. November. Sacramento, California. Available: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Water-Use-And- Efficiency/Make-Water-Conservation-A-California-Way-of-Life/Files/PDFs/Final-WCL-Primer.pdf

Los Angeles Department of Water and Power (LADWP). 2017. *Water Conservation Potential Study: Executive Report*. Available: https://www.ladwp.com/sites/default/files/2023-08/Water%20Conservation%20Study%20June%202018.pdf

Porse, E., et al. 2025. *Quantifying Replacement Rates from Indoor and Outdoor Urban Water Conservation Incentives in California*. *Journal of the American Water Resources Association*.

Southern California Association of Governments (SCAG). 2024. Connect SOCAL 2024 Demographics & Growth Forecast. Available: https://www.connectsocal.org/sites/default/files/2024-05/23-2987-tr-demographics-growth-forecast-final-040424.pdf

U.S. Census Bureau (Census Bureau). 2020. Website: American Community Survey: 2014–2018 5-Year Estimates. Available: https://www.census.gov/programs-surveys/acs/technical-documentation/table-and-geography-changes/2018/5-year.html.

U.S. Department of Agriculture (USDA), National Agricultural Statistics Service (NASS). 2025. *Cropland Data Layer (CDL), 2024* [Dataset]. USDA National Agricultural Statistics Service. https://nassgeodata.gmu.edu/CropScape/

6 Water Supply

California Department of Fish and Wildlife (CDFW). 2024. *State Water Project Incidental Take Permit for Long-Term Operations in the Sacramento-San Joaquin Delta. Sacramento, California.*

Coachella Valley Water District (CVWD). 2003. *2003 Quantification Settlement Agreement*. October 2003.

CVWD. 2012. *Coachella Valley Water Management Plan 2010 Update*. January 2012. Prepared by MWH.

_____. 2019a. *Amended and Restated Agreement Between the Metropolitan Water District of Southern California, Coachella Valley Water District, and Desert Water Agency for the Exchange and Advance Delivery of Water*.

_____. 2019b. *Second Amendment to Delivery and Exchange Agreement Between Metropolitan and Coachella for 35,000 Acre-Feet*.

_____. 2019c. *Drought Contingency Plan Implementation Agreement between Metropolitan Water District of Southern California and Coachella Valley Water District*.

CVWD and Desert Water Agency (DWA). 2014. *Mission Creek Water Management Agreement*. Dated as of July 15, 2014.

Delta Stewardship Council. (2013). *The Delta Plan: Ensuring a Reliable Water Supply for California, a Healthy Delta Ecosystem, and a Place of Enduring Value.* Delta Stewardship Council.

Department of Water Resources (DWR). (1964). *Coachella Valley Investigation*. California Department of Water Resources.

_____. 2004. *Amendment No. 19 to Water Supply Contract between the State of California Department of Water Resources and Coachella Valley Water District* (Tulare Lake Basin Water Storage District transfer) dated February 23, 2004.

_____. 2007a. *Amendment No. 20 to Water Supply Contract between the State of California Department of Water Resources and Coachella Valley Water District* (Tulare Lake Basin Water Storage District transfer) dated May 9, 2007.

_____. 2007b. *Amendment No. 19 to Water Supply Contract between the State of California Department of Water Resources and Desert Water Agency* (Tulare Lake Basin Water Storage District transfer) dated May 9, 2007.

_____. 2007c. *Amendment No. 21 to Water Supply Contract between the State of California Department of Water Resources and Coachella Valley Water* District (Berrenda Mesa Water District transfer) dated September 26, 2007.

_____. 2007d. *Amendment No. 20 to Water Supply Contract between the State of California Department of Water Resources and Desert Water Agency* (Berrenda Mesa Water District transfer) dated September 26, 2007.

