Groundwater Sustainability Plan

Monterey Subbasin

Amendment 1

Marina Coast Water District Groundwater Sustainability Agency
Salinas Valley Basin Groundwater Sustainability Agency

Draft

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List of Abbreviations

AB	Assembly Bill
AEM	airborne electromagnetic
AF	acre-foot
AFY	acre-feet per year
Ag	Agricultural
AGF	Aqua Geo Frameworks
AMBAG	Association of Monterey Bay Area Governments
ARAS	applicable or relevant and appropriate
ASR	Aquifer Storage and Recovery
AWPF	Advanced Water Purification Facility
AWTP	Advanced Water Treatment Plant
BCT	block centered transport
BGRP	Brackish Groundwater Restoration Project
BLM	U.S. Bureau of Land Management
BMP	Best Management Practice
BMPs	Best Management Practices
CA	California
CALGreen	California Green
CASGEM	California Statewide Groundwater Elevation Monitoring
CCC	California Coastal Commission
CCR	California Code of Regulations
CCRWQCB	Central Coast Regional Water Quality Control Board
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CFI	Community Facilities and Infrastructure
cfs	cubic feet per second
CIFP	Capital Improvement and Financing Plan
COCs	constituents of concern
CPE	Communication and public engagement
CPUC	California Public Utilities Commission
CSD	Community Services District
CSIP	Castroville Seawater Intrusion Project
CT	Carbon Tetrachloride
CUS	California Utility Service
CWC	California Water Code
DAC	Disadvantaged Community
DACs	disadvantaged communities
DDW	Division of Drinking Water
DMS	Data Management System
DOF	Department of Finance

DPR	direct potable reuse
DTSC	Department of Toxic Substances Control
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EPA	U.S. Environmental Protection Agency
ESD	Explanations of Significant Difference
ESHA	Environmentally Sensitive Habitat Area
ET	evapotranspiration
FFA	Federal Facility Agreement
fm	formation
FO	Fort Ord
FORA	Fort Ord Reuse Authority
ft	foot/feet
ft bgs	feet below ground surface
ft msl	foot mean sea level
ft/ft	foot per foot
GAMA	Groundwater Ambient Monitoring and Assessment Program
GDE	Groundwater dependent ecosystem
GEMS	Groundwater Extraction Management System
GMP	Groundwater Management Plan
GPCD	Gallons per Capita per Day
GPS	Global Positioning System
GRRP	Groundwater Replenishment Reuse Project
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCM	Hydrogeologic Conceptual Model
HCP	Habitat Conservation Plan
HLA	Harding Lawson Associates
HMP	Habitat Management Plan
HS	Health, Safety, and Community
HUC	Hydrologic Unit Codes
ILP	Irrigated Lands Program
ILRP	Irrigated Lands Regulatory Program
InSAR	Interferometric Synthetic Aperture Radar
IPR	indirect potable reuse
IRWM	Integrated Regional Water Management
IRWMP	Integrated Regional Water Management Plan
ISW	interconnected surface water
IWRMP	Integrated Regional Water Management Plan
JPA	Joint Powers Authority
LCLUP	Local Coastal Land Use Plan
LCP	Local Coastal Program

LUST	leaking underground storage tank
M1W	Monterey One Water
M&I	municipal & industrial
MBARD	Monterey Bay Air Resources District
MBGWFM	Monterey Subbasin Groundwater Flow Model
MBNMS	Monterey Bay National Marine Sanctuary
MCC	Monterey County Code
MCFCWCD	Monterey County Flood Control and Water Conservation District
MCHD	Monterey County Health Department
MCL	Maximum Contaminant Level
MCWD	Marina Coast Water District
MCWDGSA	Marina Coast Water District Groundwater Sustainability Agency
MCWRA	Monterey County Water Resources Agency
mg/L	milligram per liter
MGD	million gallon per day
Mmy	Monterey Formation
MOA	Memorandum of Agreement
MPWMD	Monterey Peninsula Water Management District
MRSWMP	Monterey Regional Stormwater Management Program
MRWPCA	Monterey Regional Water Pollution Control Agency
Msm	Santa Margarita Sandstone
Msu	Unnamed Miocene Sedimentary Rocks
MTBE	methyl tert butyl ether
Mus	Unnamed Miocene Sandstone
MWELO	Model Water Efficient Landscape Ordinance
M&I	Municipal and Industrial
NAD	North American Datum
83	North American Datum of 1983
NAVD 88	North American Vertical Datum of 1988
NSIP	New Seawater Intrusion Project
NEPA	National Environmental Policy Act
NLs	notification levels
NMFS	National Marine Fisheries Service
NOAA	National Oceanic & Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operations and Maintenance
ohm/cm	ohms centimeter
OS	open space
OSWCR	Online System for Well Completion Reports
OU	Operable Unit
OUCTP	Operable Unit Carbon Tetrachloride Plume

PFAS	per- and poly-fluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHxA	perfluorohexanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PMA	Project and Management Action
PS	public service
PWM	Pure Water Monterey
Q	alluvium
Qae	Aromas Sand
QAPP	Quality Assurance Project Plan
Qd	Dune Sand
Qfl	Floodplain Deposits
Qo/Qvf	Older Alluvium/Valley Fill Deposit
Qod	Older Dune Sand
QT	Paso Robles Formation
RFP	Request for Proposal
RMS	Representative Monitoring Site
ROD	Records of Decision
RP	reference point
RTP	Regional Treatment Plant
RUWAP	Regional Urban Water Augmentation Project
RWQCB	Regional Water Quality Control Board
SAFER	Safe and Affordable Funding for Equity and Resilience
SB	Senate Bill
SCEP	Stakeholder Communication and Engagement Plan
SGMA	Sustainable Groundwater Management Act
SMC	Sustainable Management Criteria
SMCL	secondary maximum contaminant level
SMCs	sustainable management criteria
SRDF	Salinas River Diversion Facility
SSURGO	Soil Survey Geographic Database
SVA	Salinas Valley Aquitard
SVBGSA	Salinas Valley Basin Groundwater Sustainability Agency
SVIHM	Salinas Valley Integrated Hydrologic Model
SVOM	Salinas Valley Operational Model
SVRP	Salinas Valley Reclamation Plant
SVWP	Salinas Valley Water Project
SWI	seawater intrusion
SWRCB	State Water Resources Control Board
TAMC	Transportation Agency for Monterey County
TCE	trichloroethylene

TDS	total dissolved solids
Tsm	Santa Margarita Sandstone
U.S.	United States
ug	micrograms
ug/L	micrograms per liter
US EPA	United States Environmental Protection Agency
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
VOC	volatile organic compound
WDR	Waste Discharge Requirement
WWTP	Wastewater Treatment Plant
WY	water year

EXECUTIVE SUMMARY

ES.1 Introduction

On September 16, 2014, the California legislature enacted the Sustainable Groundwater Management Act (SGMA) whose primary purpose is to achieve and/or maintain sustainability within the state's high and medium priority groundwater basins. Key tenets of SGMA are the concept of local control, use of best available data and science, and active engagement and consideration of all beneficial uses and users of groundwater. As such, SGMA empowers certain local agencies to form Groundwater Sustainability Agencies (GSAs) whose purpose is to manage basins sustainably through the development and implementation of Groundwater Sustainability Plans (GSPs). Under SGMA, GSPs are required to contain certain elements, the most significant of which include: a Sustainability Goal; a description of the area covered by the GSP ("Plan Area"); a description of the Basin Setting, including the hydrogeologic conceptual model, historical and current groundwater conditions, and a water budget; locally-defined sustainability criteria; networks and protocols for monitoring sustainability indicators; and a description of projects and/or management actions that will be implemented to achieve or maintain sustainability. SGMA also requires a significant element of stakeholder outreach to ensure that beneficial uses and users of groundwater are given the opportunity to provide input into the GSP development and implementation process.

This GSP covers the entire Monterey Subbasin (Department of Water Resources [DWR] Basin 3-004.10), which encompasses 30,850 acres (or 48.2 square miles) in the northwestern Salinas Valley Groundwater Basin in the Central Coast region of California (Figure ES-1). The Monterey Subbasin (Subbasin) has been designated by the California DWR as medium priority. The Subbasin is jointly managed by the Marina Coast Water District Groundwater Sustainability Agency (MCWDGSA) and the Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA) under a Framework Agreement that establishes two management areas: the Marina-Ord Management Area and the Corral de Tierra Management Area (Figure ES-2). Under the Framework Agreement, MCWDGSA has prepared GSP components for the Marina-Ord Area and the SVBGSA has prepared GSP components for the Corral de Tierra Area.

In 2022, MCWDGSA and SVBGSA submitted the original GSP for the Monterey Subbasin which was approved by DWR on April 23, 2023. This GSP Amendment 1 was prepared as part of the first five-year periodic evaluation and replaces the original GSP. The Amendment incorporates additional data about the groundwater basin, addressed recommended corrective actions from DWR's review of the original GSP, and revised the sustainable management criteria for water quality. The GSP provides an adaptive-management framework for achieving and documenting sustainable groundwater management by 2042. It will continue to be evaluated through annual reporting and future five-year periodic evaluations.

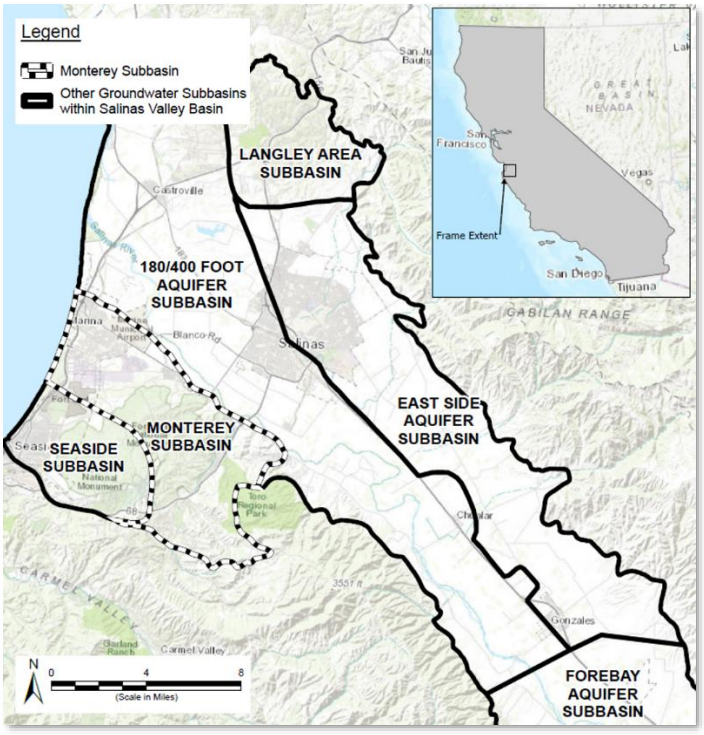


Figure ES-1 Monterey Subbasin

ES.2 Communications and Stakeholder Engagement

MCWDGSA and SVBGSA have coordinated GSP development and implementation, including the implementation of stakeholder engagement plans for the GSP. Each GSA has also guided stakeholder engagement efforts within their respective Management Areas.

As part of intra-basin coordination, regular Technical Subcommittee meetings have been held by the GSAs and Steering Committee meetings were scheduled and held on an as needed basis. In addition, stakeholders and beneficial users within each management area have been provided a variety of opportunities for engagement including: committee and board meetings, stakeholder workshops, direct outreach, website communications, public commenting opportunities, and engagement with land use and water management agencies. The SVBGSA Monterey Subbasin Committee continues to guide GSP amendments, periodic evaluations, and implementation for the Corral de Tierra Area.

The GSAs will continue to provide opportunities for public participation during implementation. The MCWDGSA and SVBGSA websites (https://www.mcwd.org/governance_meetings.html and https://svbgsa.org/meetings/) contain groundwater management updates and information for meetings and workshops.

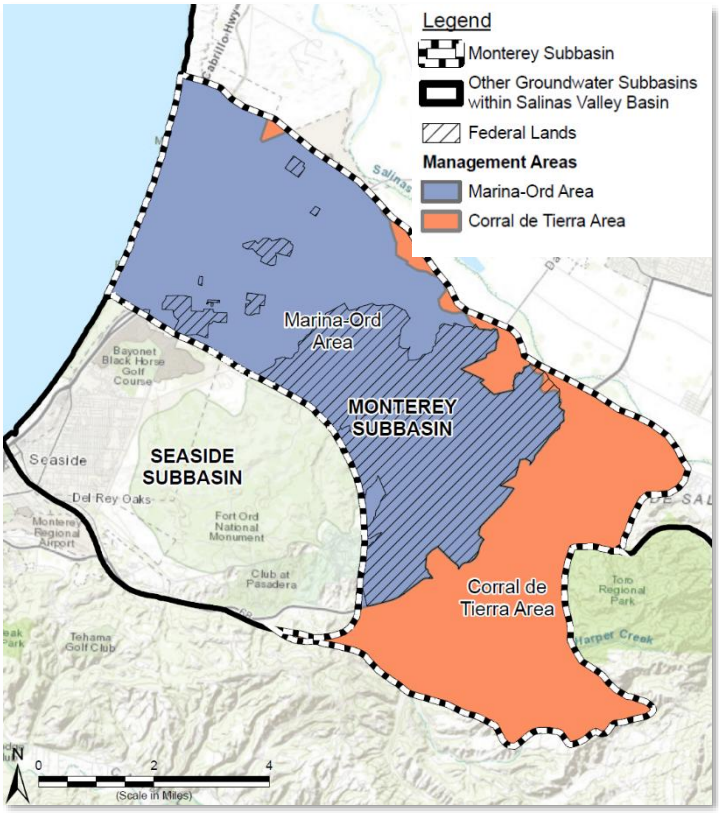


Figure ES-2 Management Areas

ES.3 Plan Area

The Monterey Subbasin lies entirely within Monterey County and is generally bounded by the 180/400-Foot Aquifer Subbasin (DWR Basin 3-004.01) to the northeast and the Seaside Subbasin (DWR Basin 3-004.08) to the southwest. The Marina-Ord Area consists of the lands within the City of Marina, City of Seaside, and the former Fort Ord. The Corral de Tierra Area consists of the remainder of the Subbasin, which includes lands generally located south of State Route 68 and a few parcels along the northern subbasin boundary.

The majority of the Subbasin is undeveloped land. Urban uses, including the municipalities of Marina and Seaside, make up primary water users in the Subbasin. Small areas of agriculture, approximately 500 acres of truck nursery and berry crops, are located along the northern subbasin boundary adjoining the 180/400-Foot Aquifer Subbasin. Urban and agricultural water users in the Subbasin rely entirely on groundwater.

Existing groundwater monitoring and management programs provide an important foundation for the GSP. A significant number of groundwater monitoring programs exist in the Subbasin and data from these programs have been used to develop the GSP and will continue to be utilized as a part of GSP implementation. The GSP also integrates applicable management programs, including those implemented by Monterey County Water Resources Agency (MCWRA) and the

Seaside Watermaster, to avoid duplicate effort and support coordinated groundwater management within the Subbasin.

ES.4 Hydrogeologic Conceptual Model

The Monterey Subbasin is located at the northwestern end of the Salinas Valley Groundwater Basin, an approximately 90-mile-long alluvial basin underlying the elongated, intermountain valley of the Salinas River. The Subbasin includes the portions of the Monterey Bay coastal plain, south of the approximate location of the Reliz Fault, as well as upland areas to the southeast of the coastal plain. Topography generally slopes down to the northwest towards Monterey Bay, ranging from sea level at the shoreline to 1,900 feet (ft) msl in the southeastern corner of the Subbasin. The water-bearing strata within the Subbasin include river and sand dune deposits of Holocene and Pleistocene age, the Aromas Sand and Paso Robles Formation of Plio-Pleistocene age, the Purisima Formation of Pliocene age, and the Santa Margarita Formation of Miocene age (Greene, 1970; Harding ESE, 2001; Geosyntec, 2007). The Monterey Formation of Miocene age, or the bottom of the Subbasin, represents the relatively non-water-bearing bedrock that underlies the Subbasin. The primary surface water bodies in the Subbasin are the Salinas River and Toro Creek.

The Monterey Subbasin is hydrostratigraphically complex and represents a transition zone between the more defined, laterally continuous aquifer system along the central axis of the Salinas Valley and the less continuous aquifer systems towards the Sierra de Salinas.

The principal aquifers within the Marina-Ord Area include the unconfined Dune Sand Aquifer and the confined aquifers known as the 180-Foot Aquifer, the 400-Foot Aquifer, and the Deep Aquifers. Hydraulic conductivity of the aquifers underlying the Marina-Ord Area varies by aquifer and location. Groundwater production generally occurs from the 180/ 400-Foot Aquifers and the Deep Aquifers. Natural groundwater recharge occurs through infiltration of surface water, deep percolation of excess applied irrigation water, and deep percolation of infiltrating precipitation. Most of the Marina-Ord Area has good recharge potential due to the high permeability of the Dune Sand Aquifer which subsequently recharges the underlying 180-Foot and 400-Foot Aquifers.

The Corral de Tierra Area includes the El Toro Primary Aquifer System, which encompasses water-bearing deposits within the Aromas Sand, Paso Robles Formation, and Santa Margarita Sandstone. Natural groundwater recharge occurs through infiltration of surface water if and where it occurs, and deep percolation of infiltrating precipitation. Most of the Corral de Tierra Area has good recharge potential due to the high permeability of soils which subsequently recharges the underlying sandy, gravelly layers of the Aromas Sand and Paso Robles Formation.

Amendment 1 refines the hydrogeologic conceptual model by incorporating two key updates:

1. A revised interpretation of the bedrock surface and offshore geology, which improves understanding of hydraulic connectivity within the Corral de Tierra Area and across its boundaries.; and

2. Incorporation of the Deep Aquifers Study, which improves understanding of the extent and hydraulic connections of the Deep Aquifers, particularly with the Seaside Subbasin.

ES.5 Baseline and Historical Groundwater Conditions

Groundwater conditions in the Subbasin are described for each of DWR's six sustainability indicators identified below. In GSP Amendment 1, groundwater conditions during the baseline (Water Year [WY] 2015-2020) and historical periods (WY 2004-2018) have been updated using revised hydrogeologic interpretations, new monitoring data, and other evaluations and assessments.

- Chronic Lowering of Groundwater Levels – Groundwater elevations have generally been stable for over three decades in the Dune Sand Aquifer, the upper and lower 180-Foot Aquifer, and the 400-Foot Aquifer within the northern Marina-Ord Area. Since the mid-2000s, groundwater levels have been declining in 400-Foot Aquifer wells located in the southwestern portion of the Marina-Ord Area and in Deep Aquifer wells. Decreases in groundwater elevations in the Deep Aquifers are the result of increased production from the Deep Aquifers in the Salinas Valley Groundwater Basin. Groundwater level declines observed in the Deep Aquifers range from about 20 ft to 50 ft over the last two decades. Groundwater level declines have also been observed historically within the El Toro Primary Aquifer System in the Corral de Tierra Area. Groundwater level declines in the El Toro Primary Aquifer System range from about 20 ft to 80 ft over the last two decades. The updated Hydrogeologic Conceptual Model (HCM) and monitoring data improve understanding of these conditions and their relation to pumping, aquifer connectivity, and groundwater conditions in adjacent subbasins.
- Changes in Groundwater Storage – Modeling results indicate an average annual loss of storage of 2,939 acre-feet per year (AFY) over the historical period (WY 2004-2018) in the Monterey Subbasin. This loss in storage is due to declining groundwater levels. There has been a minimal loss in storage due to seawater intrusion during the historical period as there has been negligible expansion of the seawater intrusion front. Seawater that enters the Monterey Subbasin from the ocean flows toward the 180/400-Foot Aquifer Subbasin boundary, where groundwater levels are lower in the seawater intruded aquifers.
- Seawater Intrusion – Seawater intrusion is a principal groundwater management concern in the coastal Marina-Ord Area. Seawater intrusion has been documented in the northern portion of the Monterey Subbasin in the lower 180-Foot and 400-Foot Aquifers. MCWRA and others have implemented a series of engineering projects and management actions to address seawater intrusion within the Salinas Valley Groundwater Basin. These actions have managed to slow the advancement of the seawater intrusion front and reduce its impacts; however, seawater intrusion remains an ongoing threat. Updated interpretation of the 2015 baseline condition, informed by additional monitoring data including wells installed in 2026, indicates that seawater intrusion extended farther inland than previously mapped.

- Groundwater Quality – Known groundwater quality concerns in the Marina-Ord Area include elevated chloride and total dissolved solids (TDS) concentrations and legacy point-source contamination from former Fort Ord. Such point source contamination is being addressed by the United States Army Corps of Engineers (Army) and includes contaminants such as Volatile Organic Compounds (VOCs) and per- and poly-fluoroalkyl substances (PFAS). The primary source of high TDS and chloride concentrations in groundwater within the Marina-Ord Area is seawater intrusion. In the Corral de Tierra Area, the most prevalent water quality concern is naturally occurring arsenic. GSP Amendment 1 refines the water quality assessment methodology in response to DWR's recommended corrective actions.
- Subsidence – No measurable subsidence has been recorded anywhere in the Monterey Subbasin.
- Depletion of Interconnected Surface Waters – GSP Amendment 1 updated the assessment of potential groundwater connection with surface water in the Corral de Tierra Area using the Salinas Valley Integrated Hydrologic Model (SVIHM). Interconnected surface waters (ISW) are identified at the City of Marina vernal ponds and along two short reaches of the Salinas River where it crosses into the Monterey Subbasin.

GSP Amendment 1 also refines the assessment of groundwater dependent ecosystems in the Corral de Tierra Area through field verifications and coordinate with the Central Coast Wetlands Group.

ES.6 Water Budget Information

Water budgets provide an accounting and assessment of the total annual volume of surface water and groundwater entering and leaving the Subbasin. This GSP presents three water budgets – historical (Water Year [WY] 2004-2018), current (WY 2018-2022), and a 50-year projected (WY 2019-2068) water budget period. Water budgets for each timeframe are presented for the Subbasin as a whole. In addition, zone budgets are presented for each management area.

The water budget information is updated in GSP Amendment 1 based on the use of a numerical groundwater flow and chloride transport model developed for the coastal portion of the regional Salinas Valley Groundwater Basin, referred to herein as the Salinas Valley Seawater Intrusion Model (SWIM). The SWIM uses the MODFLOW-USG block centered transport (BCT) functionality to simulate transient variable density groundwater flow and chloride transport conditions and is calibrated to historical groundwater levels and chloride concentrations collected from WY 1985 to 2022.

Table ES-1 summarizes inflows to and outflows from the basin-wide groundwater system by water source type during the historical water budget period and current water budget period. Water budget components include recharge, well pumping, net inter-basin flow, and net river exchange. Changes in groundwater storage are evaluated based on both groundwater elevation changes and seawater intrusion. In addition to the change in storage associated with

groundwater elevation changes, the change in freshwater storage due to the advancement or retreat of seawater intrusion is estimated separately for the whole Subbasin and Marina-Ord Area to provide a more complete assessment of changes in freshwater storage.

ES.6.1 Historical Water Budget Period

Although estimated groundwater recharge (11,152 AFY) exceeded pumping in the Monterey Subbasin (5,899 AFY) during the historical period, the net estimated annual change in groundwater storage in the Monterey Subbasin was -2,939 AFY. This value is negative indicating a loss of storage during the historical period. Inter-basin outflows accounted for the majority of the Subbasin's groundwater outflow over the historical period. Net inter-basin outflows (14,469 AFY) well exceeded groundwater pumping and total estimated recharge in the Subbasin. These estimated outflows are reflective of the large inland gradients that exist between the Monterey Subbasin and the 180/400-Foot Aquifer Subbasin. Groundwater levels in the 180/400-Foot Aquifer Subbasin are more than 40 feet below sea level in the 180- and 400-Foot Aquifers and 80 feet below sea level in the Deep Aquifers. These results demonstrate the relationship and interdependence between inter-basin inflows, outflows, and the Subbasin water budget and the need for coordinated sustainable groundwater management in all of these subbasins.

It is assumed there was zero net annual change in groundwater storage due to seawater intrusion over the historical water budget period as there has been negligible expansion of the seawater intrusion front within the Monterey Subbasin.

The loss in storage is reflected in the groundwater level declines that have been observed in the 400-Foot Aquifer and Deep Aquifers within the Marina-Ord Area and within the El Toro Primary Aquifer in the Corral de Tierra Area. The negative net annual change in storage indicates that the Monterey Subbasin was in overdraft during the historical period.

ES.6.2 Current Water Budget Period

The current basin-wide water budget is based upon WY 2018 through 2022 and is also presented in Table ES-1. The current water budget includes the same water budget components as the historical water budget but characterizes basin conditions over a much shorter period of time during which recharge was lower than during the historical period. As such, the net annual change in groundwater storage (-2,005 AFY) was larger during the current period. A net loss in storage due to seawater intrusion of -292 AFY to -585 AFY was also estimated over the current water budget period based on recent seawater intrusion reported in the WY 2025 Annual Report. However, this value is likely not representative of long-term conditions as it is not reflective of the long-term hydrologic cycle.

Table ES-1. Historical and Current Groundwater Water Budget Results, Monterey Subbasin

Water Budget Components	Net Annual Groundwater Flows (AFY) (a)	
	Historical Period WY 2004 - 2018	Current Period WY 2018 - 2022
Recharge		
● Aerial Recharge	11,152	10,034
● Streamflow Recharge (b)	5,899	4,293
	17,051	**14,327**
Well Pumping		
● Well Pumping	-5,321	-4,828
	-5,321	**-4,828**
Net Inter-Basin Flow		
● Ocean (c)	2,946	3,428
● Seaside Subbasin	501	1,057
● 180/400 Foot Aquifer Subbasin (b,c)	-17,889	-17,742
● Outside Basin	-27	22
	-14,469	**-13,235**
Groundwater Evapotranspiration Uptake		
● Groundwater ET Uptake	-225	-140
	-225	**-140**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO GROUNDWATER ELEVATIONS (GWE)	**-2,939**	**-3,872**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO SEAWATER INTRUSION (SWI) (d)	*0*	*-292 to -585*

Notes:

(a) Positive values indicate a net inflow and negative values indicate a net outflow.

(b) SWIM v4 estimates of Salinas River flows into and out of the Monterey Subbasin are uncertain due to lack of streamflow gaging data within the subbasin and will directly influence corresponding estimates of cross-boundary outflows to the 180/400-Foot Aquifer Subbasin.

(c) Cross boundary flows to/from ocean and 180/400-Foot Aquifer include both seawater and freshwater. Net seawater inflows to the Monterey Subbasin are reflected in the Change in Groundwater Storage due to Seawater Intrusion term (see Note d).

(d) Change in Groundwater Storage due to Seawater Intrusion is calculated as the annualized total aquifer volume located between the initial and final extent of the 500 mg/L chloride isocontour line over the water budget timeframe based on historical monitoring data (for historical/current water budgets) or estimated by SWIM v4 (for projected water budget). Ranges reflect the use of either effective porosity (0.15) or total porosity (0.3) in the aquifer volume calculation.

ES.6.3 Projected Water Budget Period

Projected water budgets provide estimates of future conditions of water supply and demand within a basin, as well as the aquifer response to implementation of the Plan over the planning and implementation horizon. The projected water budget uses the same tools and

methodologies that were used for the historical and current water budget, with updated inputs for climate variables (i.e., precipitation and ET), land use (water demand), and future subbasin boundary conditions. Given that historical water budget results indicate that conditions in the Monterey Subbasin are highly sensitive to conditions in adjacent subbasins, projected water budget results are presented for three alternative sets of boundary conditions in the 180/400-Foot Aquifer Subbasin. These boundary conditions include:

- Baseline Boundary Conditions, which assume that groundwater conditions in the northern Salinas Valley are consistent with the Baseline Scenario. The Baseline Scenario simulates future groundwater levels and seawater intrusion in the northern Salinas Valley without PMAs and with no changes to current land use, reservoir operation rules, or climate conditions, except for sea level rise. Under these baseline conditions, groundwater modeling presented in the 180/400 GSP Amendment 2 projects that groundwater levels would continue to decline on average.
- Near-Minimum Threshold Coastal (MTC) Boundary Conditions, which simulate conditions in the Monterey Subbasin if groundwater levels in the 180- and 400-Foot Aquifers approach MTs in the coastal portion of the 180/400 Subbasin by 2040 under Baseline Climate Conditions;
- Near-Minimum Threshold (MT) Boundary Conditions: simulate conditions in the Monterey Subbasin if water levels in the 180- and 400-Foot Aquifer approach MTs in the majority of the 180/400 Subbasin by 2040 under Baseline Climate Conditions.

The impacts of the Near-MTC Boundary Conditions are specifically assessed relative to the Marina-Ord WBZ. The Near-MTC and Near-MT Boundary Condition scenarios are predicated on the assumption that the 180/400-Foot Aquifer Subbasin will be managed to its SMCs over the 50-year projected model period. Because groundwater elevations at the Monterey-180/400 Subbasin boundary are simulated model results in the SWIM rather than independently controlled inputs, the scenarios are developed by altering groundwater extraction in the 180/400 Subbasin and adjacent subbasins relative to the Baseline Scenario. The adjustments to groundwater extraction are analytical assumptions and do not prescribe the specific projects or management actions that will be implemented in the 180/400 Subbasin or other Subbasins.

Projected water budget results are also presented for two alternative sets of hydrology and climate conditions including:

- Baseline (Historic Analog) Climate Conditions: a 50-year analog period developed to reflect the Subbasin's historical long-term average hydrologic conditions. However, this scenario does incorporate projected sea level rise.
- 2070 Climate Conditions: A water budget scenario based on 2070 "central tendency" climate change factors published by DWR.

A review of simulated water levels from the 180/400 Subbasin under these variable climate conditions shows that water levels in RMS wells in this Subbasin are at or above MTs under the Near-MT Boundary/Baseline Climate Condition scenario. However, this is not the case under

Near-MT Boundary/2070 Climate condition scenario. Therefore, the Near-MT Boundary Condition results presented herein focus on the Near-MT Boundary/2070 Climate scenario because it provides a more conservative assessment of projected groundwater storage losses associated with groundwater level declines in the Monterey Subbasin, as maintaining groundwater levels at or above MTs in the 180/400 Subbasin would reasonably be expected to further mitigate storage losses in the Monterey Subbasin.

The projected water budgets do not incorporate the potential benefits of any new PMAs within the Subbasin. Table ES-2 provides water budget results for the entire Monterey Subbasin under the identified variable climate and boundary conditions.

As shown in this table, under the projected Baseline Boundary Conditions, outflows to the 180/400 Aquifer are significant (over 15,000 AFY) and close to total estimated basin recharge, which ranges between 17,680 and 18,592 AFY depending on climate conditions, of which about a third comes from surface water recharge from the Salinas River. Further, under the projected Baseline Boundary/Baseline Climate conditions, additional ocean inflows result in significant storage losses due to SWI (-3,688 to 7,376 AFY). The 2070 Climate scenario projects smaller groundwater storage losses due to SWI (−908 to −1,816 AFY), reflecting greater areal recharge in coastal areas and reduced ocean inflow under 2070 Climate conditions[1]. Under both Baseline Boundary Condition scenarios, the combined storage losses associated with groundwater elevation declines (GWE) and seawater intrusion (SWI) are projected to be substantially greater than those estimated under historical conditions and will lead to undesirable results within the Subbasin.

Under Near-MT Boundary/2070 Climate conditions, groundwater outflows to the 180/400 Subbasin decrease by approximately 5,000 AFY relative to historical conditions. This decrease in outflows increases storage because the SWI front retreats and brings the subbasin closer into balance, where inflows equal outflows. This is particularly true in the Marina-Ord WBZ, where storage is projected to increase due to (a)higher groundwater water levels and (b) a decrease in seawater intrusion (see Table ES-3) under this scenario. Under the Near-MT Boundary/2070 Climate Scenario, a loss in storage of approximately 1,700 AFY is still projected to occur in the Corral de Tierra Area because of groundwater level declines.

As such, these projected water budget results indicate that overdraft conditions within the Monterey Subbasin will be substantially mitigated if adjacent basins are managed sustainably and SMCs are achieved. Further discussion of these results relative to SMCs in each WBZ are provided in the Sustainable Yield section below.

[1] The range in estimated storage loss for each scenario reflects the use of effective porosity (0.15) versus total porosity (0.3) in the aquifer volume calculation for SWI.

Table ES-2. Comparison of Projected Water Budget Results, Monterey Subbasin

50-Yr Net Annual Groundwater Flows (AFY) (a)	Historical	Baseline Boundary Condition		Near-MT Boundary Condition	
	WY 2004 - 2018	Baseline Climate Condition	2070 Climate Condition	Baseline Climate Condition	2070 Climate Condition
Recharge					
● Aerial Recharge	11,152	11,800	12,421	Pending	12,421
● Streamflow Recharge (b)	5,899	5,880	6,171	Pending	5,230
	17,051	**17,680**	**18,592**	**0**	**17,651**
Well Pumping					
● Well Pumping	-5,321	-9,346	-9,404	Pending	-9,341
	-5,321	**-9,346**	**-9,404**	**0**	**-9,341**
Net Inter-Basin Flow					
● Ocean (c)	2,946	4,515	2,590	Pending	500
● Seaside Subbasin	501	1,552	2,502	Pending	1,960
● 180/400 Foot Aquifer Subbasin (b,c)	-17,889	-15,477	-17,987	Pending	-12,535
● Outside Basin	-27	-19	243	Pending	241
	-14,469	**-9,429**	**-12,652**	**0**	**-9,834**
Groundwater Evapotranspiration Uptake					
● Groundwater ET Uptake	-225	-139	-155	Pending	-228
	-225	**-139**	**-155**	**0**	**-228**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO GROUNDWATER ELEVATIONS (GWE)	**-2,939**	**-1,202**	**-3,604**	**Pending**	**-1,736**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO SEAWATER INTRUSION (SWI) (d)	**0**	**-3,688 to -7,376**	**-908 to -1,816**	**Pending**	**509 to 1018**

Notes:

(a) Positive values indicate a net inflow and negative values indicate a net outflow.

(b) SWIM v4 estimates of Salinas River inflows are highly uncertain due to lack of streamflow gaging data within the subbasin, and will directly influence corresponding estimates of cross-boundary outflows to the 180/400-Foot Aquifer Subbasin.

(c) Cross boundary flows to/from ocean and 180/400-Foot Aquifer include both seawater and freshwater. Net seawater inflows to the Monterey Subbasin are reflected in the Change in Groundwater Storage due to Seawater Intrusion term (see Note d).

(d) Change in Groundwater Storage due to Seawater Intrusion is calculated as the annualized total aquifer volume located between the initial and final extent of the 500 mg/L chloride isocontour line over the water budget timeframe based on historical monitoring data (for historical/current water budgets) or estimated by SWIM v4 (for projected water budget). Ranges reflect the use of either effective porosity (0.15) or total porosity (0.3) in the aquifer volume calculation.

Table ES-3. Comparison of Projected Annual Change in Storage, Marina-Ord Area

Net Annual Change in Groundwater Storage (AFY)	Historical	Baseline Boundary Condition		Near-MTC Boundary Condition	Near-MT Boundary Condition	
	WY 2004 - 2018	Baseline Climate Condition	2070 Climate Condition	2070 Climate Condition	Baseline Climate Condition	2070 Climate Condition
Net Annual Change in Groundwater Storage due to Groundwater Elevations (GWE)	-1,500	-526	-1,143	-513	Pending	247
Net Annual Change in Groundwater Storage due to Seawater Intrusion (SWI) (a)	0	-3,688 to -7,376	-908 to -1,816	12 to 24	Pending	509 to 1018

Notes:

(a) Change in Groundwater Storage due to Seawater Intrusion is calculated as the annualized total aquifer volume located between the initial and final extent of the 500 mg/L chloride isocontour line over the water budget timeframe based on historical monitoring data (for historical/current water budgets) or estimated by SWIM v4 (for projected water budget). Ranges reflect the use of either effective porosity (0.15) or total porosity (0.3) in the aquifer volume calculation.

ES.6.4 Sustainable Yield

SGMA defines sustainable yield as "the maximum quantity of water, calculated over a base period representative of long-term conditions in the Subbasin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result" (CWC §10721(w)). DWR's Water Budget BMP (DWR, 2016b) further states that "Water budget accounting information should directly support the estimate of sustainable yield for the Subbasin and include an explanation of how the estimate of sustainable yield will allow the Subbasin to be operated to avoid locally defined undesirable results. The explanation should include a discussion of the relationship or linkage between the estimated sustainable yield for the Subbasin and local determination of the sustainable management criteria (sustainability goal, undesirable results, minimum thresholds, and measurable objectives)."

A key part of the codified definition and the BMP statement is the avoidance of undesirable results, defined as "significant and unreasonable" effects for any of the six SGMA sustainability indicators. For example, declining levels during a drought do not constitute an Undesirable Result for chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods (CWC §10721(x)(1)). Therefore, while the water budget should provide support for sustainable yield, determination of the sustainable yield for the Subbasin ultimately depends upon whether undesirable results are avoided within the timeframes required by SGMA.

Recharge, pumping, and conditions in adjacent subbasins significantly affect the sustainable yield of the Monterey Subbasin. As such, the sustainable yield established based on historical overdraft has significant uncertainty and does not address all undesirable results. Groundwater conditions

in adjacent subbasins are projected to change as these subbasins move toward sustainability. A first-order estimate of the sustainable yield is calculated by subtracting the total estimated change in storage resulting from groundwater declines and increased seawater intrusion. A description of the methods used to calculate changes in storage due to seawater intrusion is included in Section 6.2.2. Since sustainable management criteria were not established historically, the historical sustainable yield does not reflect sustainability as it is defined in this GSP. Projected water budget results have been used to estimate the projected sustainable yield under various boundary conditions. However, it should be recognized that these first-order estimates can be misleading, as the location and rates of extraction dramatically impact the sustainable yield, particularly in a coastal basin, which is subject to seawater intrusion.

Although these first-order sustainable yield estimates provide a basis for evaluating groundwater management needs, they should not be interpreted as fixed pumping limits that will prevent undesirable results. Simply reducing pumping to within the sustainable yield is not proof of sustainability and will not necessarily stop the expansion of seawater intrusion or allow water levels to reach MTs. Achievement of sustainability must ultimately be demonstrated through compliance with the SMCs established for the Subbasin.

The sustainable yield has been evaluated for each Management Area / WBZ as conditions vary and independent SMCs have been established for each area.

ES.6.4.1 Marina Ord-WBZ

Results presented in Table ES-3 indicate that if adjacent basins are managed sustainably and Near-MT Boundary Conditions are achieved, no additional loss in storage will occur as a result of groundwater level declines or seawater intrusion under projected 2070 Climate conditions. The results suggest a sustainable yield of 9,298 to 9,807 AFY, which exceeds projected rates of extraction of 8,600 AFY in this WBZ. However, review of projected water levels at RMS wells within the Marina Ord WBZ relative to water level MTs, shows that water levels are below MTs in all Deep Aquifer RMS wells under this scenario. This result is not unexpected because Deep Aquifer RMS wells in the 180/400 Subbasin do not come close to reaching MTs under the Near-MT Boundary/2070 Climate Change scenario. Given that approximately half of the projected well pumping in the Marina-Ord WBZ occurs from the Deep Aquifers, it is clear that undesirable results cannot be avoided and water level MTs in this aquifer cannot be met without (a) the implementation of projects and/or management actions in adjacent Subbasins which will raise water levels in the Deep Aquifer to water level MTs, and (b) the potential implementation of local projects and/or management actions within the Monterey Subbasin (see Section 9).

ES.6.4.2 Corral de Tierra / San Benancio WBZ

Projected Water budget results for the Corral de Tierra / San Benancio WBZ suggest that climate conditions may have a larger impact on this WBZ's Sustainable Yield than the Near-MT boundary conditions evaluated. These results indicate that under Baseline Boundary/Baseline Climate Conditions, the estimated Sustainable yield of this WBZ is projected to be 311 AFY. However, under Baseline Boundary/2070 Climate Conditions, the sustainable yield is projected to be negative. A negative sustainable yield indicates that estimated inter-basin and intra-basin

outflows from this WBZ exceed inflows, and no pumping reduction in the WBZ could balance this area without further changing conditions in adjacent areas. Projected extraction rates in this WBZ are between 710 and 764 AFY. Potential projects and management actions being considered for Corral de Tierra Area are discussed in Chapter 9.

ES.6.4.3 Toro Park / Serra Village WBZ

Projected Water budget results for the Toro Park / Serra Village WBZ indicate that under the climate and boundary conditions analyzed, the estimated Sustainable yield of this WBZ is projected to be negative. A negative sustainable yield indicates that estimated inter-basin and intra-basin outflows from this WBZ exceed inflows, and no pumping reduction in the WBZ could balance this area without further changing conditions in adjacent areas. Projected extraction rates in this WBZ are between 32 and 34 AFY. Potential projects and management actions being considered for the Corral de Tierra Area are discussed in Chapter 9.

ES.7 Monitoring Networks

The MCWDGSA and SVBGSA developed the Monterey Subbasin's SGMA Monitoring Network to: (1) collect sufficient data to assess sustainability indicators relevant to the Subbasin, (2) evaluate potential impacts to the beneficial uses and users of groundwater, and (3) assess the effectiveness of the projects and management actions implemented by the GSAs. The SGMA Monitoring Network was developed to ensure sufficient spatial distribution and spatial density. The monitoring networks for the six sustainability indicators are described below.

- Chronic Lowering of Groundwater Levels – The sustainability indicator for chronic lowering of groundwater levels is evaluated by monitoring groundwater elevations in designated monitoring wells. Over 400 wells are located within the Monterey Subbasin where water levels are regularly measured by MCWD, U.S. (United States) Army, MCWRA, MPWMD, and/or the Seaside Groundwater Basin Watermaster. Of these actively monitored wells, 35 have been selected as groundwater elevation representative monitoring site (RMS) wells in the Marina-Ord Area (2 to 6 wells per principal aquifer) and 13 have been selected as groundwater elevation RMS wells in the Corral de Tierra Area. In addition, the GSAs will incorporate groundwater level data from wells in adjacent subbasins and will continue to collaborate with agencies in adjacent subbasins.
- Changes in Groundwater Storage – Data and minimum thresholds used to define undesirable results for chronic lowering of groundwater levels and seawater intrusion will also be used to assess reduction of groundwater storage. As such, the reduction of groundwater storage monitoring network will consist of the same RMS wells as those used for groundwater elevation and seawater intrusion monitoring.
- Seawater Intrusion – The sustainability indicator for seawater intrusion is evaluated using the location of the 500 milligrams per liter (mg/L) chloride isoconcentration contour that is based on chloride concentrations, equivalent TDS concentrations, and/or specific conductivity measurements. The seawater intrusion monitoring network consists of 42

RMS wells in the Marina-Ord Area that are monitored by MCWD, U.S. Army, MCWRA, MPWMD, and/or the Seaside Groundwater Basin Watermaster.

- Groundwater Quality – The sustainability indicator for degraded water quality is evaluated by monitoring groundwater quality at a network of existing water supply wells. Separate minimum thresholds are set for the constituents of concern (COC) for public water system supply wells, on-farm domestic wells, and agricultural supply wells. There is adequate spatial coverage to access the groundwater quality in the Subbasin, and as new domestic and agricultural supply wells are added to Ag Order 4.0, they will be added to the monitoring program.
- Subsidence – DWR has, and will be, collecting land subsidence data using Interferometric Synthetic Aperture Radar (InSAR) satellite data, and will make these data available to GSAs. This subsidence dataset represents the best available data for the Monterey Subbasin and will therefore be used as the subsidence monitoring network.
- Depletion of Interconnected Surface Waters – Shallow groundwater elevations near potential locations of ISW will be used as a proxy metric for this indicator. As such, the ISW monitoring network are comprised of RMS sites adjacent to locations of interconnected surface waters. The Marina-Ord Area has one RMS well near the Marina vernal ponds. If future groundwater activities in the Subbasin or the adjacent 180/400-Foot Aquifer Subbasin may influence the condition of the Marina vernal ponds and/or the Dune Sand Aquifer, the GSAs will work with project proponents to install additional shallow groundwater monitoring wells. In the Corral de Tierra Area, SVBGSA installed one shallow ISW monitoring well near the confluence of El Toro Creek and the Salinas River. SMC will be added after the initial three to five years of data collection.

During the first five years of GSP implementation, the GSAs expanded monitoring networks and filled most identified monitoring network data gaps in the original GSP. the GSAs will continue to evaluate network performance every five years and add or modify monitoring as needed.

Data collected from the SGMA Monitoring Network will be uploaded to a Data Management System to be established and managed for the Monterey Subbasin and reported to the DWR in accordance with the Monitoring Protocols developed for the Subbasin.

ES.8 Sustainable Management Criteria

Sustainable Management Criteria (SMCs) are the metrics by which groundwater sustainability is judged under SGMA. Key terms related to SMCs under SGMA include the following:

- **Sustainability indicator** refers to any of the effects caused by groundwater conditions occurring throughout the Subbasin that, when significant and unreasonable, cause undesirable results, as described in CWC §10721(x).

  The six sustainability indicators relevant to this subbasin include chronic lowering of groundwater levels; reduction of groundwater storage; degraded water quality; land subsidence; seawater intrusion; and depletion of interconnected surface waters.

- **Undesirable Results** occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the Subbasin.

  The GSP Emergency Regulations require that the description of undesirable results include (1) the cause of groundwater conditions that would lead to or has led to undesirable results; (2) a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the Subbasin (i.e., the undesirable result criteria); and (3) potential effects that may occur or are occurring from undesirable results. An example undesirable result criterion could be defined as: more than 10% of the measured groundwater elevations being lower than the minimum thresholds.

- **Significant and Unreasonable Conditions**

  Significant and unreasonable is not defined in the Regulations. However, the definition of undesirable results states, "Undesirable results occur when significant and unreasonable effects … are caused by groundwater conditions…". The SGMA BMP states that "the GSAs must consider and document the conditions at which each of the six sustainability indicators become significant and unreasonable, including reasons for justifying each particular threshold selected." Therefore, this GSP adopts the phrase significant and unreasonable conditions to be the qualitative description of conditions used to justify selected minimum thresholds and undesirable results criteria.

- **Measurable objectives** refer to specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the Subbasin.

  Measurable objectives are quantitative goals that the GSP is designed to achieve for each sustainability indicator.

- **Minimum threshold** refers to a numeric value for each sustainability indicator used to define undesirable results.

  Minimum thresholds are quantitative indicators of an unreasonable condition.

- **Interim milestone** refers to a target value representing measurable groundwater conditions, in increments of five years, set by an Agency as part of a Plan.

  Interim milestones are targets such as groundwater elevations that will be achieved every five years to demonstrate progress towards sustainability.

The SMCs detailed in Table ES define the Subbasin's future conditions and commit the GSA to actions that will meet these objectives. In response to DWR's recommended corrective actions, GSP Amendment 1 updates the water quality SMC definition and evaluation methodology and incorporates new information on groundwater conditions into the seawater intrusion and depletion of ISW sustainability indicators.

Table ES-4 Sustainable Management Criteria Summary

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result	Interim Milestones
Chronic lowering of groundwater levels	Measured through the groundwater elevation representative monitoring well network within each management area	**Marina-Ord Area:** Minimum groundwater elevations historically observed between 1995 and 2015 in the Dune Sand, 180-Foot, 400-Foot, and Deep Aquifers.	**Marina-Ord Area:** Groundwater elevations observed in 2004 in the Dune Sand, 180-Foot, 400-Foot, and Deep Aquifers.	Over the course of any one year, exceedance of more than 20% of groundwater level minimum thresholds in **either** (a) both the Dune Sand and upper 180-Foot Aquifers, or (b) both the lower 180-Foot and 400-Foot Aquifers, or (c) the Deep Aquifers, or (d) the El Toro Primary Aquifer System.	**Whole Subbasin:** Interim milestones are described in Table 8-3 for each RMS well that is defined in Chapter 7.
		Corral de Tierra Area: Groundwater elevations observed in 2015 in the El Toro Primary Aquifer System.	**Corral de Tierra Area:** Groundwater elevations observed in 2008 in the El Toro Primary Aquifer System.		

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result	Interim Milestones
Reduction in groundwater storage	Measured through the groundwater elevation and seawater intrusion representative monitoring well networks.	**Whole Subbasin:** Minimum thresholds for chronic lowering of groundwater levels and seawater intrusion will be used as a proxy for reduction of groundwater storage minimum threshold.	**Whole Subbasin:** Measurable objectives for chronic lowering of groundwater levels and seawater intrusion will be used as a proxy for reduction of groundwater storage measurable objective.	Over the course of any one year, (1) exceedance of more than 20% of groundwater level minimum thresholds in **either** (a) both the Dune Sand and upper 180-Foot Aquifers, or (b) both the lower 180-Foot and 400-Foot Aquifers, or (c) the Deep Aquifers, or (d) the El Toro Primary Aquifer System; OR (2) exceedance of seawater intrusion minimum thresholds.	**Whole Subbasin:** Groundwater elevation and seawater intrusion interim milestones described respectively in Table 8-3 and Section 8.9.4.2 will serve as a proxy for reduction of groundwater storage interim milestones.

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result	Interim Milestones
Seawater intrusion	Measured through seawater intrusion representative monitoring well network.	**Whole Subbasin:** The approximate location in 2015 of the 500 mg/L chloride concentration isocontour in the lower 180-Foot and 400-Foot Aquifers; Approximately 3,500 feet from the coast in the Dune Sand Aquifer, upper 180-Foot Aquifer and Deep Aquifers. This distance is generally consistent with the location of Highway 1 in the Monterey Subbasin and seaward of groundwater extraction wells in the Subbasin. No seawater intrusion in the El Toro Primary Aquifer System.	**Whole Subbasin:** Measurable objective is identical to the minimum threshold.	Any exceedance of the minimum threshold is considered as an undesirable result.	**Whole Subbasin:** Identical to minimum thresholds and measurable objectives. No chloride concentration above 500 mg/L attributable to seawater intrusion in RMS wells.

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result	Interim Milestones
Degraded groundwater quality	Groundwater quality data downloaded annually from state sources and requested annually from CCRWQCB for Irrigated Lands Program (ILP) wells.	**Whole Subbasin:** No additional exceedances of either the regulatory drinking water standards or Basin Plan water quality objectives for groundwater quality constituents of concern (COC). See Table 8-5 for the list of constituents.	**Whole Subbasin:** Measurable objective is identical to the minimum threshold.	Future or new minimum threshold exceedances that are caused by a direct result of extraction or GSA groundwater management action(s) are considered as an undesirable result, unless minimum threshold exceedances have been managed to provide a water supply (i.e., treated, blended, or replaced) or beneficial users are not potentially harmed. GSA groundwater management actions include projects or management actions and regulation of groundwater extraction.	**Whole Subbasin:** Identical to minimum thresholds and measurable objectives, which represent conditions during the GSP Baseline Period.
Subsidence	Measured using DWR-provided InSAR data.	**Whole Subbasin:** Zero net long-term subsidence, with no more than 0.1 foot per year of measured vertical displacement between June of one year and June of the subsequent year to account for InSAR measurement errors.	**Whole Subbasin:** Measurable objective is identical to the minimum threshold.	Any exceedance of minimum thresholds during any one year due to lowered groundwater elevations is considered as an undesirable result.	**Whole Subbasin:** Identical to minimum thresholds and measurable objectives, which represent current conditions.

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result	Interim Milestones
Depletion of interconnected surface water (ISW)	Measured through shallow groundwater elevations as a proxy near potential locations of ISW in the ISW representative monitoring well network.	**Whole Subbasin:** Minimum shallow groundwater elevations historically observed between 1995 and 2015 near locations of interconnected surface water.	**Whole Subbasin:** Identical to minimum threshold shallow groundwater elevations.	Any minimum threshold exceeded in a shallow groundwater well near any location of ISW for more than two consecutive years.	**Whole Subbasin:** Identical to minimum thresholds and measurable objectives, which represent conditions during the GSP Baseline Period.

ES.9 Projects and Management Actions

This GSP identifies Project and Management Actions (PMAs) that will allow the Monterey Subbasin to attain sustainability in accordance with §354.42 and §354.44 of the GSP Emergency Regulations. The goal of the projects and management actions is to address significant and unreasonable results related to the chronic lowering of groundwater levels and seawater intrusion in each management area. GSP Amendment 1 refines existing PMA descriptions and adds PMAs identified after adoption of the original GSP.

The projects and management actions for this GSP are summarized in Table 9-1 and include these major categories:

- **Marina-Ord Area Local Projects and Management Actions** – Projects and management actions to be led by MCWD (or Marina-Ord Area agencies) that will primarily benefit the Marina-Ord Area.
- **Corral de Tierra Area Local Projects and Management Actions** – Projects and management actions to be led by SVBGSA that will primarily benefit the Corral de Tierra Area. The potential projects presented in the GSP, if implemented in aggregate, are adequate to supply the entirety of projected groundwater demands in the Marina-Ord Area and significantly impact the projected demand in the Corral de Tierra Area.

Additionally, GSP Amendment 1 incorporates PMAs identified in the 180/400-Foot Aquifer Subbasin GSP by reference and recognize their importance to Monterey Subbasin sustainability. The GSP highlights the hydraulic connection between the Monterey Subbasin and both the adjacent critically overdrafted 180/400-Foot Aquifer Subbasin and Seaside Subbasin. Reaching sustainability and achieving measurable objectives within the Monterey Subbasin will be affected by groundwater conditions and management within these adjacent subbasins and the greater Salinas Valley Basin.

MCWDGSA and SVBGSA have developed a SGMA implementation approach that includes regional coordination actions, participating in regional, multi-basin projects, in addition to implementing local projects and management actions. The MCWDGSA and SVBGSA are the same GSAs covering the adjacent 180/400 Subbasin and will be directly leading joint efforts to achieve sustainability. The effects of multi-subbasin PMAs on the Monterey Subbasin ultimately depend on the PMAs implemented and their design. The Subbasin GSAs will refine project design of relevant PMAs considering potential effects on the Monterey Subbasin.

ES.10 Plan Implementation

Continued GSP implementation will build on work completed during the first five years. The GSAs will continue to implement the GSP collaboratively within their respective management areas and in coordination with adjacent subbasins and regional partners.

Key activities to be undertaken by the MCWDGSA and SVBGSA over the next phase of GSP implementation include:

- Implementation and evaluation of PMAs;
- Funding development and grant applications;
- Data collection, monitoring, and reporting;
    - Monitoring network evaluation
    - Continued investigation of remaining hydrogeologic uncertainties
    - Groundwater model refinement
    - Coordination on water quality and land use planning
    - Updating the Data Management System
    - Annual monitoring and reporting
    - Figure five-year periodic evaluations
- Conducting intra-basin and inter-basin coordination; and
- Interested parties coordination and stakeholder engagement.

1 INTRODUCTION

1.1 Purpose of the Groundwater Sustainability Plan (GSP or Plan)

The purpose of this Groundwater Sustainability Plan (GSP) is to meet the regulatory requirements set forth in the three-bill legislative package consisting of Assembly Bill (AB) 1739 (Dickinson), Senate Bill (SB) 1168 (Pavley), and SB 1319 (Pavley), collectively known as the Sustainable Groundwater Management Act (SGMA). SGMA defines sustainable groundwater management as the "management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results". Undesirable results are defined by the SGMA as any of the following effects caused by groundwater conditions occurring throughout the Subbasin:

- 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 degraded water quality;
- Significant and unreasonable land subsidence; and/or
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

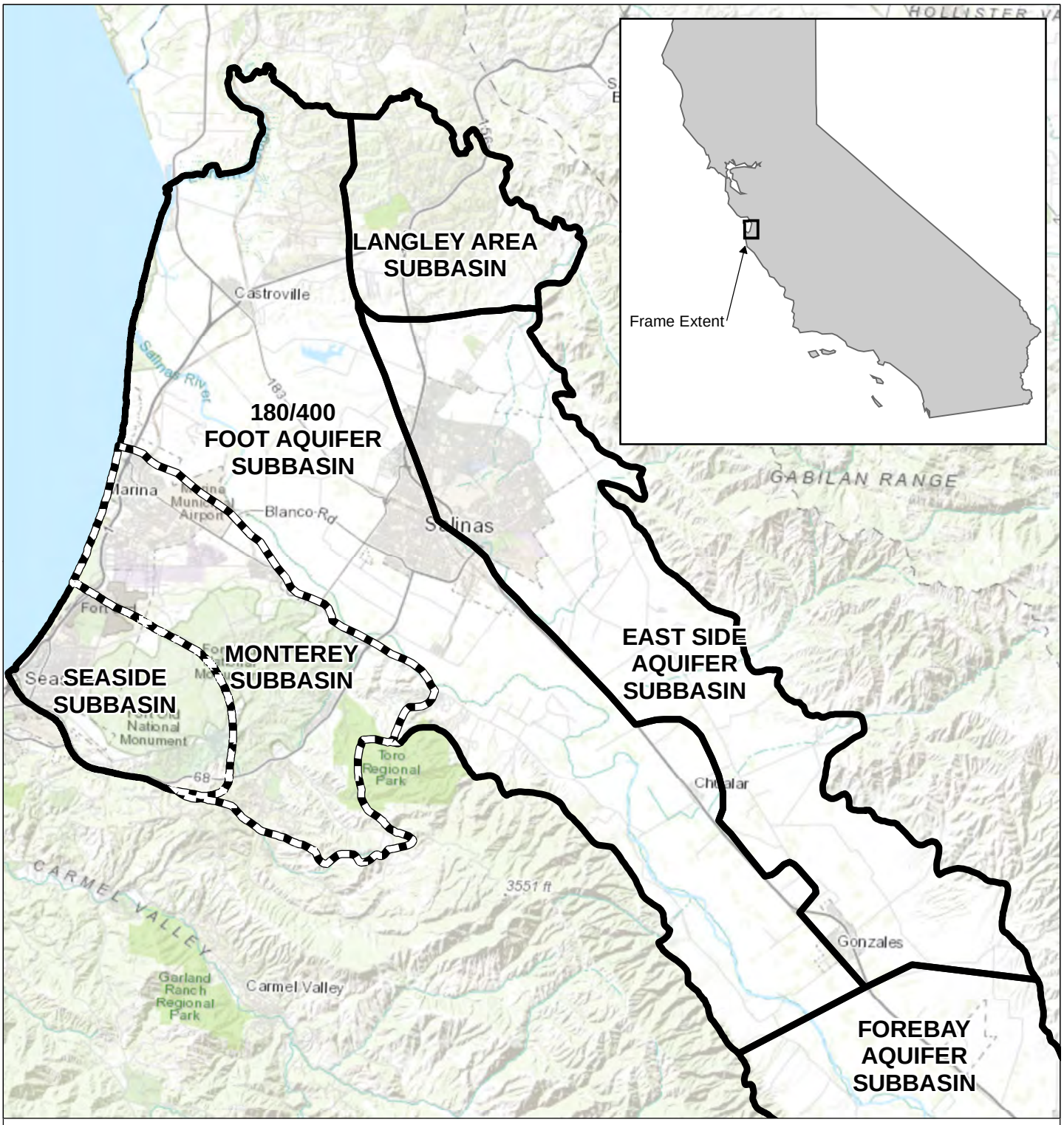
The Monterey Subbasin (Subbasin) has been designated by the California Department of Water Resources (DWR) as medium priority. The Monterey Subbasin is one of nine subbasins in the Salinas Valley. It is located at the northwestern end of the Salinas Valley and borders the Pacific Ocean (Figure 1-1). This document satisfies the GSP requirement for the Monterey Subbasin and meets all of the regulatory standards.

This GSP was co-developed by the Marina Coast Water District Groundwater Sustainability Agency (MCWDGSA) and the Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA) to meet SGMA regulatory requirements by January 31, 2022, deadline for medium and high priority basins while reflecting local needs and preserving local control over water resources. GSP Amendment 1 has been jointly prepared as part of the first 5-year periodic evaluation. This amended GSP continues to provide a path to achieve and document sustainable groundwater management within 20 years following Plan adoption and preserves the long-term sustainability of locally-managed groundwater resources now and into the future. The original GSP was approved by the MCWDGSA Board on January 17, 2022 and by the SVBGSA Board on January 13, 2022 (Appendix 1-A). The GSP Amendment 1 was approved by the MCWDGSA Board on January X, 2027 and by the SVBGSA Board on January X, 2027 (Appendix 1-A).

1.2 Sustainability Goal

The sustainability goal of the Monterey Subbasin is to manage groundwater resources for long-term community, financial, and environmental benefits to the Subbasin's residents and businesses. The goal of this GSP is to ensure long-term viable water supplies to local communities at a reasonable cost. In addition, because the Subbasin is hydrologically connected with other Salinas Valley Basin Subbasins, this GSP aims to develop a coordinated approach to groundwater management within this Subbasin and neighboring Subbasins. The Subbasin will achieve long-term sustainability through implementation of inter- and intra-basin coordination as well as projects and management actions.

Several projects and management actions are included in this GSP and detailed in Chapter 9. These projects and management actions will diversify the Subbasin's water supply portfolio, increase supply reliability, and protect the Subbasin's groundwater resources against seawater intrusion. The Subbasin's historical efforts to invest in water conservation will continue under SGMA.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

N

0 4 8

(Scale in Miles)

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 15 September 2021.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Monterey Subbasin

Marina Coast Water District

Monterey County, CA

November 2021

Figure 1-1

Path: X:\B60094\Maps\2021\09\Fig1-1_MontereySubbasin.mxd

1.3 Agency Information

The Monterey Subbasin is within the jurisdiction of the MCWDGSA and SVBGSA. The GSA boundaries are shown on Figure 1-3.

1.3.1 Name and Mailing Address of the Agency

This GSP has been prepared by MCWDGSA and SVBGSA. The following contact information is provided for each GSA that is a signatory to this GSP, pursuant to CWC §10723.8.

Marina Coast Water District Groundwater Sustainability Agency
Attn.: Remleh Scherzinger, General Manager
11 Reservation Road
Marina, CA 93933
http://www.mcwd.org

Salinas Valley Groundwater Sustainability Agency
Attn.: Piret Harmon, General Manager
1441 Schilling Place
Salinas, CA 93901
https://svbgsa.org

1.3.2 Organization and Management Structure of the Agencies

1.3.2.1 MCWDGSA

The MCWDGSA is a single agency GSA formed by MCWD and covering the areas within the MCWD service area within Monterey Subbasin, except for those areas owned by a federal government entity and thus not subject to SGMA. The GSA areas are shown on Figure 1-3. A portion of the MCWD service area and MCWDGSA jurisdiction area extend into the 180/400 Subbasin.

The MCWDGSA Board is comprised of the members of the MCWD Board. MCWD is led by a 5-member Board of Directors who each serve 4-year terms. Board members are elected at large. Decisions on all GSA-related matters require an affirmative vote of a majority of the five Board of Directors members. MCWDGSA activities are coordinated by MCWD's staff. GSA Board meetings are held jointly with MCWD Board meetings every third Monday of each month and are open to the public.

Key GSP development and implementation decisions are made by the GSA Board of Directors (Board). The Board considers staff, stakeholder, and public input captured and evaluated by the Steering Committee, MCWD stakeholder workshops, and direct communication with interested parties. The Board is the final decision-making body for adoption of GSPs completed by the GSA.

1.3.2.2 SVBGSA

Local GSA-eligible entities formed the SVBGSA in 2017. The SVBGSA represents agriculture, public utility, municipal, county, and environmental stakeholders, and is partially or entirely responsible for developing GSPs in 6 of the Salinas Valley Subbasins.

SVBGSA is a Joint Powers Authority (JPA) that was formed for six subbasins within the Salinas Valley Groundwater Basin in accordance with the requirements of California Government Code § 6500 et seq. The JPA agreement is included in Appendix 1-B. In accordance with CWC § 10723 et seq., the JPA signatories are all local agencies under CWC § 10721 with water or land use authority that are independently eligible to serve as GSAs:

- County of Monterey
- City of Salinas
- City of Gonzales
- City of King
- City of Soledad
- Monterey County Water Resources Agency
- Monterey One Water (M1W)
- Castroville Community Services District

The SVBGSA is governed and administered by an 11-member Board of Directors (Board), representing public and private groundwater interests throughout the Valley, not limited to JPA members. The Board relies on robust science and public involvement for decision-making. Board seats include representatives from the City of Salinas (1), South County Cities (1), DACs/Small Public Water Systems (1), California Public Utility Regulated Water Companies (1), Agriculture (4), Environment (1), and Public Member (1). The Board meets monthly and all meetings are open to the public. The Board is the final decision-making body for adoption and implementation of GSPs completed by the SVBGSA.

SVBGSA governance bodies include a Board of Directors, Budget and Finance Committee consisting of 5 Directors, an Executive Committee consisting of 5 Directors, a Planning Committee consisting of 5 Directors (not currently active), and an Advisory Committee. The SVBGSA's activities are coordinated by a general manager. This section provides an overview of SVBGSA governance.

For Board decision-making, when a quorum is present, a majority vote is required to conduct business. Some business items require a super majority vote or a super majority plus vote. A super majority requires an affirmative vote by eight of the 11 Board members. A super majority vote is required for:

- Approval of a GSP
- Amendment of budget and transfer of appropriations

- Withdrawal or termination of Agency members

A super majority plus requires an affirmative vote by 8 of the 11 Board members, including an affirmative vote by 3 of the 4 agricultural representatives. A super majority plus vote is required for:

- Decisions to impose fees not requiring a vote of the electorate or property owners
- Proposals to submit to the electorate or property owners (as required by law) decisions to impose fees or taxes
- Limitations on well extractions (pumping limits)

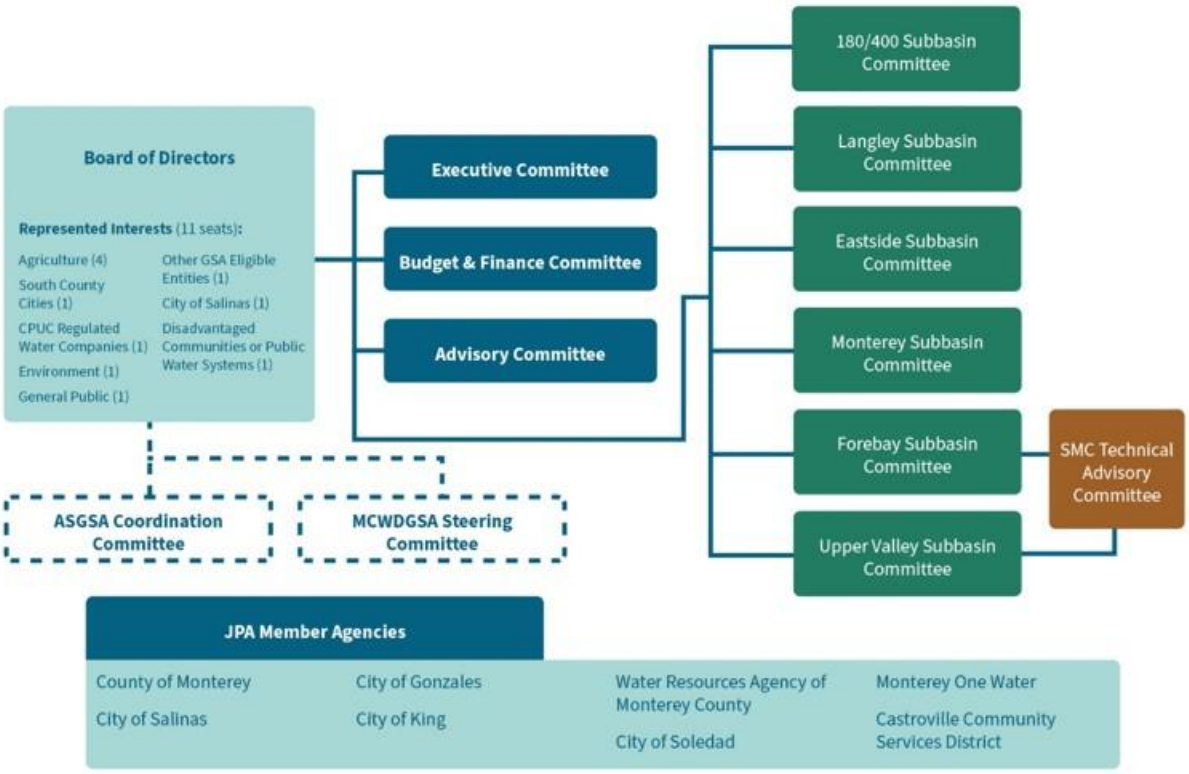


Figure 1-2 SVBGSA Board and Committees

The SVBGSA Advisory Committee provides input and recommendations to the SVBGSA Board. At the request of the Board, the Advisory Committee reviews and provides recommendations to the Board on groundwater-related issues. In 2025 the configuration and role of the Advisory Committee was updated. The Advisory Committee is comprised of 6 Subbasin Committee seats, 4 Partner Agency seats, and up to 3 of the Board-Designated seats. Members collectively represent the diverse interests of groundwater users, partner agencies, and subbasin implementation areas. The Advisory Committee strives to include a range of interests in groundwater in the Salinas Valley and outlined in SGMA including:

- Subbasin Committees Representatives – Each subbasin implementation committee (e.g. 180/400, Eastside, Langley, Monterey, Forebay, and Upper Valley) nominate a single individual to serve as its representative on the Advisory Committee. The representative must demonstrate a record of involvement and interest in groundwater management or water-related issues in one of the subbasins and be endorsed by the respective subbasin committee.
- Partner Agency/Organization Representatives – The following agencies nominate and endorse 1 representative each:
    - MCWRA
    - Arroyo Seco GSA
    - MCWDGSA
    - Monterey One Water
- Board-Designated Appointments – The SVBGSA Board of Directors may appoint up to three individuals to serve on the Advisory Committee to fill identified gaps in representation (e.g. environmental, rural residential, tribal, industrial, underserved communities), enhance expertise or geographic balance and foster collaboration across sectors.

The Advisory Committee was established by Board action and operates according to a Committee Charter which serves as the bylaws of the Advisory Committee. The Committee's charge emphasizes:

- Reviewing groundwater issues relevant to SGMA implementation in the Salinas Valley.
- Developing consensus-based recommendations that incorporate community and stakeholder perspectives.
- Supporting the Board by identifying areas of agreement and disagreement and presenting clear, well-considered options.

Subbasin Planning Committees were established in May 2020 by the Board to inform and guide planning for the 5 GSPs submitted in January 2022. In July 2021, the SVBGSA Board voted to create Subbasin Committees following GSP submittal to ensure continued involvement during GSP implementation. In the Corral de Tierra Management Area, GSP implementation, periodic evaluations and amendments, are guided and reviewed by the Monterey Subbasin Committee, which is comprised of local representatives from the Subbasin. The role of the Subbasin Committees as part of SVBGSA's community and public engagement strategies is further discussed in Chapter 2.

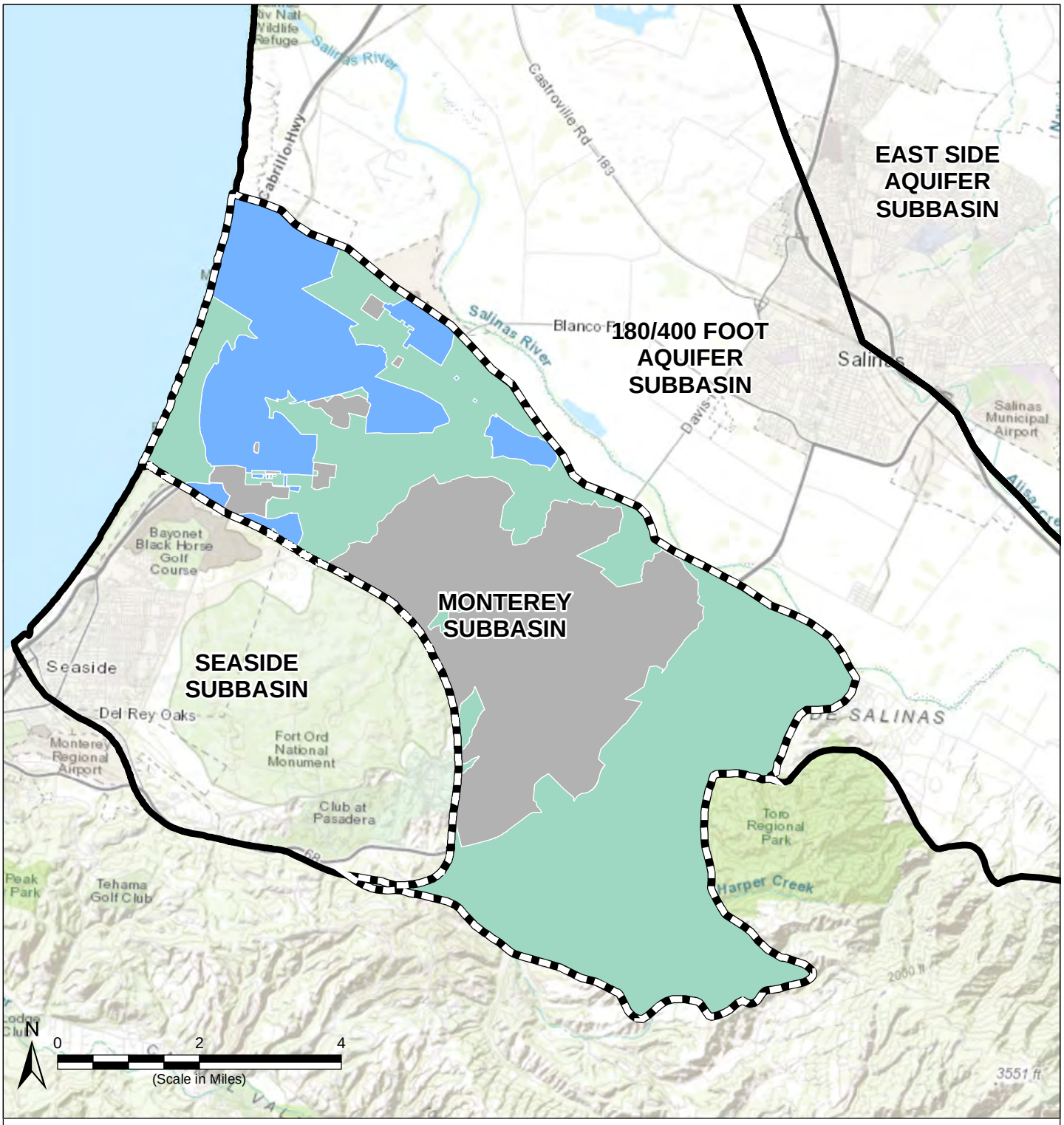
Together, the Board, Advisory Committee, and Subbasin Committees are working to implement the 6 GSPs within the SVBGSA jurisdiction, and in coordination with other GSAs. For the next phase of GSP implementation, SVBGSA will complete a Salinas Valley -wide Integrated Implementation Strategy (IIS). This strategy will detail project portfolios and groundwater

sustainability programs needed to achieve SGMA compliance across all subbasins by 2040 and to maintain sustainability through 2070.

1.3.3 Plan Manager

The plan manager for this GSP is Remleh Scherzinger, General Manager of the MCWD. The contact information for Mr. Scherzinger is provided below.

Remleh Scherzinger
General Manager
Marina Coast Water District
11 Reservation Road, Marina, CA93933-2099
831-883-5910
rscherzinger@mcwd.org



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- SVBGSA
- MCWD GSA
- Federal Land (Source 3)

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 15 September 2021.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.
3. Parcels retained by the federal government in the former Fort Ord are provided by Army Corps of Engineers on 12 Spetember 2019.

Basin GSAs

Marina Coast Water District
Monterey County, CA
November 2021

Figure 1-2

Path: X:\B60094\Maps\2021\09\Fig1-2_Basin GSAs.mxd

1.3.4 Legal Authority of the GSAs

Both GSAs involved in the development of this GSP were formed in accordance with the requirements of California Water Code (CWC) §10723 et seq.

1.3.4.1 MCWDGSA

MCWDGSA is formed in accordance with the requirements of California Water District Law, CWC §34000 by MCWD. MCWD provides water supply to residents within its service area within the City of Marina and the former Fort Ord, and is therefore a local agency under CWC §10721 with the authority to establish itself as a GSA.

1.3.4.2 SVBGSA

The SVBGSA was formed in accordance with the requirements of CWC §10723 et seq. This section lists its specific authorities for GSA formation and groundwater management. Upon establishing itself as a GSA, the SVBGSA retains all the rights and authorities provided to GSAs under CWC § 10725 et seq. as well as the powers held in common by the members.

1.3.5 Coordination Agreements

As the MCWDGSA and SVBGSA have developed a single GSP for the entire Monterey Subbasin, a Coordination Agreement per GSP Emergency Regulations §357.4 is not required between these two parties. Nonetheless, MCWDGSA and SVBGSA have successfully entered into a Framework Agreement regarding responsibilities and coordination for GSP development in the 180/400 Subbasin and the Monterey Subbasin, included as Appendix 1-B. The Framework Agreement was adopted by MCWDGSA in December 2018 and SVBGSA in January 2019.

The Framework Agreement outlined the Management Areas to be established within the Subbasin, which were later formalized in this GSP (see Figure 1-4 and detailed discussion below). According to the Framework Agreement, MCWDGSA has prepared GSP components for the Marina-Ord Management Area and SVBGSA has prepared GSP components for the Corral de Tierra Management Area. The Framework Agreement further establishes a basis for information developed by the two agencies to be integrated into a single GSP for the Monterey Subbasin, including a coordination and stakeholder engagement process, information exchange principles, as well as the acknowledgement that coordinated methodologies are to be developed for the water budget and monitoring network analysis.

1.4 Management Areas

This GSP establishes two Management Areas within the Monterey Subbasin in accordance with GSP Emergency Regulations §351(r) and §354.20. The Management Areas include

- Marina-Ord Area: This Management Area consists of the lands within the City of Marina, City of Seaside, and the former Fort Ord, which are generally located north of State Route 68; and

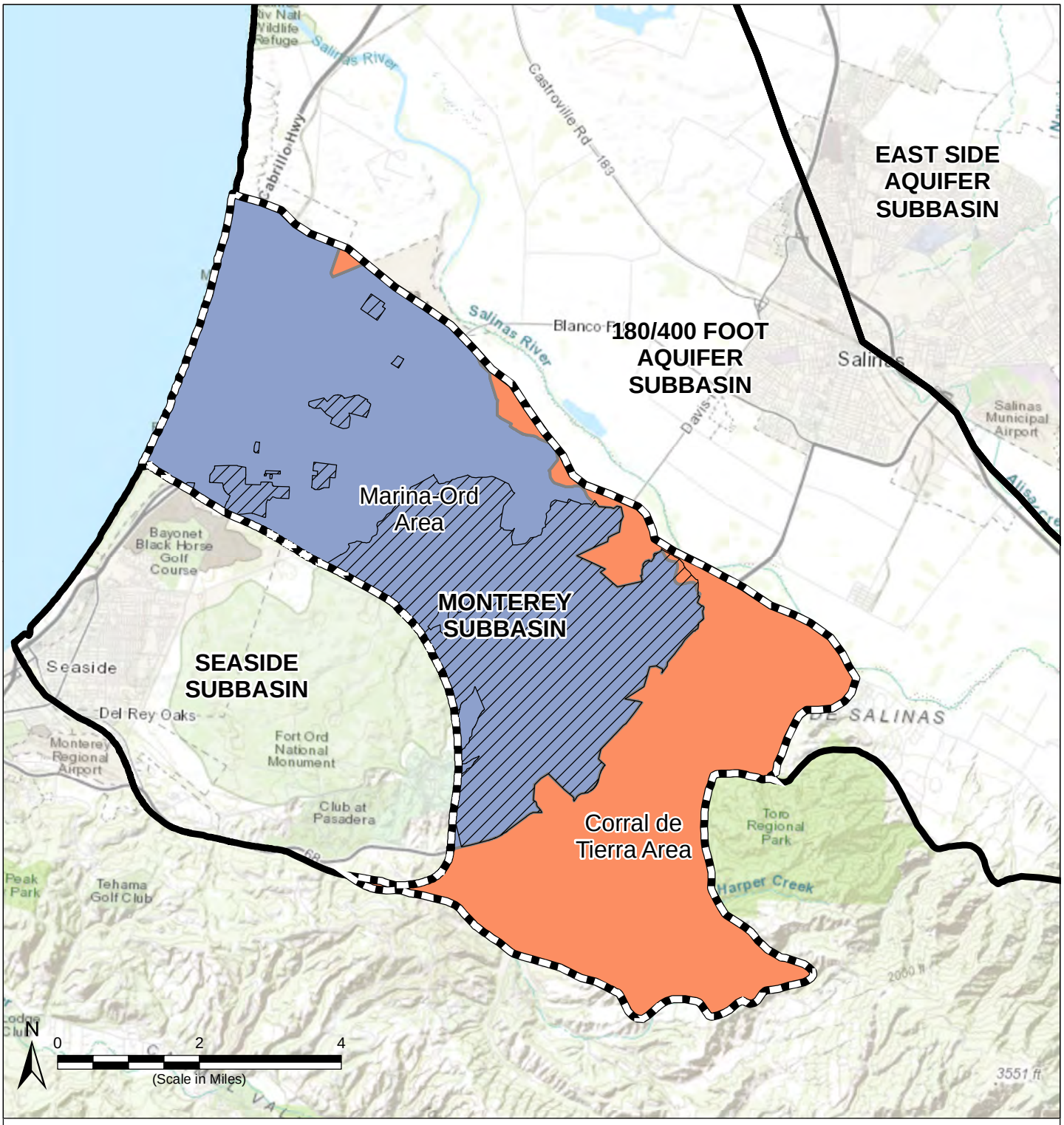
- Corral de Tierra Area: This Management Area consists of the remainder of the Subbasin, which includes lands generally south of State Route 68 and a few parcels located along the northern subbasin boundary with the 180/400-Foot Aquifer Subbasin.

The Management Areas were established considering the differences in jurisdictional, water use sector, and aquifer characteristics within these areas.

Jurisdictional and water use sector information for the Subbasin is presented in Section 3.1. Water use sectors within the Marina-Ord Area include municipal water use and minimal groundwater remediation use. The sole water purveyor within the Marina-Ord Area is the MCWD, which serves water within its service area and will serve any future redevelopment within the former Fort Ord. Water use sectors in the Corral de Tierra Area include municipal water use supplied by various small water systems as well as agricultural and grazing water use.

Aquifer characteristics within these Management Areas are discussed in Section 4.2 In general, hydrostratigraphy in the vicinity of the City of Marina consists of a series of laterally continuous aquifers consistent with the aquifers that form the distinguishing features of the northern Salinas Valley and adjacent 180/400-Foot Aquifer Subbasin. Within the southern Corral de Tierra Area, the typical aquifer sequence recognized in the northern Salinas Valley is not present.

The Management Areas are developed to facilitate GSP implementation in these areas. Specifically, the establishment of the Marina-Ord Area allows MCWDGSA to plan, fund, and implement sustainable groundwater management for the redevelopment of the former Fort Ord, within and outside of its current jurisdictional area. SVBGSA has tailored the management approach in the Corral de Tierra Area towards drinking water and agricultural users.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Federal Lands

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 15 September 2021.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Management Areas

Marina Coast Water District
Monterey County, CA
November 2021

Figure 1-3

Path: X:\B60094\Maps\2021\09\Fig1-3_ManagementAreas.mxd

1.5 Overview of GSP Amendment 1

The GSP covers the entire Monterey Subbasin and is developed jointly by the MCWDGSA and the SVBGSA. This GSP Amendment 1 is developed in concert with GSP Amendments for five other Salinas Valley Groundwater Basin subbasins subject to SGMA in Monterey County: the 180/400-Foot Aquifer Subbasin, the Forebay Aquifer Subbasin, the Upper Valley Aquifer Subbasin, the Langley Area Subbasin, and the Eastside Aquifer Subbasin. While this GSP is focused on the Monterey Subbasin, the GSP will be implemented in accordance with SVBGSA's role in maintaining and achieving sustainability for all subbasins within the Salinas Valley Groundwater Basin. The Monterey Subbasin is referred to as the Subbasin throughout this GSP, and the collection of Salinas Valley Groundwater Subbasins are collectively referred to as the Basin or the Valley.

Chapter 2 details the stakeholders that participated, and the processes followed to develop this GSP. Stakeholders worked together to gather existing information, define sustainable management criteria for the Subbasin, and develop a list of projects and management actions. Throughout preparation of GSP Amendments 1, the Subbasin GSAs continued to provide opportunities for public engagement and stakeholder input at the Subbasin Committee, Steering Committee, as well as Advisory Committee and Board meetings.

Chapters 3 through 6 describe the Basin Setting, present the hydrogeologic conceptual model, and describe historical and current groundwater conditions. It further establishes estimates of the historical, current, and future water budgets based on the best available information.

Chapter 7 and 8 proceed to detail required monitoring networks and define local sustainable management criteria.

Chapter 9 outlines projects and management actions for reaching sustainability in the Subbasin by 2042.

Additionally, GSP topics are discussed respectively for the Marina-Ord and Corral de Tierra Areas as necessary, acknowledging the hydrogeological differences and data gaps between these Management Areas. As part of the two GSAs' collaborative GSP development process, components for the Marina-Ord Area were prepared by MCWDGSA, and components for the Corral de Tierra Area were prepared by SVBGSA.

GSP Amendment 1 is developed as part of an adaptive management process using improved data, models, and analysis of projects and management actions to achieve sustainability since preparation of the original GSP. This amended GSP replaces the original and previously amended GSP. It may be updated and adapted, and further amended if needed, as new information and even more refined models become available. This includes updating SMC and projects and management actions to reflect updates and future conditions. Adaptive management will be reflected in the required GSP 5-year periodic evaluation and annual reports.

This includes updating sustainable management criteria as well as projects and management actions to reflect updates and future conditions. Adaptive management will be reflected in the required five-year assessments and annual reports.

2 COMMUNICATIONS AND STAKEHOLDER ENGAGEMENT

This chapter includes a summary of information relating to notification and communication by the Groundwater Sustainability Agencies (GSAs) with other agencies and interested parties during (GSP) development pursuant to GSP Emergency Regulations §354.10.

The Subbasin GSAs developed a Framework Agreement regarding GSP development as described in Section 1.3.5. The Framework Agreement states that the MCWDGSA will prepare GSP components for the Marina-Ord Area of the Monterey Subbasin and that the SVBGSA will prepare GSP components for the Corral de Tierra Area of the Monterey Subbasin for incorporation into a single GSP. The Framework Agreement further states that the parties agree to work collaboratively to develop and implement stakeholder engagement plans for the GSPs while each party is responsible for guiding efforts within their respective plan preparation areas.

2.1 Inter-Agency Coordination

2.1.1 Coordination Between Subbasin GSAs

The MCWDGSA and SVBGSA have made intra- and inter-basin coordination a priority to ensure successful GSP development. Pursuant to the Framework Agreement, the GSAs has organized and convened regular meetings for coordinating GSP development and implementation for the Subbasin:

- The **Technical Committee** includes staff and technical consultants from MCWDGSA and SVBGSA. The Technical Committee meets bi-weekly or monthly as needed. During GSP development and preparation of this amendment, this included review draft GSP content prepared by each GSA and resolve differences, preparation of annual reports, data and information sharing, coordination on groundwater models, and related work on GSP implementation activities.
- The **Steering Committee** includes the General Manager and one Board Member from each GSA, who will update each GSA Board of Directors. The Steering Committee reports back to each GSA's board. The Steering Committee oversees implementation of the Framework Agreement, reviews matters elevated by the Technical Committee, and works to reach consensus. The Steering Committee meetings are subject to the California Open Meeting Law ("Brown Act") and are open to the public. Since 2023, Steering Committee meetings have been held on a quarterly basis.

These coordinated efforts, along with individual agency engagement strategies, aim to create a consistent understanding of subbasin conditions among stakeholders and facilitate integration of local and regional projects and management actions needed to achieve groundwater sustainability.

2.1.2 Coordination with Other Water Agencies

In addition to coordination between GSA's, the Subbasin GSAs continues to coordinate with agencies involved in water management within the Monterey Subbasin.

MCWDGSA participates in regular committees of SVBGSA, Seaside Watermaster, and MCWRA. Additionally, MCWDGSA has established coordination agreements and regular point of contact with the Seaside Watermaster, MPWMD, MCWRA, and the U.S. Army regarding data sharing, access to monitoring wells, and coordinated monitoring and management within the Monterey Subbasin and adjacent Subbasins.

SVBGSA has a Memorandum of Understanding with MCWRA related to ongoing coordination and joint activities, as well as a service agreement for data collection under the Groundwater Monitoring Program. MCWDGSA, Arroyo Seco GSA, M1W and MCWRA have representation on the SVBGSA Advisory Committee. SVBGSA also coordinates with the agencies of the basins or subbasins adjacent to other Salinas Valley subbasins (Seaside Subbasin, Pajaro Valley Groundwater Basin, and Paso Robles Area Subbasin).

2.1.3 Coordination with Land Use Agencies

MCWDGSA and SVBGSA acknowledge the critical importance of coordinating water management and land use planning. The GSAs are coordinating with land use authorities within the Subbasin, including the County of Monterey, and the City of Marina. For the Corral de Tierra Area, SVBGSA coordinates with the County of Monterey, the land use agency, through meetings and requesting land use plan information to incorporate into GSP Amendments. SVBGSA will continue to coordinate with the County and the cities in its jurisdictional area by convening meetings with each land use agency to review the findings of the 5-year periodic evaluations and groundwater conditions, along with the land use plan information provided. This coordination is also described in the Land Use Coordination Program Implementation Action that is included in Chapter 10. This implementation action provides for more robust, on-going coordination between the GSA and land use agencies during GSP implementation. MCWDGSA and SVBGSA also solicited input from Monterey County and City of Marina prior to submitting GSP Amendment 1 to DWR, with the periodic evaluation, in January 2027.

2.2 Communication and Public Engagement by MCWDGSA

MCWDGSA's program for Communication and Engagement is designed to effectively engage a variety of relevant stakeholders in the development of a GSP that will guide the GSA to demonstrate sustainability by January 31, 2042, and maintain sustainability through the SGMA's 50-year planning timeline. Pursuant to the Framework Agreement, MCWDGSA's communication program focuses on development and implementation of GSP components within the Marina-Ord Area.

The GSA's Communication and Engagement efforts aim to support a GSP that best meets the needs of beneficial uses and users of groundwater in the Marina-Ord Area and reflects and incorporates stakeholder input as appropriate. As MCWD is the only water supplier within the Marina-Ord Area where water use is dominantly urban use, communication with stakeholders and beneficial users within the Marina-Ord Area hinges on dialogues with key stakeholder agencies identified in Section 2.2.1 below.

MCWDGSA's goal is to engage stakeholders early in the decision-making process to consider their interests and concerns and be open and transparent in any decisions that will have a substantial impact on beneficial users of groundwater in the Subbasin.

2.2.1 Defining and Describing Stakeholders in the Marina-Ord Area

MCWDGSA has identified beneficial uses and users of groundwater within the Marina-Ord Area per the interests listed in CWC §10723.2, as well as additional stakeholders of interest.

Agriculture. There are no agricultural groundwater users within the Marina-Ord Area.

Domestic Water Users. Due to well installation requirements of the Monterey County and MCWD, only domestic wells that pre-date County and City ordinances or for urban irrigation may exist within the Marina-Ord Area. Although minimal, the exact quantity of domestic wells is not well known.

Municipal Well Operators and Public Water Systems. MCWD is the only municipal well operator and public water system within the Marina-Ord Area. MCWD provides water service to the City of Marina, City of Seaside, and the former Fort Ord Army Base. A portion of the former Fort Ord is retained for use by the U.S. Army, while the remainder is being converted to civilian use for redevelopment.

Local Land Use Planning Agencies. There are several local land use planning agencies located within the Marina-Ord Area, including the City of Marina, the City of Seaside, and the County of Monterey.

Environmental Users of Groundwater. Potential groundwater dependent ecosystems exist in the Marina-Ord Area within the lands of the City of Marina and Fort Ord National Monument. Lands within the Fort Ord National Monument are not subject to SGMA. The U.S. Army currently conducts remedial activities within the Fort Ord National Monument under the guidance of the Fort Ord Habitat Management Plan (HMP) (USACE, 1997) as well as U.S. Fish and Wildlife Services Biological Opinions.

Surface Water Users. There are no surface water users within the Marina-Ord Area.

The Federal Government. The U.S. Army and the U.S. Bureau of Land Management manage federal lands within the Marina-Ord Area that are not subject to SGMA. MCWD is the exclusive water purveyor to the U.S. Army for all Army and Federal facilities within the Marina-Ord Area. There is no current or planned groundwater use by the Bureau of Land Management on its lands.

California Native American Tribes. According to the information made available by the DWR in support of GSP development, there were no tribal lands within the Marina-Ord Area. Several state-recognized tribes are present in Monterey County and the plan area as discussed in Section 3.1.2.

Disadvantaged Communities (DACs). Census Tracts 141.02 and 142.04, which are recognized as Disadvantage Community Tracts, as well as several Disadvantage Community Block Groups (a statistical division of a census tract), overly the Marina-Ord Area (Figure 2-1). There are no

Disadvantaged Community Places identified within the area[2]. Some of these disadvantaged community areas are missing income data and may include the student population from California State University Monterey Bay. These recognized DACs are located within the urban areas of the City of Marina and receive water service from MCWD.

Groundwater Monitoring Entities. Monterey Peninsula Water Management District (MPWMD) and Monterey County Water Resources Agency (MCWRA) are Monitoring Entities in the Subbasin under the CASGEM Program. Additionally, these agencies have water management authority in portions of the Marina and Ord Areas. The U.S. Army also monitors groundwater within former Fort Ord as part of its groundwater remedial efforts to address legacy groundwater contamination. Collaboration with these water agencies and the U.S. Army will be integral to the sustainable management of the Subbasin.

Other Groundwater Management Entities. The Monterey Subbasin is adjacent to the critically-overdrafted, high-priority 180/400-Foot Aquifer Subbasin and the adjudicated Seaside Subbasin of the Salinas Valley Basin. SGMA compliance within the 180/400-Foot Aquifer Subbasin is carried out by the MCWDGSA and SVBGSA. The adjudicated Seaside Subbasin is managed by the Seaside Groundwater Basin Watermaster. MCWD will inform, involve, and collaborate with SVBGSA and the Seaside Groundwater Basin Watermaster to ensure sustainable management of groundwater across basins.

M1W, formerly the Monterey Regional Water Pollution Control Agency, is a wastewater and recycled water agency serving municipalities of northern Monterey County including the Marina and Ord Areas. M1W provides advanced treated wastewater for Indirect Potable Reuse (IPR) in the Seaside Subbasin and for irrigation in the Monterey Subbasin (the Pure Water Monterey). MCWD is collaborating with M1W to develop a new IPR project to provide additional water supply and support future developments in the Marina and Ord Areas. MCWD will continue collaboration with M1W to develop reliable and cost-effective projects that benefit sustainable management of the Subbasin.

2.2.2 Venues for Public Engagement

MCWDGSA intends to provide a variety of opportunities for engagement with stakeholders. Below are the primary venues that MCWDGSA currently provides and will continue to provide to engage stakeholders and the public. Stakeholder input received has informed and/or are incorporated into corresponding sections of the GSP.

MCWDGSA Board Meetings

MCWDGSA Board meetings are open to the public and are a venue for public engagement. During selected Board meetings, MCWDGSA's technical team provided status updates of GSP

[2] DACs are identified based on having an average household income less than 80% of the State median, and Severely Disadvantaged Communities (SDACs) are identified based on having an average household income less than 60% of the State median (U.S. Census Bureau, 2014).

development, presented on key technical issues, and presented recommendations for the GSA Board to consider.

Stakeholder Workshops

Stakeholder workshops have been held to communicate progress on GSP technical components to stakeholders and to receive input on upcoming decisions and work efforts. Quarterly Stakeholder workshops that were open to the public were held during GSP development.

Additionally, MCWDGSA has been publicizing all stakeholder workshops and public meetings on its website (http://www.mcwd.org/governance_meetings.html) and to its list of stakeholders. MCWDGSA directly invites agencies and municipalities identified in Section 2.2.1 to each meeting through emails and mailings as appropriate.

One-on-One Meetings

The GSA's staff and technical team contacted interested parties for one-on-one meetings and conference calls to facilitate their input during the preparation of GSP materials and prior to the more formal meetings. The one-on-one meetings have been a venue for communication with targeted interest on specialized topics.

Website Communication

MCWDGSA has been and will continue to update its website with stakeholder workshop and GSA Board meeting materials, as well as additionally update the website with key GSP updates. Draft GSP chapters available for public review are posted on the website. A live GSP comment form is available on the website for ongoing comment submission on GSP chapters.

2.2.3 Public Meeting Summary

This section identifies public meetings, workshops, and direct outreach specific to development of the original Monterey Subbasin GSP and GSP Amendment 1. The lists will be updated throughout GSP implementation. Detailed meeting minutes and materials are available on the GSA website.

2.2.3.1 Original GSP

- MCWD Board meetings
    - GSP development planning and kickoff on March 19, 2018
    - SGMA update on April 16, 2018
    - SGMA update on May 20, 2019
    - GSP development update on February 16, 2021
    - GSP development update on August 16, 2021
    - GSP development update on October 18, 2021
    - GSP public hearing and adoption on January 17, 2022

- MCWD Stakeholder Workshops
    - Stakeholder Workshop #1 on August 25, 2020;
    - Stakeholder Workshop #2 on November 17, 2020;
    - Stakeholder Workshop #3 on March 11, 2021;
    - Stakeholder Workshop #4 on October 13, 2021; and
    - Stakeholder Workshop #5 on October 27, 2021.
- Direct Outreach
    - Website and live comment form maintenance
    - Interested parties list maintenance
    - One-on-one stakeholder meetings

2.2.3.2 GSP Amendment 1

[Pending]

2.2.4 Communication and Public Engagement during GSP Implementation

MCWDGSA communication and public engagement actions that have taken place during GSP development will continue during GSP implementation, including

- Periodic GSA Board meeting updates and stakeholder workshops;
- One-on-one stakeholder communications;
- Posting of relevant announcements and information on the GSA website;
- Stakeholder list maintenance; and
- Stakeholder Communication and Engagement Plan (SCEP) evaluation and updates.