_____. 2023. *Final Environmental Impact Report for the Delta Conveyance Project*. Certified December 21, 2023. Sacramento, CA. Available at: https://www.deltaconveyanceproject.com/planning-processes/california-environmental-quality-act/final-eir

_____. 2025. *The State Water Project Draft Delivery Capability Report 2025.* Available: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Library/Modeling-And-Analysis/Files/Modeling-and-Analysis-PDFs/Draft_DCR25_MainReport_final_2025-12-17.pdf

_____. 2026. *Bulletin 132-2023 Management of the California State Water Project* Available: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/State-Water-Project/Management/Bulletin-132/Bulletin-132/Files/Bulletin-132-23-032726.pdf

International Boundary and Water Commission (IBWC). 1973. *Minute No. 242*. Available: https://www.usbr.gov/lc/region/g1000/pdfiles/min242.pdf

Metropolitan Water District (MWD) and CVWD. 2025. *Third Amendment to the Delivery and Exchange Agreement Between The Metropolitan Water District of Southern California and Coachella Valley Water District for 35,000 Acre-Feet.* Executed June 1, 2025

National Marine Fisheries Service (NMFS). 2024. Endangered Species Act Section 7(a)(2) Programmatic Biological Opinion for the Reinitiation of Consultation on the Long-Term Operation of the Central Valley Project and State Water Project. December 6, 2024

Secretary of the Interior. 2003. *Colorado River Water Delivery Agreement: Federal Quantification Settlement Agreement for the Purposed of Section 5(B) of Interim Surplus Guidelines*. October 10, 2003. Available: https://www.usbr.gov/lc/region/g4000/crwda/crwda.pdf.

Sites Project Authority. 2019. *2019 Reservoir Project Agreement, Dated as of April 1, 2019*.

U.S. Department of the Interior Bureau of Reclamation (USBR). 1922. *Colorado River Compact, 1922*. Available: https://www.usbr.gov/lc/region/g1000/pdfiles/crcompct.pdf.

_____. 1928. *Boulder Canyon Project Act*. Available: https://www.usbr.gov/lc/region/pao/pdfiles/bcpact.pdf

_____. 1931. 1931 *Boulder Canyon Project Agreement*. Available: https://www.usbr.gov/lc/region/g1000/pdfiles/ca7pty.pdf

_____. 1968. *1968 Colorado River Basin Project Act*. Available: https://www.usbr.gov/lc/region/g1000/pdfiles/crbproj.pdf

_____. 1986. *1986 Agreement Between the United States of America and the State of California for Coordinated Operation of the Central Valley Project and the State Water Project*.

_____. 2007. *Record of Decision for the Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead. December 2007*. Available: https://www.usbr.gov/ColoradoRiverBasin/

_____. 2018. *2018 Addendum to the Coordinated Operation Agreement, Central Valley Project/State Water Project*.

_____. 2019. *Lower Basin Drought Contingency Plan Agreement*.

_____. 2020a. *Draft Report – Review of the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead*. October. Available: https://www.usbr.gov/ColoradoRiverBasin/documents/7.D.Review_DraftReport_10-23-2020.pdf

_____. 2020b (website). Boulder Canyon Operations Office – Programs and Activities, Lower Colorado River Water Accounting Reports. Available: https://www.usbr.gov/lc/region/g4000/wtracct.html.

_____. 2026. Draft Environmental Impact Statement for Post-2026 Colorado River Operations. Available: https://www.usbr.gov/ColoradoRiverBasin/post2026/

U.S. Fish and Wildlife Service (USFW). 2020 (website). Water Project Biological Opinions. Available: https://www.fws.gov/sfbaydelta/cvp-swp/index.htm

_____. 2024. Biological Opinion: Reinitiation of Consultation on the Coordinated Long-Term Operation of the Central Valley Project and State Water Project. November 8, 2024.

U.S. Government Printing Office. 1946. 1*944 United States-Mexico Treaty for Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande*. Available: https://www.usbr.gov/lc/region/pao/pdfiles/mextrety.pdf

Vasileva, P. (Financial Analyst, Coachella Valley Water District). 2025. *Email communication regarding Delta Conveyance Project water delivery and Advance Delivery Account balances*. Email to A. Antonelli, J. Le, R. Cheng, S. Burritt, A. McVey, L. Garcia, M. Reilly, M. de Jong, R. Prickett, K. Fikan, I. Reyburn, and L. Anderson. October 27, 2025.

7 Numerical Model and Plan Scenarios

American Society for Testing and Materials (ASTM) D5490-93, 1994. *Standard guide for comparing ground-water flow model simulations to site-specific information.*

ASTM D5981-96e1. 1998. *Standard guide for calibrating a ground-water flow model application*.

Coachella Valley Water District (CVWD). 2002. *Coachella Valley Final Water Management Plan.* September 2002. Prepared by MWH and WaterConsult. Available: https://cvwd.org/ArchiveCenter/ViewFile/Item/358.

_____. 2012. *Coachella Valley Water Management Plan 2010 Update*. January. Coachella, California. Final. Prepared by MWH. Available: https://cvwd.org/ArchiveCenter/ViewFile/Item/317. Fogg, G.E., G.T. O'Neill, E.M. LaBolle, and D.J. Ringel, 2000. Groundwater Flow Model of Coachella Valley, California: An Overview.

Department of Water Resources (DWR), 1979*. Coachella Valley area well standards investigation, Memorandum Report.*

Fogg, G. E., O'Neill, G. T., LaBolle, E. M., & Ringel, D. J. 2000. *Groundwater Flow Model of Coachella Valley, California: An Overview*. Prepared for Coachella Valley Water District. November 2000

Hausfather, Z. and Peters, G.P., 2020. Emissions – the "business as usual" story is misleading. *Nature*, 577, pp.618–620. https://doi.org/10.1038/d41586-020-00177-3

INTERA. 2026. *San Gorgonio Pass Subbasin groundwater sustainability plan*.

IPCC, 2021: Climate Change 2021: *The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.*

Reichard, E.G., and J.K. Meadows, J.K., 1992. *Evaluation of a Ground-Water Flow and Transport Model of the Upper Coachella Valley, California.* USGS Water-Resources Investigations Report 91-4142.

Todd Groundwater. 2023. *East Coachella Valley Agricultural Drainage System Flow Study* (Final report). Prepared for the Indio Subbasin Groundwater Sustainability Agencies, Coachella Valley Water District, Coachella Water Authority, Desert Water Agency, and Indio Water Authority. August 2023.

WSP. 2026. *Mission Creek Subbasin 2027 Alternative Plan Update*.

8 Regulatory and Policy Issues

Association of California Water Agencies (ACWA). 2024. *OAL approves Making Conservation a CA Way of Life regulation*. October 25, 2024. https://www.acwa.com/news/office-of-administrative-law-approves-making-conservation-a-california-way-of-life-regulation/

Boyd, V. 2026. *Invasive mussels spread, could clog irrigation systems*. AgAlert. January 28, 2026. https://www.agalert.com/california-ag-news/archives/january-28-2026/invasive-mussels-spread-could-clog-irrigation-systems/

California Environmental Protection Agency (CalEPA) and State Water Resources Control Board. 2026. *2026 California integrated report: Surface water quality assessments to comply with Clean Water Act sections 303(d) and 305(b): Final staff report*. California Environmental Protection Agency. https://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/docs/2026/Final%202026%20California%20Integrated%20Report%20Staff%20Report.pdf

California Department of Fish and Wildlife (CDFW). (2025, April 14). *Golden mussel response framework* Available: https://www.bing.com/search?pglt=43&q=california+multiagency+2025+golden+muscle+framework&cvid=919c569a19bb48bb850ff6aafeb1cf3b&gs_lcrp=EgRlZGdlKgYIABBFGDkyBggAEEUYOTIICAEQ6QcY_FXSAQkxNTQ3N2owajeoAgCwAgA&FORM=ANNAB1&PC=U531

California Natural Resources Agency. (2026, March). *Annual report on the Salton Sea Program*. https://saltonsea.ca.gov/

City of Coachella. 2016. *2015 Urban Water Management Plan*. July 27, 2016. Available: https://www.coachella.org/Home/ShowDocument?id=4620

Coachella Valley Regional Water Management Group (CVRWMG). 2018. *2018 Coachella Valley Integrated Regional Water Management & Stormwater Resource Plan* (Final December 2018; amended December 2020). https://www.mswd.org/DocumentCenter/View/193/2018-Coachella-Valley-IRWM-SWR-Plan-Chapters-PDF