MCWDGSA has been and will continue to hold periodic stakeholder workshops to inform the public on the progress of implementing the plan, including the status of projects and management actions. Meeting information and other materials from GSA Board meetings and public workshops will continue to be available on the MCWDGSA's website (https://www.mcwd.org/gsa_about.html). Meeting materials for past and future GSA Board that are open to the public are available at (https://www.mcwd.org/governance_meetings.html).

Critical to the success of the Monterey GSP will be public understanding of the projects and management actions planned for sustainability, as well as sustainability implementation actions and other groundwater management activities. These important actions are specifically described in Chapter 9. The GSAs' schedule to implement them is described in Chapter 10. In addition, each project or management action may be subject to public noticing requirements during its planning and implementation phases, as detailed in their respective project descriptions in Chapter 9.

Additional important actions of GSP implementation will be the production of the required Annual Report by April 1 each year for the Monterey Subbasin. The Annual Report covers annual data collected each water year (WY) from October 1 through September 30. The annual report are prepared through a collaborated effect between the Subbasin GSAs. The Annual Report provides an annual benchmark for the Subbasin GSAs to provide to the public and stakeholders to assess progress towards sustainability. The Annual Report also includes assessment of the six sustainable management criteria (SMCs) for the Subbasin. The Annual Report provides an important opportunity to reengage subbasin stakeholders in its review and to discuss sustainability status and goals.

2.3 Communication and Public Engagement by SVBGSA

Given the importance of the Monterey GSP to the Corral de Tierra Area communities, residents, landowners, farmers, ranchers, businesses, and others, SVBGSA's program for communication and engagement is based on inclusive stakeholder input as the primary component of the Monterey GSP process. To encourage ongoing stakeholder engagement SVBGSA deployed the following strategies in the preparation of the Monterey Subbasin GSP and GSP Amendment 1:

- Conducted an inclusive outreach and education process that best supports the success of a well-prepared GSP that meets SGMA requirements.
- Kept the public informed by distributing accurate, objective, and timely information.
- Invited input and feedback from the public at every step in the decision-making process.
- In 2020, established the Monterey Subbasin Subbasin Planning Committee that completed a comprehensive planning process that engaged the Advisory Committee in discussion of key plan elements and the Board of Directors on review of the Plan.
- In 2022, established the Monterey Subbasin Implementation Committee that continued to provide input on GSP implementation, including ongoing SGMA compliance and development of Project and Management Actions (PMAs), including engagement on key items also discussion with the Advisory Committee and Board of Directors. In 2024, the Subbasin Committee Program further refined their processes and roles.
- In 2025, refined the configuration and role of the Advisory Committee to focus on multi-subbasin considerations across the Valley, including the IIS and recommendations for the portfolio of PMAs to be prioritized in this and other subbasin GSP amendments. MCWDGSA has a seat on the newly configured Advisory Committee.
- In 2026, presented information to the Subbasin Committees as the GSP amendments and evaluations were developed. All GSP chapters were posted for public review and comments.
- Followed consistent stakeholder outreach for GSP amendments.

This process ensured that stakeholders had multiple opportunities to review and comment on the development of the chapters.

2.3.1 Defining and Describing Stakeholders in the Corral de Tierra Area

SVBGSA has identified beneficial uses and users of groundwater within the Corral de Tierra Area in accordance with the interests listed in CWC §10723.2, as well as additional stakeholders of interest in the Salinas Valley. Groundwater is an important supply for over 400,000 people living within the Salinas Valley. Beneficial users in the Valley are the key stakeholders targeted for robust public engagement for GSP development and implementation. Beneficial users in the Valley include the following:

Agriculture. Includes row crops, field crops, vineyards, orchards, cannabis, and rangeland. The Salinas Valley agricultural region supports a $55 billion dollar production value and produces a large percentage of the nation's produce and healthy foods. Agriculture is the largest user of groundwater in the Valley accounting for over 200,000 irrigated acres and 94% of pumping in the Valley.

Domestic Water Users. Includes urban water use and related non-agricultural water uses in the cities and census-designated places and rural residential wells used for drinking water. Urban water use includes small local water systems, small state water systems, and small and large public water systems.

Industrial Users. Includes industrial water users, such as coolers, agricultural wash facilities, quarries and oil production.

Environmental Users. Environmental users include the habitats and associated species maintained by conditions related to surface water flows such as steelhead trout, and groundwater dependent ecosystems (GDE) including brackish and freshwater marsh and riparian habitats. Environmental users include native vegetation and managed wetlands.

Stakeholders associated with these beneficial users and uses are listed below. These users are in many cases also represented on the SVBGSA Board and Advisory Committees as described in the next section.

Environmental organizations. Environmental organizations that are stakeholders include, but are not limited to, Sustainable Monterey County, League of Women Voters of Monterey County, Landwatch Monterey County, Friends and Neighbors of Elkhorn Slough, California Native Plant Society Monterey Chapter, Trout Unlimited, Surfriders, the Nature Conservancy, Carmel River Steelhead Association, Central Coast Wetlands Group, and the Elkhorn Slough Foundation

Underrepresented communities (URCs) and Disadvantaged Communities. URCs and DACs and organizations that represent with them include, but are not limited to, the Cities of Gonzales, Greenfield, King, Salinas, and Soledad, Castroville Community Services District (CSD), San Jerardo Cooperative, San Lucas, San Vicente Mutual Water Company, Environmental Justice Coalition for Water, and Community Water Center

City and county government. Cities of Greenfield, Gonzales, King, Marina, Salinas, and Soledad, County of Monterey

California Native American Tribes. According to the information made available by the DWR in support of GSP development, there were no tribal lands within or in the vicinity of the Subbasin at the time of the original GSP. However, several state recognized tribes are present in Monterey County and the plan area.

Land use organizations. Sustainable Monterey County, League of Women Voters of Monterey County, Landwatch Monterey County, Friends and Neighbors of Elkhorn Slough

Residential well owners. Represented by public members and members of mutual water companies and local small or state small water systems.

Water agencies. MCWRA, Marina Coast Water District, Arroyo Seco Groundwater Sustainability Agency, Castroville Community Services District, Monterey One Water, Seaside Groundwater Basin Watermaster, MPWMD.

California Public Utilities Commission (CPUC)-regulated water companies. Alisal Water Service (Alco), California Water Service Company (Cal Water), California American Water.

2.3.2 Venues for Public Engagement and Public Meeting Summary

During original GSP development, SVBGSA subbasin planning committees were comprised of local stakeholders and Board members and were appointed by the Board of Directors following a publicly noticed application process by the SVBGSA. Subbasin planning committees provided input throughout plan development, review, and recommendations, with assistance provided by SVBGSA staff and technical consultants.

These committees represent constituencies that are considered important stakeholders to develop comprehensive subbasin plans for the Salinas Valley or are not represented on the Board. A list of the SVBGSA Subbasin Committee members is included in the Acknowledgements section of this GSP.

Subbasin planning committee meetings are subject to the Brown Act and are noticed publicly on the SVBGSA website. Public comment is taken on all posted agenda items. Subbasin planning committees have been engaged in an iterative planning process that combines education of pertinent technical topics through presentations and data packets and receiving GSPs chapters for review and comment. A live GSP comment form is available on the SVBGSA website for ongoing comment submission on all GSP chapters. All GSP chapters were posted for public review and comment.

Community engagement and public transparency on SVBGSA decisions are paramount to building a sustainable and productive solution to groundwater sustainability in the Basin. At the conclusion of the planning process in August 2021 for the Monterey GSP, the SVBGSA held more than 38 planning meetings and technical workshops on each aspect of the Monterey Subbasin GSP.

In addition to regularly scheduled committee meetings, a series of workshops were held for the Monterey Subbasin Planning Committee as detailed below. These workshops are informational for committee members, stakeholders, and the general public and cover pertinent topics to be

included in the GSPs. Workshops were timed to specific chapter development for the GSP. Subject matter experts were brought in as necessary to provide the best available information to Subbasin Planning Committee members.

2.3.2.1 Corral de Tierra GSP Preparation and GSP Amendments

Given the importance of groundwater and the development of the Monterey GSP to the communities, residents, landowners, farmers, ranchers, businesses, and others, inclusive stakeholder input was a primary component of the Monterey Subbasin GSP process. To encourage ongoing stakeholder engagement SVBGSA deployed the following strategies in the preparation of the Monterey Subbasin GSP and GSP Amendment 1:

- Conducted an inclusive outreach and education process that best supports the success of a well-prepared GSP that meets SGMA requirements.
- Kept the public informed by distributing accurate, objective, and timely information.
- Invited input and feedback from the public at every step in the decision-making process.

In 2020, SVBGSA established the Monterey Subbasin Planning Committee that completed a comprehensive planning process that engaged the Advisory Committee in discussion of key plan elements and the Board of Directors on review of the Plan.

In 2022, SVBGSA established the Monterey Subbasin Implementation Committee that continued to provide input on GSP implementation. In 2024, the Board approved a Subbasin Committee Program that clarified and refined their roles. Subbasin committees do the comprehensive work of reviewing annual reports and monitoring data, providing input on PMAs, general GSP implementation, and review of plan updates and amendments, with assistance and information provided by SVBGSA staff and technical consultants.

In 2025, SVBGSA refined the configuration and role of the Advisory Committee to focus on multi-subbasin considerations across the Valley, including the IIS and recommendations for the portfolio of projects and management actions to be prioritized in this and other subbasin GSP amendments.

In 2026, SVBGSA presented information to the Subbasin Committees as the GSP amendments and evaluations were developed. All GSP chapters were posted for public review and comments.

Publicly noticed drafts of the Monterey Subbasin GSP and allowed for required public comment periods as required by SGMA. Public comments received are included in Appendix 2-A.

Community engagement and public transparency on SVBGSA decisions is paramount to building a sustainable and productive solution to groundwater sustainability in the Salinas Valley.

2.3.3 Goals for Communication and Public Engagement

Ultimately, the success of the Monterey Subbasin GSP will be determined by the collective action of every groundwater user. To meet ongoing water supply needs, both for drinking water and for agricultural and other economic livelihoods, the Subbasin must achieve and maintain

sustainability into the future. This outreach engages the public early and frequently, and keeps the internal information flow seamless among staff, consultants, committee members and the SVBGSA Board regarding the goals and objectives of the Monterey Subbasin GSP and associated monitoring and implementation activities.

Communications and Public Engagement (CPE) Actions provide outreach during the Subbasin planning efforts and assist SVBGSA in being receptive to stakeholder needs through communication tools. The CPE Actions also forecast how SVBGSA will communicate during GSP implementation.

The goals of the CPE Actions are:

1. To keep stakeholders informed through the distribution of accurate, objective, and timely information while adhering to SGMA requirements for engagement (noted above).
2. To articulate strategies and communications channels that will foster an open dialogue and increase stakeholder engagement during the planning process.
3. To invite input from the public at every step in the decision-making process and provide transparency in outcomes and recommendations.
4. To ensure that the Board, staff, consultants, and committee members have up-to-date information and understand their roles and responsibilities.
5. To engage the public on GSP Implementation progress especially for PMAs and Annual Reports.

2.3.4 Communication and Outreach Objectives

The following are the communications and outreach objectives of the CPE Actions:

- Expand Audience Reach
- Maintain a robust stakeholder list of interested individuals, groups and/or organizations.
- Secure a balanced level of participants who represent the interests of beneficial uses and users of groundwater.
- Increase Engagement
- Keep interested stakeholders informed and aware of opportunities for involvement through email communications and/or their preferred method of communications.
- Publish meeting agendas, minutes, and summaries on the SVBGSA website: www.svbgsa.org.
- Inform and obtain comments from the general public through GSP online comment form and public meetings held on a monthly basis.
- Facilitate productive dialogues among participants throughout the GSP planning process.

- Seek the input of interest groups during the planning and implementation of the GSP and any future planning efforts.
- Increase GSP Awareness
- Provide timely and accurate public reporting of planning milestones through the distribution of outreach materials and posting of materials on the SVBGSA website for the GSP.
- Secure quality media coverage that is accurate, complete, and fair.
- Utilize social media to engage with and educate the general public.
- Track Efforts
- Maintain an active communications tracking tool to capture stakeholder engagement and public outreach activities and to demonstrate the reporting of GSP outreach activities.

2.3.5 Target Audiences and Stakeholders

SVBGSA stakeholders consist of other agencies and interested parties including all beneficial users of groundwater or representatives of someone who is. Under the requirements of SGMA, all beneficial uses and users of groundwater must be considered in the development of GSPs, and GSAs must encourage the active involvement of diverse social, cultural, and economic elements of the population.

There are a variety of audiences targeted within the Basin whose SGMA knowledge varies from high to little or none. Given this variance, SVBGSA efforts are broad and all-inclusive. Target audiences include:

- SVBGSA Board of Directors, Advisory Committee and Subbasin Planning Committees
- SVBGSA Groundwater Sustainability Fee Payers
- Partner agencies including Monterey County Environmental Health Department, County of Monterey, MCWRA, and the Greater Monterey County Integrated Regional Water Management Group (RWMG)
- Municipal and public water service providers
- Private and local small or state small water system providers

- Local municipalities and communities
  - Elected officials within the Basin
  - Beneficial uses and users of groundwater including, agriculture, domestic wells and local small or state small water systems, and environmental uses such as wetlands, , including non-profit organizations and industry groups that represent them
  - Diverse social, cultural, and economic segments of the population within the Basin including URCs

- The general public

Stakeholder involvement and public outreach is critical to the GSP development because it helps promote the plan based on input and broad support. The following activities summarize involvement opportunities and outreach methods to inform target audiences and stakeholders. It is important to note that levels of interest will evolve and shift according to the GSP's implementation opportunities and priorities.

2.3.6 Stakeholder Database

A stakeholder database of persons and organizations of interest will be created and maintained. The database will include stakeholders that represent the region's broad interests, perspectives, and geography. It will be developed by leveraging existing stakeholder lists and databases and by conducting research of potential stakeholders that may be interested in one or all of the following categories: municipal users and groundwater users including agricultural, urban, industrial, commercial, institutional, rural, environmental, URCs, state lands and agencies, and integrated water management.

2.3.7 Key Messages and Talking Points

SVBGSA developed key messages focused on getting to know your GSA, an overview of groundwater sustainability planning for our community, and how we intend to continue outreach through implementation. These messages were guided by the underlying statements:

- The GSP process, both planning and implementation, is transparent and direct about how the GSP will impact groundwater users.
- SVBGSA represents the groundwater interests of all beneficial uses/users of the Corral de Tierra Area equitably and transparently to ensure that the Subbasin achieves and maintains sustainable groundwater conditions.
- SVBGSA is committed to working with stakeholders using an open and transparent communication and engagement process.
- As the overall GSP will be more comprehensive with an engaged group of stakeholders providing useful information, SVBGSA will create as many opportunities as possible to educate stakeholders and obtain their feedback on GSP implementation and plan updates.

These messages are being used by SVBGSA as the basis for specific talking points/questions and answers (Q&A) to support effective engagement with audiences (Appendix 2-B).

2.3.8 Engagement Strategies

SVBGSA utilizes a variety of tactics to achieve broad, enduring, and productive involvement with stakeholders during the development and implementation of the GSPs. Below are activities that SVBGSA uses to engage the public:

- Develop and maintain a list of interested parties
- Hold Board, Advisory Committee, Subbasin Committees and other Committee Meetings
    - Publish regular public notices and updates (Brown Act compliance)
    - Offer public informational sessions and subject-matter workshops
    - Provide hybrid meeting access online via Zoom or other appropriate platform
- Provide SVBGSA website resources for topics including SGMA, SVBGSA, GSPs, Projects and Management Actions, annual reports, groundwater models, hydrogeology and educational resources, and annual budget and Groundwater Sustainability Fee information, including:
    - SVBGSA web map: provides access to visualize, search and export data
    - StoryMaps include how water moves through the Salinas Valley, groundwater challenges, sustainability goals and the current status
- Utilize social media platforms, including Facebook, Instagram and YouTube to share information, communicate with stakeholders and grow engagement
- Publish email newsletters to communicate directly with interested parties
- Garner earned media coverage through the use of press releases, media pitching and relationship-building with local reporters (appendix 2D includes SVBGSA's media policy)
- Publish op-eds in local newspapers
- Create and share engaging video content
- Place advertising in local media (including digital, print, radio and audio streaming)
- Post fliers/posters in public locations to share key initiatives
- Utilize co-promotional opportunities and existing channels with agencies, committees, and organizations including email newsletters, social media, board meetings and mailings to key audiences
- Provide talks and presentations to various stakeholder groups, associations, community organizations, and educational institutions
- Host workshops on key topics
- Make materials bilingual and provide interpretation services

2.3.9 Communication and Public Engagement Actions Timeline and Tactics

CPE Actions and GSP milestone requirements by phase include:

- Prior to initiating plan development: Share how interested parties may contact the GSA and participate in development and implementation of the plan submitted to DWR. (23 California Code of Regulations §353.6)

- Prior to GSP development: Establish and maintain an interested persons' list. (CWC §10723.4)
- Prior to and with GSP submission:
    - Record statements of issues and interests of beneficial users of basin groundwater including types of parties representing the interests and consultation process
    - Lists of public meetings
    - Inventory of comments and summary of responses
    - Communication section in GSP (23 California Code of Regulations §354.10) that includes: agency decision-making process, identification of public engagement opportunities and response process, description of process for inclusion, and method for public information related to progress in implementing the plan (status, projects, actions)

- Supporting tactics to be used to communicate messages and supporting resources available through GSP development and GSP implementation include:
    - SVBGSA website, updated regularly to reflect meetings and workshop offerings
    - Direct email via Mailchimp sent approximately monthly to announce board meetings, special workshop offerings and other opportunities for engagement
    - Outreach to local media to secure coverage of announcements and events, radio interviews, op-ed placement
    - Workshops, information sessions and other community meetings
    - Social media, specifically Facebook, updated regularly to share information and support other outreach efforts

2.3.10 Communication and Public Engagement Actions – Annual Evaluation and Assessment

Annually SVBGSA will summarize annual conditions and GSA activities to gather input for annual reports. A summary of CPE actions will be included within annual reports. Development of the subsequent fiscal year work plan happens in parallel with annual reporting. The GSA reviews community outreach activities and their effectiveness and considers the appropriate CPE actions for the upcoming year in its annual work plan and budget.

2.3.11 Communication and Public Engagement during GSP Implementation

The communication and public engagement outlined above is also applicable, and is intended to continue through, GSP Implementation. Critical to the success of the Monterey GSP will be public understanding of the projects and management actions planned for sustainability, as well as sustainability implementation actions and other groundwater management activities.

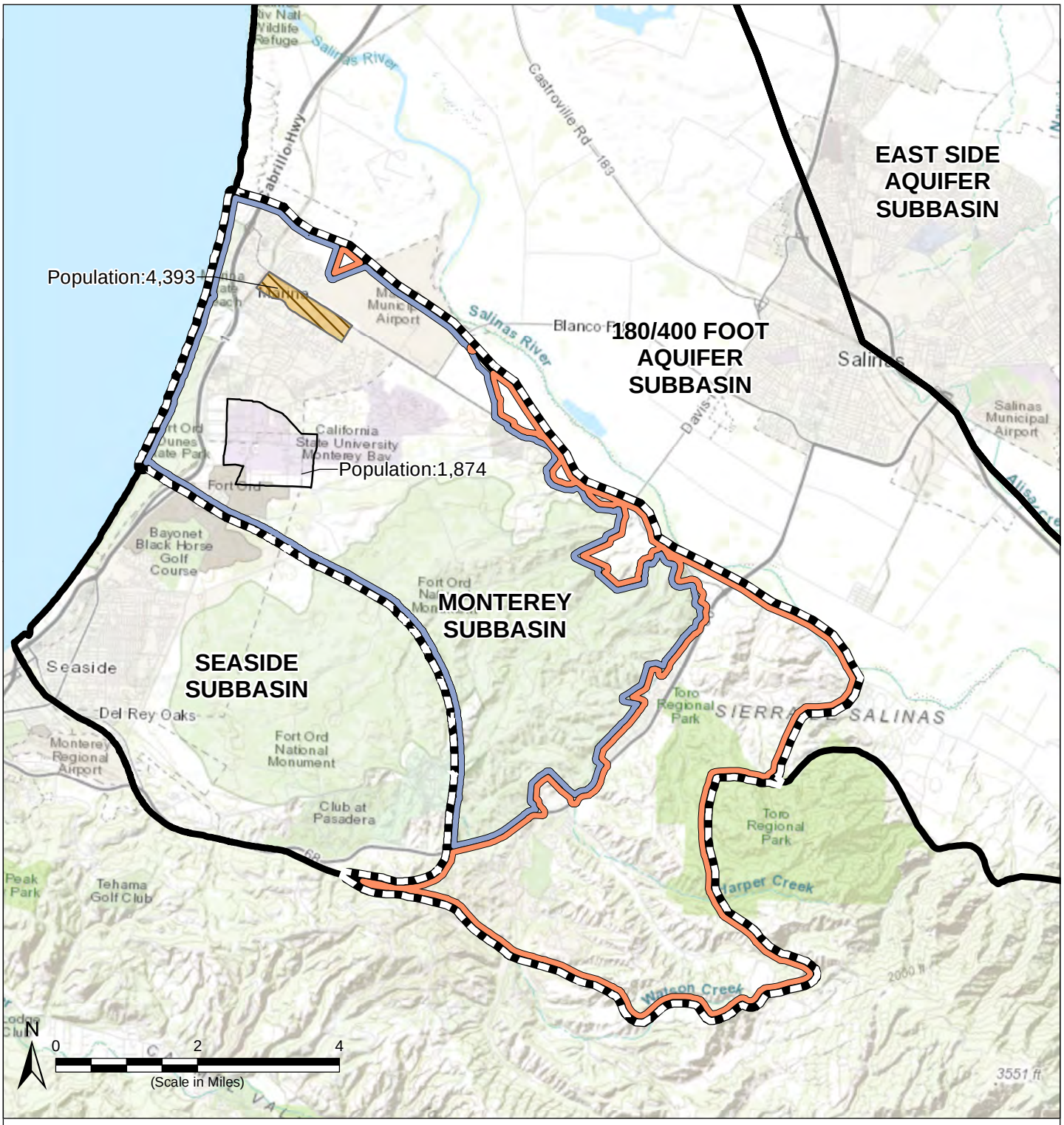
Additional important actions of GSP implementation will be the production of the required Annual Report by April 1 each year for the Monterey Subbasin. The Annual Report covers annual data collected each water year from October 1 through September 30. The Annual Report provides an annual benchmark for SVBGSA to provide to the public and stakeholders to assess progress towards sustainability. The Annual Report also includes assessment of the six sustainable management criteria (SMCs) for the Subbasin. The Annual Report provides an important opportunity to reengage the Monterey Subbasin Committee in its review and to discuss sustainability status and goals.

2.4 Public comments on the GSP

Appendix 2-C includes a table that summarizes the public comments received as well as the Subbasin GSAs' responses and revisions made to the GSP. Appendix 2-D includes written public comments received during the GSP development. Additional detailed responses are included in Appendix 2-E. Public comments received during SVBGSA Subbasin Committee Meetings and responses are included in Appendix 2-F. Contents in Appendices 2-C through 2-E will be updated as more comments are received during GSP implementation.

2.5 Underrepresented Communities and DACs

As described in Section 2.2.1, DACs are recognized within the urban areas of the City of Marina. These areas are shown on Figure 2-1. Due to well installation requirements of the Monterey County and the City of Marina, only a very small number of domestic wells that pre-date County and City ordinances exist within the city. In turn, these communities rely on water services provided by MCWD. The Subbasin GSAs has engaged residents of DACs during the development and implementation of the GSP through engagement of MCWD customers and coordination with the City of Marina.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra

Disadvantaged Community Census Tract

- Data Not Available
- Severely Disadvantaged Community
- Disadvantaged Community

Disadvantaged Community Census Place

- Data Not Available
- Severely Disadvantaged Community
- Disadvantaged Community

Disadvantaged Community Census Block Group

- Data Not Available
- Severely Disadvantaged Community
- Disadvantaged Community

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 19 November 2021.
2. DAC shapefiles acquired from DWR's DAC Mapping Tool on 19 November 2021 at https://data.cnra.ca.gov/dataset/dacs-census.

SDACs and DACs within the Monterey Subbasin

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 2-1

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3 PLAN AREA

This section presents a description of the Plan Area, and a summary of the relevant jurisdictional boundaries and other key land use features potentially relevant to the sustainable management of groundwater in the Monterey Subbasin. This section also describes the water monitoring programs, water management programs, and general plans relevant to the Subbasin and their influence on the development and execution of this GSP.

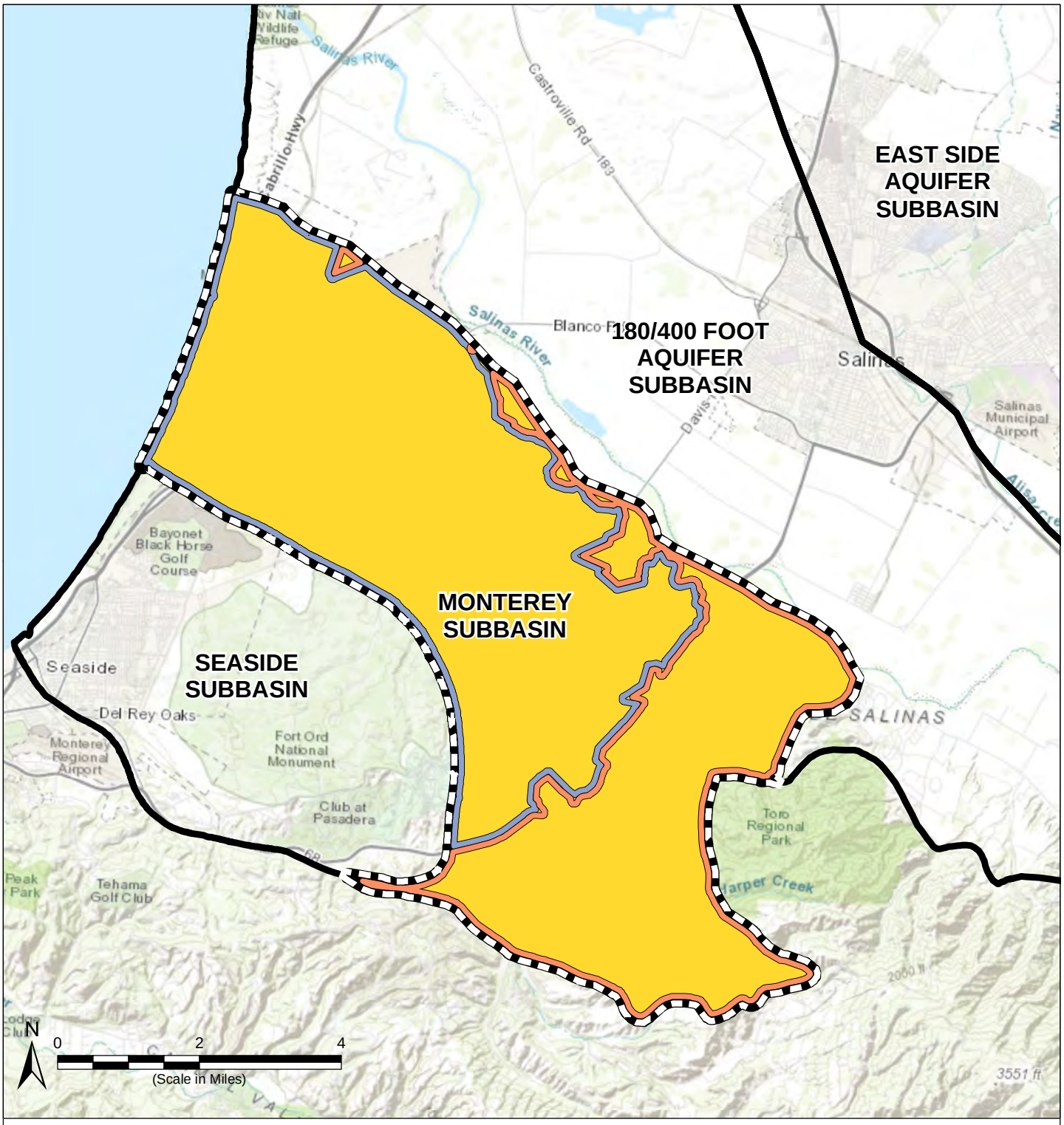
3.1 Summary of Jurisdictional Areas and Other Features

3.1.1 Plan Area Setting

This GSP covers the entire Monterey Subbasin (DWR Basin 3-004.10), which encompasses 30,850 acres (or 48.2 square miles) in the northwestern Salinas Valley Groundwater Basin in the Central Coast region of California (see Figure 3-1). The Subbasin is covered by the MCWDGSA and the SVBGSA and lies entirely within Monterey County. The Subbasin is bounded on the northeast by the 180/400-Foot Aquifer Subbasin (DWR Basin 3-004.01) and on the southwest by the Seaside Subbasin (DWR Basin 3-004.08).

The GSAs have established two Management Areas within the Subbasin, as discussed in Section 1.4 and shown on Figure 3-1. These Management Areas are described as follows:

- Marina-Ord Area: This Management Area consists of the lands within the City of Marina, City of Seaside, and the former Fort Ord.
- Corral de Tierra Area: This Management Area consists of the remainder of the Subbasin, which includes lands that are generally south of State Route 68 and a few parcels located along the northern subbasin boundary with the 180/400 Subbasin.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Plan Area

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 14 September 2021.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Plan Area (Monterey Subbasin)

Monterey Subbasin
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Figure 3-1

Path: X:\B60094\Maps\2021\09\Fig3-1_Plan Area.mxd

3.1.2 Jurisdictional Boundaries

The Subbasin falls entirely within Monterey County and contains portions of the municipalities of Marina and Seaside. The City of Marina is located in the northern portion of the Subbasin and is a community of approximately 22,000 residents (DOF, 2020). The City of Seaside is on Highway 1 approximately two miles south of the City of Marina, and has a population of approximately 34,000 (DOF, 2020). Unincorporated areas of the County in the Subbasin are predominantly suburban and rural residential. The Highway 68 communities in the 93908 zip code—including Toro Park, Serra Village, Las Palmas Ranch, Corral de Tierra, and San Benancio—are estimated to contain approximately 12,000 to 14,000 residents.

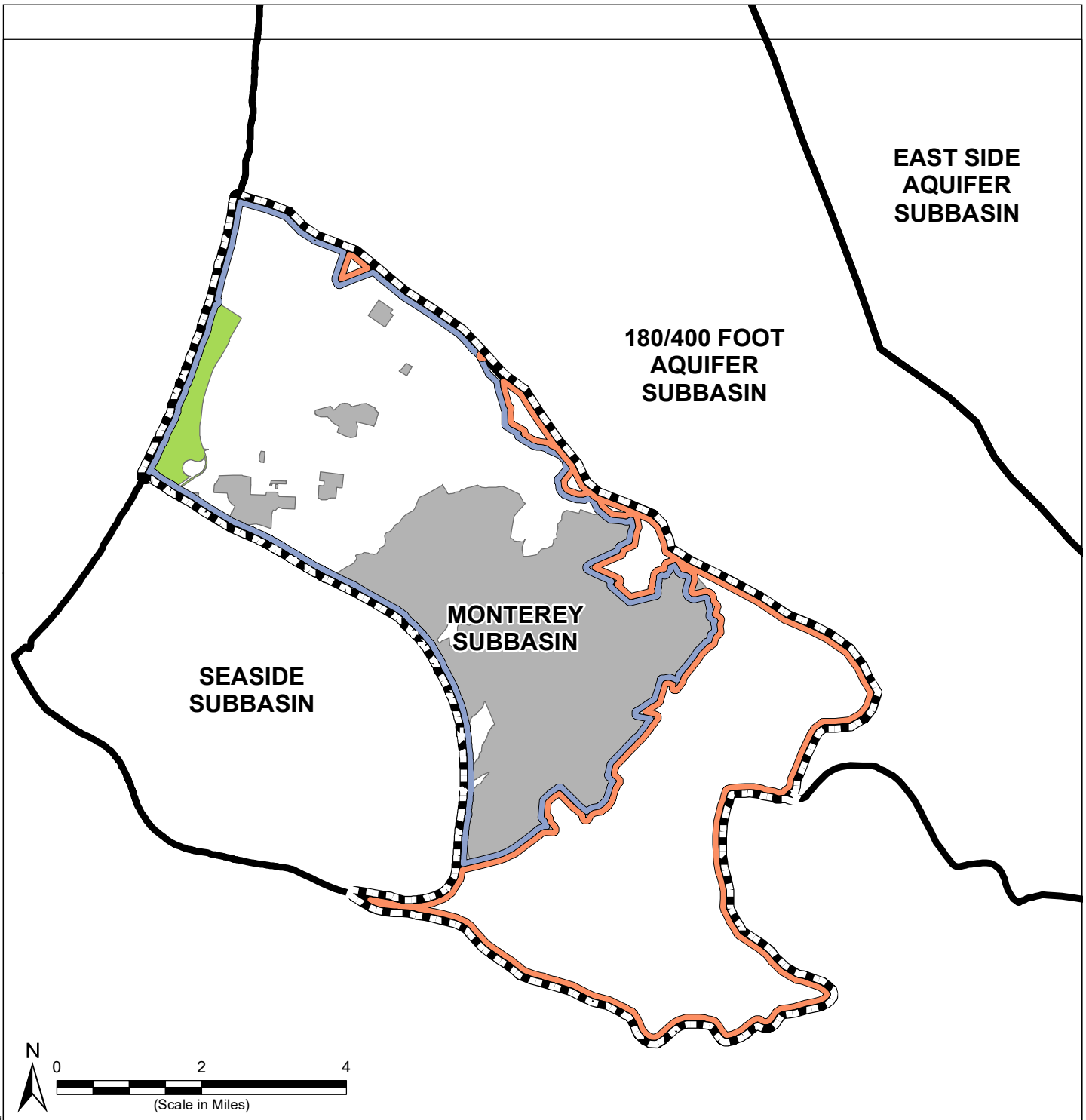
A large portion of the Subbasin was home to the 45-square mile former Fort Ord military base. The base was closed in 1994 and had since been undergoing conversion to civilian use. As of 2019, most of the property transfers were completed, and environmental cleanup is ongoing. A large portion of the land is transferred to the Bureau of Land Management (BLM) as part of the National Conservation Lands and consists of the Fort Ord National Monument. A small portion of the base was retained by the U.S. Army for an active military installation. As shown on Figure 3-2, a total of 9,200 acres of the Subbasin is federally owned lands managed by the U.S. Army and the BLM located at the former Fort Ord. Those lands are not subject to the SGMA.

The Fort Ord Dunes State Park, a state-owned park, is located along the western boundary of the Subbasin adjacent to the Pacific Ocean, with a total area of 916 acres.

According to the information made available by the DWR[3] in support of GSP development, there are no federally recognized tribes and there were no tribal lands within or in the vicinity of the Subbasin at the time of the original GSP. However, several state recognized tribes are present in Monterey County and the plan area. The Ohlone-Costanoan Esselen Nation is now stewarding land in the Highway 68 corridor in the adjacent Seaside Subbasin, and additional conservation and open space (OS) lands within the Corral de Tierra area may have tribal interests and values.

Areas under federal and state jurisdiction are shown on Figure 3-2.

[3] SGMA Data Viewer: https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Federal and State Jurisdiction

- State
- Federal

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 15 September 2021.
2. State land information obtained from DWR Dataset.
3. Parcels retained by the federal government in the former Fort Ord area are provided by Army Corps of Engineers on 12 September 2019.

Federal and State Jurisdictional Areas

Monterey Subbasin
Groundwater Sustainability Plan
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Figure 3-2

Path: X:\B60094\Maps\2021\09\Fig3-2_Federal_and_State_Lands.mxd

3.1.3 Agencies with Water Management Responsibilities

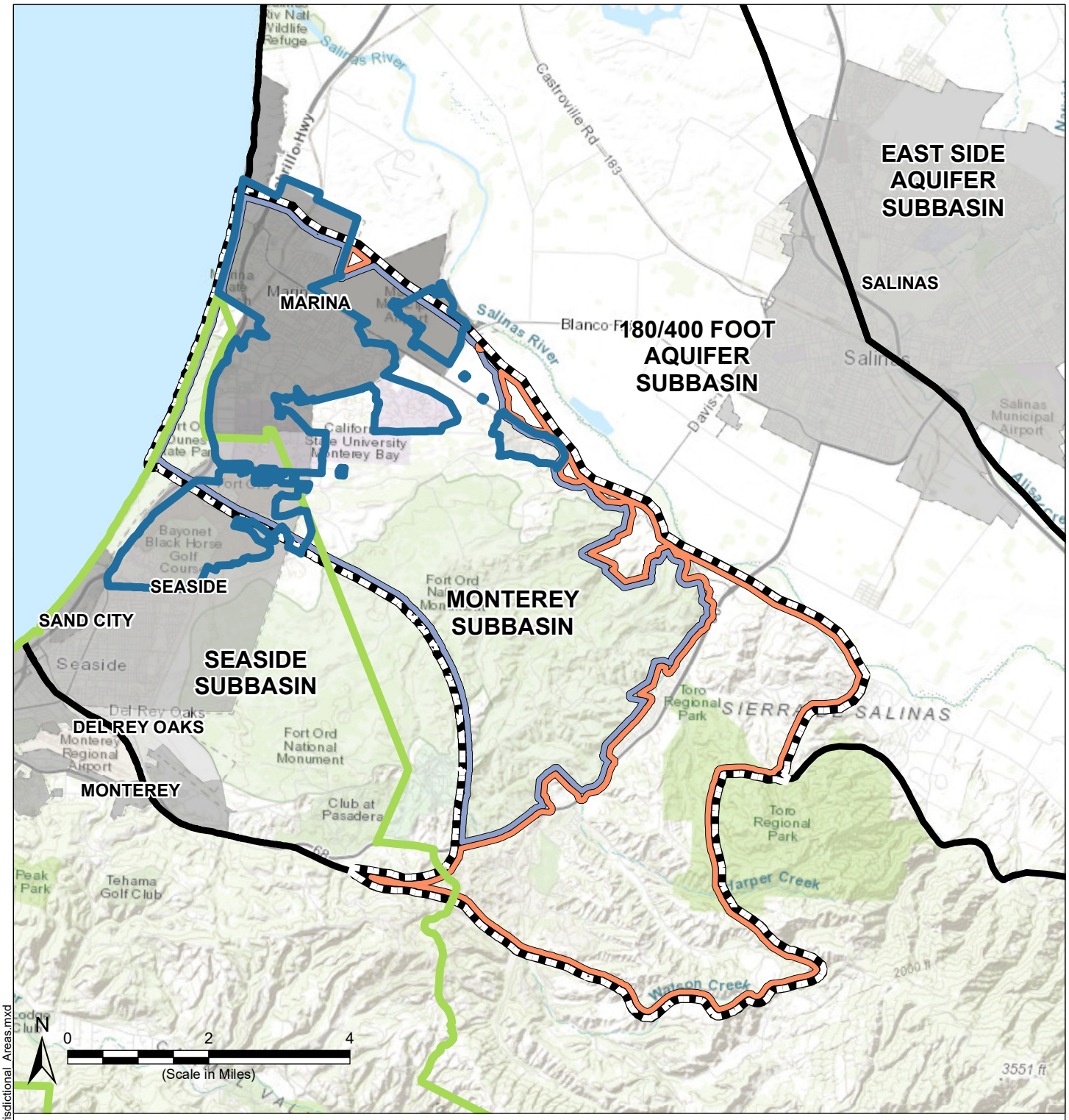
As shown on Figure 3-3, the main water supplier in the Subbasin is MCWD, which has a service area covering the entire City of Marina and all parcels within the Ord Subarea that currently receive potable water or that have received final land use development approvals by the applicable land use jurisdiction within its jurisdictional boundary. Within the former Fort Ord, MCWD is the exclusive water purveyor to all non-federal lands and the U.S. Army for all Army and Federal facilities. By a 2001 deed from the Army through the Fort Ord Reuse Authority, MCWD owns all the water infrastructure within the former Fort Ord (MCWD, 2016). A small portion of MCWD's service area further extends into the 180/400-Foot Aquifer Subbasin.

The MCWD provides sewer collection services within its jurisdictional boundaries. Wastewater collected by MCWD is conveyed to the M1W (formerly Monterey Regional Water Pollution Control Agency) Regional Treatment Plant located in the 180/400-Foot Aquifer Subbasin.

The public water systems in the whole Monterey Subbasin are listed in Table 3-1 and shown on Figure 3-4. In the Corral de Tierra area, several larger public water systems are owned and operated by CPUC regulated utilities. There are also over 60 State Small Water Systems (5-14 connections) and Local Small Water Systems (2-4 connections) in the Monterey Subbasin that provide water.

Table 3-1 Public Water Systems in the Monterey Subbasin

Water System No	Agency Name	Acres
CA2710017	Marina Coast Water District	19,476
CA2710012	California Water Service Company - Salinas Hills	2,626
CA2710004	California American Water Company - Monterey District	2,368
CA2710021	California American Water Company - Toro	2,168
CA2702009	Laguna Seca Recreation Water System	487
CA2700612	Laguna Seca Water Company	77
CA2702315	Corral De Tierra Country Club Water System	71
CA2701367	Tierra Meadows Home Owners Association Water System	44
CA2700775	Tierra Verde Mutual Water Company	21
CA2700731	Z Ranch Mutual Water Company	18
CA2702030	Cypress Community Church Water System	17
CA2701740	Bluffs Water System	6
CA2701681	Exxon Station Water System	1
	Total	**27,385**



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area
- MCWD
- MPWMD

Cities

- Del Rey Oaks
- Marina
- Monterey
- Salinas
- Sand City
- Seaside

Sources

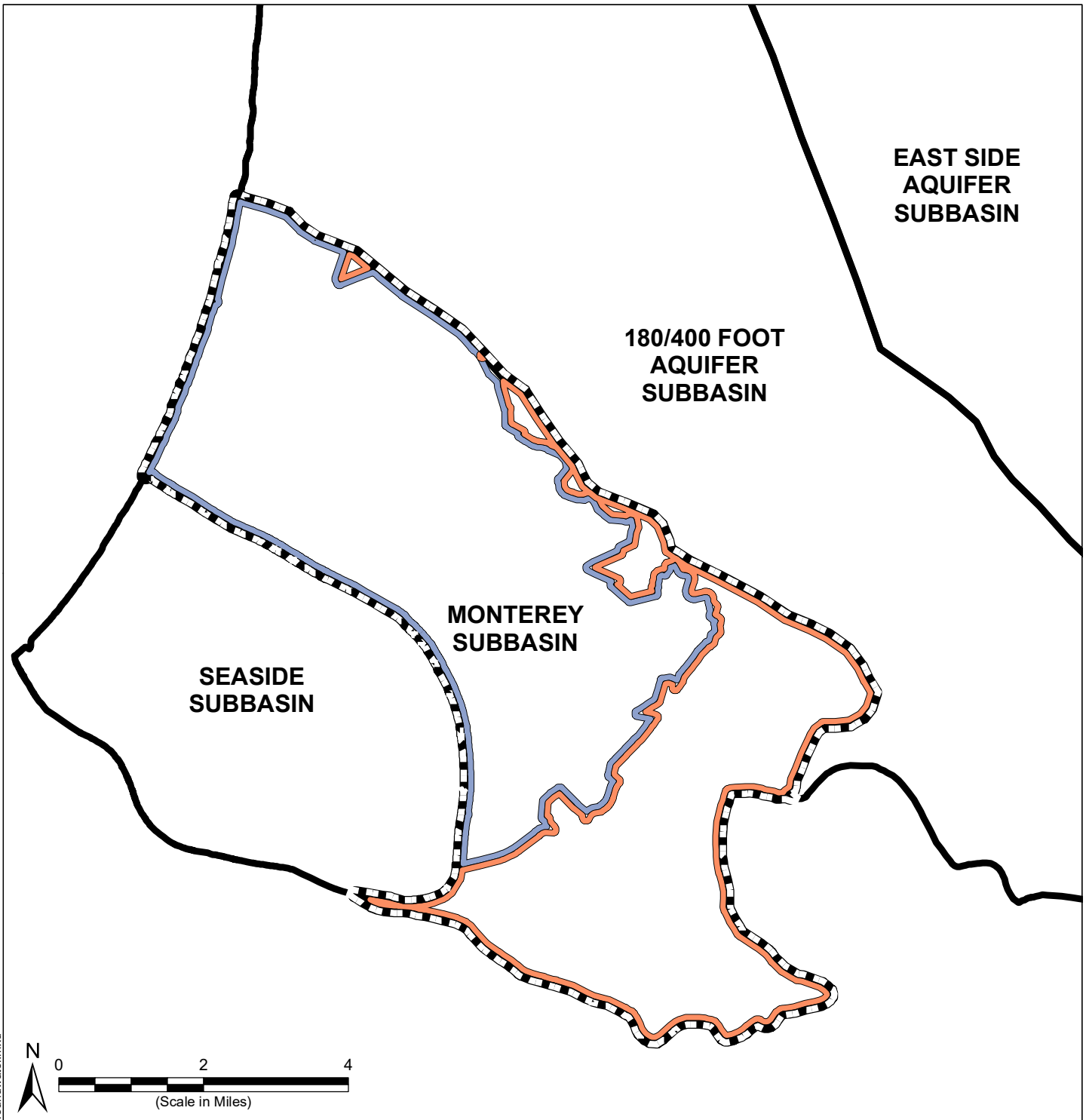
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 14 September 2021.
2. City Limits defined by Local Agency Formation Commission (LAFCO), Monterey County Geological Information System, accessed 11 July 2019.

Cities and Water District Judicational Areas

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 3-3

Path: X:\B60094\Maps\2021\09\Fig3-3_Cities_Water_District_Jurisdictional_Areas.mxd



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management

- Marina-Ord
- Corral de Tierra
- Municipal Areas Dependent on Groundwater

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 14 September 2021.
2. Municipal areas shown as public water system service areas dependent on groundwater, obtained from Tracking California https://trackingcalifornia.org/water/download.

Municipal Areas Dependent on Groundwater

Monterey Subbasin
Groundwater Sustainability Plan
November 2021
Figure 3-4

Path: X:\B60094\Maps\2021\09\Fig3-4_MunicipalAreasDependentonGroundwater.mxd

Other agencies with water management responsibilities within the Subbasin include the Monterey County Water Resources Agency (MCWRA) and the Monterey Peninsula Water Management District (MPWMD). MCWRA governance areas include all lands within Monterey County, which includes the Subbasin. MPWMD manages groundwater and surface water in areas on the Monterey Peninsula and in the Carmel River Basin and includes the City of Seaside, a portion of which extends into the Subbasin. Management programs of these agencies are further discussed in Section 3.2.

3.1.4 The County of Monterey has authority over well permitting. Adjudicated Areas and Alternative Areas

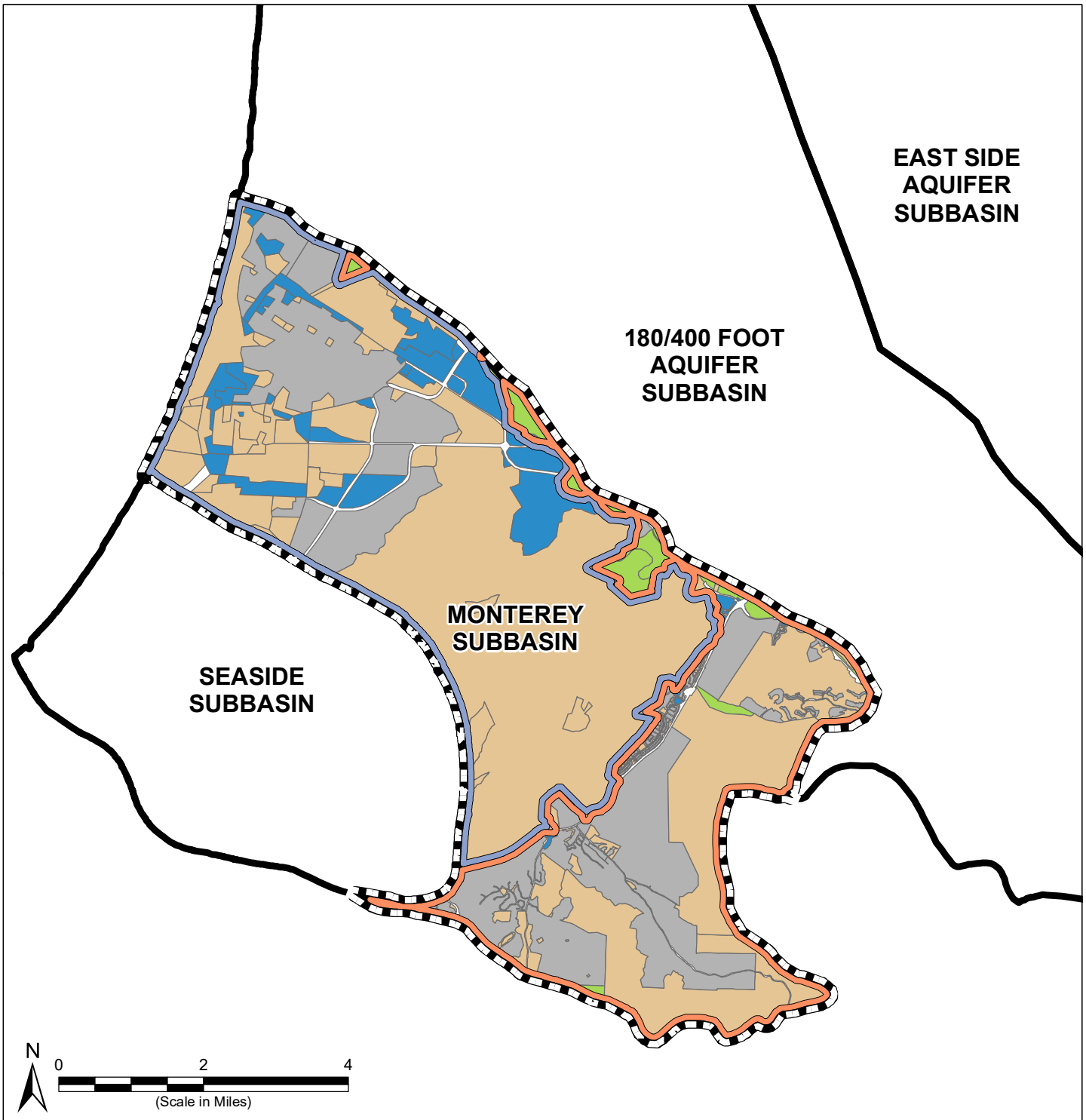
The Subbasin is not adjudicated and does not contain any areas covered by an Alternative Plan. However, this subbasin shares a jurisdictional boundary with the Seaside Adjudicated Subbasin. This boundary is based on a presumed groundwater flow divide between the two subbasins and may be vulnerable to future pumping or impacts to the groundwater conditions in either Subbasin. The adjudicated area is not managed by MCWDGSA or the SVBGSA. The adjudicated Seaside Subbasin is managed by the Seaside Basin Watermaster.

3.1.5 Existing Land Use and Water Use

Land use planning authority in the Subbasin is the responsibility of the County of Monterey and the cities of Marina and Seaside. Redevelopment of the former Fort Ord was under the oversight of the Fort Ord Reuse Authority (FORA), established in 1994 and terminated in June 2020. Prior to its termination, FORA allocated assets/liabilities and transitioned land use planning within former Fort Ord to each of the local jurisdictions, including the Cities of Marina and Seaside, the City of Monterey, and the County of Monterey.

The County of Monterey land use authority in the unincorporated areas outside of city limits. County land use plans identify residential, open space, and agricultural land uses in the Corral de Tierra Management Area, including the County's Toro Park. Infrastructure and public services in several unincorporated communities in the Monterey Subbasin are managed by County Service Areas, including Toro Park/Serra Villages and Las Palmas.

Figure 3-5 shows simplified land use designations within the Monterey Subbasin. The majority of the Subbasin is undeveloped land. Municipal and residential are the primary developed land uses within the Subbasin, with approximately 2,500 acres of municipal coverage and 8,100 acres of residential coverage. Small areas of agriculture, approximately 500 acres of truck nursery and berry crops, are located along the northern Subbasin boundary adjoining the 180/400-Foot Aquifer Subbasin. Municipal, residential and agricultural water uses in the Subbasin rely entirely on groundwater.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Current Land Use

- Open/Public/Military
- Agriculture
- Municipal
- Residential

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 15 September 2021.
2. Land use information are obtained from Monterey County Open Data, accessed 12 June 2020.

Land Use

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 3-5

Path: X:\B60094\Maps\2021\09\Fig3-5_Simpl_LandUse_TW.mxd

3.1.6 Well Density per Square Mile

Figure 3-6 through Figure 3-8 show the density of wells per square mile within the Subbasin, based on the Online System of Well Completion Report (OSWCR) database compiled by DWR. According to these records, 102 production wells, 304 domestic wells, and 17 public supply wells have been installed within the Public Land Survey Systems sections that fall partially or entirely within the Subbasin.

Groundwater is the primary water source for all water use sectors in the Subbasin. Municipal areas dependent on groundwater within the Subbasin are shown on Figure 3-4.

Within the Marina-Ord Area, MCWD is the exclusive water purveyor to all non-federal lands and to the Army for all Army and Federal facilities within the former Fort Ord. Due to well installation requirements of the Monterey County and the City of Marina (see Section 3.5.4), only a very small number of domestic wells that pre-date County and City ordinances exist within the Marina-Ord Area. Fort Ord contamination and seawater intrusion limit the use of the majority of these wells. In turn, these communities rely on water services provided by MCWD. MCWD operates seven active production wells that supply approximately 3,556 acre-feet per year (AFY) to its customers as of WY 2025.

Within the Corral de Tierra Area, in addition to the public water systems operated by regulated utilities, there were over 400 domestic wells and small community water system wells estimated in the original GSP (Wallace Group, 2020). The OSWCR contains many well records with missing information and does not consistently reflect well abandonment, replacement, or destruction. To develop a more accurate and complete dataset of active wells in the Salinas Valley, MCWRA conducted a desktop analysis and established a well registration program under Ordinance 5426, which requires all wells to be registered with MCWRA. As part of the desktop analysis, MCWRA reviewed well records from OSWCR, the Monterey County Environmental Health Bureau and its own records. Through the registration program, well owners now submit or verify well information via an online portal or form.

The registration process collects general information on well ownership, construction specifications, location, and well status. Location and depth data, in particular, support analysis of the relationship between wells and groundwater conditions.

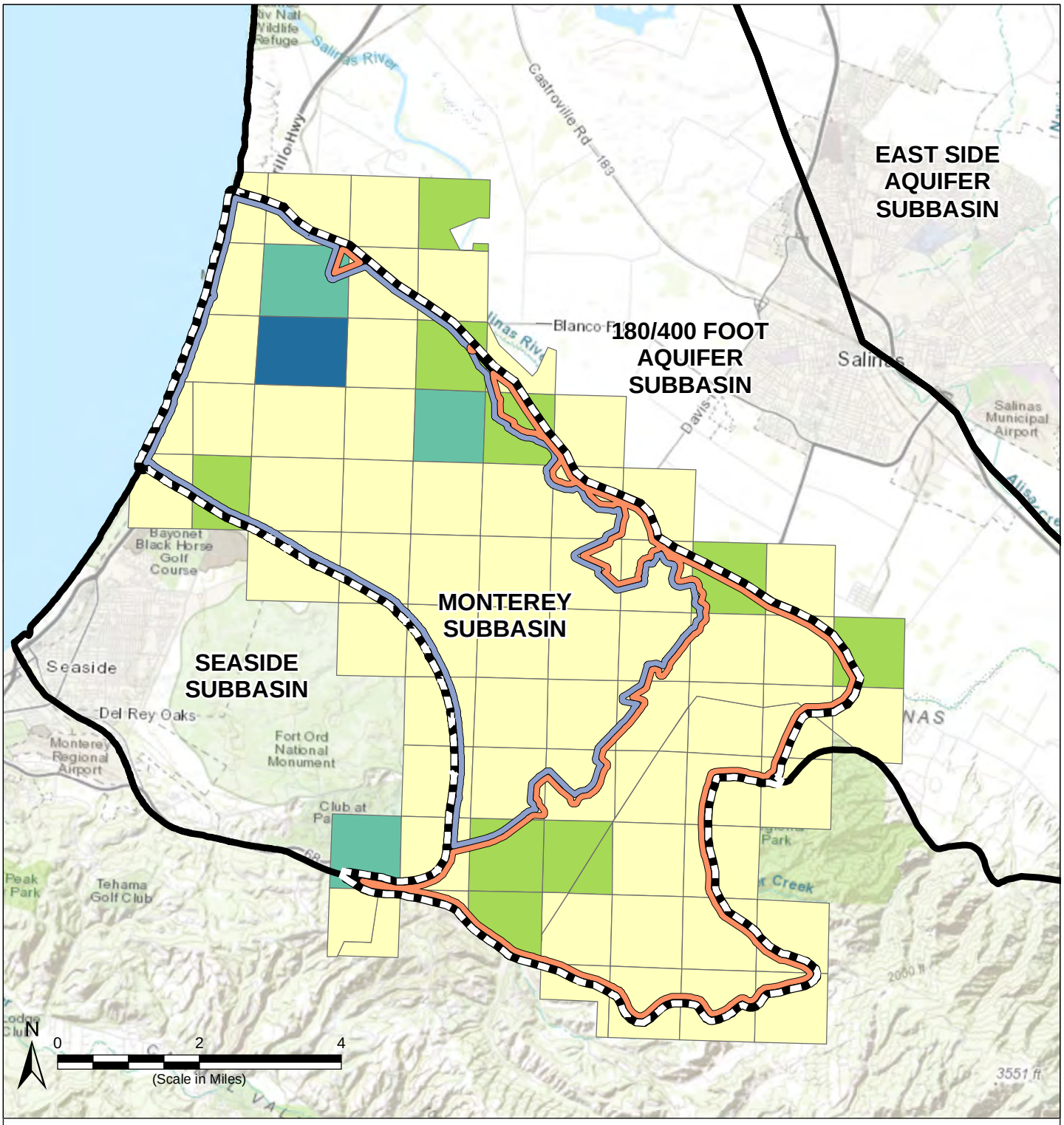
The data used in GSP Amendment 1 reflect the first 6 months of well registration. Table 3-2 summarizes the number and types of active wells in the Corral de Tierra Area, including those identified through the desktop analysis and registration process with sufficient information (location, depth, and ownership). MCWRA will continue the registration program, assess spatial data to determine where there may be missing registrations, and continue outreach to well owners. Table 3-2 includes the well count numbers from the OSWCR database for comparison. OSWCR classifies wells as domestic, production, and public supply; production wells include wells that are designated as irrigation, municipal, public, or industrial, and only exclude those designated as domestic. For OSWCR well counts, public supply wells are subtracted from the production category so as to not double count. Because well type information is predetermined by OSWCR, it is unclear whether some public supply wells are included within the domestic

category, and therefore the extent of any overlap between these categories cannot be determined from the available data. Some domestic wells may be classified as de minimis extractors, defined as pumping less than 2 AFY. for domestic purposes. As of GSP Amendment 1, 55 wells in the Corral de Tierra Area have sufficient information (location, depth, and ownership). Some of the domestic wells identified by DWR may not be reflective of active wells in the Subbasin, as some wells may have been abandoned or are inactive. Alternatively, some of the domestic wells may not have adequate location information to be considered registered for MCWRA's purposes. However, this discrepancy suggests that future registration efforts may be most effective if focused on domestic well owners. The average domestic well depth is approximately 560 feet based on active wells registered to MCWRA.

Groundwater use in the Corral de Tierra Area is approximately 955 AFY as of WY 2025 and is primarily used for municipal, domestic, and agricultural purposes.

Table 3-2 Well Count Summary for the Corral de Tierra Area

Category	MCWRA	OSWCR
Domestic	11	200
Irrigation	8	24
Public Supply	4	4
Total	23	228



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra

Public Well Density

- 0
- 1
- 2
- 3 - 5
- 6 - 7

Notes

1. All locations are approximate.
2. Well density is shown on PLSS sections within the Subbasin.

Sources

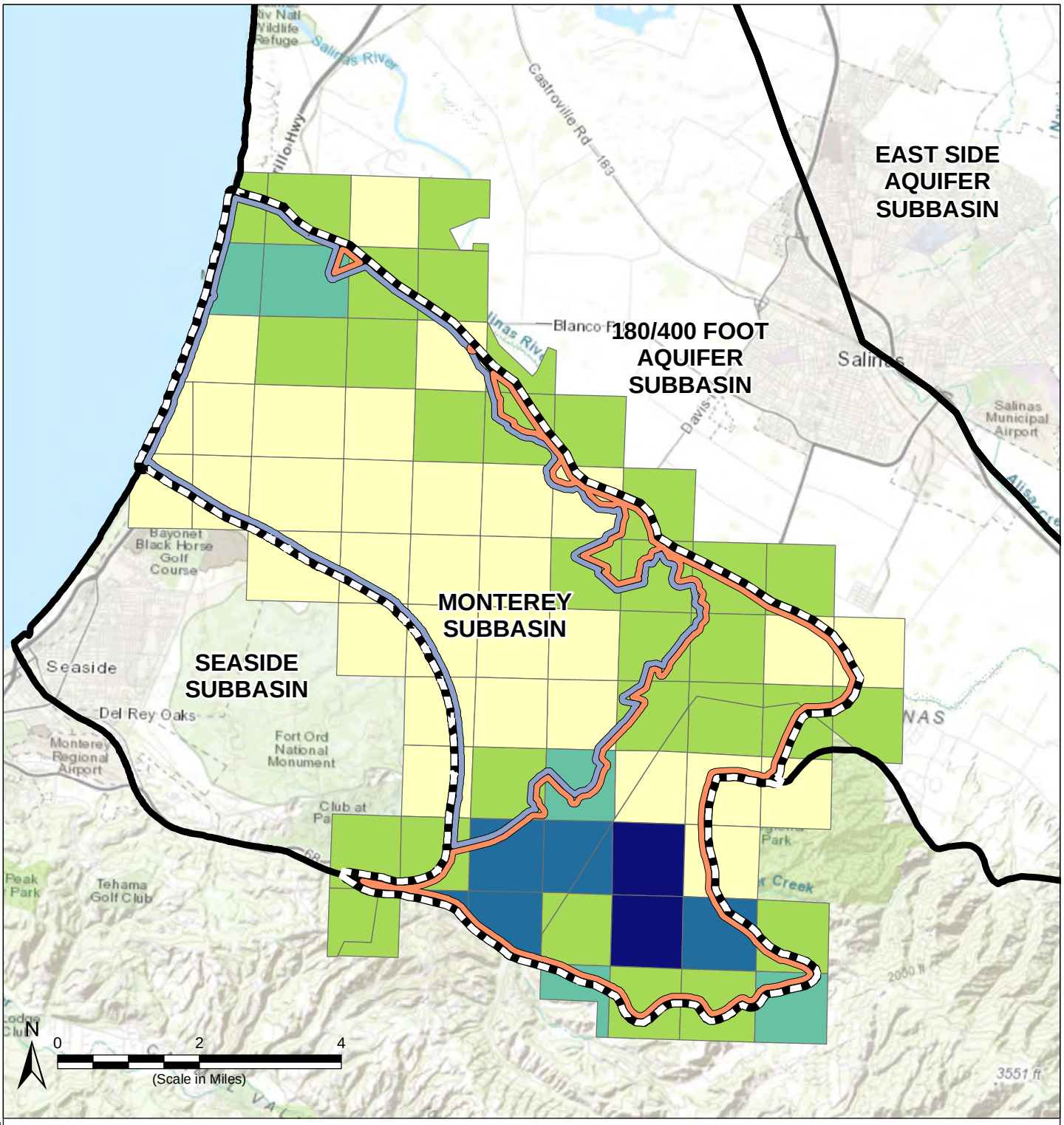
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 15 September 2021.
2. Well count information obtained from Well Completion Report Map Application on February 15, 2018 and includes domestic wells, production wells, and public wells.

Public Well Density

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 3-6

Path: X:\B60094\Maps\2021\09\Fig3-6_PublicWellDensity.mxd



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Domestic Well Density

- 0
- 1 - 5
- 6 - 14
- 15 - 26
- 27 - 44

Notes

1. All locations are approximate.
2. Well density is shown on PLSS sections within the Subbasin

Sources

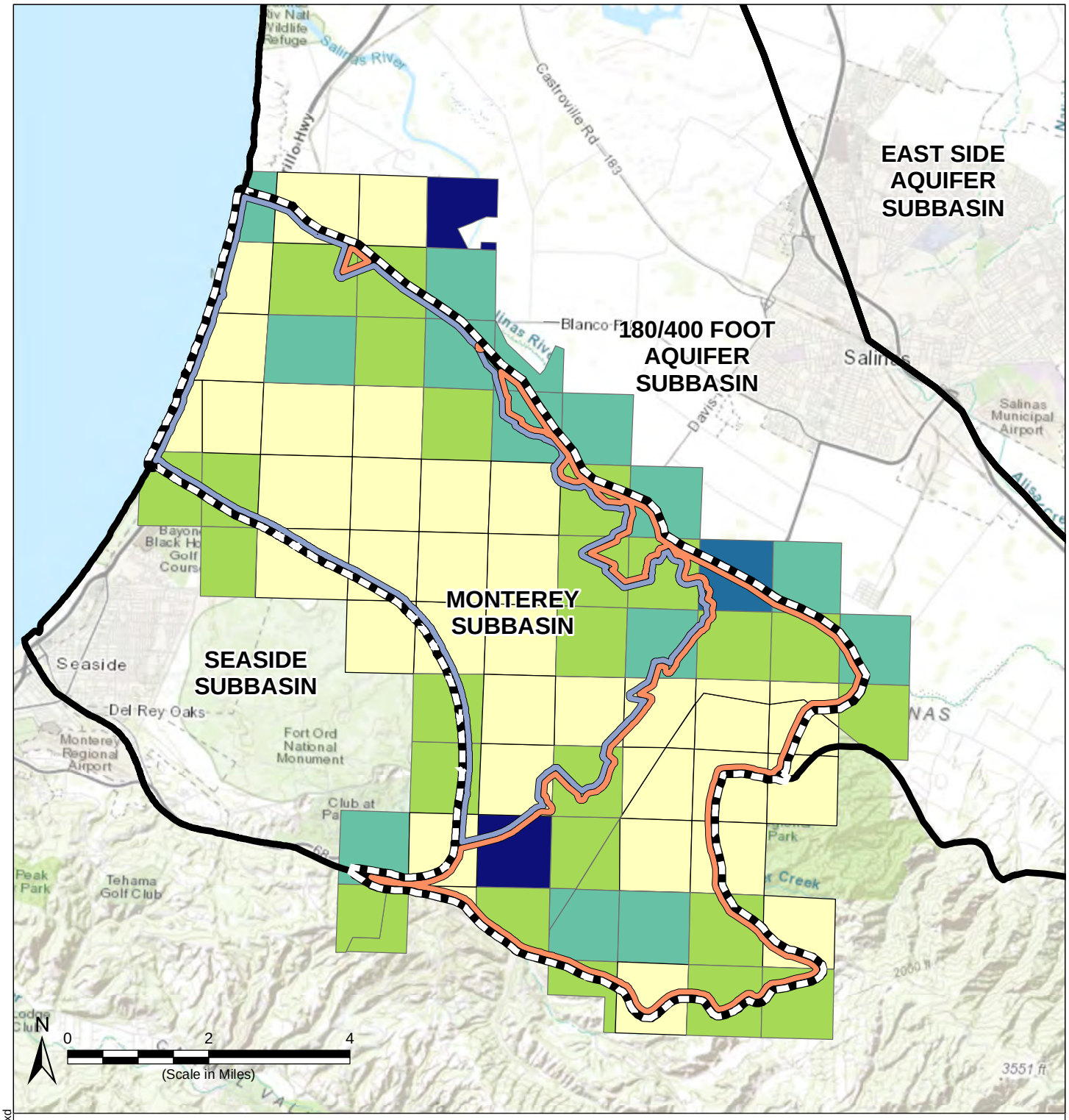
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 15 September 2021.
2. Well count information obtained from Well Completion Report Map Application on February 15, 2018 and includes domestic wells, production wells, and public wells.

Domestic Well Density

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 3-7

Path: X:\B60094\Maps\2021\09\Fig3-7_DomesticWellDensity.mxd



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Production Well Density

- 0
- 1 - 2
- 3 - 5
- 6 - 8
- 9 - 11

Notes

1. All locations are approximate.
2. Well density is shown on PLSS sections within the Subbasin

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 15 September 2021.
2. Well count information obtained from Well Completion Report Map Application on February 15, 2018 and includes domestic wells, production wells, and public wells.

Production Well Density

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 3-8

Path: X:\B60094\Maps\2021\09\Fig3-8_ProductionWellDensity.mxd

3.2 Water Resources Monitoring and Management Programs

3.2.1 Existing Monitoring Programs

Existing groundwater monitoring in the Subbasin as of 2021 includes:

- The CASGEM Program tracks long-term groundwater elevation trends in groundwater basins throughout California. The CASGEM program's mission is to establish a permanent, locally-managed program of regular and systematic monitoring in all of California's alluvial groundwater basins. In the Subbasin, MCWRA and MPWMD are the CASGEM monitoring entities.
- The United States Geological Survey (USGS) collects surface water and groundwater data across the United States. Existing USGS monitoring wells and stream gauges are located within the Monterey Subbasin.
- The Groundwater Ambient Monitoring and Assessment (GAMA) Program is a comprehensive groundwater quality monitoring program created by the State Water Resources Control Board (SWRCB) in 2000. The GAMA Program monitors groundwater quality trends throughout California, including within the Monterey Subbasin.
- The SWRCB's Division of Drinking Water monitors groundwater quality from public water system wells. There are 15 active public water systems located within the Subbasin.
- Local small or state small water system wells are regulated by the Monterey County Department of Public Health. Local small water systems serve 2 to 4 service connections and state small water systems serve 5 to 14 connections. MCWD, MCWRA, and MPWMD each conduct periodic monitoring for groundwater elevation and quality in their production wells or selected wells in their respective areas. Additionally, MCWD has installed transducers in selected production wells.
- Multiple sites are monitoring groundwater quality as part of investigation or compliance monitoring programs through the Central Coast Regional Water Quality Control Board (CCRWQCB).
- MCWRA monitors seawater intrusion with a network of 152 monitoring wells, most wells located within the 180/400 Subbasin. MCWRA collects samples in June and August that are analyzed for major cations and anions, and uses the data to produce chloride isocontours in the 180/400 Subbasin. The seawater intrusion monitoring network comprises a combination of production wells and dedicated monitoring wells.
- In 2024, SVBGSA and MCWRA established a Groundwater Monitoring Program (GMP) for the Salinas Valley Groundwater Basin, adopted by MCWRA under MCWRA Ordinance No. 5426. The GMP integrates well registration, groundwater level monitoring, groundwater extraction reporting, and groundwater quality monitoring into a single coordinated program. The GMP also incorporates a Deep Aquifers Monitoring Plan to monitor conditions in the deeper aquifers of the Salinas Valley. The existing monitoring programs described below are being incorporated into and expanded under the GMP.

- The U.S. Army Corps of Engineers (the Army) conducts periodic monitoring for groundwater elevation and quality for remediation purposes in the former Fort Ord. Several additional sites are monitored for groundwater elevation and quality as part of investigation or compliance monitoring programs through the CCRWQCB.

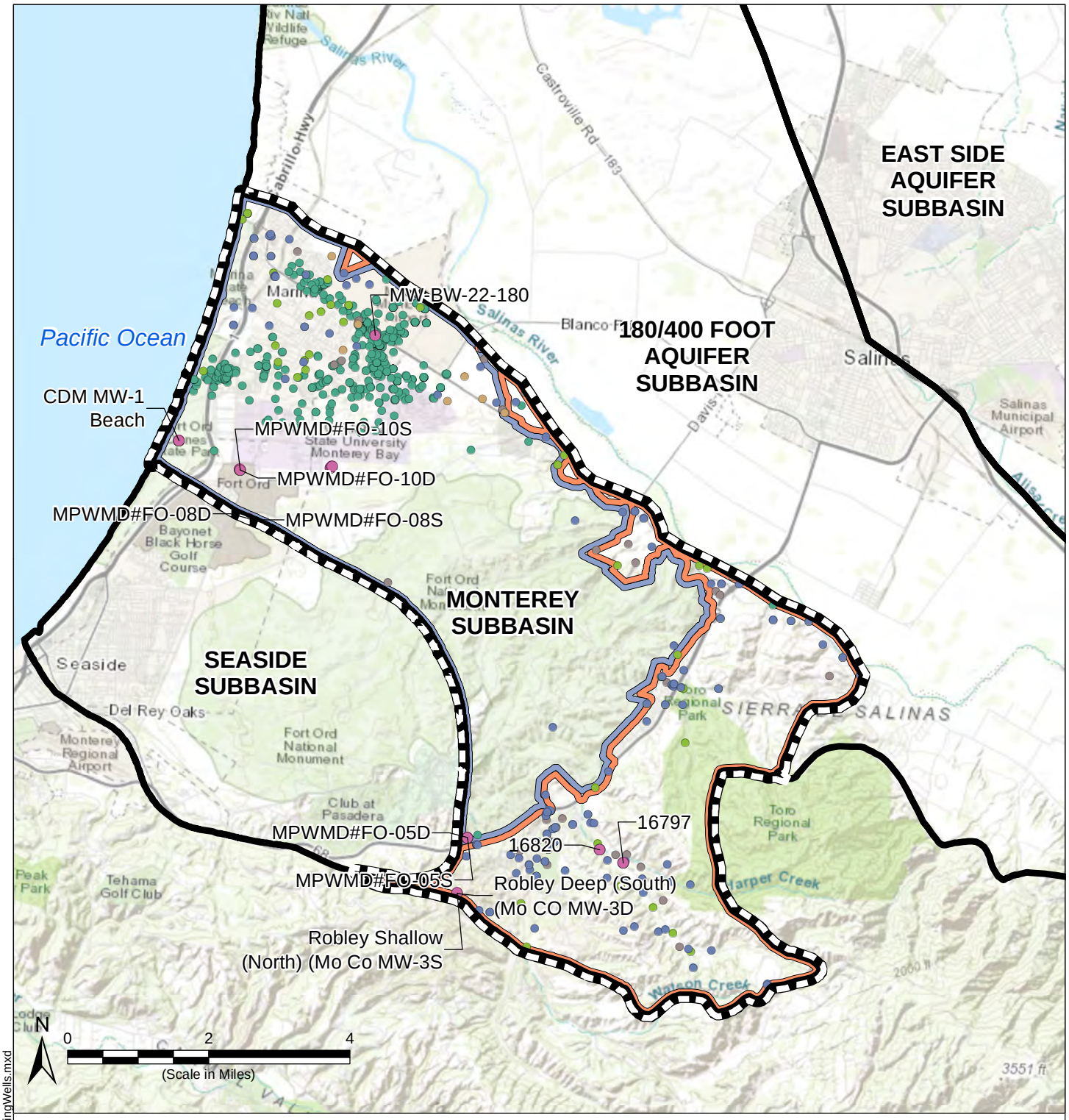
Well locations of the above monitoring programs are shown on Figure 3-9.

Groundwater elevation from CASGEM, USGS, SWRCB, as well as MCWRA, MPWMD, and the Army's monitoring networks, have been used to characterize groundwater level conditions (see Section 5.1 Groundwater Elevations and Flow Direction). Water quality data from MCWRA, MPWMD, and the Army's monitoring networks, in coordination the Airborne Electromagnetic (AEM) Surveys have been used to characterize seawater intrusion and identify water quality concerns (see Section 5.3 Seawater Intrusion and Section 5.4 Groundwater Quality Concerns).

For surface water, there are no surface water inflows beyond those produced from seasonal precipitation in the Subbasin (Geosyntec, 2007). The USGS monitored streamflows for El Toro Creek at station 11152540 until 2001 (Geosyntec, 2007). The logarithmic mean of 525 AFY is representative of average flows as shown in Figure 4-20 and Figure 4-21 in Section 4 (Geosyntec, 2007). As of 2021, there are no active surface gauges in the Corral de Tierra Area.

3.2.1.1 Limits to Operational Flexibility

The existing monitoring networks will be integral to the ongoing monitoring and reporting that will be conducted pursuant to this GSP. For the above-mentioned monitoring programs, the Monterey Subbasin GSP has incorporated the CASGEM program into its monitoring network, as applicable. The MCWD, MCWRA (a member of SVBGSA), Seaside Watermaster, and MPWMD also conduct routine groundwater quality monitoring as part of their management efforts. These existing programs will continue and will inform GSP implementation. The Monterey Subbasin Monitoring Network is further described in Section 7 Monitoring Network.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Public Monitoring Wells

- CASGEM
- Fort Ord
- SWRCB GAMA
- USGS
- MCWD
- MCWRA

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 15 September 2021.
2. Public monitoring well locations are obtained from respective monitoring agencies.

Locations of Public Monitoring Wells

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 3-9

Path: X:\B60094\Maps\2021\09\Fig3-9_LocationsofPublicMonitoringWells.mxd

3.2.2 Existing Management Programs

The following groundwater management programs exist within the Monterey Subbasin.

3.2.2.1 Integrated Regional Water Management

The majority of the Monterey Subbasin falls within the Greater Monterey County Integrated Regional Water Management Region (Greater Monterey County Region), while a portion of the Subbasin along the southern boundary is within the Monterey Peninsula-Carmel Bay-South Monterey Bay Region (Monterey Peninsula Region). These portions of the Subbasin are therefore included in the Greater Monterey County Integrated Regional Water Management Plan (IWRMP) and the Monterey Peninsula Region IWRMP, respectively.

The Greater Monterey County Region includes the entire Monterey County, excluding the Pajaro River Watershed Region and the Monterey Peninsula Region. The Integrated Regional Water Management (IRWM) Plan for the Greater Monterey County Region was developed by the Greater Monterey County Regional Water Management Group (RWMG), which consists of government agencies, nonprofit organizations, educational organizations, water service districts, private water companies, and organizations representing agricultural, environmental, and community interests.

The IRWM Plan consists of a set of goals and objectives that were identified by the RWMG as being critical to address water resource issues within the planning area in the areas of:

- Water Supply
- Water Quality
- Flood Protection and Floodplain Management
- Environment
- Regional Communication and Cooperation
- Disadvantaged Communities
- Climate Change

The IRWM Plan includes more than 25 projects that could assist regional groundwater management (Greater Monterey County Regional Water Management Group, 2018).

3.2.2.2 MCWRA Management of the Salinas Valley Groundwater Basin

The MCWRA was formed in 1947 by State law, originally as the Monterey County Flood Control and Water Conservation District (MCFCWCD), and established by the Monterey County Flood Control and Water Conservation District Act (District Act). The prevention of seawater intrusion was a principal reason for the enactment of the District Act in 1947. In 1990, the District Act was repealed and replaced by the existing Monterey County Water Resources Agency Act (Agency Act); however, much of the District Act was carried over into the Agency Act. Pursuant to MCWRA's enabling legislation, the MCWRA Act (Agency Act, CWC App. § 52-1, *et seq*), MCWRA

has broad authority regarding groundwater regulation. This is specifically called out in Sections 8, 9(n), 21 and 22 of the Agency Act. Section 8 states the purposes of the MCWRA Act, which includes control of groundwater extractions as required to prevent or deter the loss of usable groundwater. Likewise, Section 9 covers the powers of MCWRA and subsection (n) states that MCWRA may "Develop and distribute water to persons in exchange for ceasing or reducing groundwater extractions, and prevent groundwater extractions which are determined to be harmful to the groundwater basin." Section 21 allows MCWRA to seek injunctive relief against the export of water from the Salinas Valley. Section 22 of the Agency Act explicitly provides MCWRA with the ability to prohibit groundwater extraction when appropriate studies determine a portion of the groundwater basin to be threatened by loss of usable supply as a result of seawater intrusion after a noticed public hearing by the Board of Supervisors. The Agency Act was enacted prior to the development of SGMA, which requires groundwater sustainability to be achieved according to 6 sustainability criteria.

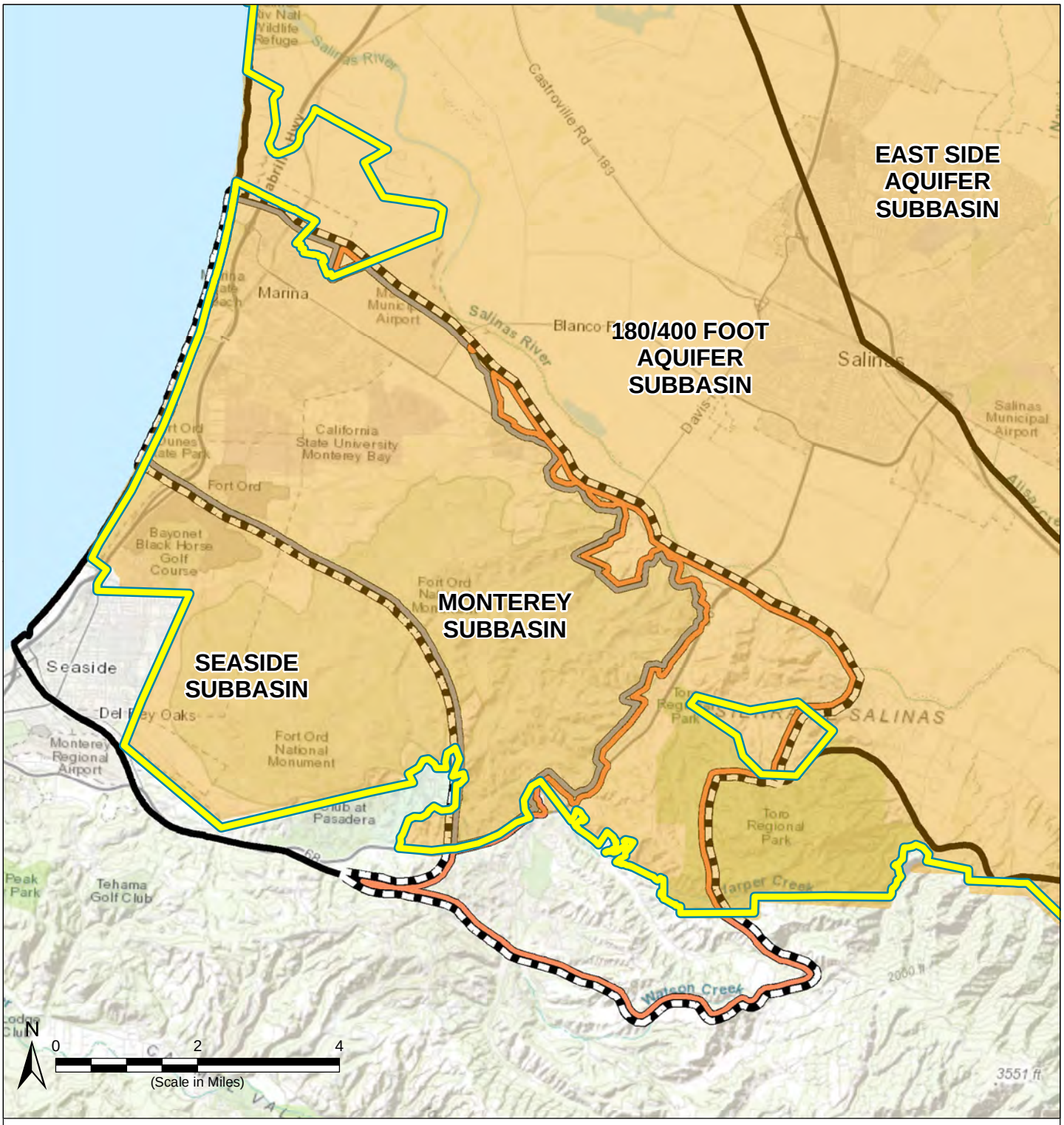
MCWRA is governed by a 9-member Board of Directors who are appointed by the 5-member MCWRA Board of Supervisors. The Board of Supervisors of the County is ex officio of the Board of Supervisors of MCWRA (MCWRA Act, Sec. 15).

MCWRA has developed projects and programs to reduce the adverse impacts from pumping and seawater intrusion within the 180/400 and Monterey Subbasins.

As shown on Figure 3-10, Zones 2C, 2Y, and 2Z cover a majority of the Monterey Subbasin, including most of the land north of Harper Canyon. The areas not covered by these zones include a small portion of the City of Marina, and San Benancio Gulch and Calera Canyon along Corral de Tierra Road up to the intersection with State Route 68. A description of the zones is provided below[4]:

- Under provisions of the District Act, the MCFCWCD established the Zone 2 and Zone 2A benefit assessment zones to fund the construction of Nacimiento Reservoir and the San Antonio Reservoir, respectively. In 2003, MCWRA created 2C to fund operation and maintenance of the reservoirs and eliminate charges in Zones 2 and 2A.
- Zone 2Y was established to collect assessments for the operation and maintenance of the Castroville Seawater Intrusion Project.
- Zone 2Z was established to collect assessment for the operation and maintenance of the Salinas Valley Reclamation Project.

[4] Annexation Zone https://www.co.monterey.ca.us/home/showdocument?id=22209



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- MCWRA Zone 2C
- MCWRA Zone 2Y
- MCWRA Zone 2Z

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 10 December 2021.
2. MCWRA Zone 2C boundary obtained from Monterey County Open Data, accessed 10 June 2020.

MCWRA Zones

Marina Coast Water District
Monterey County, CA
November 2021

Figure 3-10

Path: X:\B60094\Maps\2021\09\Fig3-10_MCWRA Zones.mxd

Additional information on MCWRA monitoring programs and well permitting programs is provided in Sections 3.2.1 and 3.5.4, respectively.

1993 and 1996 Annexation Agreements

MCWRA established annexation zones to institute water supply projects and collect assessments to fund them under various Monterey County Ordinances. The two major historic groundwater users within the Subbasin, the Federal Government and the MCWD, respectively entered into annexation agreements with MCWRA in 1993 and 1996 to be annexed to Zones 2 and 2A[5]. The 1996 Annexation Agreement and Groundwater Mitigation Framework for Marina Area Lands was the fifteenth annexation to Zones 2 and 2A since 1991.[6] In the annexation agreements, the MCWRA recognized that MCWD and the Federal Government had been pumping groundwater for many years and had strong claims to groundwater rights[7] MCWD and the Federal Government agreed that all non-federal lands within the annexed areas would pay assessments to MCWRA Zones 2 and 2A (later superseded by Zones 2C, 2Y, and 2Z) for regional projects to protect the Salinas Valley Groundwater Basin and reduce seawater intrusion. The Annexation Agreements are attached as Appendix 3-A.

Under the 1993 and 1996 Annexation Agreements, the Federal Government agreed to limit groundwater pumping from the Salinas Valley Groundwater Basin ("Basin") to 6,600 AFY, and MCWD agreed to limit pumping from the Basin to 3,020 AFY, respectively; MCWD's share to be used to serve the City of Marina[8](MCWRA/U.S. Army, 1993; MCWRA/MCWD, 1996). In 2001, the Federal Government transferred ownership of the Fort Ord water system infrastructure to MCWD, including the ability to pump no more than 4,871 AFY[9] of groundwater (of the 6,600 AFY described in the 1993 Agreement) from the Basin. MCWD is using the 4,871 AFY of groundwater to provide water service to those jurisdictions within the former Fort Ord, which are entitled to

[5] The MCWRA Board of Directors adopted an Annexation Policy dated March 29, 1993, which provided for the process for lands not then included within Zones 2 and 2A to be annexed into both zones subject to the annexation process in Agency Act §43, the preparation of final environmental documents, and the setting of annexation fees.
[6] 1996 Annexation Agreement, Section 3.1.
[7] Section 45 of the Agency Act provided MCWRA to develop a water allocation formula for groundwater users in the County "to preserve agricultural access to an adequate water supply and to preserve agriculture as a mainstay of the Salinas Valley economy". Board of Supervisors Resolution 91-476 adopted September 24, 1991, directed MCWRA staff to prepare information for a water allocation formula for Zone 2 and 2A and bring it back to the Board on or before January 1, 1992, and further directed MCWRA staff to prepare an emergency allocation ordinance for Zones 2 and 2A for consideration by the Board no later than April 1, 1992. While a draft report was prepared, the draft report was never approved by the Board.
[8] In addition, under the 1996 Annexation Agreement, 920 AFY of groundwater was allocated to Armstrong Ranch development, and 500 AFY (of brackish water) to CEMEX in the adjacent 180/400-Foot Aquifer Subbasin.
[9] Under Article 2.a of Amendment No. 1 dated October 23, 2001, to the Memorandum of Agreement between the U.S. Government acting through the Secretary of the Army and FORA, the Army agreed to reserve only 1,691 AFY, or 38 AFY less than the amount actually reserved by the Army in the October 23, 2001 deed. The 38 AFY was to be transferred to FORA and then to MCWD. FORA was to allocate the 38 AFY to the City of Seaside for the benefit of Bay View Mobile Home Park subject to use limitations prescribed in Amendment No. 1 to be administered by the City of Seaside pursuant to its land use authority. MCWD has requested FORA and the City of Seaside to correct this oversight with the Army but it has not been yet corrected.

water service pursuant to the Fort Ord Base Reuse Plan (Section 3.5.1.4). Under a long-term water service agreement with the Army, MCWD provides water service to all Federal activities within the former Fort Ord utilizing the Army's groundwater pumping rights.

To protect the 180-Foot and 400-Foot aquifers, the 1993 and 1996 Annexation Agreements limit the volume of groundwater that MCWD can extract from the 180-Foot and 400-Foot Aquifers. To offset that limitation, the 1996 Annexation Agreement provides "…*that the '900-foot'*[10] *aquifer should be managed to provide safe, sustained use of the water resource, and to preserve to MCWD the continued availability of water from the '900-foot' aquifer."*

The 1993 and 1996 Annexation Agreements further provided that MCWRA will seek to develop a replacement potable water supply, such that most groundwater pumping within Fort Ord and Marina Area Lands could be curtailed. However, by Resolution 00-172 adopted on April 25, 2000, the Board of Supervisors of the MCWRA indicated that the MCWRA has no contractual obligation to fund such a system using assessments from MCWRA Zones 2A or 2B (the resolution does not mention other potential sources of funds). MCWD is developing new water supplies to support redevelopment of the former Fort Ord and to supplement its groundwater supplies. These efforts are incorporated in this GSP and discussed further in Section 9.5.

MCWRA Groundwater Export Prohibition

The Monterey County Water Resources Agency Act, §52.21 prohibits the export of groundwater from any part of the Salinas Valley Groundwater Basin, including the Monterey Subbasin. In particular, the Act states:

> *For the purpose of preserving [the balance between extraction and recharge], no groundwater from that basin may be exported for any use outside the basin, except that use of water from the basin on any part of Fort Ord shall not be deemed such an export. If any export of water from the basin is attempted, the Agency may obtain from the superior court, and the court shall grant, injunctive relief prohibiting that exportation of groundwater.*

The Agency Act was adopted at a time when the Seaside Subbasin was considered to be hydrologically separate from the Salinas Valley Groundwater Basin, but the above Agency Act section expressly made use of Salinas Valley groundwater within any part of Fort Ord, even though within the Seaside Subbasin, as being exempt from the export prohibition. In 2003, DWR included the Seaside Subbasin within the Salinas Valley Groundwater Basin, which DWR now designates as the Seaside Subbasin.

County Ordinance Nos. 5302 and 5303 Regarding Deep Aquifer Wells

Due to identified concerns regarding the risk of seawater intrusion into the Deep Aquifers the County of Monterey Board of Supervisors adopted Ordinance No. 5302 in May 2018, pursuant to Government Code Section 65858. The ordinance was an interim urgency ordinance, which took

[10] aka the Deep Aquifer. Section 5.3 of the 1996 Annexation Agreement.

effect immediately upon adoption. The ordinance prohibited the acceptance or processing of any applications for new wells beneath areas impacted by seawater intrusion and in the Deep Aquifers of the Salinas Valley, with stated exceptions including municipal wells and replacement wells. The ordinance was originally only effective for 45 days, but at the June 26, 2018, County of Monterey Board of Supervisors meeting, the Board of Supervisors extended the ordinance to May 21, 2020, by adoption of Ordinance No. 5303. The ordinance also required that all new wells in the Deep Aquifers meter groundwater extractions, monitor groundwater elevations and quality, and all data submitted to MCWRA and SVBGSA. Ordinances Nos. 5302 and 5303 have expired.

In December 2020, County Ordinance No. 5339 was adopted and placed a 90-day moratorium on new well construction permit applications. The moratorium was adopted so the County could study the impact of the California Supreme Court's decision on August 27, 2020, in the case Protecting Our Water and Environmental Resources *et al.*, v. County of Stanislaus *et al.*, (10 Cal.5th 479 (2020); "Protecting Our Water").

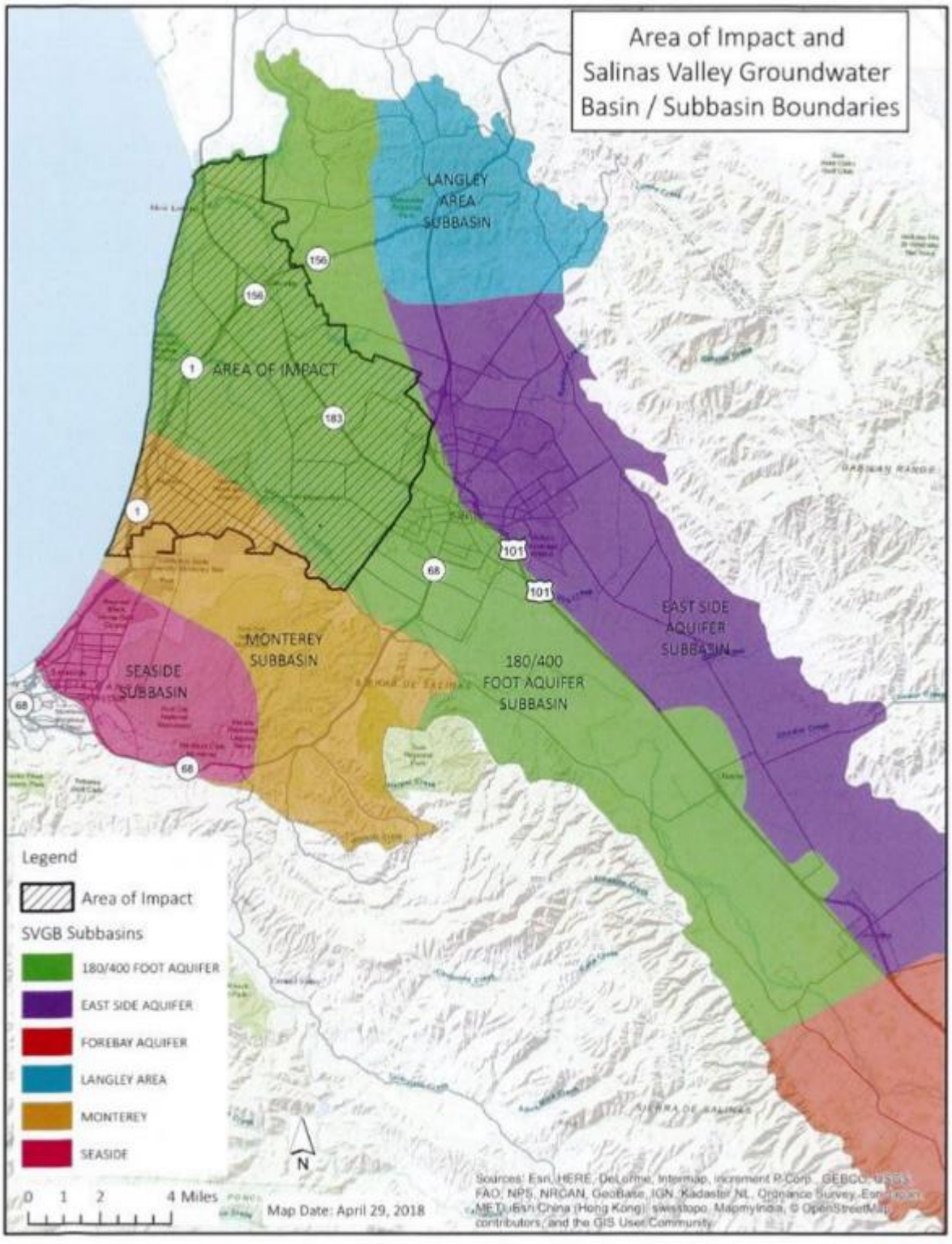


Figure 3-11 Map of Ordinance No. 5302 Area of Impact (Monterey County Board of Supervisors, 2018)

Monterey County Groundwater Management Plan

MCWRA developed a GMP that is compliant with AB3030 and SB1938 legislation (MCWRA, 2006). This GMP exclusively covered the Salinas Valley Groundwater Basin in Monterey County. The original 2020 GSP succeeded the GMP as the management plan for the Subbasin, and this GSP Amendment replaces the original GSP and GSP Amendment 1.

The GMP identified 3 objectives for groundwater management:

- **Objective 1:** Development of Integrated Water Supplies to Meet Existing and Projected Water Requirements
- **Objective 2:** Determination of Sustainable Yield and Avoidance of Overdraft
- **Objective 3:** Preservation of Groundwater Quality for Beneficial Use

To meet these 3 objectives, the GMP identified ~~14~~ elements that should be implemented by MCWRA. These included groundwater monitoring; monitoring of surface water storage, flow, and quality; determination of basin yield and overdraft; continuation of conjunctive use operations; water quality management; identification of well construction, abandonment, and destruction policies; and public education. Since the GSP replaces the GMP as the management plan for the Subbasin, the GSP incorporates and refines the elements of the GMP to comply with SGMA.

3.2.2.3 Urban Water Management Plans

Marina Coast Water District Urban Water Management Plan

The Marina Coast Water District was formed in 1960. Today MCWD serves municipal and industrial water uses within the City of Marina and the former Fort Ord. MCWD's Urban Water Management Plan (UWMP) is updated every 5 years and describes the service area; reports historical and projected population; identifies historical and projected water demand; quantifies current and projected water supplies; and describes demand management measures. MCWD's most recent UWMP is the 2025 UWMP (MCWD, 2026). GSP Amendment 1 incorporates water supply projects identified in the 2025 UWMP into its discussion of projects and management actions in Chapter 9. However, the projected water budget analysis in Chapter 6 relies on information from the 2020 UWMP (MCWD, 2021), because the groundwater modeling tools used to develop the projected water budgets was completed before the 2025 UWMP became available.