Colorado River Basin Salinity Control Forum. (2026). *2026 review: Water Quality Standards for Salinity, Colorado River System*. Available://barnettwater.sharepoint.com/Shared%20Documents/Forms/AllItems.aspx?id=%2FShared%20Documents%2FForum%2FTriennial%20Reviews%2F2026%20Review%2FJune%202026%20Public%20Review%20Draft%2F2026%20TRIENNIAL%20REVIEW%20%28Public%20Review%20Draft%202026%2D06%2D15%29%2Epdf&parent=%2FShared%20Documents%2FForum%2FTriennial%20Reviews%2F2026%20Review%2FJune%202026%20Public%20Review%20Draft&p=true&ga=1

Colorado River Regional Water Quality Control Board (RWQCB). 1993, Amended in 2006. *Water Quality Control Plan Colorado River Basin – Region 7 (Basin Plan)*. Available: http://www.waterboards.ca.gov/rwqcb7/publications_forms/publications/docs/basinplan_2006.pdf

_____. 2020. *General Waste Discharge Requirements for Discharges of Waste from Irrigated Agricultural Lands for Dischargers that are Members of a Coalition Group in the Coachella Valley, Riverside County, Order R7-2020-0026*. Available: https://www.waterboards.ca.gov/coloradoriver/board_decisions/adopted_orders/boardorders 2020.html

_____. 2023. *2023 triennial review of Water Quality Control Plan for the Colorado River Basin: Final staff report*. https://www.waterboards.ca.gov/coloradoriver/water_issues/programs/basin_planning/docs/2023/final-staff-report.pdf

Coachella Valley Water District (CVWD), Desert Water Agency (DWA), and Indio Water Authority (IWA). 2015. *Coachella Valley Groundwater Basin Salt and Nutrient Management Plan*. Final, June. Available: https://www.cvwd.org/DocumentCenter/View/2441/Coachella-Valley-Groundwater-Basin-Salt- and-Nutrient-Management-Plan-Final-PDF?bidId=

CVWD. 2018. "As EPA lifts drinking water order for Oasis Mobile Home Park, CVWD sets sights on long- term fix." *CVWD News*, May 29, 2020. Available: https://www.cvwd.org/CivicAlerts.aspx?AID=343

Department of Water Resources (DWR). 2018. *Guidance for Climate Change Data Use During Groundwater Sustainability Plan Development.* Available: https://water.ca.gov/Programs/Groundwater-Management/SGMA-Groundwater-Management/Best-Management-Practices-and-Guidance-Documents

_____. 2025. *State Water Project Adaptation Strategy: Reducing Vulnerabilities to Climate Change*. Available: https://cadwr.app.box.com/s/yfrzk3xxwic3xxiljhl2qqh6m4l7ymth

_____. 2024. *Making conservation a California way of life*. July 3, 2024. https://www.dwa.org/making-conservation-a-california-way-of-life

DWA. 2016. *2015 Urban Water Management Plan*. June 2016. Available: https://dwa.org/wp-content/uploads/bsk-pdf-manager/2020/08/101-26P7-UWMP2015-AMENDED_2020-07-FINAL- p.pdf

_____. 2026. *Water quality report: 2025 data*. https://www.dwa.org/files/2083bc68b/WQR+2025+%28delivered+in+2026%29+FINAL+WEB.pdf

Hopkins, F. M. (2018). *Inland Deserts region report* (Report No. SUM-CCCA4-2018-008). California's Fourth Climate Change Assessment. California Governor's Office of Planning and Research, California Natural Resources Agency, and California Energy Commission. http://www.climateassessment.ca.gov/regions/docs/20180827-InlandDeserts.pdf

Office of Environmental Health Hazard Assessment (OEHHA). 2015. *OEHHA Adopts Updated Public Health Goal for Perchlorate.* February 27, 2015. Available: https://oehha.ca.gov/water/press- release/press-release-water/oehha-adopts-updated-public-health-goal-perchlorate-0#:~:text=SACRAMENTO%20%E2%80%93%20The%20Office%20of%20Environmental,for%20per chlorate%20in%20drinking%20water.&text=%E2%80%9CIt%20is%20set%20at%20a,for%20peop le%20of%20all%20ages.%E2%80%9D