MCWD provides water service to ten Land Use Jurisdictions (LUJs) within its service area and currently serves a combination of groundwater and recycled water. Water use during 2025 within the MCWD service area was approximately 3,681 AFY. The 2025 UWMP anticipates that projected customer water demand within the entire service area would be 8,442 AFY by 2040 and 12,179 AFY by 2050, including 3,358 AFY within the Marina Service Area and 7,867 AFY for the existing and future developments within the Ord Service Area.

The UWMP notes that, "[a]s part of the FORA process, FORA allocated the appropriative Salinas Valley Groundwater Basin supply of 6,600 AFY to respective Ord Service Area LUJs… three LUJs are projected to exceed their groundwater supply allocation. Therefore, as development occurs, and an LUJ requests supply that exceeds its groundwater allocation, MCWD will work with the respective LUJ to identify and develop additional supplies as needed."

MCWD continues to diversify its water supplies and plans to meet its projected demands through a combination of groundwater, recycled water, and desalinated water supplies. In 2021, MCWD began receiving the first 600 AFY of advanced treated water from the Pure Water Monterey (PWM) Project, representing a portion of MCWD's total PWM entitlement of 1,427 AFY. In 2025, MCWD delivered 414 AFY of this supply to its customers and is expanding its recycled water program to serve additional customers. MCWD is renovating its 300 AFY Reservation Road Desalination Facility with a completion date in 2027. A total of 2,300 AFY of desalinated water supply is anticipated to be available by 2035.

In addition, the MCWD UWMP describes its current and planned demand management measures to sustainably manage its water resources and comply with statewide efficiency mandates. MCWD's implementation of demand management measures resulted in MCWD receiving state-wide recognition of its water conservation achievements during the 2014-2017 drought.

California Water Service – Salinas District Urban Water Management Plan

Cal Water provides water service to portions of the City of Salinas and surrounding communities through its Salinas District in the 180/400, Monterey, Eastside, and Langley Subbasins. A portion of the California Water Service area includes their "Salinas Hills" water system in the Corral de Tierra Area of the Subbasin. The Cal Water 2025 UWMP (California Water Service, 2026) describes the service area; reports historical and projected population; identifies historical and projected water demand by category such as single-family, multi-family, commercial, industrial, institutional/government, and other; and describes the distribution system and identifies system losses and water supply reliability. The UWMP projects water demands through 2050 and evaluates water supply reliability under normal, single dry-year, and multiple dry-year conditions.

The UWMP describes the system's reliance on groundwater and Cal Water's support for the development and implementation of GSPs. Cal Water maintains an active well maintenance program to identify wells requiring replacement and intends to maintain sufficient wells and distribution facilities to accommodate future demand. To maintain system reliability and accommodate future growth, the UWMP describes supply-augmentation projects to reactivate 1 existing inactive well and bring three new wells online to extract an additional 7,090 AF/yr. by 2050. Cal Water also identifies groundwater sustainability considerations under SGMA as a driver for its ongoing conservation planning and resource management.

The UWMP recognizes that GSAs have authority under SGMA to implement projects and management actions. It states that the applicable GSPs contain various PMAs, and that if future actions such as groundwater pumping allocations or pumping fees are adopted, Cal Water will consider them in future supply planning.

Cal Water has and intends to take an active role in the local and state-wide management of groundwater resources over the next 5 to 25+ years by fully supporting and participating in the principal edicts of SGMA. Cal Water has had active participation with the SVBGSA, the SVBGSA Board, the SVBGSA technical advisory committees, and the subbasin committees.

The 2025 UWMP addresses groundwater quality as a factor in water supply reliability. Cal Water routinely monitors its wells and treated water for regulated constituents and tracks changes in constituent concentrations to proactively address potential water quality issues. Where source-water constituents are detected at concentrations requiring treatment, Cal Water may take affected wells offline and implement appropriate treatment. Cal Water also evaluates groundwater contamination when siting new wells and avoids areas of known contamination. Based on these monitoring and management practices, the UWMP concludes that water quality is not expected to affect the reliability of Cal Water's supplies through 2050.

Cal Water's UWMP notes that groundwater will continue to remain as its sole supply. The 2025 UWMP incorporates climate change into its reliability analyses and concludes that available supplies are expected to remain sufficient to meet projected demands, including during a 5-year drought and under projected climate change conditions.

3.2.2.4 CCRWQCB Agricultural Order

In 2021 the CCRWQCB issued Agricultural Order No. R3-2021-0040, the Proposed General Waste Discharge Requirements for Discharges from Irrigated Lands (CCRWQCB, 2021). The permit requires that growers implement practices to reduce nitrate leaching into groundwater and improve receiving water quality. Specific requirements for individual growers are structured into 3 phases based on the relative risk their operations pose to water quality. Each of the 3 phases encompass a different area of the Central Coast Basin. Monitoring results from this new Agricultural Order (Ag Order 4.0) will be incorporated into this GSP Amendment's groundwater quality data.

3.2.2.5 Water Quality Control Plan for the Central Coast Basins

The Water Quality Control Plan for the Central Coastal Basin (Basin Plan) was most recently updated in June 2019 (CCRWQCB, 2019). The objective of the Basin Plan is to outline how the quality of the surface water and groundwater in the Central Coast Region should be managed to provide the highest water quality reasonably possible. Water quality objectives for both groundwater and surface water are provided in the Basin Plan.

The Basin Plan lists beneficial users, describes the water quality that must be maintained to allow those uses, provides an implementation plan, details SWRCB and CCRWQCB plans and policies to protect water quality, and describes statewide and regional surveillance and monitoring programs. Present and potential future beneficial uses for waters in the Basin are municipal supply; agricultural supply; groundwater recharge; recreation; sport fishing; warm fresh water habitat; wildlife habitat; rare, threatened, or endangered species habitat; and spawning, reproduction, and/or early development of fish.

3.2.2.6 Title 22 Drinking Water Program

The SWRCB Division of Drinking Water (DDW) regulates public water systems in the State to ensure the delivery of safe drinking water to the public. A public water system is defined as a system for the provision of water for human consumption that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year. Private domestic wells, wells associated with drinking water systems with fewer than 15 residential service connections, industrial, and irrigation wells are not regulated by the DDW.

The DDW enforces the monitoring requirements established in Title 22 of the California Code of Regulations (CCR) for public water system wells, and all the data collected must be reported to the DDW. Title 22 also designates the MCLs and secondary maximum contaminant level (SMCLs) for various waterborne contaminants, including volatile organic compounds, non-volatile synthetic organic compounds, inorganic chemicals, radionuclides, disinfection byproducts, general physical constituents, and other parameters.

Monterey County Water Resources Agency Ordinance No. 3709

MCWRA Ordinance No. 3709, adopted in 1993 by the MCWRA Board of Supervisors of the Water Resources Agency, prohibits groundwater extractions and the drilling of new extraction wells in certain portions of the 180-Foot Aquifer after January 1, 1995. The ordinance pertains to portions of the Pressure 180-Foot Aquifer in MCWRA's Pressure Area, which includes portions of the northern 180/400 -Foot Aquifer Subbasin and portions of the Monterey and Eastside Subbasins, defined in the ordinance boundary delineation as Territory A and Territory B and as shown on Figure 3-12.

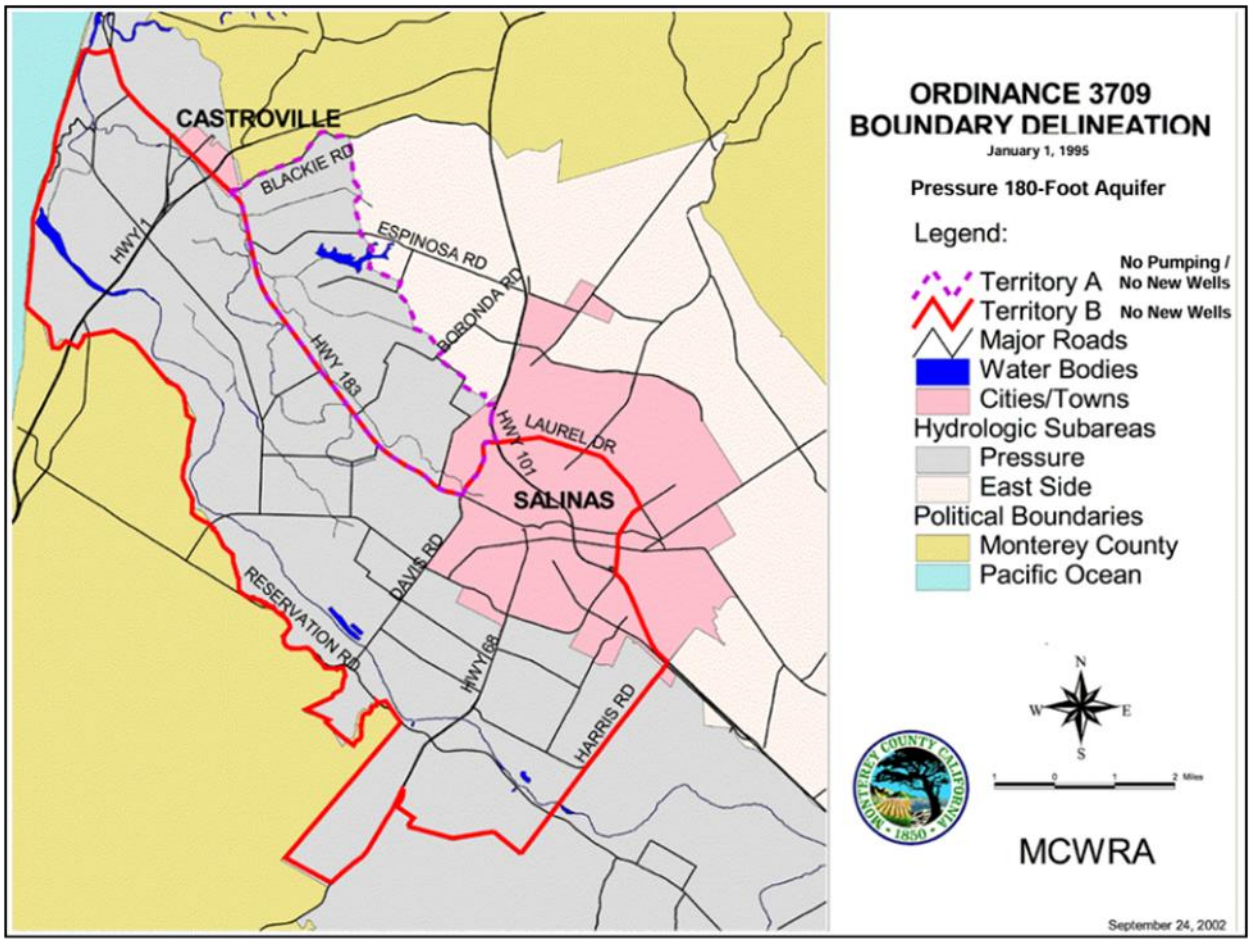


Figure 3-12 Territory A and Territory B of MCWRA Ordinance No. 3709

Monterey County Water Resources Agency Ordinance No. 3790

Adopted in 1994, MCWRA Ordinance No. 3790 establishes regulations for the classification, operation, maintenance, and destruction of groundwater wells in the Castroville Seawater Intrusion Project area, also known as Zone 2B.

County Public Policy of Safe and Clean Water

In December 2018, the County Board of Supervisors adopted Resolution No. 18-385 recognizing the human right to safe and clean drinking water. The resolution established a public policy recognizing that all residents of Monterey County have the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes, including disadvantaged individuals and groups and communities in rural and urban areas. The intent of the policy is to inform the County when implementing policies and regulations affecting water supply and usage and to help the County focus on the issue of drinking water pollution in certain Monterey County domestic wells and water systems. The policy also serves to identify potential

future threats due to drought and a lack of available drinking water without impacting water rights or expanding or creating new County obligations.

3.2.2.7 Limits to Operational Flexibility

This GSP has been developed to be coordinated with the requirements, management plans and monitoring programs administered by other jurisdictions in the area, including SVBGSA, MCWRA, MCWDGSA, CCRWQCB, and the Federal Government. For example:

- The IRWMP and GSP development are complementary management processes. To the extent that the issues identified for the greater IRWMP region affect the Subbasin, these issues will be discussed in the following sections of this GSP. The implementation of this GSP will contribute to the sustainable use of water supplies within the IRWMP region and the IRWMP is not expected to limit operational flexibility in the Subbasin.
- The purpose and objective of MCWRA's groundwater management of the Subbasin, which focuses on providing regional solutions to protection of the Subbasin and preventing seawater intrusion, aligns with the goals of this GSP. The GSP will augment and integrate with MCWRA's historical management of the Subbasin.

Some of the existing management and regulatory programs include well registration, extraction monitoring, new well restrictions, pumping allowances and restrictions, recharge requirements and/or water quality protection standards that will limit operational flexibility. These limits to operational flexibility have already been incorporated into the projects and programs included in this GSP. Examples of limits on operational flexibility include:

- Pumping allowances in the MCWRA annexation agreements with MCWD and the Federal Government may restrict groundwater use. However, current groundwater use by MCWD within the City of Marina and the former Fort Ord is well below the annexation agreement pumping allowances. These agreements are not expected to adversely affect the Subbasin's ability to reach sustainability.
- The groundwater export prohibition included in the Agency Act prevents export of water out of the Subbasin. This prohibition is not expected to adversely affect the Subbasin's ability to reach sustainability.
- The Basin Plan and the Title 22 Drinking Water Program restrict the quality of water that can be recharged into the Subbasin as well as the location of groundwater recharge.
- Well construction restrictions within the Former Fort Ord (see Section 3.5.4.2) may limit certain activities and the Subbasin GSAs' ability to access certain sources of water. However, the restrictions are not expected to adversely affect the Subbasin's ability to reach sustainability.

3.3 Conjunctive Use Programs

There is no existing conjunctive use program within the Monterey Subbasin. The Pure Water Monterey Project is an advanced water recycling project with a conjunctive use component

under development by MPWMD, M1W, and MCWD in the adjacent Seaside Subbasin. The project is discussed in Section 9.5.3.

However, a segment of the Salinas River runs through a portion of the Subbasin. MCWRA operates conjunctive use programs related to the Nacimiento and San Antonio Reservoirs and Monterey County Water Recycling Programs. Together, the multiple subbasins that comprise the Salinas Valley represent a highly managed, conjunctive use framework in which surface water infrastructure, groundwater extraction, and recycled water supplies are closely integrated to mitigate long-term basin impacts and sustain agricultural productivity.

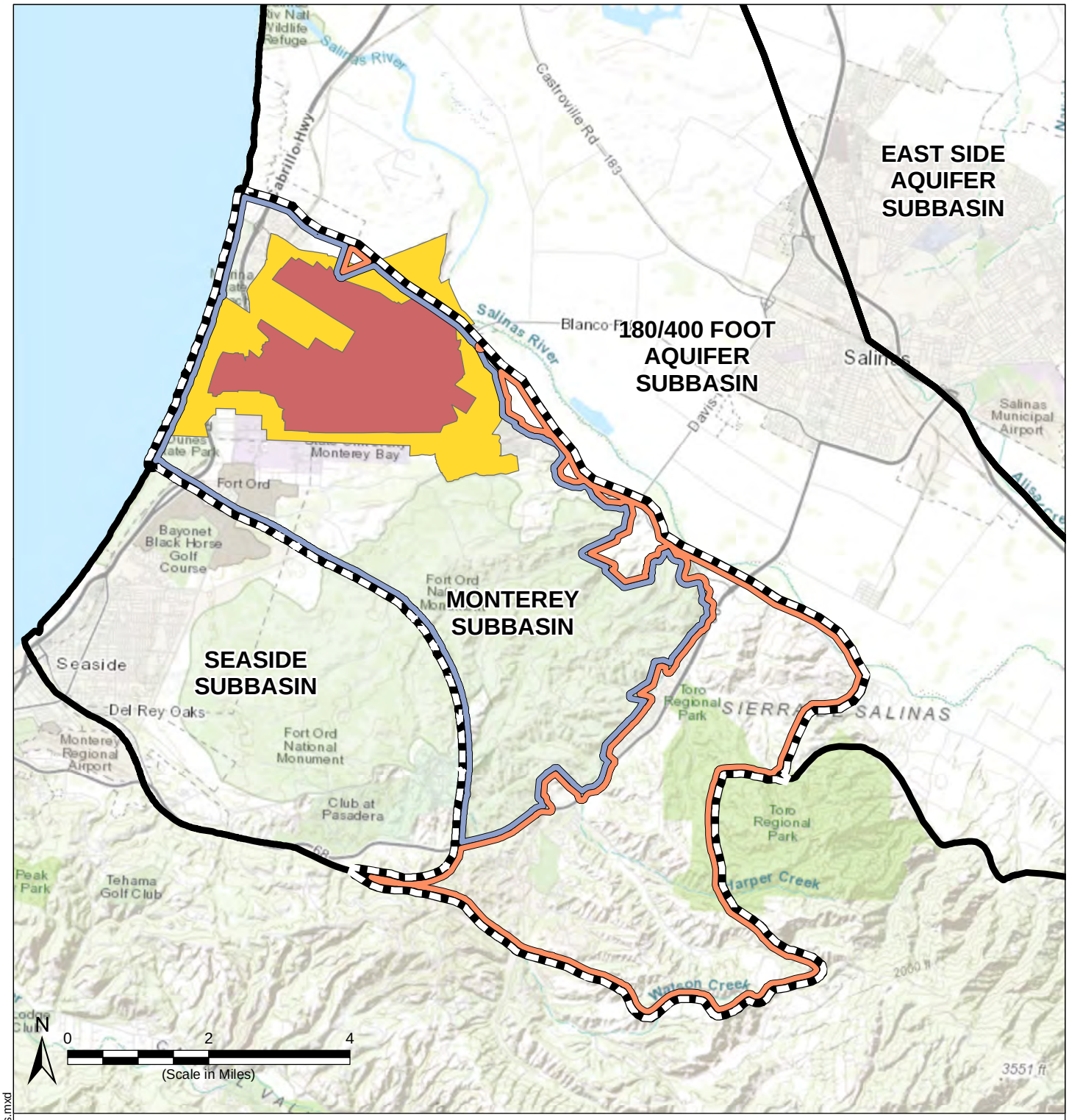
3.4 Groundwater Cleanup at the Former Fort Ord

The former Fort Ord military base consists of 27,827 acres across the Monterey, 180/400-Foot Aquifer, and Seaside Subbasins. Within the Monterey Subbasin, the former Fort Ord encompasses more than half of the Subbasin's area. The Fort Ord military base was established in 1917 by the U.S. Army as a maneuver area and field artillery target range. The base was officially closed in 1994.

Remedial investigation and cleanup action at Fort Ord led by the Army began in 1986. The cleanup activities at Fort Ord have included groundwater and soil remediation associated with industrial and waste disposal activities, and later included munitions cleanup. The site was added to the National Priorities List (NPL)on February 21, 1990. The Army was designated as the lead agency and the U.S. Environmental Protection Agency (EPA) was designated as the lead regulatory agency for the Superfund process at Fort Ord. A Federal Facility Agreement (FFA) was signed by the Army, U.S. Environmental Protection Agency (U.S. EPA), the California Department of Toxic Substances Control (DTSC), and the CCRWQCB in 1990.

As of 2021, groundwater remediation is ongoing at three sites: Operable Unit (OU) 2, Sites 2 and 12, and OUCTP, for volatile organic compound (VOC) constituents of concern.

Activity and use limitations are in place at the former Fort Ord such as zoning restrictions, deed or access restrictions, and well installation restrictions. County Ordinance No. 04011 of 2005 was adopted to prohibit and/or regulate new water wells in areas within the former Fort Ord due to groundwater contamination constraints. Well construction is prohibited in areas overlying or adjacent to the contamination plumes in the former Fort Ord (i.e., Prohibition Zone) and is subject to special review in areas that may be impacted by the contamination plumes (i.e., Consultation Zone). The Prohibition and Consultation Zones were last updated in 2016 and are shown on Figure 3-13.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra

Fort Ord Special Groundwater Protection Zones

- Prohibition Zone
- Consultation Zone

Notes

1. All locations are approximate.
2. Monterey County Ordinance No. 04001 (Monterey County Code Title 15, Chapter 15.08.140) prohibits and/or regulates contruction of new water wells within the Fort Ord groundwater protection zones shown herein, which overlay or are adjacent to the contamination plumes on the former Fort Ord. Current groundwater protection zone are obtained from Source 2.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 14 September 2021.
2. U.S. Department of the Army, 2017. Final 4th Five-Year Review Report for Fort Ord Superfund Site, Monterey County, California, prepared by the Fort Ord Base Realignment and Closure Office, dated September 2017.

Fort Ord Special Groundwater Protection (Contamination) Zones

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 3-13

Path: X:\B60094\Maps\2021\09\Fig3-11_FortOrdProhibitionZones.mxd

3.5 Land Use Elements or Topic Categories of Applicable General Plans

Monterey County and the cities of Marina and Seaside have land use authority over all or portions of the Monterey Subbasin. Additionally, the Fort Ord Reuse Authority oversees reuse of the former Fort Ord army base within the Subbasin. Land use is an important factor in water management, as described below. The following sections provide a general description of these land use plans and how implementation may affect groundwater in the Monterey Subbasin. The following descriptions were taken from publicly available general plans at the time of the GSP preparation.

3.5.1 General Plans and Other Land Use Plans

This section identifies relevant policies in the current General Plans that could: (1) affect water demands in the Monterey Subbasin (e.g., due to population growth and development of the built environment), (2) influence the GSP's ability to achieve sustainable groundwater use, and (3) affect implementation of General Plan land use policies.

3.5.1.1 Monterey County General Plan

The County of Monterey 2010 General Plan was prepared and adopted prior to SGMA and includes policies related to water supplies and construction of wells. The Public Services Element includes a goal for long-term water supply and related policies considered in the review of discretionary development permits. Relevant elements of the Monterey County General Plan (Monterey County 2010) are summarized in Table 3-3.

Table 3-3 Monterey County General Plan Summary

Element	Goal/Policy	
Land Use	LU-1.4	Growth areas shall be designated only where an adequate level of services and facilities such as water, sewerage, fire and police protection, transportation, and schools exist or can be assured concurrent with growth and development. Phasing of development shall be required as necessary in growth areas in order to provide a basis for long-range services and facilities planning.
Open Space	OS-3.8	The County shall cooperate with appropriate regional, state and federal agencies to provide public education/outreach and technical assistance programs on erosion and sediment control, efficient water use, water conservation and re-use, and groundwater management. This cooperative effort shall be centered through the Monterey County Water Resources Agency.
et. seq. Public Services (PS)	GOAL PS-2	Assure an adequate and safe water supply to meet the county's current and long-term needs.
	PS-2.1	Coordination among, and consolidation with, those public water service providers drawing from a common water table to prevent overdrawing the water table is encouraged.

Element	Goal/Policy	
	PS-2.2	The County of Monterey shall assure adequate monitoring of wells in those areas experiencing rapid growth provided adequate funding mechanisms for monitoring are established in the Capital Improvement and Financing Plan (CIFP).
	PS-2.3	New development shall be required to connect to existing water service providers where feasible. Connection to public utilities is preferable to other providers.
	PS-2.4	Regulations for installing any new domestic well located in consolidated materials (e.g., hard rock areas) shall be enacted by the County.
	PS-2.5	Regulations shall be developed for water quality testing for new individual domestic wells on a single lot of record to identify: a) Water quality testing parameters for a one-time required water quality test for individual wells at the time of well construction. b) A process that allows the required one-time water quality test results to be available to future owners of the well. Regulations pursuant to this policy shall not establish criteria that will prevent the use of the well in the development of the property. Agricultural wells shall be exempt from the regulation.
	GOAL PS-3	Ensure that new development is assured a long-term sustainable water supply.
	PS-3.1	Except as specifically set forth below, new development for which a discretionary permit is required, and that will use or require the use of water, shall be prohibited without proof, based on specific findings and supported by evidence, that there is a long-term, sustainable water supply, both in quality and quantity to serve the development [see Plan for list].
	PS-3.2	Specific criteria for proof of a Long-Term Sustainable Water Supply and an Adequate Water Supply System for new development requiring a discretionary permit, including but not limited to residential or commercial subdivisions, shall be developed by ordinance with the advice of the General Manager of the Water Resources Agency and the Director of the Environmental Health Bureau. A determination of a Long-Term Sustainable Water Supply shall be made upon the advice of the General Manager of the Water Resources Agency. The following factors shall be used in developing the criteria for proof of a long-term sustainable water supply and an adequate water supply system: [see Plan for list]
	PS-3.3	Specific criteria shall be developed by ordinance for use in the evaluation and approval of adequacy of all domestic wells. The following factors shall be used in developing criteria for both water quality and quantity including, but not limited to: [see Plan for list]
	PS-3.4	The County shall request an assessment of impacts on adjacent wells and instream flows for new high-capacity wells, including high-capacity urban and

Element	Goal/Policy	
		agricultural production wells, where there may be a potential to affect existing adjacent domestic or water system wells adversely or in-stream flows, as determined by the Monterey County Water Resources Agency. In the case of new high-capacity wells for which an assessment shows the potential for significant adverse well interference, the County shall require that the proposed well site be relocated or otherwise mitigated to avoid significant interference. The following factors shall be used in developing criteria by ordinance for use in the evaluation and approval of adequacy of all such high-capacity wells, including but not limited to: a) Effect on wells in the immediate vicinity as required by the Monterey County Water Resources Agency or Environmental Health Bureau. b) Effects of additional extractions or diversion of water on in-stream flows necessary to support riparian vegetation, wetlands, fish, and other aquatic life including migration potential for steelhead, for the purpose of minimizing impacts to those resources and species. This policy is not intended to apply to replacement wells.
	PS-3.5	The Monterey County Health Department shall not allow construction of any new wells in known areas of saltwater intrusion as identified by Monterey County Water Resources Agency or other applicable water management agencies: a) Until such time as a program has been approved and funded that will minimize or avoid expansion of salt water intrusion into useable groundwater supplies in that area; or b) Unless approved by the applicable water resource agency. This policy shall not apply to deepening or replacement of existing wells, or wells used in conjunction with a desalination project.
	PS-3.6	The County shall coordinate and collaborate with all agencies responsible for the management of existing and new water resources.
	PS-3.7	A program to eliminate overdraft of water basins shall be developed as part of the CIFP for this Plan using a variety of strategies, which may include but are not limited to: a) Water banking; b) Groundwater and aquifer recharge and recovery; c) Desalination; d) Pipelines to new supplies; and/or e) A variety of conjunctive use techniques. The CIFP shall be reviewed every five years in order to evaluate the effectiveness of meeting the strategies noted in this policy. Areas identified to be at or near overdraft shall be a high priority for funding.
	PS-3.8	Developments that use gray water and cisterns for multi-family residential and commercial landscaping shall be encouraged, subject to a discretionary permit.

Element	Goal/Policy	
	PS-3.9	A tentative subdivision map and/or vesting tentative subdivision map application for either a standard or minor subdivision shall not be approved until the applicant provides evidence of a long-term sustainable water supply in terms of yield and quality for all lots that are to be created through subdivision.
	PS-3.10	In order to maximize agricultural water conservation measures to improve water use efficiency and reduce overall water demand, the County shall establish an ordinance identifying conservation measures that reduce agricultural water demand.
	PS-3.11	In order to maximize urban water conservation measures to improve water use efficiency and reduce overall water demand, the County shall establish an ordinance identifying conservation measures that reduce potable water demand
	PS-3.12	The County shall maximize the use of recycled water as a potable water offset to manage water demands and meet regulatory requirements for wastewater discharge, by employing strategies including, but not limited to, the following: a) Increase the use of treated water where the quality of recycled water is maintained, meets all applicable regulatory standards, is appropriate for the intended use, and re-use will not significantly impact beneficial uses of other water resources. b) Work with the agricultural community to develop new uses for tertiary recycled water and increase the use of tertiary recycled water for irrigation of lands currently being irrigated by groundwater pumping. c) Work with urban water providers to emphasize use of tertiary recycled water for irrigation of parks, playfields, schools, golf courses, and other landscape areas to reduce potable water demand. d) Work with urban water providers to convert existing potable water customers to tertiary recycled water as infrastructure and water supply become available.
	PS-3.13	To ensure accuracy and consistency in the evaluation of water supply availability, the Monterey County Health Department, in coordination with the MCWRA, shall develop guidelines and procedures for conducting water supply assessments and determining water availability. Adequate availability and provision of water supply, treatment, and conveyance facilities shall be assured to the satisfaction of the County prior to approval of final subdivision maps or any changes in the General Plan Land Use or Zoning designations.
	PS-3.14	The County will participate in regional coalitions for the purpose of identifying and supporting a variety of new water supply projects, water management programs, and multiple agency agreements that will provide additional domestic water supplies for the Monterey Peninsula and Seaside Subbasin, while continuing to protect the Salinas and Pajaro River groundwater basins from saltwater intrusion. The County will also participate in regional groups including representatives of the Pajaro Valley Water Management Agency and the County of Santa Cruz to identify and support a variety of new water supply, water management and multiple agency agreement that will provide additional

Element	Goal/Policy	
		domestic water supplies for the Pajaro Groundwater Basin. The County's general objective, while recognizing that timeframes will be dependent on the dynamics of each of the regional groups, will be to complete the cooperative planning of these water supply alternatives within five years of the adoption of the General Plan and to implement the selected alternatives within five years after that time.
	PS-3.15	The County will pursue expansion of the Salinas Valley Water Project (SVWP) by investigating expansion of the capacity for the Salinas River water storage and distribution system. This shall also include, but not be limited to, investigations of expanded conjunctive use, use of recycled water for groundwater recharge and seawater intrusion barrier, and changes in operations of the reservoirs. The County's overall objective is to have an expansion planned and in service by the date that the extractions from the Salinas Valley groundwater basin are predicted to reach the levels estimated for 2030 in the EIR for the Salinas Valley Water Project. The County shall review these extraction data trends at five-year intervals. The County shall also assess the degree to which the Salinas Valley Groundwater Basin (Zone 2C) has responded with respect to water supply and the reversal of seawater intrusion based upon the modeling protocol utilized in the Salinas Valley Water Project EIR. If the examination indicates that the growth in extractions predicted for 2030 are likely to be attained within ten years of the date of the review, or the groundwater basin has not responded with respect to water supply and reversal of seawater intrusion as predicted by the model, then the County shall convene and coordinate a working group made up of the Salinas Valley cities, the MCWRA, and other affected entities. The purpose will be to identify new water supply projects, water management programs, and multiple agency agreements that will provide additional domestic water supplies for the Salinas Valley. These may include, but not be limited to, expanded conjunctive use programs, further improvements to the upriver reservoirs, additional pipelines to provide more efficient distribution, and expanded use of recycled water to reinforce the hydraulic barrier against seawater intrusion. The county's objective will be to complete the cooperative planning of these water supply alternatives within five years and to have the projects on-line five years following identification of water supply alternatives.

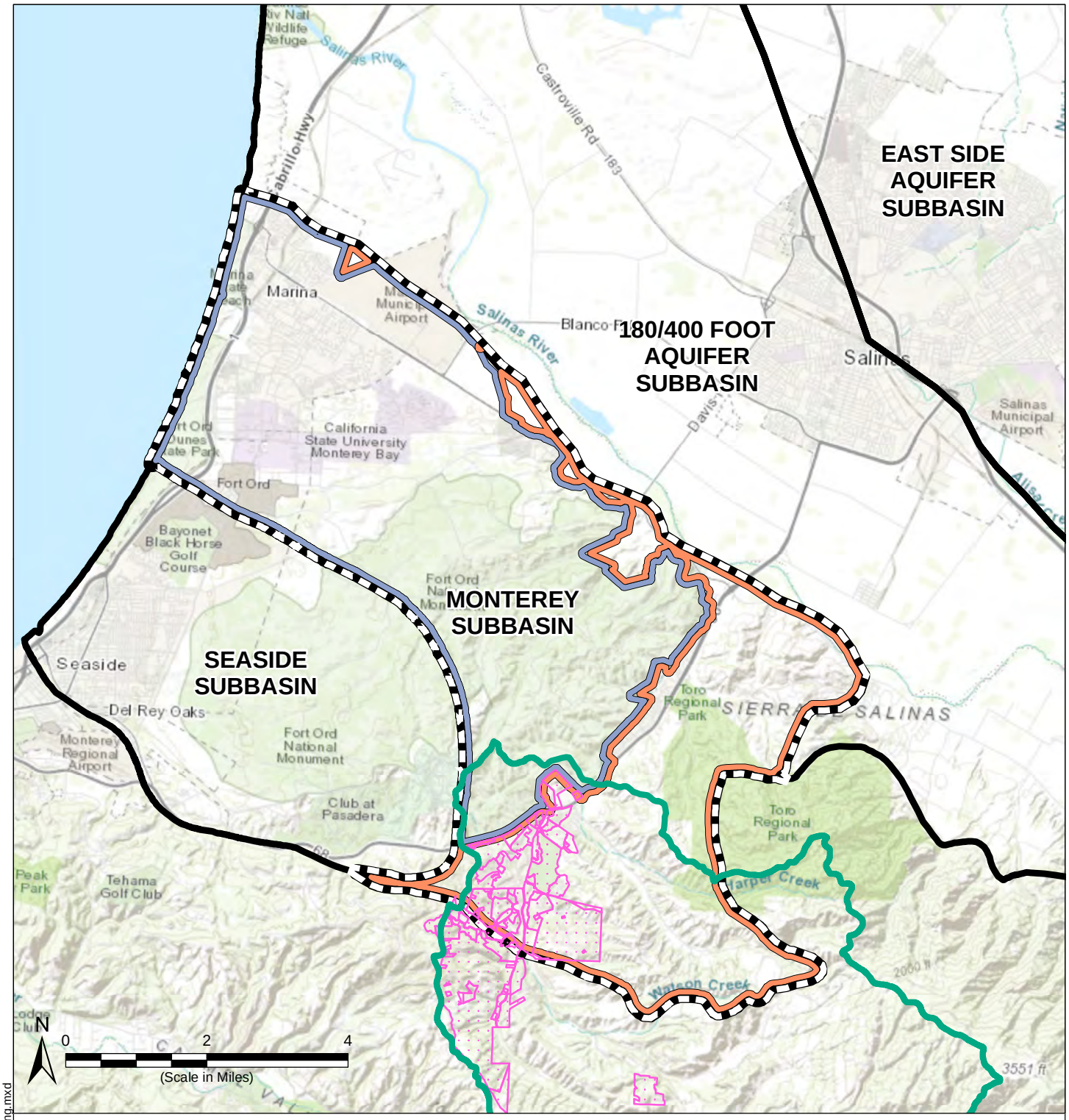
The Monterey County General Plan does not include population projections; however, the Association of Monterey Bay Area Governments (AMBAG) has developed population projections through 2050, as shown in Table 3-4.

The County imposed a B-8 Zoning overlay in 1992 to the southwestern portions of the Subbasin in the Corral de Tierra area due to declining groundwater elevations and the concern for build-out demand negatively impacting future supplies. This overlay is shown in Figure 3-14. This zoning limits any development to single-family homes on lots that existed before 1991. This zoning overlay only covers a small portion of the Corral de Tierra Management area.

Table 3-4 Monterey County Population Projections (AMBAG, 2026)

Geography	2020	2023	2030	2035	2040	2045	2050	Change 2020-2050 Num.	Change 2020-2050 %
AMBAG Region	**774,105**	**762,456**	**784,684**	**794,720**	**803,136**	**809,027**	**813,708**	**39,603**	**5%**
Monterey County	**439,035**	**433,953**	**446,857**	**451,331**	**454,652**	**458,107**	**461,279**	**22,244**	**5%**
Carmel-By-The-Sea	3,168	3,105	2,881	2,961	3,018	3,057	3,082	-86	-3%
Del Rey Oaks	1,579	1,559	1,670	1,782	1,850	1,912	1,958	379	24%
Gonzales	8,548	8,384	11,430	11,489	11,555	11,631	11,647	3,099	36%
Greenfield	18,782	20,155	21,149	21,371	21,498	21,557	21,633	2,851	15%
King City	13,395	13,968	14,871	14,938	14,975	15,044	15,158	1,763	13%
Marina	21,738	22,269	27,568	29,100	31,706	33,071	34,305	12,567	58%
Marina balance	20,813	21,546	25,707	25,839	25,845	25,910	25,944	5,131	25%
CSUMB (portion)	925	723	1,861	3,261	5,861	7,161	8,361	7,436	804%
Monterey	28,474	27,189	28,714	29,428	29,995	30,526	30,859	2,385	8%
Monterey balance	24,258	24,114	24,514	25,228	25,795	26,326	26,659	2,401	10%
Presidio & NSAM	4,216	3,075	4,200	4,200	4,200	4,200	4,200	-16	0%
Pacific Grove	14,978	14,872	15,223	15,404	15,602	15,768	15,894	916	6%
Salinas	161,776	160,870	161,947	162,791	163,127	163,871	164,615	2,839	2%
Sand City	368	378	1025	1068	1092	1,113	1,121	753	205%
Seaside	32,731	30,187	30,507	30,906	31,521	32,120	32,626	-105	0%
Seaside balance	25,080	24,971	23,652	24,051	24,666	25,265	25,771	691	3%
Fort Ord (portion)	4,202	2,112	3,751	3,751	3,751	3,751	3,751	-451	-11%
CSUMB (portion)	3,449	3,104	3,104	3,104	3,104	3,104	3,104	-345	-10%
Soledad	27,550	26,462	26,061	26,174	26,176	25,754	25,292	-2,258	-8%
Soledad balance	19,433	19,565	20,887	21,962	22,612	22,685	22,900	3,467	18%
SVSP & CTF	8,117	6,897	5,174	4,212	3,564	3,069	2,392	-5725	-71%
Unincorporated	105,948	104,555	103,811	103,919	102,537	102,683	103,089	-2,859	-3%
Unincorp. balance	103,407	102,014	101,276	101,384	101,302	101,448	101,854	-1,553	-2%
CSUMB	2,541	2,541	2,535	2,535	1,235	1,235	1,235	-1306	-51%
San Benito County	**64,209**	**65,165**	**68,913**	**69,294**	**69,977**	**70,662**	**71,030**	**6,821**	**11%**
Hollister	41,675	42,547	45,633	45,691	45,745	45,850	45,884	4,209	10%
San Juan Bautista	2,084	2,032	2,035	2,049	2,066	2,083	2,098	14	1%
Unincorporated	20,450	20,586	21,245	21,554	22,166	22,729	23,048	2,598	13%
Santa Cruz County	**270,861**	**263,338**	**268,914**	**274,095**	**278,507**	**280,258**	**281,399**	**10,538**	**4%**
Capitola	9,859	9,558	10,070	10,635	11,029	11,262	11,395	1536	16%
Santa Cruz	64,695	62,929	68,057	71,343	74,839	75,583	75,950	11,255	17%
Santa Cruz balance	46,287	44,385	45,557	46,343	46,839	47,583	47,950	1,663	4%
UCSC	18,408	18,544	22,500	25,000	28,000	28,000	28,000	9,592	52%
Scotts Valley	12,069	11,872	12,322	12,603	12,887	13,094	13,235	1,166	10%
Watsonville	51,809	50,820	51,475	51,835	52,005	52,180	52,251	442	1%
Unincorporated	132,429	128,159	126,990	127,679	127,747	128,139	128,568	-3,861	-3%

Sources: Data for years 2020-2023 are from DOF. Forecast years were prepared by AMBAG and PRB.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- El Toro B8 Planning Zone
- El Toro Planning Area

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 15 September 2021.
2. Monterey County El Toro Planning Area and Zoning Information obtained from Monterey County Open Data, accessed 10 June 2020.

Path: X:\B60094\Maps\2021\09\Fig3-12_MontereyCountyB8Zoning.mxd

Monterey County B-8 Zoning Areas

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 3-14

3.5.1.2 City of Marina General Plan

The City of Marina was founded in 1915 and incorporated in 1975. The first General Plan was adopted in 1978. The overall goal of the Marina General Plan is "the creation of a community which provides a high quality of life for all its residents; which offers a broad range of housing, transportation, and recreation choices; and which conserves irreplaceable natural resources" (City of Marina, 2010).

The General Plan recognizes that future water demands will require changes in the management of water resources in the area. Water conservation, reclamation, and reuse will constitute major components of future water management efforts. The policies and programs of the General Plan are designed to promote water conservation, the use of recycled water to protect water quality, and to ensure that the demand of future community development does not exceed the capacity to provide water in an environmentally acceptable way [3.42].

The General Plan includes the following measures related to water-supply planning:

- New developments must have identified water sources [3.45].
- A 15% reserve will be maintained between demand and supply. When demand exceeds 85% of the available supply, no new development will be allowed until supplemental water sources are identified [3.47].

The primary responsibility for water resource management in Marina rests with MCWD as the water purveyor, and MCWRA as the entity responsible for managing the surface water and groundwater resources of the Salinas Valley Groundwater Basin.

3.5.1.3 City of Seaside General Plan

The City of Seaside is in the process of updating its general plan to a planning horizon of 2040. The plan "seeks to protect the coastal system and preserve the natural habitat that extends beyond the City's boundaries in balance with Seaside's desire to be developed as a well-rounded mixed-use community. Equity, sustainability, collaboration, and innovation are centrally embedded in the General Plan goals, policies, and actions to achieve a mixed use urbanscape." (City of Seaside, 2017)

The primary responsibility for water resource management in the City of Seaside within the Monterey Subbasin rests with MCWD, the water purveyor, and MCWRA, which is the entity responsible for managing the surface water and groundwater resources of the Salinas Valley Groundwater Basin. The plan acknowledges an inadequate supply of water on the Monterey Peninsula as a constraint for new developments and establishes programs to work with MCWD to develop water conservation methods and secure water supply for both existing and proposed uses within the city.

The Seaside General Plan includes the following goals, policies, and implementation measures that are related to groundwater or land use management, and that could potentially influence the implementation of this GSP.

- **Goal Health, Safety, and Community (HSC)-8**: Buildings and landscapes that promote water conservation, efficiency, and the increased use of recycled water.
- **Goal HSC-11**: New construction that meets a high-level of environmental performance.
- **Goal Community Facilities and Infrastructure (CFI)-2:** A sustainable water supply that supports existing community needs and long-term growth.
- **Goal CFI-3:** Clean and sustainable groundwater.

3.5.1.4 Fort Ord Base Reuse Plan

The former Fort Ord, which covers more than half of the Subbasin's area, is currently under redevelopment. Redevelopment of the former Fort Ord was under the oversight of the FORA, established in 1994 and recently terminated in June 2020. Prior to its termination, FORA allocated assets/liabilities and transitioned land use planning within former Fort Ord to each of the local jurisdictions, including the Cities of Marina and Seaside, the City of Monterey, and the County of Monterey. The governing document of Fort Ord's redevelopment, the Fort Ord Base Reuse Plan, was incorporated into each individual jurisdictional area's land use plans, which are then incorporated into MCWD's UWMP as described in Section 3.2.2.4.

The Fort Ord Base Reuse Plan, Final Reassessment Report (EMC, 2012), projected a total water demand of 9,000 AFY at buildout. This projected water demand is an additional 2,400 AFY over and above the 6,600 AFY groundwater supply described under the 1993 Annexation Agreement (MCWRA/U.S. Army, 1993; see Section 3.2.2.2). Development of the 2,400 AFY of additional water supply was identified as one of the mitigation measures for redevelopment of the former Fort Ord. As described in Section 3.4 above, within the former Fort Ord, MCWD has been designated as the exclusive (1) water and sewer collection service provider and (2) developer and implementer of all new water supplies for all non-federal lands. Under an exclusive contract with the Army, MCWD is responsible for providing water and sewer collection services for the Army and other Federal agencies within the former Fort Ord. Water demand projections associated with implementation of the Fort Ord Base Reuse Plan are included in MCWD's UWMP (Section 3.2.2.3).

The following efforts have been conducted by FORA and MCWD to support implementation of the Fort Ord Base Reuse Plan:

In 2005, the FORA and MCWD Boards of Directors both approved the Regional Urban Water Augmentation Project (RUWAP) Hybrid Alternative, which included recycled water and desalination supply components providing 1,200 AFY each. FORA and MCWD then agreed upon a modified RUWAP Hybrid Alternative that would provide 1,427 AFY of recycled water and 1,500 of desalinated water to the former Fort Ord. The FORA Board Resolution No. 07-10 (FORA, 2007) allocated the 1,427 AFY of RUWAP recycled water to the various land use jurisdictions (EMC, 2012). Section 9.5.3 describes MCWD current and planned water supply projects implementing RUWAP.

In 2015, the FORA Board of Directors endorsed a joint water supply planning process between FORA, M1W, and MCWD to identify the "Additional Water Augmentation Component." In 2016, MCWD, M1W, and FORA entered into an agreement to fund an analysis to identify alternatives to supply the additional 973 AFY of Water Augmentation (i.e., the total of 2,400 AFY required by the EIR subtracted by 1,427 AFY to be provided by the RUWAP). The Three Parties (FORA, MCWD, and M1W) recognize there may be a number of options to meet the 973 AFY "Additional Water Augmentation Component," and through this Water Supply Augmentation Study, aim to systematically identify and evaluate the potential supply augmentation alternatives, and select a preferred option. The three-party Water Supply Augmentation Study began in 2018 and was completed in June 2020. Water supply options being evaluated include brackish water and seawater desalination, increased water conservation measures, additional advanced treatment water, and IPR/groundwater recharge and replenishment. IPR was selected by the study as the water supply alternative and is discussed further in Section 9.5.3.

3.5.1.5 California Coastal Act and Local Coastal Programs

The Subbasin consists of approximately three miles of Monterey Bay coastline that are within the California Coastal Zone.

The California Coastal Act requires that local governments in the Coastal Zone create and implement Local Coastal Programs (LCPs) to conserve coastal-dependent land use. The Cities of Marina and Seaside have approved LCPs for Coastal Zones within their respective incorporated limits. The LCPs each consists of a Local Coastal Land Use Plan (LCLUP) and a Local Coastal Implementation Plan (City of Marina, 2025a, 2025b; City of Seaside, 2013a, 2013b). Additionally, a portion of the Subbasin's Coastal Zone consists of the Fort Ord Dunes State Park managed by the California Department of Parks and Recreation which is located west of Highway 1 and south of the City of Marina.

This GSP has been developed to be coordinated with the goals, policies, and requirements administered by the Marina and Seaside LCLUPs as well as the California Coastal Commission (CCC). Policies in the local LCLUPs related to habitat management have been incorporated into the SMC included in this GSP. Requirements to obtain and comply with coastal development permits have been incorporated into the projects and management actions included in this GSP.

3.5.2 Effects of Land Use Plan Implementation on Water Demand

The general plans detailed above guide future growth and development within their jurisdictional areas. This additional growth, particularly with redevelopment of the former Fort Ord, may place additional demands on groundwater resources within the Subbasin. However, the goals, policies, and implementation measures established by the existing land use plans are complementary to sustainable groundwater management of the Subbasin relative to future land use development and conservation. For example:

- The Monterey County General Plan encourages the growth areas to be designated only where adequate level of services and facilities such as water exists or can be ensured concurrent with growth and development. The plan initiates a program to eliminate

overdraft of water basins as part of the CIFP. The program includes various strategies such as water banking, groundwater and aquifer recharge as well as looking for new water sources such as expansion of the Salinas Valley Water Project (SVWP). The Monterey County General Plan aligns with the GSP.

- The City of Marina General Plan prohibits any new development that requires water allocation in excess of the available supply or in excess of its designated water allocation for that portion of former Fort Ord within the City. The plan encourages the City to work closely with MCWD to supply water to the current infrastructures prior to or concurrent with new developments while the existing or new developments should utilize water more efficiently.
- The City of Seaside plans to remove water supply constraints for development and redevelopment of the City by working with regional water suppliers. The plan also encourages coordination with regional and local water suppliers and participation in water conservation programs.
- The Fort Ord Reuse Plan relies on the nearby cities, such as City of Seaside and City of Marina, and Monterey County to manage the former Ford Ord area. Implementation of former Fort Ord's redevelopment will be pursuant to these local jurisdictions' land use plans and policies.

3.5.3 Effects of GSP Implementation on Water Supply Assumptions

Successful implementation of this GSP will help to ensure that the Subbasin groundwater supply is sustainably managed as set forth by SGMA. Therefore, implementation of this GSP is not anticipated to significantly affect the current water supply assumptions or land use plans.

Within the Marina-Ord Area, implementation of this GSP may induce management and project costs to be funded by MCWD to secure water supply for future development within the former Fort Ord, which will be supported by fees levied on such new developments for new water supplies. Within the Corral de Tierra Area, Implementation of this GSP Amendment may affect water supply assumptions of relevant land use plans over the planning and implementation horizon. Implementation of GSP PMAs is necessary to avoid undesirable results and mitigate overdraft, including the potential for demand management if needed. Changes in the cost of groundwater may affect whether surface water or groundwater is used. Land use changes may occur as a result of these activities and based on financial decisions by individual growers or landowners.

3.5.4 Well Permitting Process

The Monterey County Code Chapter 15.08 contains the County's regulations for the construction, repair, destruction, and reconstruction of all water wells. The Chapter sets forth certain technical requirements that appear to be purely ministerial in their application; however, the Chapter also refers to DWR Bulletin Nos. 74-81 and 74-1 and gives the Health Officer discretion to impose unspecified conditions on a permit, grant variances, and deny an application if in his/her

judgment it would defeat the purposes of the Chapter. Permit review considers whether a well would be location in an area where groundwater quality programs are known to exist or where a well will intersect more than 1 aquifer, among other things.

On August 29, 2018, the State Third Appellate District Court of Appeal published an opinion in *Environmental Law Foundation v. State Water Resources Control Board* (26 Cal.App.5th 844), a case that may impact future permitting of wells near navigable surface waters to which they may be hydrologically connected. The Court of Appeal found that while groundwater itself is not protected by the public trust doctrine, the doctrine does protect navigable waters from harm caused by extraction of groundwater if it adversely affects public trust uses. Further, it found that Siskiyou County, as a subdivision of the State, shares responsibility for administering the public trust. Similarly, the County is responsible for well permitting. Therefore, it has a responsibility to consider the potential impacts of groundwater withdrawals on public trust resources when permitting wells near areas where groundwater may be interconnected with navigable surface waters.

Moreover, California Supreme Court's decision in *Protecting Our Water and Environmental Resources v. County of Stanislaus* (10 Cal.5th 479 (2020)) held that Stanislaus County could not categorically classify its issuance of groundwater well construction permits as ministerial decisions exempt from environmental review under the California Environmental Quality Act (CEQA). The Monterey County Health Department, Environmental Health Bureau issues well permits and does inhouse CEQA review on all well application in consultation when need with County Counsel. If the well application is in conjunction with a building permit, EHB receives input from the County of Monterey Housing & Community Development. Although the Monterey County Code has not yet been amended in response to these cases, discretionary well permit review, where determined to be needed, may require analyses of the effects of pumping from new wells, including factors such as both the total volume and seasonal timing of extraction, how the new wells may affect nearby wells and regional groundwater levels, and whether the wells are located in area with overdraft conditions. GSPs have established SMC that provide quantifiable minimum thresholds that can be used in these evaluations.

As in the land use discussion, the Public Service element of the County's 2010 General Plan addresses permitting of individual wells. Table 3-5 summarizes the 2010 General Plan's water supply guidelines for the creation of new residential or commercial lots (Monterey County, 2010). Table 3-6 depicts the decision matrix from the Monterey County General Plan for permitting new residential or commercial wells for existing lots (Monterey County, 2010).

Table 3-5 County of Monterey Water Supply Guidelines for the Creation of New Residential or Commercial Lots

Major Land Groups	Water Well Guidelines
Public Lands	Individual Wells Permitted in Areas with Proven Long-Term Water Supply
Agriculture Lands	Individual Wells Permitted in Areas with Proven Long-Term Water Supply
Rural Lands	Individual Wells Permitted in Areas with Proven Long-Term Water Supply
Rural Centers	Public System; Individual Wells Allowed in limited situations
Community Areas	Public System

Table 3-6 County of Monterey Well Permitting Guidelines for Existing Residential and Commercial Lots

Characteristics of Property	Water Connection Existing or Available from the Water System	Not Within a Water System or a Water Connection Unavailable
Greater than or equal to 2.5 Acres connected to a Public Sewage System or an on-site wastewater treatment system	Process Water Well Permit	Process Water Well Permit
Less than 2.5 Acres and connected to a Public Sewage System	Process Water Well Permit	Process Water Well Permit
Less than 2.5 Acres and connected to an on-site wastewater treatment system	Do not Process Water Well Permit	Process Water Well Permit

3.5.4.1 Marina Coast Water District Ordinance No. 31

MCWD Ordinance No. 31 (codified as Chapter 3.32 of the MCWD Code and Ordinances) prohibits water wells to be constructed or reconstructed within the boundary of MCWD, except wells constructed by MCWD. Exceptions apply to shallow wells that are less than one-hundred feet deep for non-potable purposes and wells that predate the ordinance.

3.5.4.2 Well Construction Restrictions within the Former Fort Ord

County Ordinance No. 04011 of 2005 was adopted to prohibit and/or regulate new water wells in areas within the former Fort Ord due to groundwater contamination constraints. Well construction is prohibited in areas overlying or adjacent to the contamination plumes in the former Fort Ord (i.e., Prohibition Zone) and is subject to special review in areas that may be impacted by the contamination plumes (i.e., Consultation Zone). The Prohibition Zone and Consultation Zone within the former Fort Ord are shown on Figure 3-13 above.

3.5.4.3 Interim Moratorium on New Well Permits within Area of Impact (Expired)

County Ordinance No. 5302 and 5303 were interim urgency ordinances adopted to prohibit approval of wells in a defined, seawater intruded "Area of Impact" and in the Deep Aquifers of the Salinas Valley Groundwater Basin in the unincorporated area of Monterey County, due to the immediate threat to the public health, safety, and welfare posed by new wells in these areas. The ordinances are discussed in Section 3.2.2.2 and the "Area of Impact" is shown on Figure 3-11. The moratorium on well construction permit applications has expired since May 2021. Well construction applications for the Deep Aquifers are currently being reviewed and permitted on a case-by-case basis.

4 HYDROGEOLOGIC CONCEPTUAL MODEL

This section presents the hydrogeologic conceptual model (HCM) for the Subbasin. As described in the Hydrogeological Conceptual Model Best Management Practices (BMP) document (DWR, 2016a), an HCM provides, through descriptive and graphical means, an understanding of the physical characteristics of an area that affect the occurrence and movement of groundwater, including geology, hydrology, land use, aquifers and aquitards, and water quality. This HCM serves as a foundation for subsequent Basin Setting analysis, including water budgets (Chapter 6), numerical models, monitoring network development (Chapter 7), and the development of SMC (Chapter 8).

This HCM has been updated with newly available data and technical studies as part of the first GSP 5-year Periodic Evaluation and this Amendment. The updated HCM strengthens the historical understanding of the Subbasin presented in the submitted GSP to guide SGMA implementation with greater accuracy. This HCM update focuses on key areas where new data indicated an updated understanding was needed. The primary updates to this HCM include:

- Update of the location and character of the bedrock surface including offshore geology, and subsequently revising the primary aquifers above the bedrock as needed;
- Incorporation of the results of the *Deep Aquifers Study* (M&A, 2024a) by refining the extent and depth of the Aquitard that separates the 400-Foot Aquifer from the Deep Aquifers (400/Deep Aquitard);
- Incorporation of previous studies with new data to modify the coastal aquitards to refine known extents, gaps, and thin spots; and
- Based on the updated aquifers and aquitards, refined relationships with the Seaside Subbasin and the 180/400-Foot Aquifer Subbasin (180/400 Subbasin) and refined connection between the Coastal and Corral de Tierra Areas of the Monterey Subbasin.

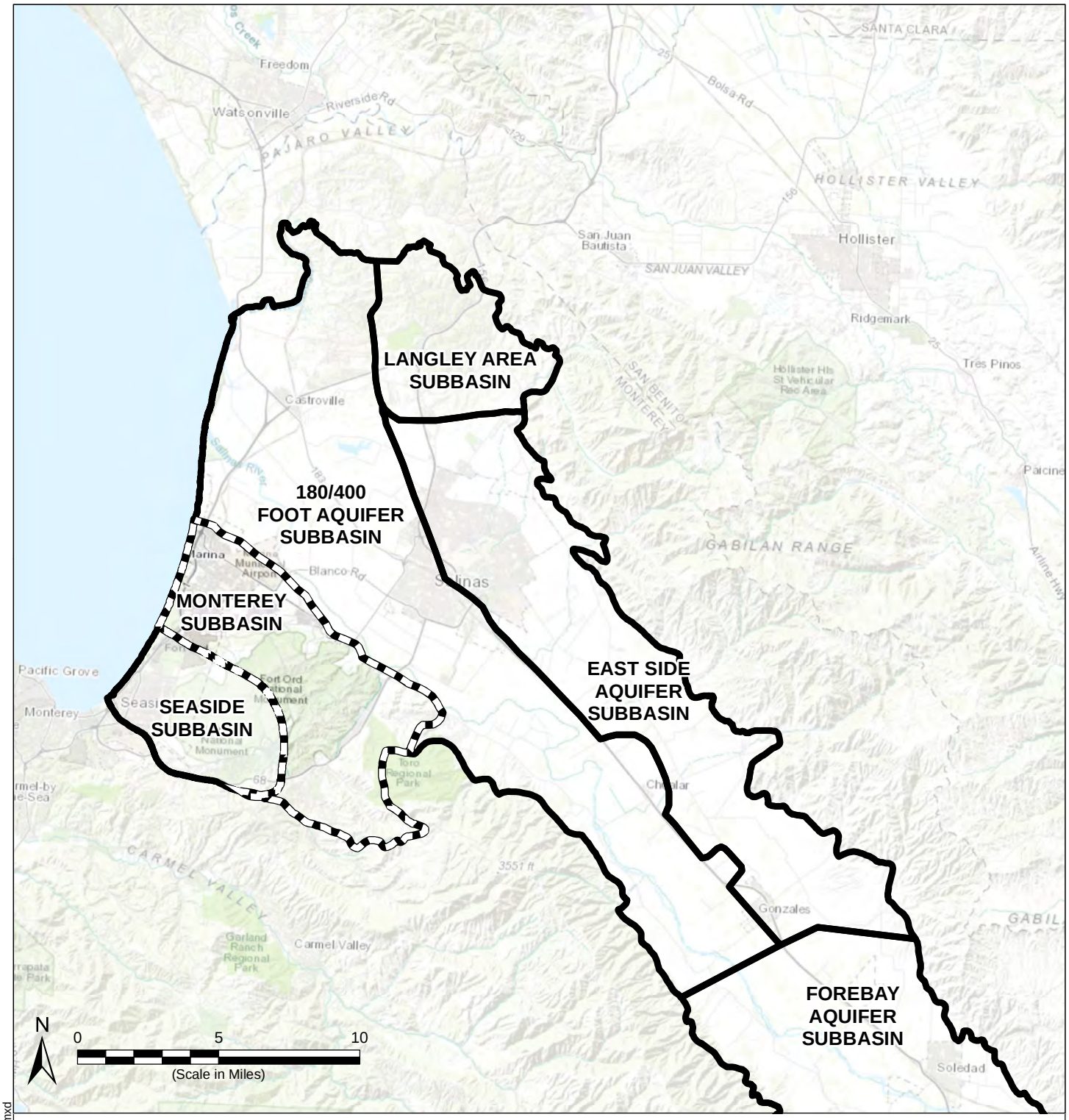
4.1 General Description

The Monterey Subbasin (Subbasin; DWR Basin No. 3-004.10) is located at the northwestern end of the Salinas Valley Groundwater Basin, an approximately 90-mile-long alluvial basin underlying the elongated, intermountain valley of the Salinas River. The Subbasin includes the portions of the Monterey Bay coastal plain, south of the approximate location of the Reliz Fault, as well as upland areas to the southeast of the coastal plain. The Subbasin is bordered by the 180/400 Subbasin to the northeast and by the adjudicated Seaside Subbasin to the southwest (Figure 4-1 and Figure 4-2).

4.1.1 Geological and Structural Setting

The Subbasin geology forms the physical framework in which groundwater occurs and moves. The geology described here is based on previously published scientific reports from investigations conducted by the USGS, State of California, other consulting firms, and academic institutions.

The Salinas Valley was formed through periods of structural deformation and periods of marine and terrestrial sedimentation in a tectonically active area on the eastern edge of the Pacific Plate. The water-bearing sediments of the Salinas Valley are over 2,000 feet thick in places and are composed of unconsolidated marine and alluvial sediments of Pliocene and younger age (Brown & Caldwell, 2015). Within the Monterey Subbasin, the water-bearing strata include river and sand dune deposits of Holocene and Pleistocene age, the Aromas Sand and Paso Robles Formation of Plio-Pleistocene age, the Purisima Formation of Pliocene age, and the Santa Margarita Formation of Miocene age (Greene, 1970; Harding ESE, 2001; Geosyntec, 2007). The Monterey Formation of Miocene age represents the relatively non-water-bearing bedrock that underlies the majority of the Subbasin (see Section 4.1.2.2, Bottom of the Basin).



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Sources

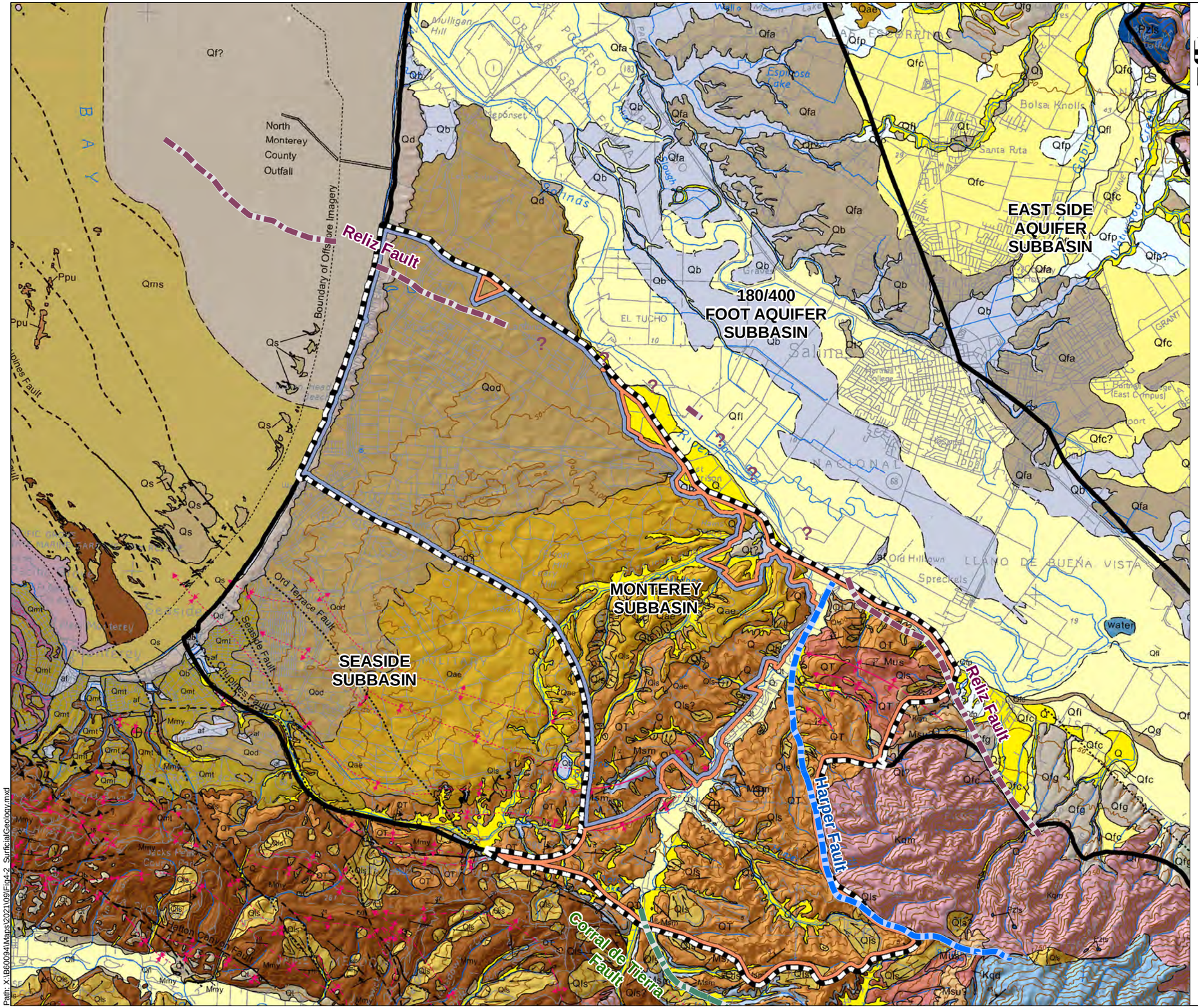
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 14 September 2021.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

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Salinas Valley Subbasins

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 4-1



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Estimated Fault Locations

- Corral de Tierra Fault
- Harper Fault
- Reliz Fault
- Anticlinal fold; solid where well located; dashed where inferred; dotted where concealed; queried where existence or continuation is uncertain.
- Synclinal fold; solid where well located; dashed where inferred; dotted where concealed; queried where existence or continuation is uncertain.

Surficial Geology Units

Q	Alluvium	QT	Plio-Pleistocene continental deposits
Qd	Dune sand	Qls	Landslide deposits
Qb	Basin deposits	Qod	Older Dune Sand
Qo	Older alluvium	Ppu	Purisima Formation
Qt	Terrace deposits	Msm	Santa Margarita Sandstone (Mv-Basalt interbed)
Qfl	Flood plain deposits	Mmy	Monterey Formation
Qar	Aromas Sand (undivided)	Msu	Unnamed Miocene sedimentary rocks
Qae	Eolian facies	Mus	Unnamed Miocene sandstone
Qaf	Fluvial facies	Kqm	Quartz monzonite

Sources

1. Basemap layers obtained from Department of Conservation, California of Geological Survey, "Geological Map of the Monterery 30'X60' Quadrangle and Adjacent Areas".
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

N

0 1.5 3

(Scale in Miles)

Surficial Geology

Monterey Subbasin
Groundwater Sustainability Plan
November 2021
Figure 4-2

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4.1.1.1 Geologic Formations

Major geologic units of the Monterey Subbasin are described below, starting at the ground surface and moving downwards through the strata from youngest to oldest. The corresponding designation on Figure 4-2 Surficial Geology is provided in parenthesis.

- *Alluvium, Flood Plain Deposits, Landslide Deposits (Q, Qfl, Qls)* – Holocene Alluvium consists of unconsolidated stream and basin deposits that occur at the base of eastern Subbasin hillslopes. These deposits have gradational contacts with the Floodplain Deposits (Qfl) that occur along El Toro Creek and its tributaries. The Floodplain Deposits consist predominantly of unconsolidated layers of mixed sand, gravel, silt, and clay that were deposited in a fluvial environment by the Salinas River and its tributaries. Numerous landslides are present in upland portions of the Subbasin such as San Benancio, Harper, and Corral de Tierra Canyons.
- *Older Dune Sand (Qod)* – This Pleistocene unit blankets most of the northwestern portions of the Subbasin and is the predominant surface deposit present in approximately one-third of the Subbasin. This unit only exists southwest of the Salinas River and is up to 250 feet thick. This sand is predominantly fine- to medium-grained, with thin, gentle to moderate cross-bedding (Harding ESE, 2001).
- *Older Alluvium (Qo)* – This Pleistocene unit comprises alternating, interconnected beds of fine-grained and coarse-grained deposits, predominantly associated with alluvial fan depositional environments. The Older Alluvium underlies the coastal Marina-Ord Area but is not exposed at the ground surface. This unit underlies the Older Dune Sand, and in the Marina-Ord Area has been referred to in some reports as Valley Fill Deposits, which is described as including an estuarine clay layer (Salinas Valley Aquitard) and underlying sand and gravel fluvial sequence (Harding ESE, 2001).
- *Aromas Sand (Qae)* – This Pleistocene unit is composed of cross-bedded sands containing some clayey layers (Harding ESE, 2001). This unit was deposited predominantly in eolian, high-energy alluvial, alluvial fan, and shoreline environments, with the predominant deposition environment being eolian (Harding ESE, 2001; Greene, 1970; Dupre, 1990). The Aromas Sand includes several cemented, clay-rich zones that act as caprock when exposed at the tops of hills, or can create perched zones within the formation (Harding ESE, 2001). The Aromas Sand extends into the northern portion of the 180/400 Subbasin (MCWRA, 2017). The Aromas Sand is exposed throughout the ridge and hilltops in the southeastern portion of the Subbasin, while the unit is buried beneath Older Dune Sand and Alluvium in the vicinity of the City of Marina. The thickness of the Aromas Sand varies within the Subbasin and is up to 300 feet thick (Harding ESE, 2001; Muir, 1982). Although a clayey or hard red bed is often observed at the basal contact with the underlying Paso Robles Formation, the stratigraphic relationship between the Aromas Sand and the Paso

Robles Formation is difficult to discern due to lithologic similarities and the complex interface between them (Harding ESE, 2001; Dupre, 1990).

- *Paso Robles Formation (QT)* – This Pliocene to lower Pleistocene unit is composed of lenticular beds of sand, gravel, silt, and clay from terrestrial deposition (Thorup, 1976; Durbin *et al.*, 1978). The depositional environment is largely fluvial but also includes alluvial fan, lake, and floodplain deposition (Harding ESE, 2001; Thorup, 1976; Greene, 1970). The individual beds of fine and coarse materials typically have thicknesses of 20 to 60 feet (Durbin *et al.*, 1978). Durbin *et al.* (1978) reports that the thickness of the Paso Robles Formation is variable due to erosion of the upper part of the unit. Varying thicknesses ranging from 500 feet to 1,000 feet are found within the Subbasin. Outcrops of the Paso Robles Formation occur in the central and southern portions of the Subbasin. The Paso Robles Formation has three main bodies: an upper, middle, and lower body (Harding ESE, 2001; HydroMetrics, 2009). The middle body of the Paso Robles Formation is clay-rich, and often separates the more productive zones of the upper and lower bodies (Harding ESE, 2001; HydroMetrics, 2009).
- *Purisima Formation (Ppu)* – This Pliocene unit consists of interbedded siltstone, sandstone, conglomerate, clay and shale deposited in a shallow marine environment (Greene, 1977; Harding ESE, 2001). The Purisima Formation has been found in boreholes near the cities of Marina and Seaside; however, the unit is missing from the more inland portions of the Monterey and Seaside Subbasins (Harding ESE, 2001; HydroMetrics, 2009; Geosyntec, 2007). The Purisima Formation ranges in thickness from 500 to 1,000 feet (Feeney and Rosenberg, 2003).
- *Santa Margarita Sandstone (Msm)* –The Miocene Santa Margarita Sandstone is a friable, arkosic sandstone. In the northern portion of the Subbasin, the Paso Robles Formation conformably overlies the Purisima Formation, which interfingers with the Santa Margarita Sandstone (Durbin, 2007; HydroMetrics, 2009). Towards the boundaries with the Seaside Subbasin and the Corral de Tierra Area, the Paso Robles unconformably overlies over the Santa Margarita Sandstone. Outcrops of the Santa Margarita Sandstone are found in the Corral de Tierra Area.
- *Monterey Formation (Mmy)* – The Monterey Formation (Miocene) is a shale or mudstone deposited in a shallow marine environment (Harding ESE, 2001; Greene, 1977). As discussed below, the Monterey Formation is relatively impervious. The top of the Monterey Formation is defined as the bottom of the Subbasin (Section 4.1.2.2). There is one small outcrop of Monterey Formation in the Corral de Tierra portion of the subbasin that anchors the bedrock at the surface near Toro Creek (Figure 4-12).
- *Unnamed Miocene Sandstone (Mus)* – An unnamed Miocene sandstone unit (Mus) underlies the Monterey Formation. The Mus unit consists of an upper part of marine arkosic sandstone and conglomerate; and a lower part of continental sandstone and conglomerate (Wagner et al., 2002). This unit is exposed in the Corral de Tierra Area

near the eastern and southern Subbasin boundaries. This unit is sometimes referred to as the Basal Sandstone in other reports (Geosyntec, 2007).

- *Unnamed Miocene Sedimentary Rocks (Msu)* – Miocene metamorphic sedimentary rocks (Msu) are deposited on granitic rocks of the Galiban Range. The Msu unit is comprised of granitic conglomerate and arkosic sandstone of marine and non-marine sources (Wagner et al., 2002). This unit is exposed in the Corral de Tierra Area near the eastern Subbasin boundary. These unnamed Miocene units (i.e., Mus and Msu) are approximately 250 feet thick (Geosyntec, 2007).

4.1.1.2 Surface Geology

As shown on Figure 4-2, the predominant surficial geologic unit covering the coastal plain portion of the Subbasin is "Qod" (i.e., Older Dune Sand [Pleistocene]). South of the coastal plain area, the Eolian facies of Aromas Sand “Qae” (Pleistocene) comprises the hills of the Fort Ord area. Further south near Highway 68 and in the Corral de Tierra Area, the predominant surficial geologic unit is “QT” (Paso Robles Formation [Plio-Pleistocene]). Other minor units in the area include "Q” (Alluvium [Holocene]), and “Qls” (Landslide Deposits [Pleisto-Holocene]), found in thin strips along the intermittent tributaries to El Toro Creek, which is a tributary to the Salinas River (as discussed above); and "Qls" (landslide deposits) that exist in pockets in the upland areas.

4.1.2 Subbasin Extent

4.1.2.1 Lateral Basin Boundaries

The Monterey Subbasin is bounded by the following combination of Subbasin boundaries and physical boundaries of the Salinas Valley Basin:

Two subbasins are adjacent to the Monterey Subbasin.

1. The 180/400 Subbasin. The northeastern boundary with the 180/400 Subbasin generally coincides with a buried trace of the Reliz Fault (DWR, 2016a) and is divided into two parts based on potential groundwater flow impacts. The Reliz Fault does not appear to be a barrier to groundwater flow between these subbasins in the northern area but may potentially impact groundwater flow in the southern area (see Section 4.2.2.3). In 2024, the bedrock surface in the Corral de Tierra was revised significantly based on new data. This updated interpretation improves the understanding of the hydraulic connectivity within the Subbasin, including locations of no or limited groundwater flow along the Toro Creek corridor. As a result, the potential for groundwater flow into the 180/400 Subbasin from the Corral de Tierra Area is more limited than previously conceptualized.
2. The Seaside Subbasin. The southwestern boundary with the Seaside Subbasin is based on an inferred groundwater divide. The boundary with the Seaside Subbasin was formally established in the Seaside Basin Adjudication Amended Decision (Superior

Court of California, 2007). However, recent data indicate more groundwater connection between these two areas than previously understood. In particular, the results of the Deep Aquifers Study found the Deep Aquifers are present within the Seaside Subbasin based on the identified extent of the 400/Deep Aquitard that terminates at the Laguna Seca Anticline. The revised bedrock surface in the Toro area indicates a shared 'bowl' between the Monterey Subbasin Corral de Tierra Area and the Seaside Subbasin Laguna Seca Area. Therefore, this GSP considers the hydraulic connection between both the coastal areas, and the Laguna Seca-Corral areas of the Seaside Subbasin and the Monterey Subbasin.

Two additional physical features bound the Monterey Subbasin.

1. The Monterey Bay shoreline. The Monterey Bay shoreline bounds the northwestern edge of the Subbasin. The Subbasin aquifers extend across this boundary into the subsurface underlying Monterey Bay and there are no hydrogeologic barriers limiting groundwater flow across this coastal boundary. The recent HCM updates included the Bay geology, extending the contacts between formations to Monterey Canyon where they crop out and are in contact with ocean water. The geometry of the Bay was also updated to reflect the most recent bathymetry. These changes are mainly geometry and geology focused and affirm that there are no hydrogeologic barriers to groundwater flow across the coastal boundary.
2. The Sierra de Salinas. The Sierra de Salinas bound the eastern and southern edge of the Subbasin. One part of this boundary follows the contact between Pleistocene units and the Cretaceous quartz monzonite, and another part of this boundary generally follows the contact between Pleistocene units and Miocene Monterey Formation rocks as shown on Figure 4-2.

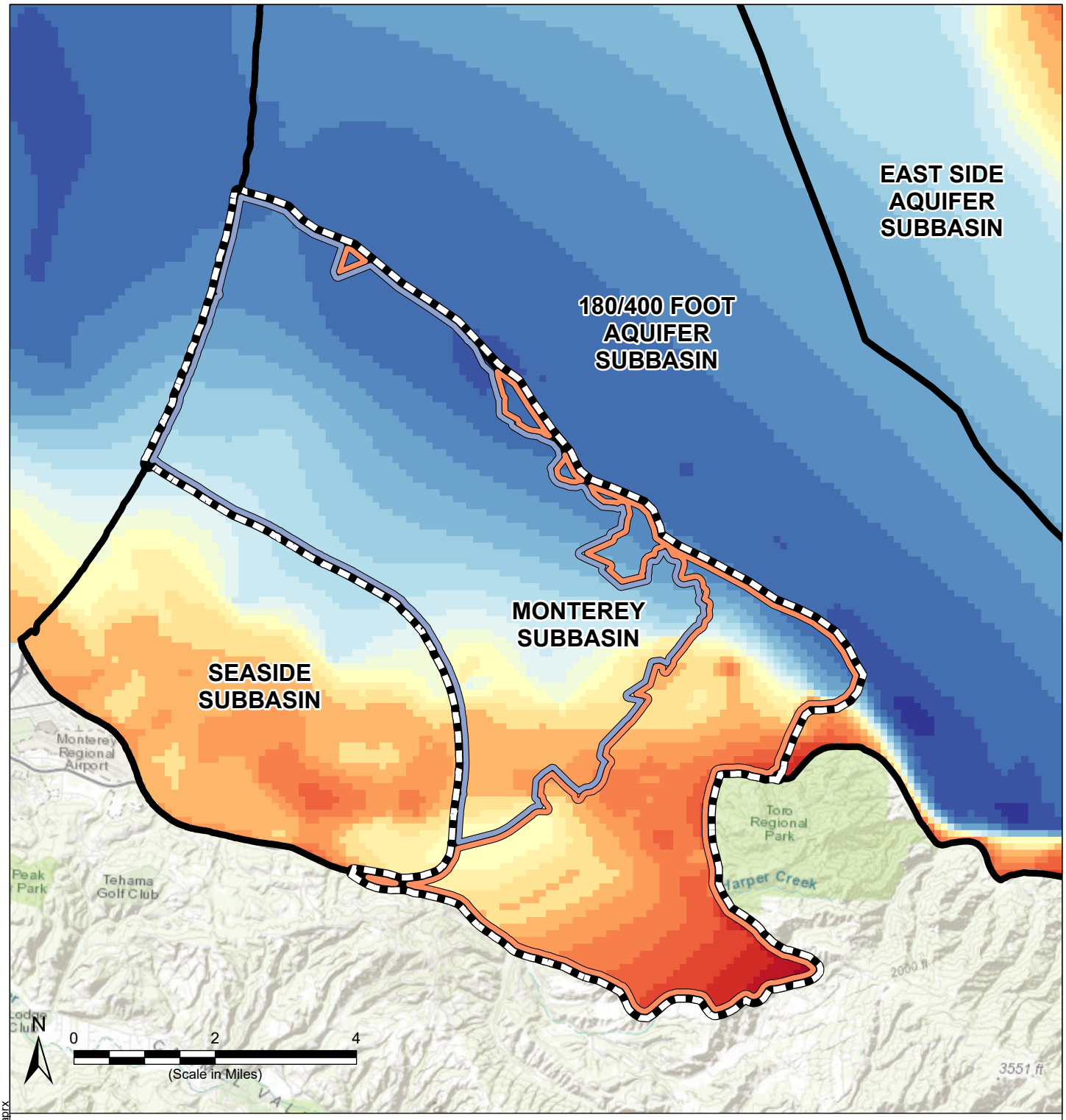
4.1.2.2 Bottom of the Basin

The base, or bottom, of the Subbasin has been updated in 2024 with newly available data, and expanded to include updates to offshore geology. The base of the groundwater basin is primarily defined as the top of Monterey Formation. The Monterey Formation has low hydraulic conductivity as it is comprised of shale and diatomite (Yates et al., 2002) and yields water that is generally of low water quality (Geosyntec, 2007). Figure 4-3 shows contours that define the top elevation of the Monterey Formation for most of the Monterey Subbasin.

The deepest groundwater production wells in the Subbasin generally extend to depths within the Purisima or Santa Margarita Formations above the Monterey Formation, and are found closer to the coast. Along the northeastern boundary of the Subbasin, where the Monterey Formation is overlain by the Purisima Formation (Durbin 2007, Yates et al., 2005, Greene 1970, Greene 1977), the deepest groundwater extractions are from MCWD wells MCWD-10, -11, and -12, which are screened across Paso Robles and Purisima Formations from 780 feet below ground surface (ft bgs) to 1,840 ft bgs. In the Corral de Tierra Area, many wells are screened in the Aromas Sand and Paso Robles Formation continental deposits as well as the Santa Margarita Sandstone.

Slightly south of the Corral de Tierra Area, in the watershed but outside of the Subbasin, a number of wells tap both the Monterey Formation and the unnamed sandstone and conglomerate unit (Geosyntec, 2007; Feeney and Rosenberg, 2003).

The top of the Monterey Formation ranges from an elevation of 1,000 feet NAVD88 in the Corral de Tierra Area to -2,400 feet NAVD88 near the coast. As shown on Figure 4-3 and Figure 4-4, there is a set of an east/northeast trending highs and lows on the surface of the Monterey Formation near the Marina Ord-Corral de Tierra boundary. This reflects the mapped structural deformation of the unit in this area illustrated by the pink anticline and synclines in Figure 4-2. Additionally, the depth to the Monterey Formation can illustrate the structural, depositional, and erosional complexity which defines this hydrostratigraphic setting (Figure 4-4).



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Basin Bottom Elevation (feet NAVD88)

-3,000 - -2,800	-799 - -600
-2,799 - -2,600	-599 - -400
-2,599 - -2,400	-399 - -200
-2,399 - -2,200	-199 - 0
-2,199 - -2,000	1 - 200
-1,999 - -1,800	201 - 400
-1,799 - -1,600	401 - 600
-1,599 - -1,400	601 - 800
-1,399 - -1,200	801 - 1,000
-1,199 - -1,000	1,001- 1,200
-999 - -800	1,201 - 1,400

Notes

1. All locations are approximate.

Sources

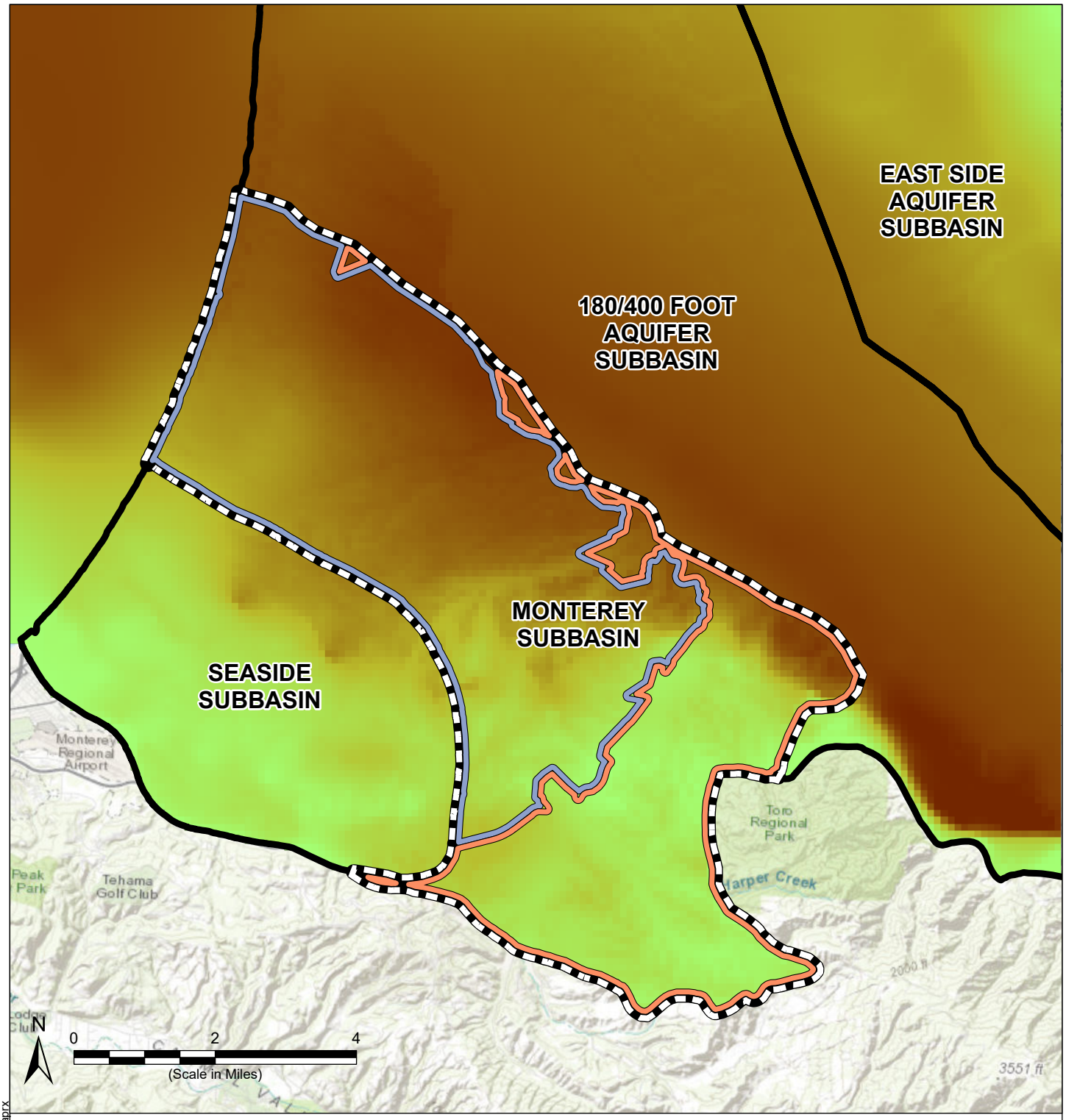
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 12 June 2026.

Bottom of the Basin – Top of the Monterey Formation

Monterey Subbasin
Groundwater Sustainability Plan
June 2026

Figure 4-3

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Amendment_fig4-3.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Depth to Top of Monterey Formation (ft bgs)

High : 3133

Low : 0

Abbreviations

Ft bgs = feet below ground surface

Notes

1. All locations are approximate.
2. The depth to the top of the Monterey Formation is obtained from subracting the elevation of the top of the Monterey Formation (Figure 4-3) from ground surface elevation.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 15 June 2026.

Depth to Top of the Monterey Formation

Monterey Subbasin
Groundwater Sustainability Plan
June 2026

Figure 4-4

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Amendment_fig4-4.aprx

4.1.3 Physical Characteristics

4.1.3.1 Topographic Information

Figure 4-5 shows the topography within the Monterey Subbasin. Topography generally slopes down to the northwest towards Monterey Bay, ranging from sea level at the shoreline to 1,900 feet mean sea level (ft msl) in the southeastern corner of the Subbasin.

In the coastal area of the Subbasin, the topography is shaped by active coastal sand dunes, followed by coastal plain and older stabilized sand dunes. Coastal sand dunes are present along a narrow quarter-mile-wide stretch of land where the Subbasin meets the bay. These coastal dunes rise to approximately 100 feet in elevation and grade eastward into a narrow coastal plain varying in width from one to two miles. Older sand dunes dominate the topography in the northwestern portion of the Subbasin and the majority of the Marina-Ord Area (CH2M, 2004). As a result, there are few well-defined drainages in this portion of the Subbasin.

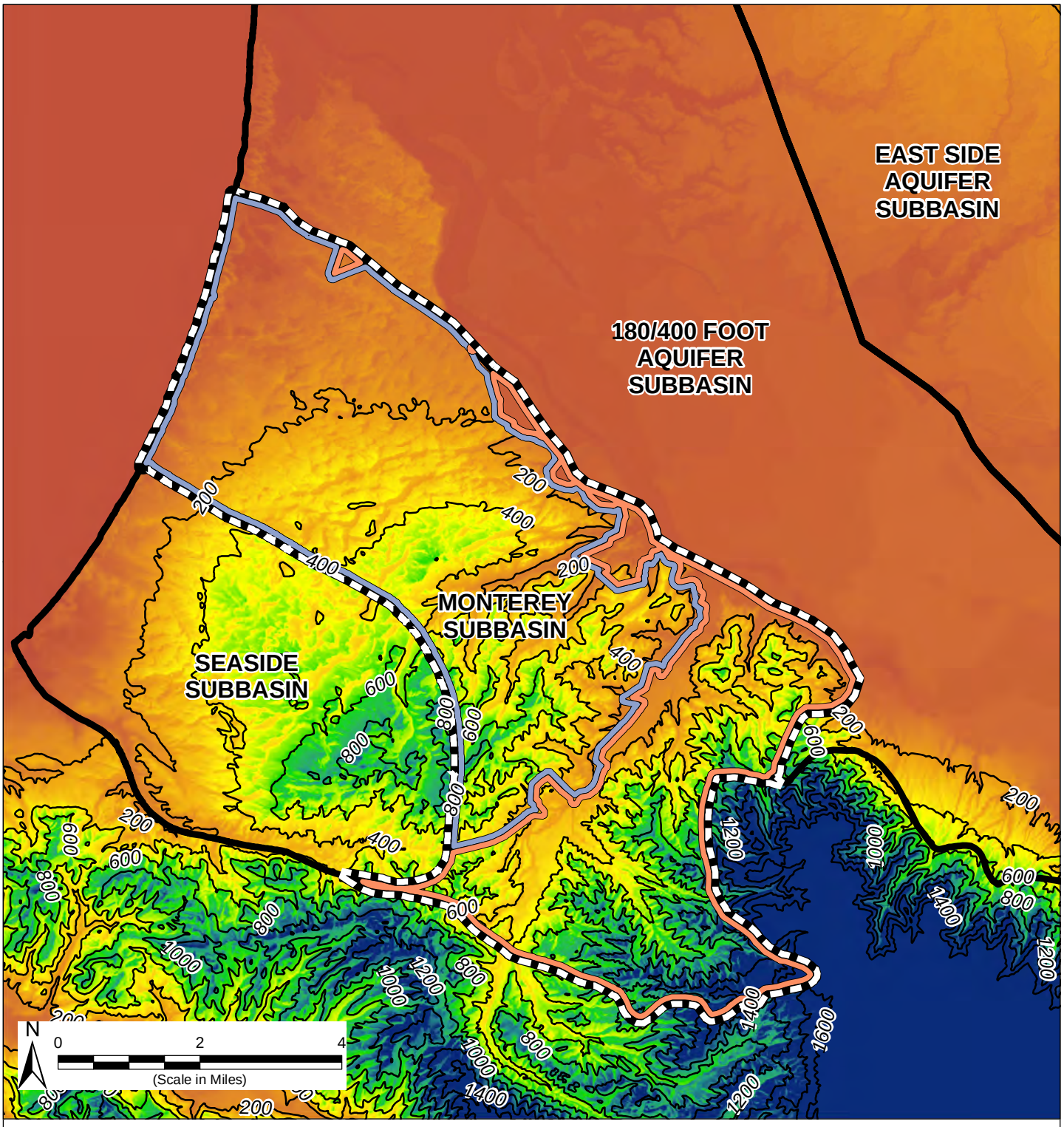
The topography of the southeastern uplands area is characterized by low hills and small sub-watersheds with well-defined drainages. Runoff from these areas is northeastward towards the Salinas River by way of El Toro Creek or other smaller tributaries.

4.1.3.2 Soil Characteristics

The soils of the Subbasin are derived from the underlying geologic formations and influenced by the historical and current patterns of climate and hydrology. Soil types can influence groundwater recharge and are an important consideration for the siting of potential artificial recharge projects.

Soils within the Subbasin are shown on Figure 4-6, and are based on the U.S Department of Agriculture Natural Resources Conservation Service Soil Survey Geographic Database (SSURGO). Soils within the Subbasin are relatively coarse in texture, with the predominant types being sand, loamy sand, and fine sandy loam. Textures are generally coarser near the coast and finer to the south.

Figure 4-7 shows the infiltration potential of soils based on SSURGO's Hydrologic Soil Group designations. Soils within the Subbasin are predominantly of Hydrologic Soil Group A in the coastal plain area, indicating high infiltration rates and low runoff potential. In the Fort Ord hills area, soils predominantly belong to Hydrologic Soil Groups C and D, with below-average and low infiltration rates, respectively, and moderately high and high runoff potential, respectively. A mix of Hydrologic Soil Groups A through D exist in the Corral de Tierra Area east of El Toro Creek.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Elevation Contour (200-ft interval)

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Land Surface Elevation (ft msl)

High : 1500
1200
900
600
300
Low : 0

Sources

1. Surface elevation data obtained from USGS NED (https://viewer.nationalmap.gov/basic/).

Abbreviations

ft = feet
ft MSL = feet mean sea level

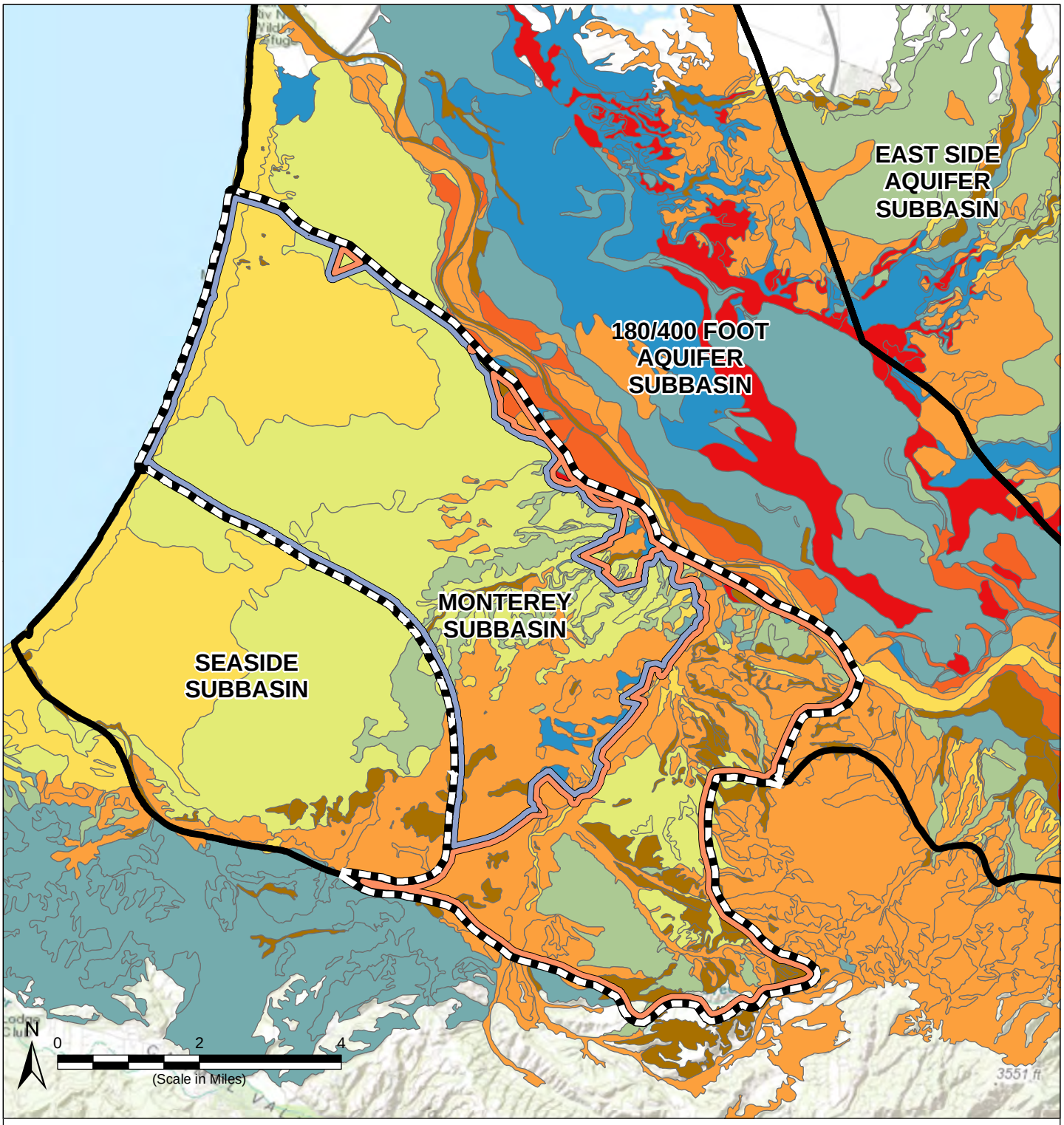
Notes

1. All locations are approximate.

Topography

Monterey Subbasin
Groundwater Sustainability Plan
November 2021
Figure 4-5

Path: X:\B60094\Maps\2021\09\Fig4-5_Topography.mxd



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Soil Texture

- Other
- Clay
- Clay Loam
- Loam
- Loamy Sand
- Sand
- Sandy Loam
- Silt Loam
- Silty Clay

Abbreviations

DWR	= California Department of Water Resources
MCWD	= Marina Coast Water District
SSURGO	= Soil Survey Geographic Database

Notes

1. All locations are approximate.
2. Soil textures are based on map units extracted from SSURGO database (https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx) and generalized into soil texture categories. Only the soil units of greatest extent are included in their own category. Additonal soil units grouped as "Other".