Salton Sea Authority. 2016. *Salton Sea Funding and Feasibility Action Plan Benchmark 7: Project Summary.* Available: https://saltonsea.com/wp-content/uploads/2017/02/SS-Benchmark-7_5- 11-16r.pdf

Sneed, M., and Brandt, J.T. 2007. *Detection and measurement of land subsidence using global positioning system and interferometric synthetic aperture radar, Coachella Valley, California, 1996–2005*: U.S. Geological Survey Scientific Investigations Report 2007–5251, v. 2.0, 31 p. Available: https://doi.org/10.3133/sir20075251.

_____. 2020. *Detection and Measurement of Land Subsidence and Uplift Using Global Positioning System Surveys and Interferometric Synthetic Aperture Radar, Coachella Valley, California, 2010–17, USGS Scientific Investigations Report 2020-5093*. 74p., Available: https://doi.org/10.3133/sir202050

State Water Resources Control Board (SWRCB). 2018. *Water Quality Control Policy for Recycled Water*. adopted December 11, 2018. Available: https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2018/121118_ 7_final_amendment_oal.pdf

_____. 2020. *Resolution No. 2020-0036: Adopting Revised Detection Limits for Purposes of Reporting (DLR) for Perchlorate of 0.002 mg/L and 0.001 mg/L*. California Environmental Protection Agency. https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2020/rs2020_0036_regtext.pdf

Todd Groundwater. (2023, August). *East Coachella Valley Agricultural Drainage System Flow Study* (Final report). Prepared for the Indio Subbasin Groundwater Sustainability Agencies, Coachella Valley Water District, Coachella Water Authority, Desert Water Agency, and Indio Water Authority.

Todd Groundwater & Rincon Consultants. (2026). *2025 Regional Urban Water Management Plan*. Prepared for Coachella Valley Water District, Coachella Water Authority, Desert Water Agency, City of Indio, Mission Springs Water District, and Myoma Dunes Mutual Water Company. Available: https://www.cvrwmg.org/wp-content/uploads/2026/05/2025-Coachella-Valley-RUWMP_Final-1.pdf

U.S. Department of the Interior Bureau of Reclamation (USBR). 2012. *2012 Colorado River Basin Water Supply and Demand Study.* https://www.usbr.gov/lc/region/programs/crbstudy/finalreport/index.html

_____. 2021. *West-Wide Climate and Hydrology Assessment* (Technical Memorandum No. ENV-2021-001, Version 1.1). U.S. Department of the Interior. Available: https://www.usbr.gov/climate/secure/docs/2021secure/westwidesecurereport.pdf

U.S. Fish and Wildlife Service. 2020. *Sonny Bono Salton Sea*. 2020. Available: https://www.fws.gov/refuge/sonny_bono_salton_sea/about.html

U.S. Geological Survey (USGS). 2023. *Quality of Groundwater Used for Domestic Drinking-Water Supply in the Coachella Valley, 2020* (Open-File Report 2022–1122). Available: https://doi.org/10.3133/ofr20221122

West Yost. 2020. Groundwater Monitoring Program Workplan*, Coachella Valley Salt and Nutrient Management Plan Update*. December 23. Prepared by West Yost.

_____. 2021. *Workplan to Develop the Coachella Valley Salt and Nutrient Management Plan.* Prepared by West Yost.

9 Sustainable Management

Agua Caliente Band of Cahuilla Indians, Coachella Valley Water District, Desert Water Agency, & United States. 2025. *Agua Caliente Band of Cahuilla Indians Water Rights Settlement Agreement*. , May 19, 2025. https://www.aguacaliente.org/documents/Agua_Caliente_Water_Settlement_Agreement.pdf

Coachella Valley Water District (CVWD), Desert Water Agency (DWA), and Mission Springs Water District (MSWD). 2013. *Mission Creek/Garnet Hill Water Management Plan*. January 2013. Prepared by MWH. Available: http://www.cvwd.org/DocumentCenter/View/1149/Mission-Creek-Garnet-Hill-WMP-Final-Report-Sections-PDF?bidId=

CVWD. 2002. *Coachella Valley Final Water Management Plan.* September 2002. Prepared by MWH and WaterConsult. Available: https://cvwd.org/ArchiveCenter/ViewFile/Item/358.

_____. 2012. *Coachella Valley Water Management Plan 2010 Update*. January. Coachella, California. Final. Prepared by MWH. Available: https://cvwd.org/ArchiveCenter/ViewFile/Item/317.

Colorado River RWQCB, 2020, *Coachella Valley Salt and Nutrient Management Plan, letter to Steve Bigley, Mark S. Krause, Trish Rhay.* February 19, 2020.

Department of Water Resources (DWR). 2019. *Sustainable groundwater management program alternative assessment staff report: Coachella Valley–Indio Subbasin*. July 17, 2019. https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Alternatives/Files/ExistingPlans/Indio/03_Indio_Staff_Report.pdf

_____. 2024. *Statement of findings regarding the periodic review and approval of the Coachella Valley–Indio Subbasin alternative groundwater sustainability plan*. June 27, 2024. https://cawaterlibrary.net/document/statement-of-findings-regarding-the-periodic-review-and-approval-of-the-coachella-valley-indio-subbasin-alternative-groundwater-sustainability-plan/

Sneed, M. and Brandt, J. T. 2020. Mitigating Land Subsidence in the Coachella Valley, California, USA: An Emerging Success Story, Proc. IAHS, 382, 809–813, https://doi.org/10.5194/piahs-382-809-2020, 2020.

Todd Groundwater. 2023. *East Coachella Valley Agricultural Drainage System Flow Study* (Final report). Prepared for the Indio Subbasin Groundwater Sustainability Agencies, Coachella Valley Water District, Coachella Water Authority, Desert Water Agency, and Indio Water Authority. August 2023.

West Yost. 2021. *Coachella Valley Salt and Nutrient Management Plan Development Workplan*. Prepared for the Coachella Valley SNMP Agencies

_____. 2020. *Groundwater Monitoring Program Workplan: Coachella Valley Salt and Nutrient Management Plan Update*. Prepared for the Coachella Valley SNMP Agencies. December 23, 2020. https://www.cvwd.org/DocumentCenter/View/5547/CV-SNMP-Groundwater-Monitoring-Program-Workplan_final

10 Monitoring Program

Department of Water Resources (DWR). 2010. California Statewide Groundwater Elevation Monitoring (CASGEM) Program Procedures for Monitoring Entity Reporting. December 2010. https://water.ca.gov/-/media/DWR-Website/Web- Pages/Programs/Groundwater-Management/CASGEM/Files/CASGEM-Procedures-for-Monitoring-Entity- Reporting-Final-121610_ay_19.pdf

_____.2016. *Monitoring Networks and Identification of Data Gaps, Best Management Practices for Sustainable Management of Groundwater*. December 2016. https://water.ca.gov/-/media/DWR- Website/Web-Pages/Programs/Groundwater-Management/Sustainable-Groundwater-Management/Best- Management-Practices-and-Guidance-Documents/Files/BMP-2-Monitoring-Networks-and-Identification-of- Data-Gaps_ay_19.pdf

Indio Subbasin GSAs (Coachella Valley Water District [CVWD], Coachella Water Authority [CWA], Desert Water Agency [DWA], and Indio Water Authority [IWA]). 2016. *SGMA Alternative Groundwater Sustainability Plan Bridge Document for the Indio Subbasin*. December 2016. Prepared by Stantec. Available: file:///C:/Users/rprickett/Downloads/20161228%20SGMA%20Bridge%20Document%20-%20Indio%20-%20Final.pdf

Sneed, M., Brandt, J. T., & Solt, M. 2014. *Land Subsidence, Groundwater Levels, and Geology in the Coachella Valley, California, 1993–2010* (Scientific Investigations Report 2014–5075). U.S. Geological Survey. https://doi.org/10.3133/sir20145075