Sources

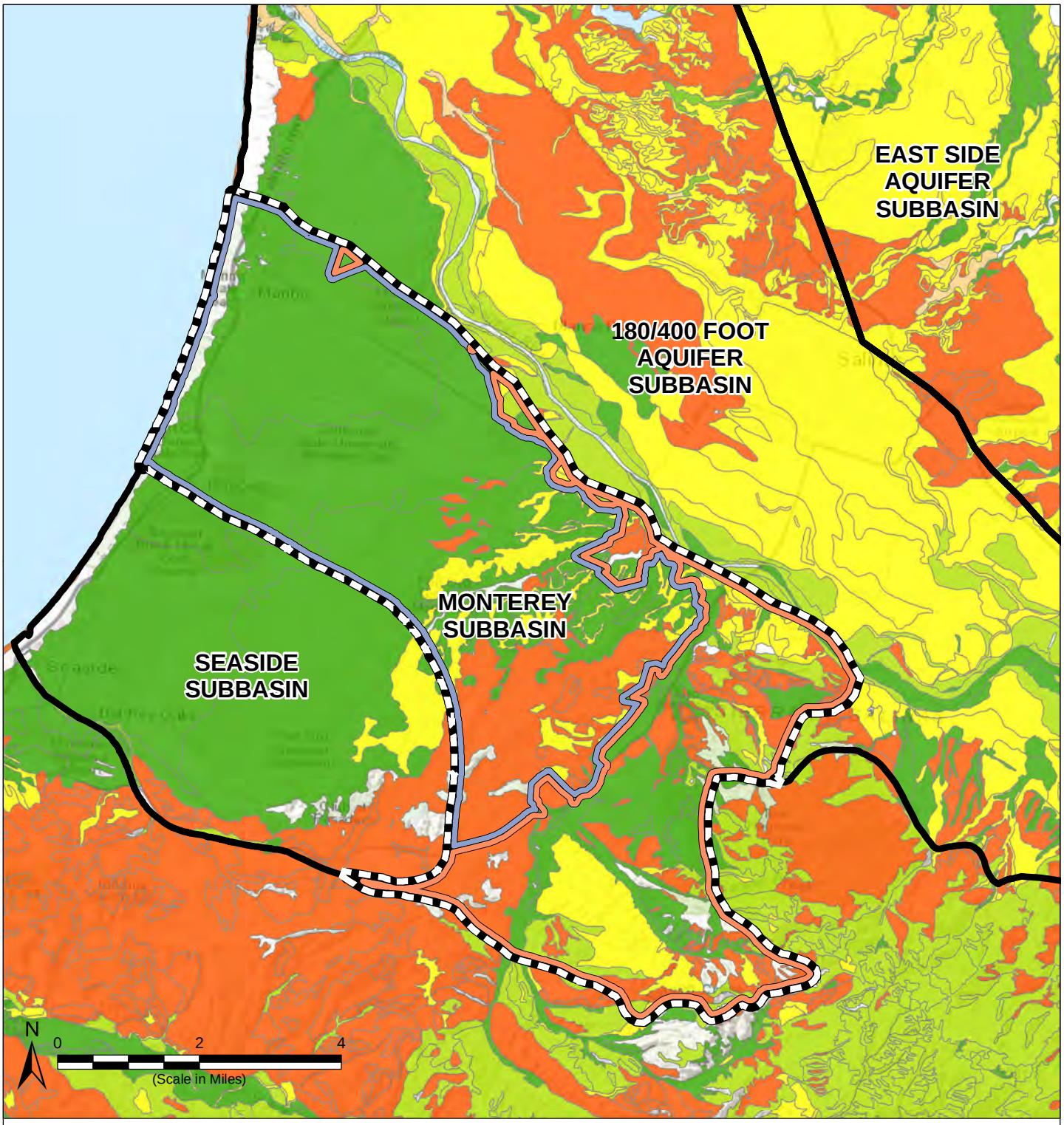
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 14 September 2021.
2. Soil data is obtained from SSURGO (https://gdg.sc.egov.usda.gov/GDGOrder.aspx#).

Soil Map Units

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 4-6

Path: X:\B60094\Maps\2021\09\Fig4-6_SoilMapUnit.mxd



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra

Hydrologic Soil Groups

- A: High Infiltration Rate
- B: Moderate Infiltration Rate
- C: Slow Infiltration Rate
- D: Very Slow Infiltration Rate

Abbreviations

SSURGO = Soil Survey Geographic Database

Notes

1. All locations are approximate.
2. Hydrologic soil groups are per Source 2.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 14 September 2021.
2. Soil data is obtained from SSURGO (https://gdg.sc.egov.usda.gov/GDGOrder.aspx#).

Hydrologic Soil Groups

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 4-7

Path: X:\B60094\Maps\2021\09\Fig4-7_HydroSoilGroup.mxd

4.1.3.3 Recharge and Discharge Areas

Most of the Marina-Ord Area has good recharge potential for the Dune Sand Aquifer, which subsequently has the potential to recharge the underlying 180-Foot and 400-Foot Aquifers due to the high infiltration potential of the soils. This recharge is discussed further below in the general water quality section. There is still uncertainty regarding the location and recharge mechanism for the Deep Aquifers (see discussion for each aquifer in Section 4.2.2). Additionally, due to the prevailing hydraulic gradient, the Subbasin currently receives an inflow of seawater across the coastal northwestern boundary. Return flow from urban irrigation is not a significant source of recharge, and there are currently no artificial recharge projects within the Subbasin. Discharge of groundwater from the Subbasin is predominantly through groundwater pumping from private and municipal supply wells and groundwater remediation extraction wells, as well as agricultural pumping for the relatively small area of irrigated lands adjacent to Reservation Road and the 180/400 Subbasin.

Soils of varying infiltration potential exist in the Corral de Tierra Area. Recharge from precipitation to the Aromas Sand/Paso Robles continental deposits and the Santa Margarita Sandstone in the southern Corral de Tierra Area is approximately 2 to 3 inches of the total annual precipitation (Geosyntec, 2007; Fugro, 1996). This equals around 10 to 20 percent of average precipitation, which is approximately 16 inches of rain per year (Fugro, 1996). There is also a minimal volume of recharge from septic systems, and it is assumed that this recharge is to the shallow alluvial sediments (Yates et al., 2002). Recharge to the unnamed sandstone and conglomerate likely occurs in areas of higher elevation in the Sierra de Salinas south of the Monterey Subbasin (Geosyntec, 2007).

According to several previous investigations, groundwater discharge to El Toro Creek causes the creek to flow perennially starting at a location below the Corral de Tierra Country Club. Streamflow data for the period 1961 to 2001 from USGS gage 11152540, located north of San Benancio Road, indicate a mean annual streamflow of 1,590 AFY (Geosyntec, 2007), which is attributable to a combination of groundwater discharge and what portion is attributable to runoff. Recent revisions to the bedrock indicate this streamflow may be more related to the bedrock rise in this vicinity.

4.2 Subbasin Hydrogeology

The Monterey Subbasin is hydrostratigraphically complex and represents a transition zone between the more defined, laterally continuous aquifer system along the central axis of the Salinas Valley and the less continuous aquifer systems towards the Sierra de Salinas. Past hydrostratigraphic analyses of the Subbasin have generally focused on areas where groundwater production and remediation activities have occurred, i.e., in the vicinity of the City of Marina, in the eastern portion of the former Fort Ord, and within the southern Corral de Tierra Area. Limited subsurface information exists in the central portion of the Subbasin (i.e., the BLM-managed Federal Land area). The description of the hydrogeology presented herein is based on the best available information for the Subbasin, which was updated in 2024 and refines previously

published understandings. Hydrogeologic information for the Marina-Ord Area and the Corral de Tierra Area are described independently given the uncertainty regarding the hydrogeologic connections between these areas.

4.2.1 Cross Sections

Figure 4-8 through Figure 4-12 present cross sections that illustrate the geologic setting within the Subbasin. These cross sections represent the updates to the HCM from both the Deep Aquifers Study as well as other revisions using the most recently available data. These cross sections show conceptual understanding of the principal aquifers as they were determined through analysis of AEM and well completion report data. The model layers reflect hydrostratigraphy more than the geology, particularly as some principal aquifers include portions of geologic units, and other principal aquifers represent more than one geologic unit, depending on their hydrologic function.

Together, the cross sections provide an updated interpretation of the Subbasin's HCM and support evaluation of groundwater connectivity across key areas of the Subbasin. The sections illustrate both areas where principal aquifers appear to be continuous across subbasin boundaries and areas where structural features may locally restrict or influence groundwater flow.

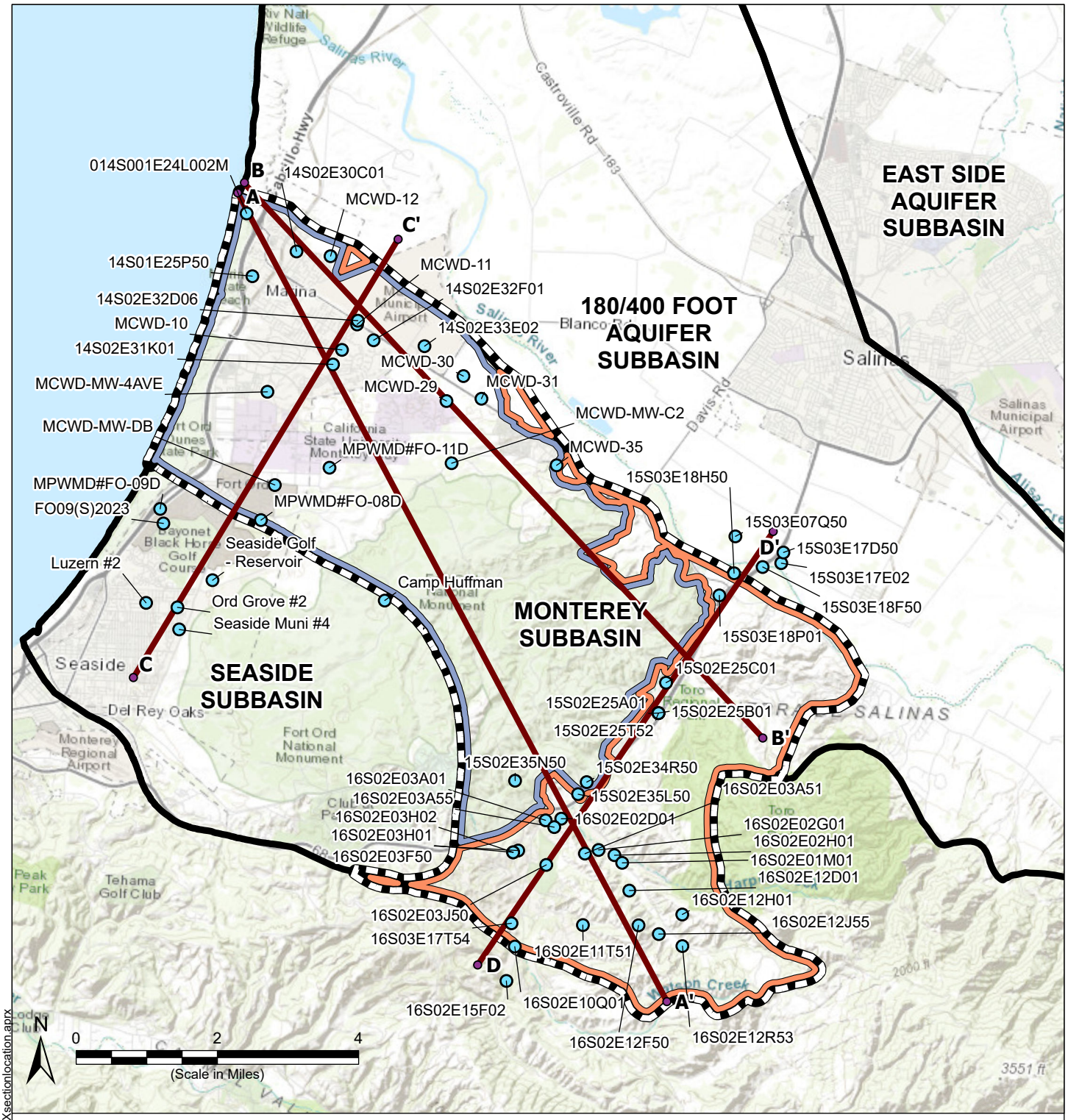
Cross section A-A' (Figure 4-9) extends from the northwestern end of the Marina-Ord Area to the southeastern end of the Corral de Tierra Area. This cross section is drawn generally along the longest diagonal of the Subbasin and intersects all of the Subbasin's principal aquifers. The section shows the structural uplift over the Laguna Seca Anticline, which raised the Monterey Formation shown in gray as bedrock. This uplift resulted in greater erosion of the formations and sediments above the bedrock in the Corral de Tierra Area. As a result, the uplift may act as a partial barrier to groundwater flow in the overlying Santa Margarita and Paso Robles Formations. These conditions limit the potential for groundwater flow between the Corral de Tierra/San Benancio bowl portion of the Corral de Tierra Area and the Marina-Ord Area.

Cross section B-B' (Figure 4-10) is located near the Monterey-180/400 Subbasin boundary and extends across the Marina-Ord Area and the eastern Highway 68 bowl of the Corral de Tierra Area. Similar to Cross Section A-A', this section shows structural uplift along the northern end of the Laguna Seca Anticline. The section indicates that the 400-Foot Aquifer, interpreted as the upper Paso Robles Formation, is not present in the Corral de Tierra Area. However, the lower Paso Robles Formation, which constitutes portions of the Deep Aquifers, appear to be at least partially continuous across the Laguna Seca Anticline between the Marina-Ord and Corral de Tierra Areas.

Cross section C-C' (Figure 4-11) extends through the Marina-Ord Area generally parallel to the coastline. This section illustrates the hydrostratigraphic connectivity among the coastal portions of the 180/400, Monterey, and Seaside Subbasins. The 400/Deep Aquitard and Deep Aquifers are present continuously across the three subbasins, and no subsurface barrier to groundwater flow is identified along this section. This section also shows the transition from the hydrostratigraphic

units of the northern Salinas Valley to the aquifer delineations used in the Seaside Subbasin. The Salinas Valley Aquitard, Intermediate 180-Foot Aquitard, and 180/400-Foot Aquitard terminate within the Monterey Subbasin. Although the Dune Sand and Aromas Sand geologic units extend into the Seaside Subbasin, they are generally located above the saturated zone in this area and are not used for groundwater production.

Cross section D-D' (Figure 4-12) extends through the Corral de Tierra Area and shows structural deformation that has potential impacts on groundwater flows. Based on both AEM and surface geology data, the bedrock (as Monterey Formation) is lifted up near Toro Creek at San Benancio Road and near the Reliz Fault. Analysis of the new data supports the delineation of two structural 'bowls' within the Corral de Tierra Area: the Corral de Tierra/San Benancio bowl and the eastern Highway 68 bowl. The Corral de Tierra/San Benancio bowl appears to be partially isolated from both the coastal area, 180/400 Subbasin, and the Laguna Seca due to areas where the bedrock rises; however, there is likely some degree of hydraulic connection.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Section Locations
- Section Wells

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 7 July 2026.

Cross-Section Locations

Monterey Subbasin
Groundwater Sustainability Plan
July 2026

Figure 4-8

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Amendment_fig4-8_Xsectionlocation.aprx

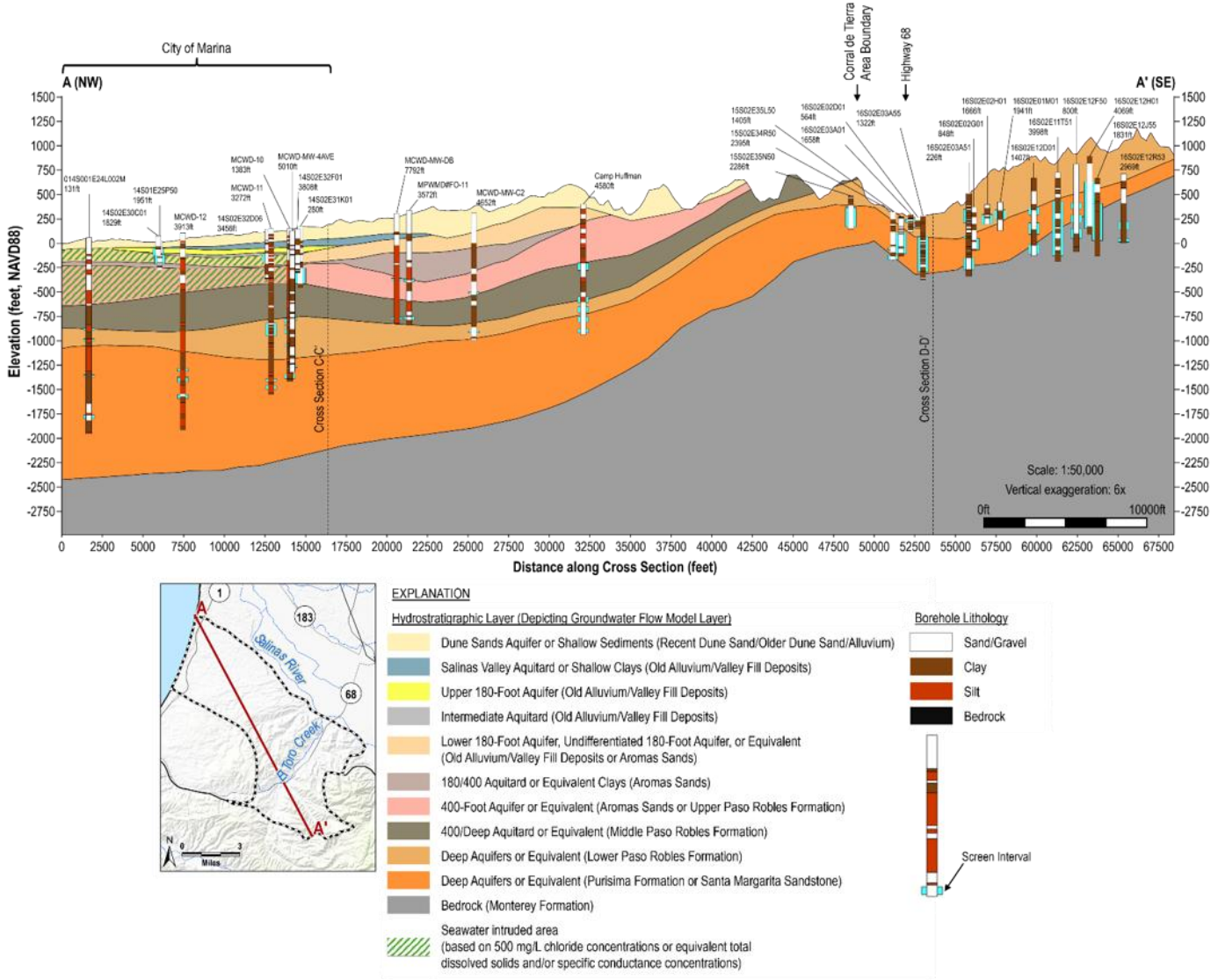


Figure 4-9 Cross-Section A-A'

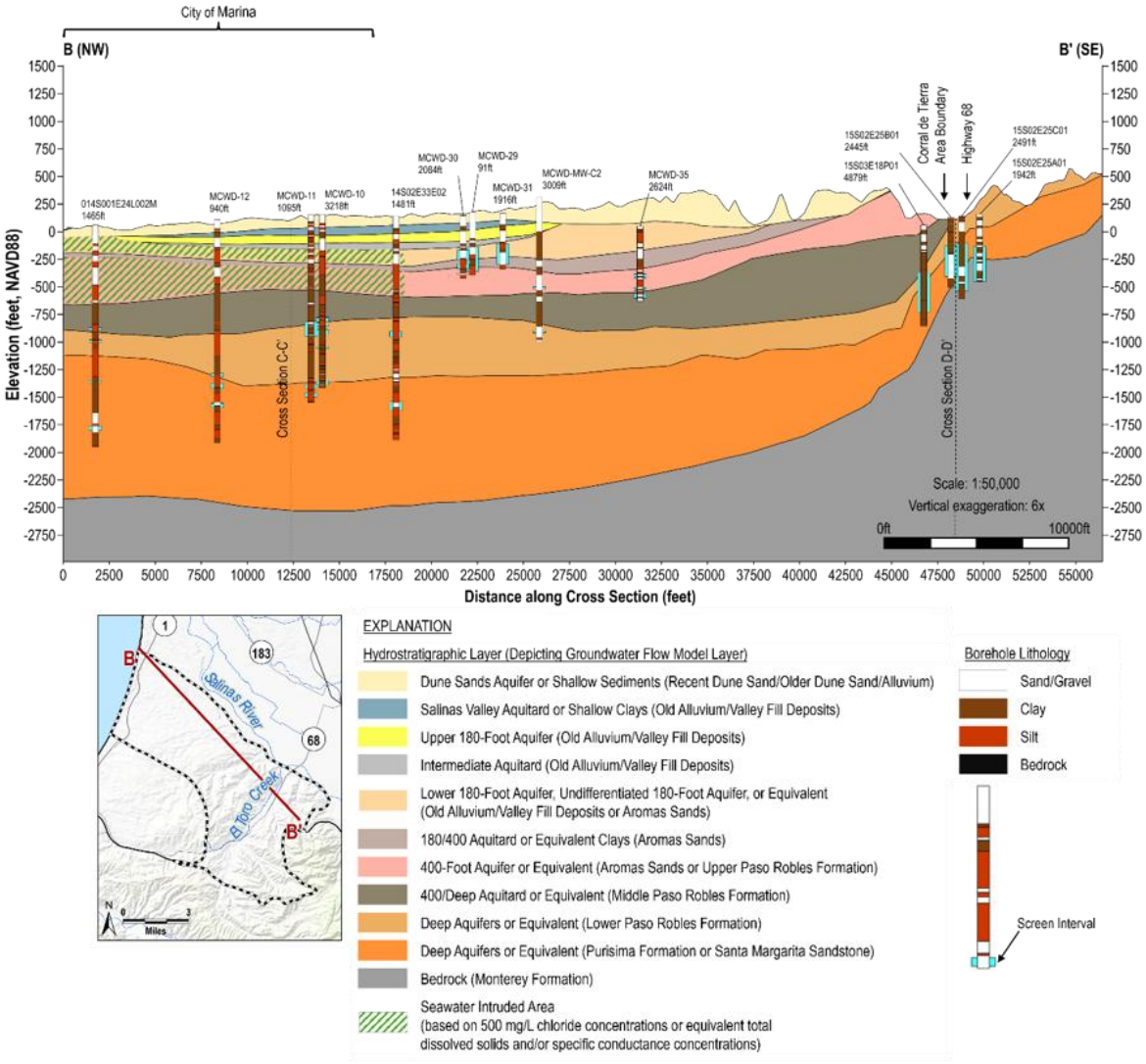


Figure 4-10 Cross-Section B-B'

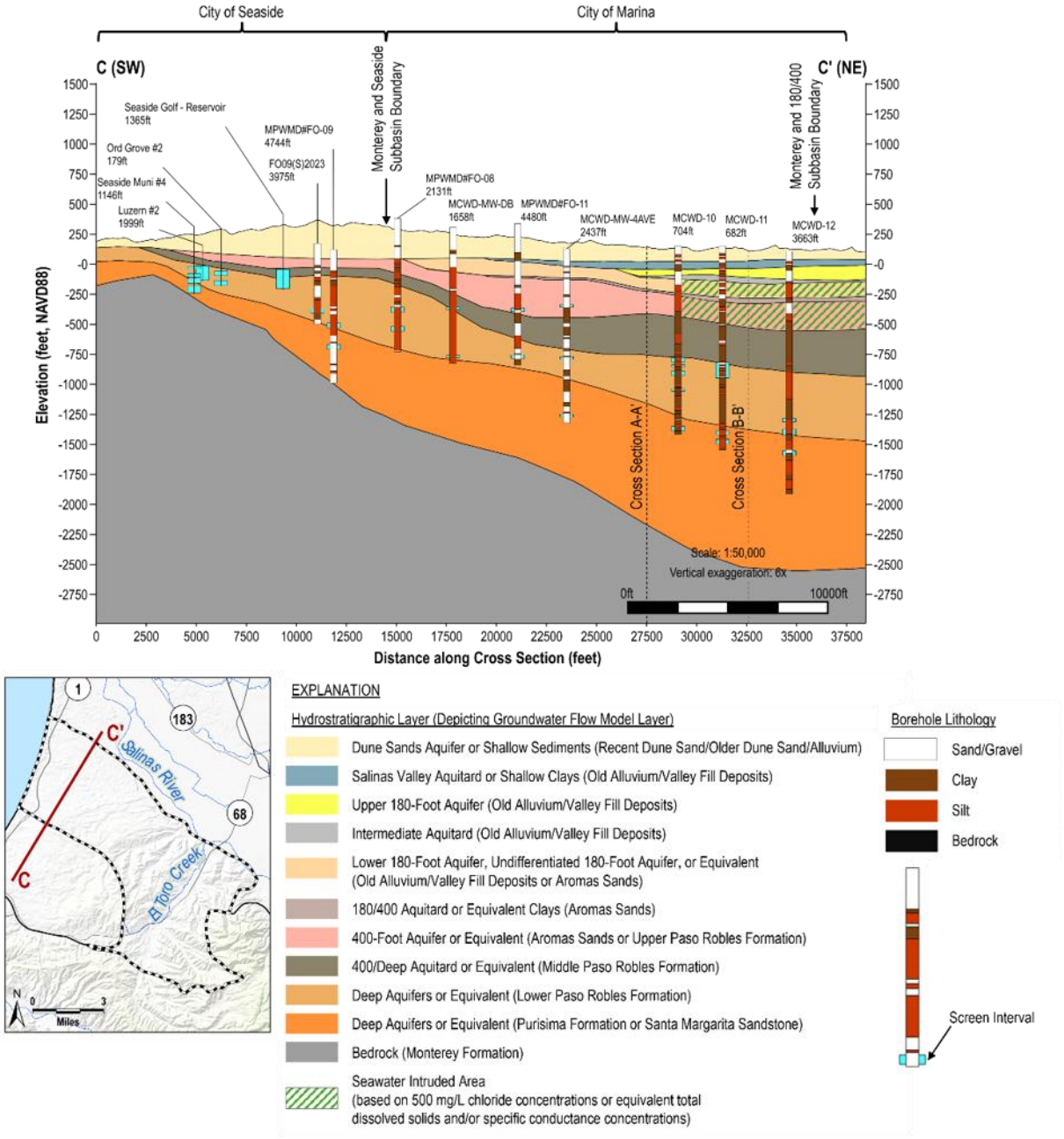


Figure 4-11 Cross-Section C-C'

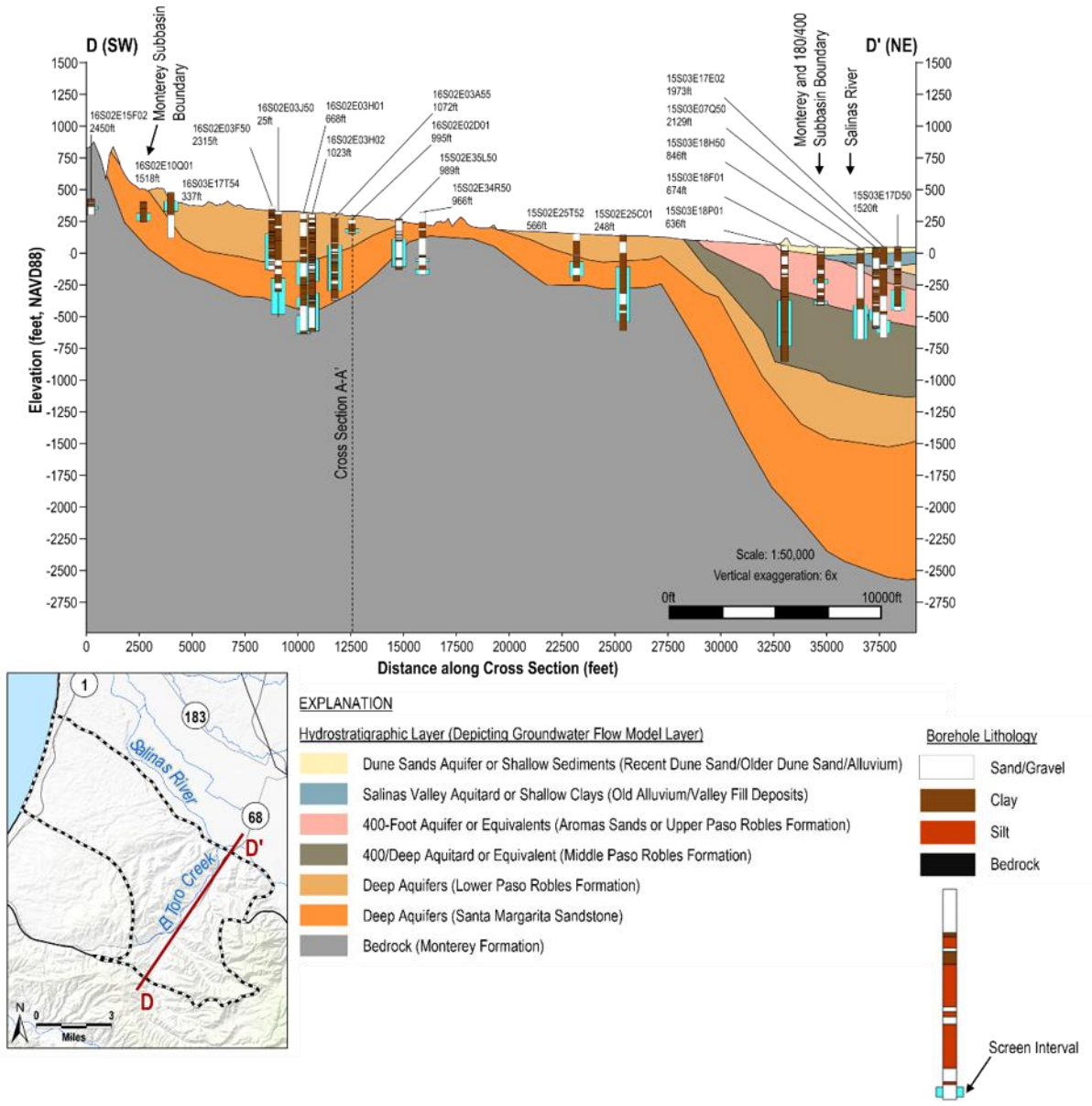


Figure 4-12 Cross-Section D-D'

4.2.2 Principal Aquifers and Aquitards

Hydrostratigraphy in the Marina-Ord Area consists of a series of laterally continuous aquifers consistent with the aquifers that form the distinguishing features of the northern Salinas Valley. The aquifers that have historically been identified in the Marina-Ord Area in previous reports include the unconfined Dune Sand Aquifer and the confined aquifers known as the 180-Foot Aquifer, the 400-Foot Aquifer, and the Deep Aquifers. Within the southern Corral de Tierra Area, the aquifers have historically been described by their geologic names, such as the Aromas Sand, Paso Robles Formation, and Santa Margarita Sandstone (Geosyntec, 2007; Yates, 2005). Based on the best available information, these geologic formations are grouped together to form the El Toro Primary Aquifer System for the Corral de Tierra Area, which is described in more detail below. These geologic formations also comprise portions of the 400-Foot Aquifer and the Deep Aquifers in the northern Salinas Valley including the Marina-Ord Area. Even though the geology is the foundation for the principal aquifers of the Subbasin, the principal aquifers are not solely determined by the geologic formations. Rather, the hydrologic functions of the sediments comprising the formations are the basis of the hydrostratigraphy that governs groundwater flows and other relationships. These relationships will be described in more detail in the sections below.

The following set of principal aquifers and aquitards are defined in the Monterey Subbasin:

- Dune Sand Aquifer
- Fort-Ord/Salinas Valley Aquitard
- 180-Foot Aquifer
- 180/400-Foot Aquitard
- 400-Foot Aquifer
- 400/Deep Aquitard
- Deep Aquifers
- El Toro Primary Aquifer System

The principal aquifer and aquitard designations and relationships to geologic formations are illustrated in Table 4-1. This table is based on the 2017 Monterey County Water Resources Agency's *Recommendations to address the expansion of seawater intrusion in the Salinas Valley groundwater basin* report, but has been modified to reflect specific hydrogeologic conditions and relationships within the Subbasin (Harding ESE, 2001; Feeney and Rosenberg, 2003).

Table 4-1 Generalized Geologic-Hydrogeologic Relationships

<table>
<tr><th>Period/Epoch</th><th>Geological Unit</th><th>Principal Aquifers and Aquitards
Corral de Tierra Area</th><th>Principal Aquifers and Aquitards
Marina-Ord Area</th></tr>
<tr><td>Holocene</td><td>Recent Dune Sand (Qd)
Older Dune Sand (Qod)</td><td rowspan="3">N/A</td><td>Dune Sand Aquifer</td></tr>
<tr><td rowspan="4">Pleistocene</td><td rowspan="2">Old Alluvium/Valley Fill Deposits (Qo/Qvf)</td><td>Fort Ord-Salinas Valley Aquitard</td></tr>
<tr><td rowspan="2">180-Foot Aquifer</td></tr>
<tr><td rowspan="2">Aromas Sand (Qae)</td></tr>
<tr><td>180/400-Foot Aquitard</td></tr>
<tr><td rowspan="3">Paso Robles Formation (QT)</td><td rowspan="4">El Toro Primary Aquifer System</td><td rowspan="2">400-Foot Aquifer</td></tr>
<tr><td>400/Deep Aquitard</td></tr>
<tr><td rowspan="2">Pliocene</td><td rowspan="3">Deep Aquifers</td></tr>
<tr><td>Purisima Formation (Ppu)</td></tr>
<tr><td rowspan="2">Miocene</td><td>Santa Margarita Formation (Msm)</td></tr>
<tr><td>Monterey Formation (Mmy)</td><td>N/A
(Minimally Water-Bearing) Bedrock</td><td>N/A
(Minimally Water-Bearing) Bedrock</td></tr>
</table>

Not all of these principal aquifers occur across the entire Monterey Subbasin due to the complex geologic setting present. The Dune Sand, 180-Foot, and 400-Foot Aquifers are generally not present in the Corral de Tierra Area, although they are present in the Marina-Ord Area. The Paso Robles, Santa Margarita, and Purisima Formations are generally present across the whole subbasin, even though the correlated principal aquifers are not. However, the presence of the same geologic unit does not mean the same hydrostratigraphy or hydraulic connectivity is present. Principal aquifers of the Marina-Ord Area and Corral de Tierra Area are discussed in Section 4.2.2.1 and 4.2.2.2, respectively. Connectivity of the principal aquifers within the Monterey Subbasin and across adjacent subbasins are discussed in Section 4.2.2.3.

4.2.2.1 Marina-Ord Area

Water-bearing geologic units in the Marina-Ord Area include the Dune Sands, the Old Alluvium/Valley Fill Deposits, the Aromas Sand, the Paso Robles Formation, the Santa Margarita Sandstone, and the Purisima Formation. These geologic units form a series of laterally continuous

aquifers consistent with the aquifers that form the distinguishing features of the northern Salinas Valley. The following set of principal aquifers and aquitards are defined in the Marina-Ord Area:

- Dune Sand Aquifer
- Fort-Ord/Salinas Valley Aquitard
- 180-Foot Aquifer
- 180/400-Foot Aquitard
- 400-Foot Aquifer
- 400/Deep Aquitard
- Deep Aquifers

Dune Sand Aquifer

The Dune Sand Aquifer is composed of fine to medium, well-sorted dune sands of Holocene age (Ahtna Engineering, 2013). The Dune Sand Aquifer is also sometimes referred to as the "A-Aquifer" beneath Fort Ord (Harding Lawson Associates (HLA, 1994; Jordan et al., 2005; Harding ESE, 2001). Groundwater in the Dune Sand Aquifer is unconfined. The aquifer is perched away from the coast, in areas where the Fort Ord-Salinas Valley Aquitard (FO-SVA) exists and groundwater in the 180-Foot Aquifer has fallen below the bottom elevation of the FO-SVA. It is hydraulically connected to the underlying 180-Foot Aquifer in areas nearer to the coast. The average saturated thickness of the Dune Sand Aquifer is approximately 50 feet. As shown on Figure 4-7, the sandy soils of this aquifer have high infiltration potential.

A north-south trending groundwater divide exists in the Dune Sand Aquifer. West of the groundwater divide, groundwater in the Dune Sand Aquifer flows westward, and both recharge the 180-Foot Aquifer and flow to the Pacific Ocean near the edge of the FO-SVA. Water from the Dune Sand Aquifer that recharges the 180-Foot Aquifer flows in response to gradients in the 180-Foot Aquifer, which is currently eastward (i.e., inland). East of the groundwater divide, groundwater in the Dune Sand Aquifer flows northeastward towards the Salinas River. A conceptual model of this groundwater flow is shown on Figure 4-13 below.

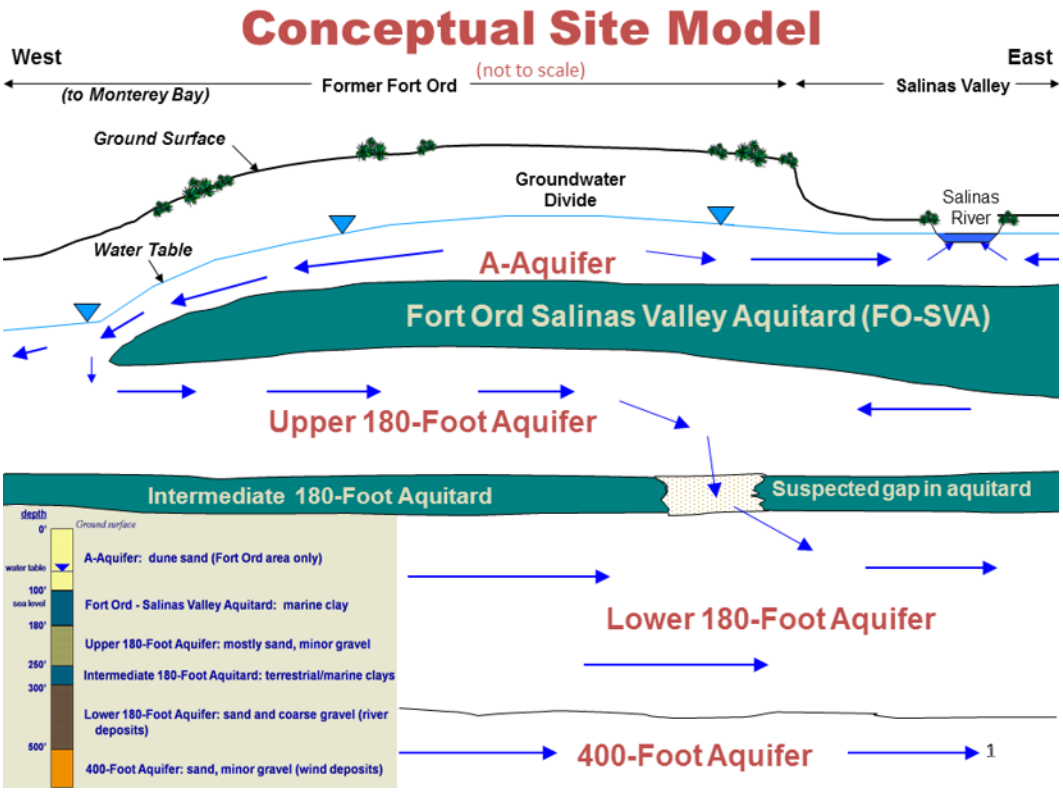


Figure 4-13 Conceptual Model of Principal Aquifers in the Marina-Ord Area

This aquifer is recharged primarily by rainfall infiltration and in turn provides a source of deep percolation into the upper 180-Foot aquifer and eventually into the lower 180-Foot and 400-Foot Aquifers in the Monterey Subbasin (HLA, 1994).

Extraction and infiltration activities associated with remediation in the former Fort Ord take place within the Dune Sand Aquifer.

Fort Ord-Salinas Valley Aquitard

The FO-SVA is composed of laterally extensive blue or yellow sandy clay layers with minor interbedded sand layers (Harding ESE, 2001; DWR, 2004a). The FO-SVA generally correlates to the Pleistocene Older Alluvium stratigraphic unit, which is shown as Valley Fill. The FO-SVA was deposited in a shallow sea during a period of relatively high sea level. Harding ESE noted that the FO-SVA beneath the former Fort Ord might be formed under a different depositional event than the Salinas Valley Aquitard (SVA) unit beneath the Salinas Valley (e.g., estuarine deposits vs. flood plain deposits). However, the two clay units are hydraulically equivalent (Harding ESE, 2001).

The FO-SVA is generally encountered at depths of less than 150 feet. While this clay layer is relatively continuous in the northern portion of the Valley, it is not monolithic across the Subbasin. The clay layer is missing in some areas and pinches out in certain areas.

Within the Subbasin, the FO-SVA is continuous beneath the City of Marina and most of Fort Ord (Harding ESE, 2001; Kennedy/Jenks, 2004; Ahtna Engineering, 2013; MACTEC, 2006). The extent

of the FO-SVA is illustrated on

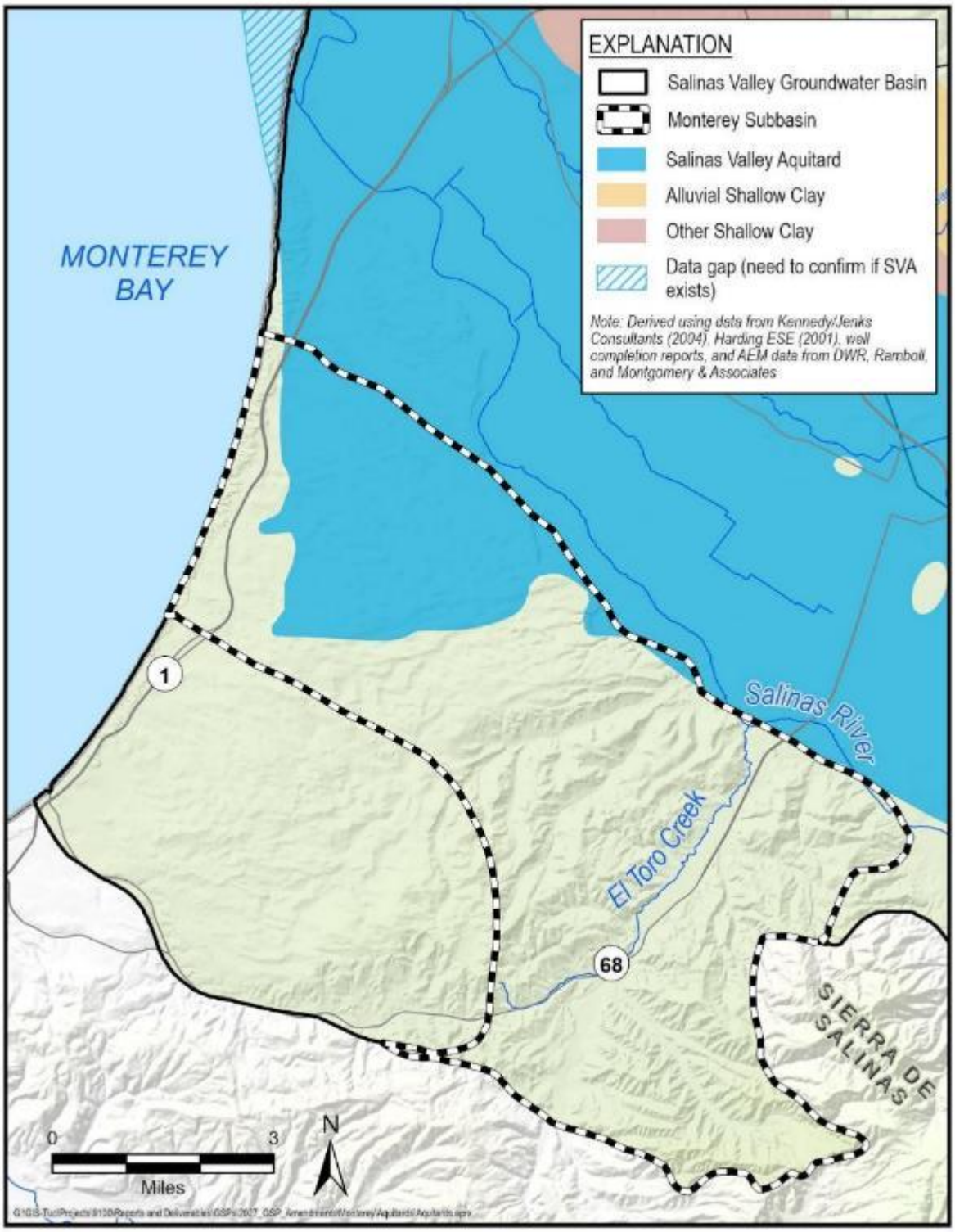


Figure 4-14. The FO-SVA thins towards the Monterey Subbasin/Seaside Subbasin boundary as well as toward the coast, where it appears to pinch out near Highway 1 (Harding ESE, 2001). The

thinning and pinching out of the FO-SVA in these locations increases the vertical hydraulic connection between the Dune Sand Aquifer and underlying 180-Foot Aquifer.

180-Foot Aquifer

The FO-SVA generally overlies and confines the 180-Foot Aquifer. The 180-Foot Aquifer consists of interconnected sand and gravel beds that are from 50 to 150 feet thick. The sand and gravel layers of this aquifer are interlayered with clay lenses (Ahtna Engineering, 2013). This aquifer is correlated to the Older Alluvium (Valley Fill) or upper Aromas Sand formations (Harding ESE, 2001; Kennedy/Jenks, 2004; Ahtna Engineering, 2013).

The gravels, sands, and interspersed clays of the 180-Foot Aquifer are found in the vicinity of the City of Marina and extend a short distance southwest beyond the extent of the FO-SVA (HLA, 1994). Beneath the ocean, the sediments "extend to submarine outcrops on the floor and canyon walls of Monterey Bay (Harding ESE, 2001; Todd Engineers, 1989; Greene, 1977; DWR, 1946). As discussed above, the aquifer is confined where overlain by the FO-SVA. It may become unsaturated where groundwater elevation is lower than the bottom elevation of the FO-SVA, or unconfined where the FO-SVA pinches out. The 180-Foot Aquifer is found generally at depths between 100 and 400 ft bgs beneath the Marina-Ord Area, with varying thickness.

South of the City of Marina, in a portion of the former Fort Ord, the 180-Foot Aquifer is separated into an "upper" zone of sandy deposits with some gravel and a "lower" zone of gravel with sand and clay lenses; the two zones are separated by a thin clay layer (Ahtna Engineering, 2013). Data collected within the former Fort Ord show that significant head differences exist between the upper and lower zones of the 180-Foot Aquifer. This thin clay layer, locally referred to as the Intermediate 180-Foot Aquitard, is not laterally extensive and connects with other known clays

closer to the boundary with the 180/400 Subbasin (

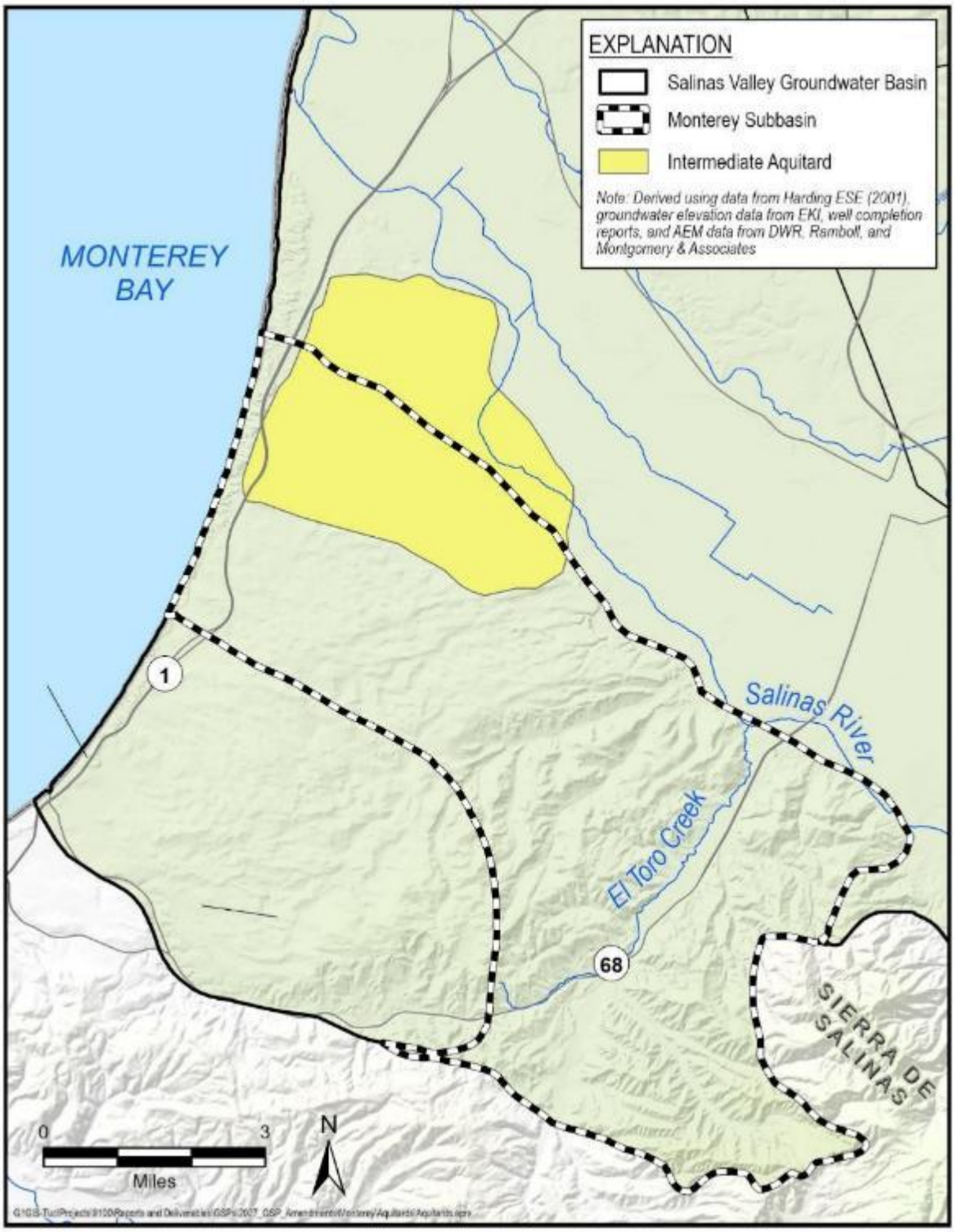


Figure 4-15). However, within the Monterey Subbasin where it occurs, it is a distinct and important hydrostratigraphic layer.