Sneed, M., and Brandt, J. 2020*. Detection and Measurement of Land Subsidence and Uplift Using Global Positioning System Surveys and Interferometric Synthetic Aperture Radar, Coachella Valley, California*, 2010–17, USGS Scientific Investigations Report 2020-5093, 74p., https://doi.org/10.3133/sir20205093

U.S. Environmental Protection Agency (EPA). 2017. *Groundwater Sampling* (SESDPROC-301-R4). Region 4, Science and Ecosystem Support Division. https://19january2021snapshot.epa.gov/sites/static/files/2017-07/documents/groundwater_sampling301_af.r4.pdf

U.S. Geological Survey (USGS). 2015. *National Field Manual for the Collection of Water-Quality Data* (Techniques of Water-Resources Investigations, Book 9). U.S. Geological Survey. https://doi.org/10.3133/twri09

11 Projects and Management Actions

California Urban Water Conservation Council (CUWCC).1991. *Memorandum of Understanding Regarding Urban Water Conservation (MOU).*

California Water Efficiency Partnership (CalWEP). 2021. *2021-2023 Strategic Plan*.

Coachella Valley SNMP Agencies. 2021. *Workplan to Develop the Coachella Valley Salt and Nutrient Management Plan*. April.

Coachella Valley Water District (CVWD). 2010. Unpublished Coachella Valley groundwater level data.

_____.2012. *Coachella Valley Water Management Plan* 2010 Update. January 2012. Prepared by MWH. CVWD. 2014. Oasis Area Irrigation System Expansion Project: Preliminary Design Report. Prepared by DAHL Consultants (DAHL).

_____.2019. *Ordinance 1302.4. Coachella Valley Water District Establishing Landscape and Irrigation System Design Criteria.* February 2019.

_____.2020. *2020-2021 Engineer's Report on Water Supply and Replenishment Assessment.* April 2020. Prepared by Wildermuth Environmental, Inc.

CVWD, Coachella Water Authority (CWA), DWA, Indio Water Authority (IWA), MSWD, and Myoma Dunes Municipal Water Company (MDMWC). 2021a. *2020 Coachella Valley Regional Urban Water Management Plan.* June 2021. Prepared by Water Systems Consulting.

CVWD, CWA, DWA, and IWA. 2021b. *Indio Subbasin Annual Report for Water Year 2019-2020*. February 2021. Prepared by Todd Groundwater and Woodard & Curran.

CVWD, DWA, and IWA. 2015. *Coachella Valley Groundwater Basin Salt and Nutrient Management Plan.* Prepared by MWH.

Colorado River RWQCB. Amended 2019. *Water Quality Control Plan for the Colorado River Basin Region*.

East Valley Reclamation Authority (EVRA). 2020. *Evaluation of Indirect Potable Reuse at the Valley Sanitary District Water Reclamation Facility.* November 2020. Prepared by Geoscience Support Services, Inc.

Malcolm Pirnie, Inc. 2008. *Phase 2 Draft Surface Water Treatment Process Evaluation Report.*

QWEL. 2018. *Qualified Water Efficient Landscaper Reference Manual.* https://www.qwel.net/files/QWEL_Reference_Manual_CA_INTERACTIVE.pdf

U.S. Department of the Interior Bureau of Reclamation (USBR). 2007. *Colorado River Interim Guidelines for East Basin Shortages and Coordinated Operations for Lakes Powell and Mead.*

12 Plan Evaluation and Implementation

Coachella Valley Regional Water Resilience Plan. 2026. *Project Goals and Timeline*. https://www.cvwaterresilience.org/goals-timeline/

Coachella Valley Water District (CVWD). 2002. *Coachella Valley Final Water Management Plan.* September 2002. Prepared by MWH and WaterConsult. Available: https://cvwd.org/ArchiveCenter/ViewFile/Item/358.

_____.2012. *Coachella Valley Water Management Plan 2010 Update*. January. Coachella, California. Final. Prepared by MWH. Available: https://cvwd.org/ArchiveCenter/ViewFile/Item/317.

Department of Water Resources (DWR). 2016. *Monitoring Networks and Identification of Data Gaps, Best Management Practices for Sustainable Management of Groundwater*. December 2016.

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