The 180-Foot Aquifer receives recharge from the overlying Dune Sand Aquifer as well as percolation through the FO-SVA, and rainfall and surface water infiltration in areas where the FO-SVA does not exist. This recharge mechanism is also supported by the similar geochemistry between the Dune Sand Aquifer and the 180-Foot Aquifer (Section 4.2.4.1). Subsurface inflows and outflows to the 180-Foot Aquifer also occur from the 180-Foot Aquifer of the 180/400 Subbasin and from the Aromas Sand southeast of the former Fort Ord where there may be a hydrologic connection (HLA, 1994).

The primary uses of the 180-Foot Aquifer are for municipal water supply in the lower 180-Foot Aquifer. Extraction and infiltration activities associated with remediation in the former Fort Ord also take place within the 180-Foot Aquifer.

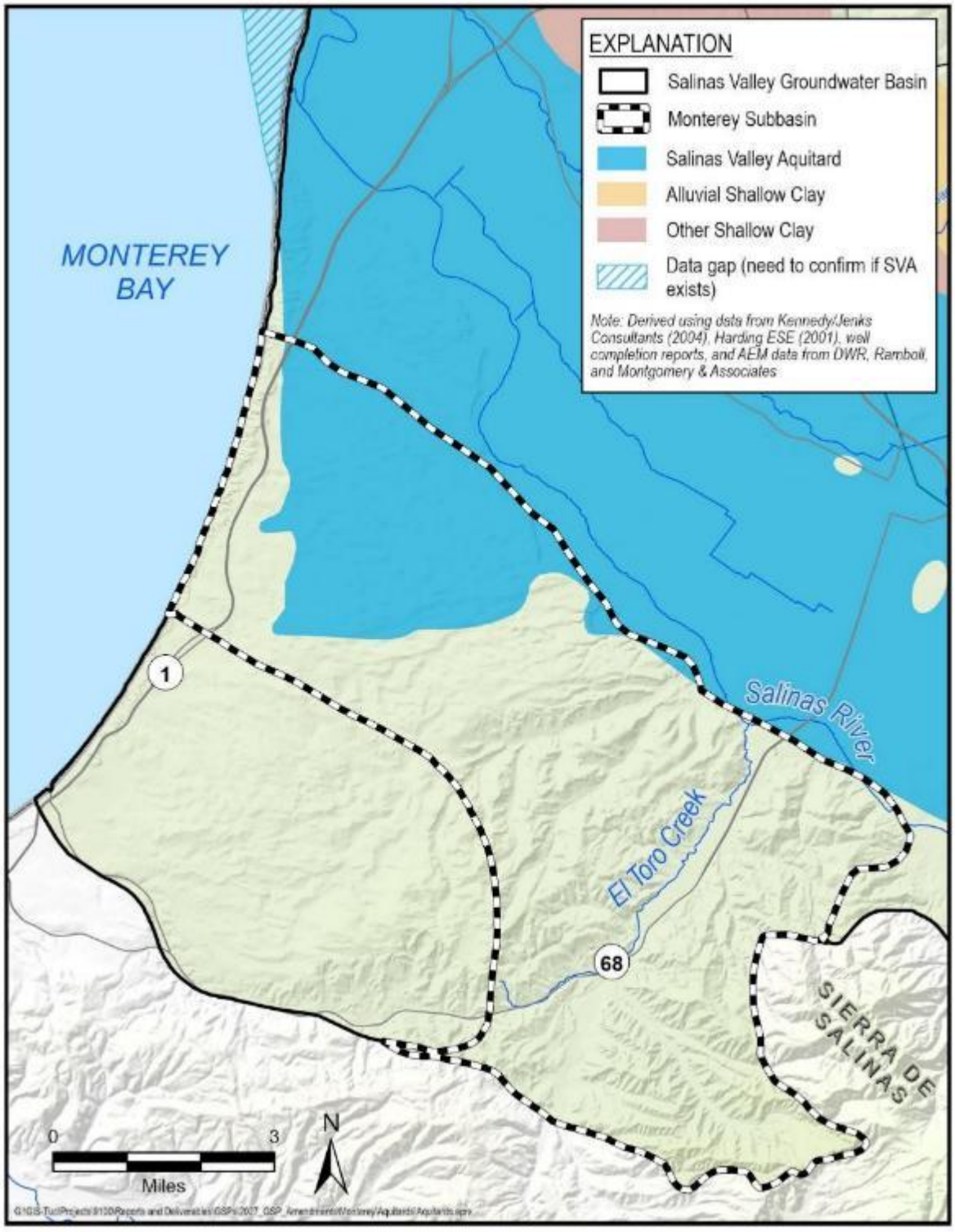


Figure 4-14 Extent of the Salinas Valley Aquitard

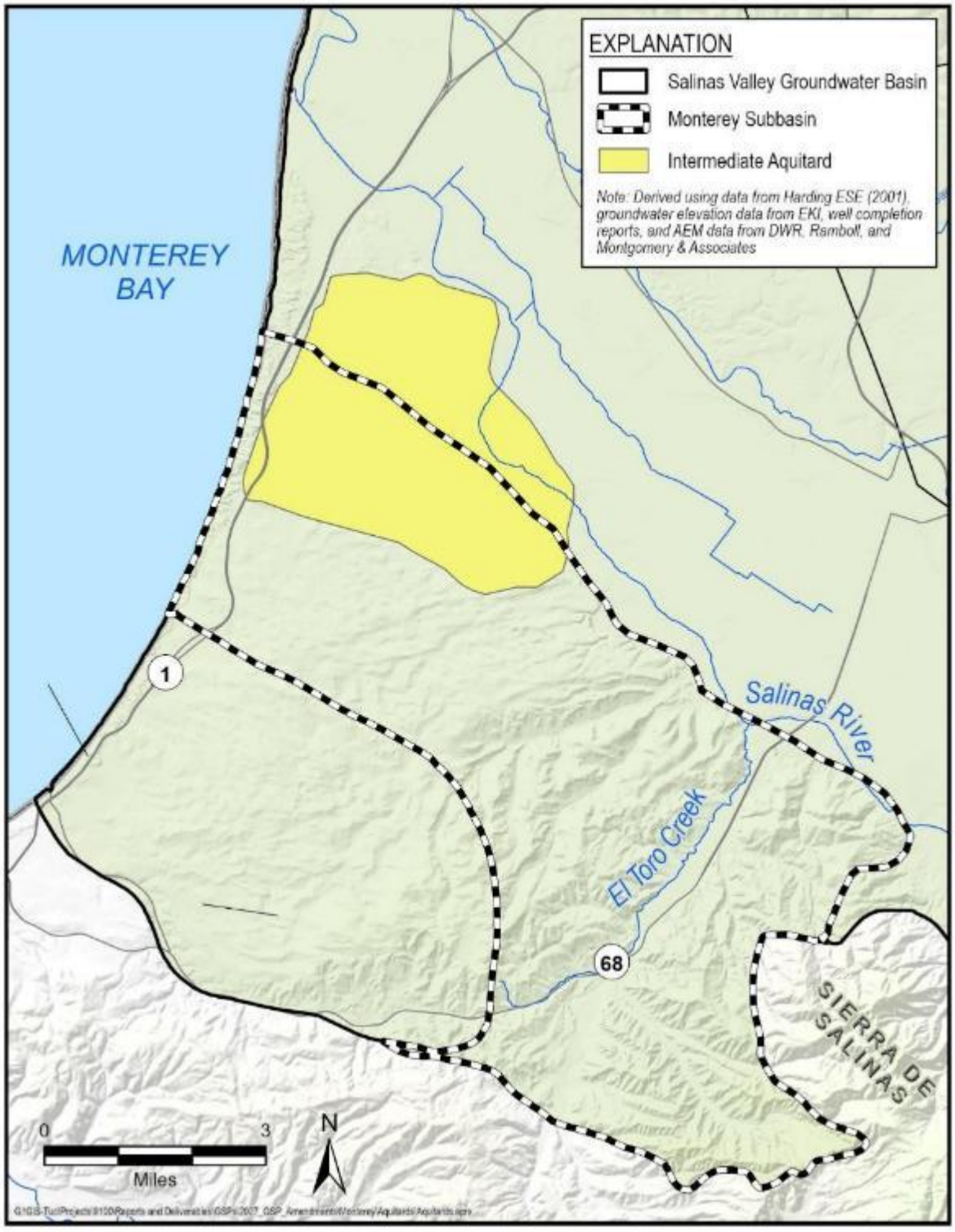


Figure 4-15 Extent of the Intermediate 180-Foot Aquitard

180/400-Foot Aquitard

The base of the 180-Foot Aquifer is the 180/400-Foot Aquitard. This aquitard consists of interlayered clay and sand layers, including a marine blue clay layer (DWR, 2004a). The 180/400-Foot Aquitard varies in thickness and quality across the Subbasin, and "varies laterally throughout the Fort Ord area" (MACTEC, 2006). Therefore, areas of hydrologic connection between the 400-Foot and 180-Foot Aquifers exist, and Fort Ord is one of several locations where this aquitard is thin or discontinuous (Kennedy/Jenks, 2004). Recent updates have identified locations where

this aquitard is thin or missing, and is shown on

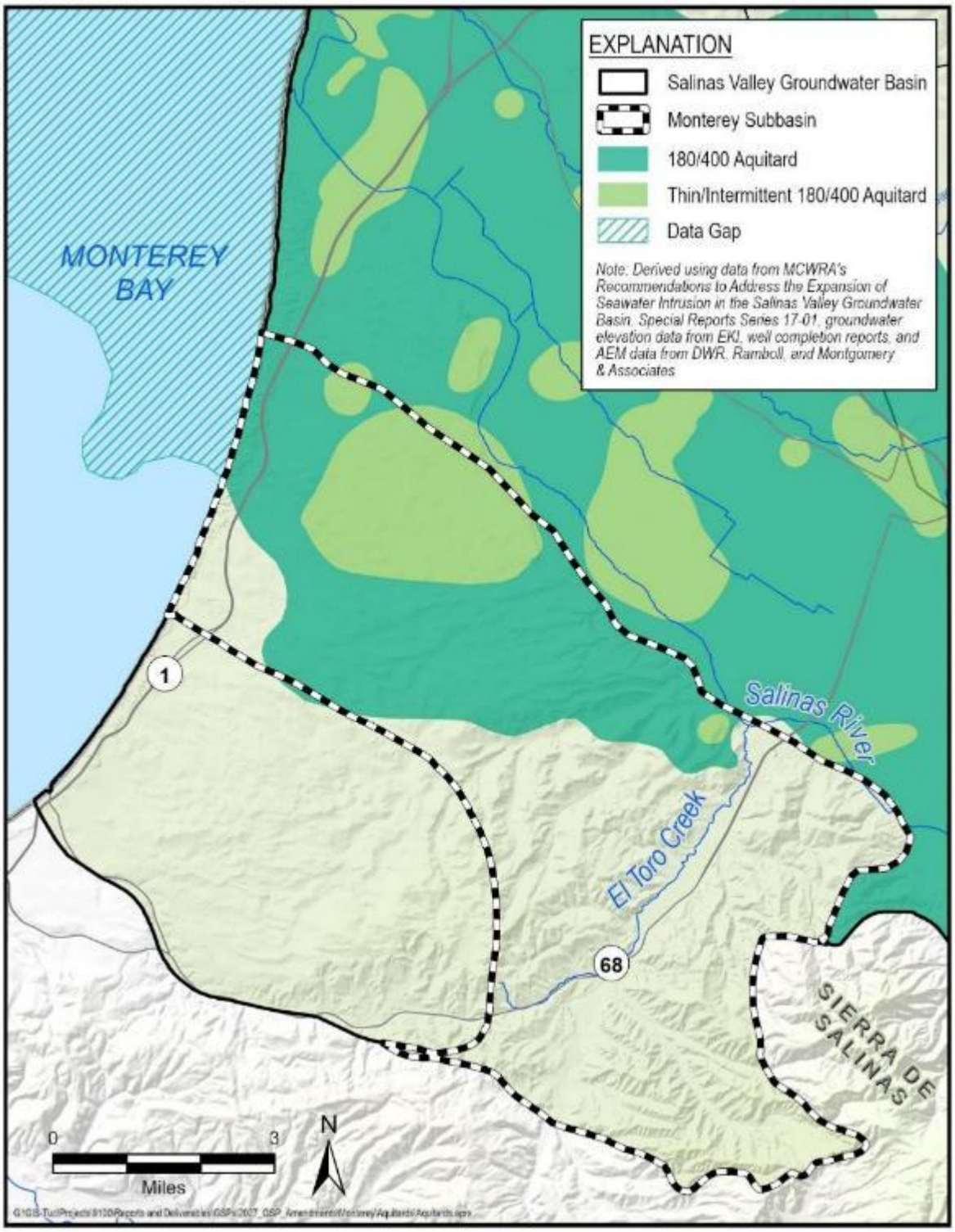


Figure 4-16.

400-Foot Aquifer

The 400-Foot Aquifer is comprised of fine to medium-grained sand with varying degrees of interbedded clay lenses (Ahtna Engineering, 2013). The 400-Foot Aquifer appears to be composed of portions of the Aromas Sand near the coast, and the upper member of the Paso Robles Formation (HLA, 1994; Harding ESE, 2001), although it is sometimes difficult to delineate the transition between the two formations (Harding ESE, 2001). It is usually encountered between 270 and 470 ft bgs in the Marina-Ord Area. The upper portion of the 400-Foot Aquifer merges and interfingers with the 180-Foot Aquifer in some areas where the 180/400-Foot Aquitard is missing (DWR, 1973).

Due to its geologic composition, the 400-Foot Aquifer has been believed to be connected to the shallow Paso Robles aquifer in Seaside Subbasin (Yates, 2005). In the Seaside Subbasin, this aquifer consists of several continuous water-producing zones and unconfined zones where granular materials of the Paso Robles Formation are in contact with surficial deposits. Recent updates, including results from the Deep Aquifers Study (M&A, 2024a), provide clarity on which member of the Paso Robles Formation is analogous to the 400-Foot Aquifers. This is the upper member, which is above the continuous, clay-rich middle member that serves as the 400/Deep Aquitard. Therefore, Seaside Subbasin wells completed in the Paso Robles Formation should be carefully reviewed with respect to the mapped 400/Deep Aquitard, as well as the lithologic descriptions to determine if the screened interval falls above or below the aquitard, and therefore should be included in the 400-Foot Aquifer or the Deep Aquifers.

Recharge to this aquifer likely occurs from both the overlying 180-Foot Aquifer through gaps and thin spots, the Dune Sands where they are in contact with the sediments that comprise the 400-Foot Aquifer, and outcrops of the Aromas Sand and Paso Robles Formations in and near the Corral de Tierra Area. Groundwater flow direction in the 400-Foot Aquifer is influenced by groundwater pumping and the connection with neighboring Subbasins.

The primary uses of the 400-Foot Aquifer are for municipal supply in the Marina-Ord Area.

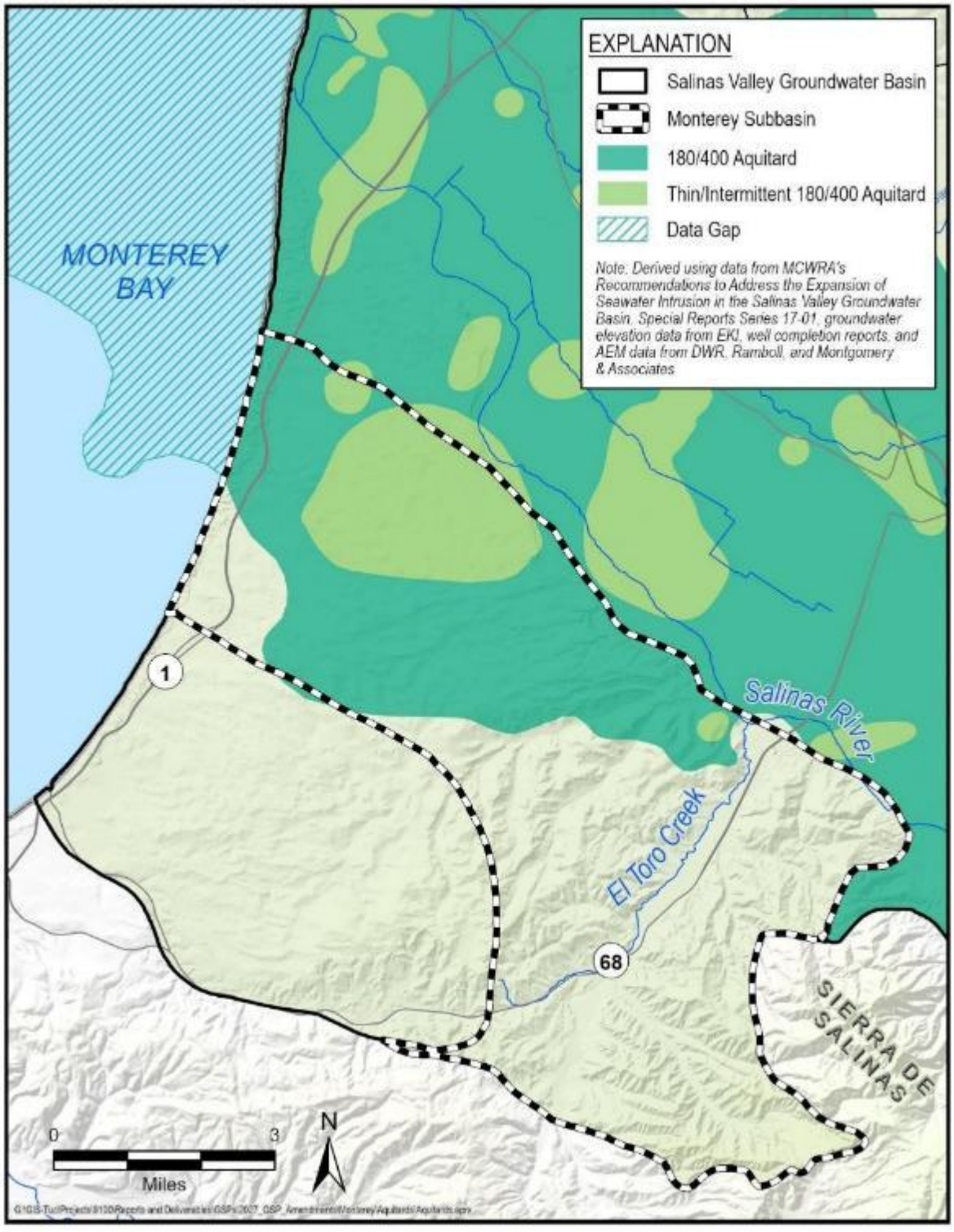


Figure 4-16 Extent of the 180/400-Foot Aquitard

400/Deep Aquitard

The base of the 400-Foot Aquifer is the 400/Deep Aquitard. In some areas of the Salinas Valley Basin, this aquitard can be several hundred feet thick (Kennedy/Jenks, 2004). This aquitard was defined and mapped in the Deep Aquifers Study and extends through the majority of the Monterey Subbasin (Figure 4-17). This aquitard is the middle member of the Paso Robles Formation, which has been identified as a clay-rich member in previous studies (Harding ESE, 2001). This means that lenses of sand and gravel occur in this member and may provide pathways for groundwater flow. Current data show that there is hydraulic separation between the 400-Foot and Deep Aquifers resulting from this aquitard, but vertical gradients between the two aquifers may induce connection.

Deep Aquifers

The updated understanding of the Deep Aquifers presented in the Deep Aquifers Study focused on the presence of the 400/Deep Aquitard to delineate the Deep Aquifers from the shallower principal aquifers. The Study delineated the lateral extent of the Deep Aquifers throughout the majority of the Subbasin and into adjacent and nearby subbasins by tracing the continuous presence of the 400/Deep Aquitard, which is the middle member of the Paso Robles Formation. The extent of the Deep Aquifers into the Monterey Subbasin is shown on Figure 4-17.

The 400/Deep Aquitard was identified and traceable southward to the Laguna Seca Anticline in the Seaside Basin. This confirms that the Deep Aquifers exist throughout the coastal Marina-Ord Area of the Monterey Subbasin up to the Laguna Seca Anticline, and that the Deep Aquifers are in hydraulic communication with both the Seaside and 180/400 Subbasins. The depth of the 400/Deep Aquitard and the Deep Aquifers were refined with AEM data and well completion reports, and mirror the uplifted structure through this region.

The Deep Aquifers incorporate all the productive zones below the 400/Deep Aquitard, including the previously named 800-Foot, 900-Foot, 1,100-Foot, and 1,500-Foot Aquifers; and comprise portions of the Paso Robles Formation, Purisima Formation, and Santa Margarita Sandstone. The Deep Aquifers may be up to 2,000 feet thick and have alternating sandy-gravel layers and clay layers which do not differentiate into distinct aquifer and aquitard units (DWR, 2004a). Due to the geologic formations' depositional environments, the Deep Aquifers consist of alternating layers of sand and gravel mixtures with discontinuous clays rather than distinct, coherent aquifers and aquitards (Brown and Caldwell, 2015). There is a strong likelihood of flow through these confining layers (MCWRA, 2018). The Deep Aquifers overlie the low permeability Monterey Formation, which is defined as the bottom of the Subbasin.

The Deep Aquifers likely receive inflows from adjacent aquifers, or from leakage from overlying aquifers (Thorup, 1976; Feeney and Rosenberg, 2003; M&A, 2024a). Oxygen and deuterium analyses of water from the Deep Aquifers suggest that, unlike the upper aquifer system (i.e., 180-Foot and 400-Foot Aquifers), water in the Deep Aquifers was not recharged under current climatic conditions (MCWRA, 2017). Additionally, tritium and carbon-14 analyses of Deep Aquifers water indicate that it was recharged thousands of years before present (Hanson et al., 2002). Age dating of groundwater by USGS indicates that groundwater in the Deep Aquifers near

the Monterey Coast may be 25,000 to 30,000 years old (Hanson et al., 2002). Current data suggest that extractions may be supported by depletion of groundwater storage (Feeney and Rosenberg, 2003; M&A, 2024a). Specific storage was calculated at 0.000013/ft, which suggests that the volume of groundwater that can be removed from storage is not large (Feeney and Rosenberg, 2003).

In other areas of the Salinas Valley, the geologic units of the Deep Aquifers are grouped into one hydrostratigraphic unit, because long-screened agricultural wells mix their respective productive zones, effectively combining them into one aquifer unit. However, within the Monterey Subbasin, available data shows that the Deep Aquifers are separated into an upper and lower zone. The lower zone overlies the bedrock and extends to approximately 2,000 ft bgs at the Monterey-180/400 Subbasin boundary. Water levels in the upper Deep Aquifer are significantly lower than in the lower Deep Aquifer, given that the majority of groundwater extraction occurs from the upper Deep Aquifer. The Deep Aquifers in the Seaside Subbasin are similarly separated into a shallower Paso Robles Aquifer and a deeper Santa Margarita Aquifer, which likely connects to the upper and lower Deep Aquifers within the Marina-Ord Area, respectively.

The Deep Aquifers are used primarily for municipal water supply in the Marina-Ord Area.

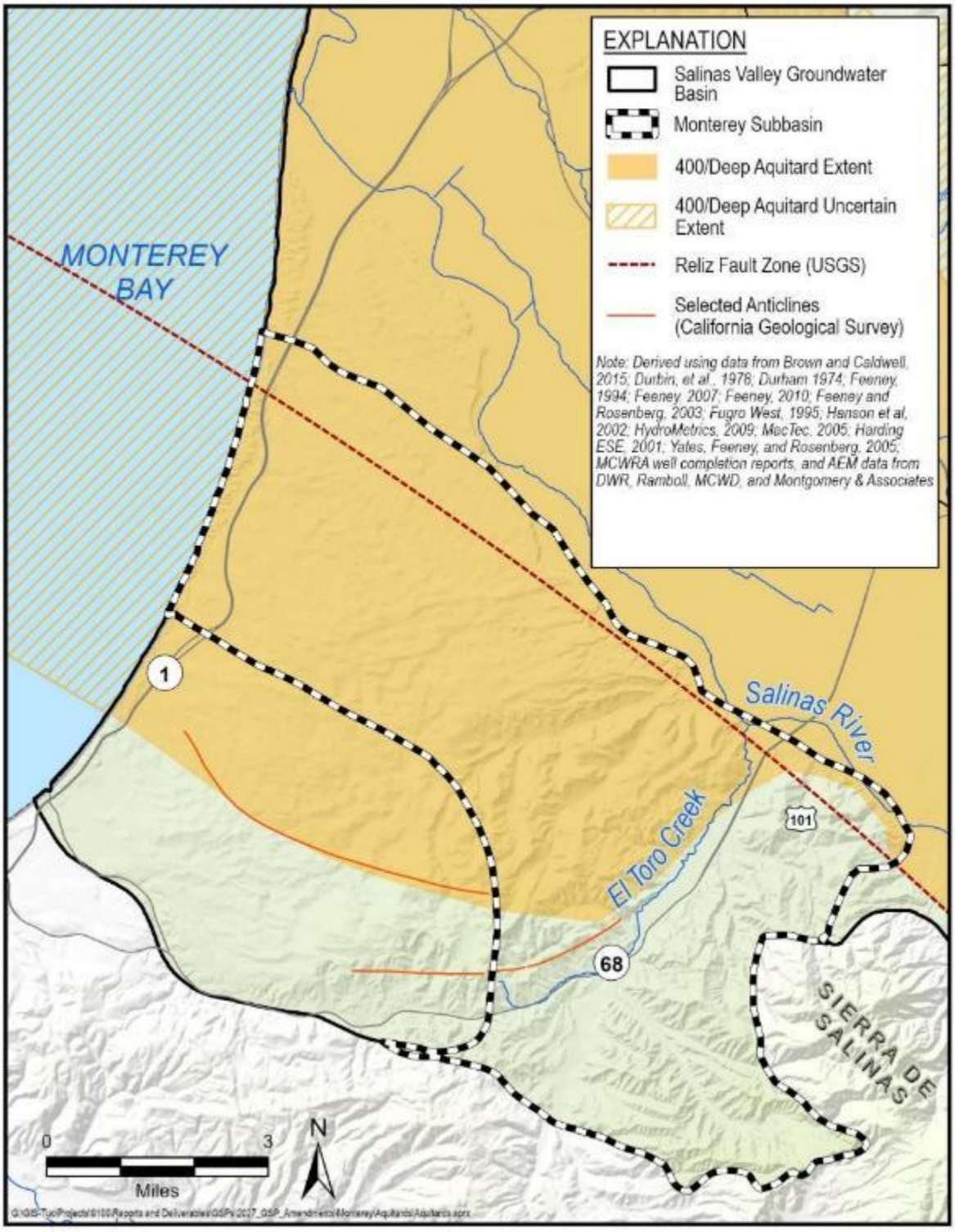


Figure 4-17 Extent of the Deep Aquitard

4.2.2.2 Corral de Tierra Area

The shallowest water-bearing sediments within the Corral de Tierra Area are thin and occur along stream corridors. These sediments range from 0 to 120 feet thick and are a part of the Holocene alluvium unit (Geosyntec, 2007). The geologic map in Figure 4-2 shows this unit as Q (Quaternary Alluvium). Several small domestic wells draw groundwater from these local alluvial aquifers, but these volumes of groundwater extraction are minimal (Geosyntec, 2007). Since this volume of groundwater is neither economic nor significant, these shallow sediments are not considered a principal aquifer, nor are they included in the El Toro Primary Aquifer System. Groundwater in these sediments is hydraulically connected to both the small streams found in the area and the principal aquifer due to a lack of continuous or regional aquitard to interrupt infiltration and percolation (El Toro Creek, San Benancio Gulch, Watson Creek, and Calera Creek; see Section 4.3) (Geosyntec, 2007).

El Toro Primary Aquifer System

There is one single principal aquifer in the Corral de Tierra Area called the El Toro Primary Aquifer System comprising three water-bearing geologic units: the Aromas Sand, the Paso Robles Formation, and the Santa Margarita Sandstone (Geosyntec, 2007). These formations are grouped into one functional primary aquifer due to many wells being screened across more than one formation in this area, thereby causing the hydrostratigraphy to effectively function as one aquifer. The longer screen lengths allow for better well yields as this design accesses more saturated thickness of the aquifer.

Within the Corral de Tierra Area, the eolian Aromas Sand deposits are up to 200 feet thick and comprise the hills in the Area. The Paso Robles Formation comprises a series of nonmarine, semi-consolidated continental deposits that consist of fine to coarse-grained sands and gravels of Plio-Pleistocene age. Due to local variations of conformability and similarity of sediments, these units are sometimes referred to collectively as continental deposits (Geosyntec, 2007). The geologic map on Figure 4-2 shows the Aromas Sand and Paso Robles Formation units as Qae and QT, respectively.

The Paso Robles Formation is frequently found at the surface in the Corral de Tierra Area. While different members of this formation have been identified in principal aquifers and aquitards in the greater Salinas Valley Groundwater Basin, erosion and structural deformities have impacted the available thickness and identification of these members within the Corral de Tierra Area. The recent updates to the HCM have further refined the understanding of the transition of observed Paso Robles Formation in the Corral de Tierra and Marina-Ord Areas, but the hydraulic relationship is still not well understood due to the lack of available data through the Fort Ord area. The cross section A-A' on Figure 4-9 shows the most recent interpretation of the hydrostratigraphy across the subbasin, with the upper Paso Robles Formation, or 400-Foot Aquifer, terminating prior to the Laguna Seca Anticline. This indicates that a 400-Foot Aquifer hydraulic connection through the upper Paso Robles Formation between the Corral de Tierra and the Marina-Ord area may be nonexistent. However, the Lower Paso Robles Formation, or portions of the Deep Aquifers, are somewhat continuous over the Laguna Seca Anticline between

the two areas. This indicates that the potential for hydraulic connection between the Corral de Tierra Area and Deep Aquifers likely exist through the lower Paso Robles Formation, although likely limited.

The Santa Margarita Sandstone is a Miocene-aged, marine, white, thick and locally cross-bedded, very fine to coarse-grained arkosic sandstone with an average thickness of 100 to 300 feet in the Subbasin. However, there are portions of the Santa Margarita Sandstone that crop out in the hills northwest of Highway 68. The geologic map in Figure 4-2 shows this unit as Msm. In the cross-sections, this unit is grouped together with the Purisima Formation as the hydrostratigraphic unit just above the bedrock. This is due to the limited extent of both units within the Subbasin. Similar to the Paso Robles Formation, the Santa Margarita Sandstone comprises part of the Deep Aquifers closer to the coast, where it is encountered at significant depth from the surface.

Recharge to the El Toro Primary Aquifer System is primarily through precipitation and potentially through the streambeds and alluvial sediments. Groundwater flow direction is generally towards the identified bedrock bowls, which are separated by the bedrock high along Toro Creek. These are the Corral de Tierra/San Benancio bowl which combines the Corral de Tierra and Laguna Seca subareas into one isolated groundwater system, and the eastern Highway 68 bowl which is along Toro Creek and may be in hydraulic connection with the 180/400 Subbasin. However, groundwater flow is primarily toward pumping centers.

The primary use of groundwater from the El Toro Primary Aquifer System is domestic (municipal and rural residential), with minimal agricultural supply.

Immediately outside the southern end of the Subbasin, small amounts of groundwater are also produced from the Monterey Formation and the unnamed sandstone, which underlies the Monterey Formation (Anderson-Nichols and Co., 1981). Additional information regarding hydrogeology of these formations can be found in the *El Toro Groundwater Study* and the *Seaside Groundwater Basin Modeling and Protective Groundwater Elevations* report (Geosyntec, 2007; HydroMetrics, 2009). Additionally, the Monterey Formation is defined as the bottom of the Subbasin. As such, neither the Monterey Formation nor the unnamed sandstone is considered a principal aquifer, nor are they included in the El Toro Primary Aquifer System.

4.2.2.3 Interconnectivity

Hydrostratigraphy in the Marina-Ord Area consists of a series of laterally continuous aquifers consistent with the aquifers that form the distinguishing features of the northern Salinas Valley. The Marina-Ord Area principal aquifers are in connection with the equivalent principal aquifers in the 180/400 and Seaside Subbasins. Groundwater connection between the Marina-Ord Area and the 180/400 Subbasin is relatively well established based on water levels observed in the 180-Foot, 400-Foot, and Deep Aquifers as well as seawater migration between subbasins in the 180-Foot and 400-Foot Aquifers. Additionally, the recent Deep Aquifers Study delineated the lateral extent of the Deep Aquifers, which includes portions of the Monterey Subbasin and the adjacent subbasins, and includes both the Paso Robles and Santa Margarita Aquifers of the Seaside Subbasin.

The 2022 GSP generally correlated the 400-Foot Aquifer and Deep Aquifers in the Monterey Subbasin with the Paso Robles and Santa Margarita Aquifers of the Seaside Subbasin, respectively, based on geologic composition and previous studies, including Yates (2005). However, recent HCM updates indicate that these correlations should be evaluated on a well-by-well basis, because the middle member of the Paso Robles Formation is interpreted as the clay-rich 400/Deep Aquitard. The updated HCM indicates that many wells screened in the Paso Robles Formation in the southern Marina-Ord Area and Seaside Basin, which were historically associated with the 400-Foot Aquifer, are screened below the laterally continuous 400/Deep Aquitard and more appropriately associated with the Deep Aquifers. As a result, the shallower Paso Robles Aquifer and a deeper Santa Margarita Aquifer of the Seaside Subbasin likely connects to the upper and lower Deep Aquifers within the Marina-Ord Area, respectively. This revised interpretation affects the understanding of groundwater elevations and gradients in the 400-Foot Aquifer and Deep Aquifers, as reflected in the groundwater elevation contours presented in Section 5.1.2.

Correlations between geologic formations and hydrostratigraphic units should not be simplified without careful review of well construction, screened intervals, geophysical logs, and local stratigraphic context, particularly for modeling and future management purposes.

Within the southern Corral de Tierra Area, the aquifers have historically been described by their geologic names, such as the Aromas Sand, Paso Robles Formation, and Santa Margarita Sandstone (Geosyntec, 2007; Yates, 2005). Based on the best available information, these geologic formations are grouped together to form the El Toro Primary Aquifer System for the Corral de Tierra Area, which has been described in more detail above. As discussed above, the 400-Foot Aquifer, interpreted as the upper Paso Robles Formation, is not present in the Corral de Tierra Area. In addition, although the lower Paso Robles Formation and Santa Margarita Sandstone exist, the Deep Aquifers are not defined in the Corral de Tierra due to the lack of the continuous 400/Deep Aquitard, which defines the extent of the Deep Aquifers. This aquitard was found to generally terminate at the apex of the Laguna Seca Anticline.

Groundwater connection between the Corral de Tierra Area and the Seaside Subbasin's Laguna Seca Area is relatively well established with production wells screened in the Paso Robles Formation and Santa Margarita Sandstone, and with the updated bedrock surface indicating a shared structural bowl between these two jurisdictional areas. Based on the revised bedrock surface, hydraulic connection between the Corral de Tierra Area and the Marina-Ord Area is likely reduced over the Laguna Seca anticline. However, there are no geologic features restricting flow between the Corral de Tierra Area and the 180/400 Subbasin, but as mentioned in Section 4.1.2.1, flow is likely less than previously understood.

4.2.3 Structural Restrictions to Flow

There are no known structural restrictions to flow between the Marina-Ord Area and the adjacent Subbasins.

A buried trace of the Reliz Fault (also known as the Reliz-King City Fault or King City Fault) has been said to generally align with the boundary between the Monterey Subbasin and the 180/400

Subbasin. However, the location of this fault is poorly constrained or defined. Beneath the bottom of the Subbasin, the Monterey Formation is displaced downward on the northeast side of the Reliz Fault by as much as 1,000 ft (Durbin, 2007). There is no sign of the fault affecting "late Pleistocene or younger sediments" (HLA, 1994; Feeney and Rosenberg, 2003). This fault does not appear to impede groundwater flow in the Dune Sand Aquifer, the 180-Foot Aquifer, the 400-Foot Aquifer, or the Deep Aquifers, based on observed groundwater elevation and seawater intrusion conditions across the Subbasin boundary (see Chapter 5).

The Corral de Tierra Area is surrounded by several structural features. It is bounded on the east by the Reliz Fault and the Corral de Tierra Fault to the southwest (Geosyntec, 2007). The Harper Fault is between these two other faults, closer to the Reliz Fault (Geosyntec, 2007). All of these faults strike to the northwest and steeply dip to the northeast. A northeast striking syncline occurs roughly along Highway 68, and mirrors the Laguna Seca Anticline, which is a defining feature within the Subbasin. A deeper anticlinal feature is shown in Figure 4-2 near San Benancio Creek and appears to be orthogonal to the syncline, which parallels Highway 68 (Geosyntec, 2010). Additional east-trending anticlines are shown near the boundary between the Seaside Subbasin and the Corral de Tierra Area. The recent HCM updates have shown a shallower, more undulating bedrock surface through the Corral de Tierra Area with a surficial outcrop near Toro Creek.

The primary structures that appear to constrain groundwater flow in the Corral de Tierra Area are (1) the revised bedrock surface within the Corral de Tierra Area and (2) the Laguna Seca anticline between the Corral de Tierra Area and the Marina-Ord Area. The revised bedrock surface includes an uplifted area near Toro Creek, which isolates the groundwater into "bowls" as discussed above, thereby reducing hydraulic connectivity along the Toro Creek corridor between the two "bowls". AEM data signature for the Monterey Formation supports a stronger delineation of the Laguna Seca Anticline. This potentially reduces hydraulic connection between the Corral de Tierra Area and the Marina-Ord Area. While both the Paso Robles Formation and Santa Margarita Sandstone continue over the anticline, their thickness has been reduced through erosion, which may reduce flow across the anticline.

4.2.4 General Water Quality

This section presents a general discussion of the natural fresh groundwater quality in the Monterey Subbasin, focusing on general geochemistry. The distribution and concentrations of specific constituents of concern, including seawater intrusion, are discussed further in Chapter 5. This discussion is based on data from previous reports. Key diagrams are included in Appendix 4-A.

4.2.4.1 Marina-Ord Area

Dune Sand Aquifer

Groundwater in the Dune Sand Aquifer has a sodium-chloride chemical character. Groundwater in this aquifer is primarily fresh; minimal seawater intrusion has occurred in this aquifer.

180-Foot Aquifer

Water quality in the 180-Foot Aquifer beneath the Marina-Ord Area is distinct from the water quality in the Salinas Valley and has a more sodium-chloride chemical character (i.e., a higher proportion of sodium and chloride) (HLA, 1994). West of the SVA, groundwater quality is similar throughout the combined Dune Sand Aquifer and 180-Foot Aquifer (HLA, 1994). Groundwater in both aquifers is likely recharged from precipitation infiltrating through similar geologic materials.

The Dune Sand Aquifer contributes recharge to the 180-Foot Aquifer, as groundwater from this aquifer flows westward until it reaches the SVA, after which it turns eastward within the 180-Foot Aquifer. While seawater intrusion has occurred in the lower 180-Foot Aquifer in the northern portion of the Subbasin, groundwater in the upper 180-Foot Aquifer remains fresh.

400-Foot Aquifer

Water quality in the 400-Foot Aquifer is chemically distinct from the water quality of the overlying Dune Sand and 180-Foot Aquifer. The 400-Foot Aquifer has a calcium-bicarbonate chemical character (HLA, 1994). However, some wells have higher concentrations of chloride, which is indicative of seawater intrusion. Wells screened in the gravel layers of the 400-Foot Aquifer have elevated concentrations of sodium. This characteristic is similar to that of wells screened in the gravel layers of the 180-Foot Aquifer and those in the Salinas Valley (HLA, 1994).

Seawater intrusion has occurred in the 400-Foot Aquifer in the northern portion of the Subbasin.

Deep Aquifers

General water chemistry in the Deep Aquifers is determined by the source water and sediments where the water is drawn from. Deep Aquifers groundwater is a mixed water type between sodium bicarbonate and sodium chloride water types, and changes with geography (M&A, 2024a). Previous analyses of water chemistry by MCWRA described Deep Aquifers groundwater as having “a distinct character, with higher pH than groundwater in the overlying aquifers, relatively low calcium and high sodium concentrations, and an elevated temperature” (MCWRA, 2017). This was confirmed by the Deep Aquifers Study (M&A, 2024a). Isotope analyses indicate the Deep Aquifers were not recharged under recent climatic conditions. Isotope analysis also revealed that the groundwater in the Deep Aquifers might have been recharged thousands of years ago (Hanson et al., 2002). Ratios of chloride-to-boron and isotope analysis (18O, 2H, 3H, 14C) were used to infer the sources and age of groundwater (Hanson et al., 2002). Groundwater in the upper portions of the Deep Aquifers had similar chloride-to-boron ratios to groundwater in the overlying aquifers, which suggests a similar source of recharge.

Seawater intrusion has not been observed in the Deep Aquifers through adoption of the original GSP.

4.2.4.2 Corral de Tierra Area

Groundwater in the El Toro Primary Aquifer System has an intermediate chemical character (no dominant cation or anion) but the chemical composition varies slightly between lithologic units. Uniform moderate to high total dissolved solids (TDS) concentrations were found throughout the

El Toro Primary Aquifer System, which supports the hydraulically connected geologic units. Isotope analysis further indicates that groundwater throughout the El Toro Primary Aquifer System has similar recharge sources (Geosyntec, 2007).

4.2.5 Aquifer Properties

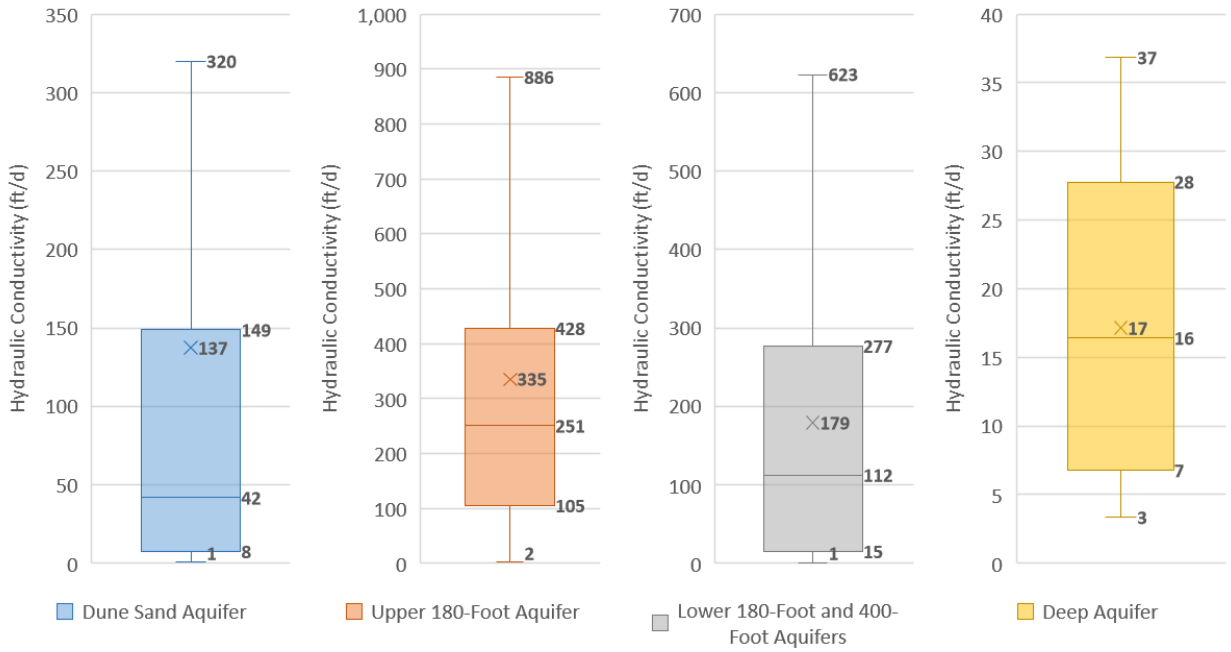
4.2.5.1 Marina-Ord Area

Hydraulic conductivity information of the aquifers underlying the Marina-Ord Area is obtained from previous reports and presented below. The statics of hydraulic conductivity data for each aquifer are presented in Table 4-2 and Figure 4-18. Supporting hydraulic conductivity and transmissivity data and maps are included in Appendix 4-A.

It should be noted that available estimates of hydraulic conductivity for the Deep Aquifers are from wells located in the coastal areas, and they represent a variety of depth intervals with screen lengths ranging from 20 to more than 800 feet (Appendix 4-A). Transmissivity values estimated for Deep Aquifers wells range from about 50 to 6,000 feet squared per day (ft^2/day), with geometric mean of about 1,500 ft^2/day.

Table 4-2 Summary of Marina-Ord Area Hydraulic Conductivity Values

Aquifer	Median Hydraulic Conductivity Value (ft/d)	Mean Hydraulic Conductivity Value (ft/d)	25 to 75 Percentile Values (ft/d)
Dune Sand Aquifer	42	137	8 – 149
Upper 180-Foot Aquifer	251	335	105 – 428
Lower 180-Foot and 400-Foot Aquifers	112	179	15 – 277
Deep Aquifer	16	17	7 – 28



Notes:

(a) On the box plots,

Line represents the median hydraulic conductivity value for each aquifer,

"X" represents the mean hydraulic conductivity value for each aquifer,

Top and bottom of the boxes represents upper (Q3) and lower (Q1) quartile values (i.e., 75% and 25% of the range), and

Top and bottom of the whiskers represents Q1 or Q3 +/- 1.5* Interquartile Range, where the Interquartile Range is the difference between Q3 and Q1 values.

Figure 4-18 Summary of Marina-Ord Area Hydraulic Conductivity Values

4.2.5.2 Corral de Tierra Area

The most comprehensive compilation of hydraulic conductivities in the Corral de Tierra Area comes from the *Seaside Groundwater Basin Modeling and Protective Groundwater Elevations* (HydroMetrics, 2009). This study describes a model that covers the adjudicated Seaside Subbasin and the Monterey Subbasin. This study collected previously published hydraulic conductivity values for the geologic units encountered in the region. The model separates the aquifer by geologic formation, and Table 4-3 shows hydraulic conductivity estimated for the Paso Robles Formation and the Santa Margarita Sandstone.

The study also estimated storage coefficients, which relate to an aquifer's ability to store groundwater for each of the principal aquifers. These include specific yield (set at a value of 0.08 for the unconfined aquifers) and specific storage (set at a value of 0.0006 for the confined aquifers) (HydroMetrics, 2009). These values were selected for the Seaside model. Specific

storage values range from 5×10^{-5} to 5×10^{-3} for confined aquifers, and specific yield values may range from 0.1 to 0.01 in unconfined aquifers (Todd, 1980).

Table 4-3 El Toro Primary Aquifer Hydraulic Conductivity Values (modified from HydroMetrics, 2009)

Principal Aquifer	Geologic Formation	Hydraulic Conductivity (feet per day)	Source	Reference
El Toro Primary Aquifer System	Paso Robles	20	Pump Test	Fugro, 1996
		2	Model Calibration	Yates et al., 2005
	Santa Margarita	63	Pump Test	Fugro, 1996
		3-5	Model Calibration	Yates et al., 2005

In addition, measurements of aquifer properties were compiled for the aquifers in the Corral de Tierra as part of an effort to fill data gaps. Aquifer property information was compiled from existing well completion reports and slug tests conducted at 2 new monitoring wells installed by the SVBGSA. Estimated hydraulic conductivities from these new sources of information range from 0.6 to 0.7 feet/day for the Paso Robles Formation (based on 2 wells), from about 0.2 to 1.5 feet/day for the Santa Margarita Formation (based on 3 wells), and from 1 to 20 feet/day for the transmissive sediments of the El Toro Primary Aquifer System (based on 3 wells, including the 2 slug tests). Furthermore, average hydraulic conductivity values from the calibrated Salinas Valley Integrated Hydrologic Model (SVIHM) (M&A, 2025a) are about 8 feet/day for the Paso Robles Formation and 5 feet/day for the Santa Margarita Formation in the Corral de Tierra Area.

Since many wells are screened across both the Paso Robles Formation and the Santa Margarita Sandstone, aquifer properties for the El Toro Primary Aquifer System reflect a composite of properties (Geosyntec, 2007).

4.3 Surface Water Bodies

Surface water features and subwatersheds at the 12-digit Hydrological Code (HUC-12) level within the Subbasin are shown on Figure 4-19.

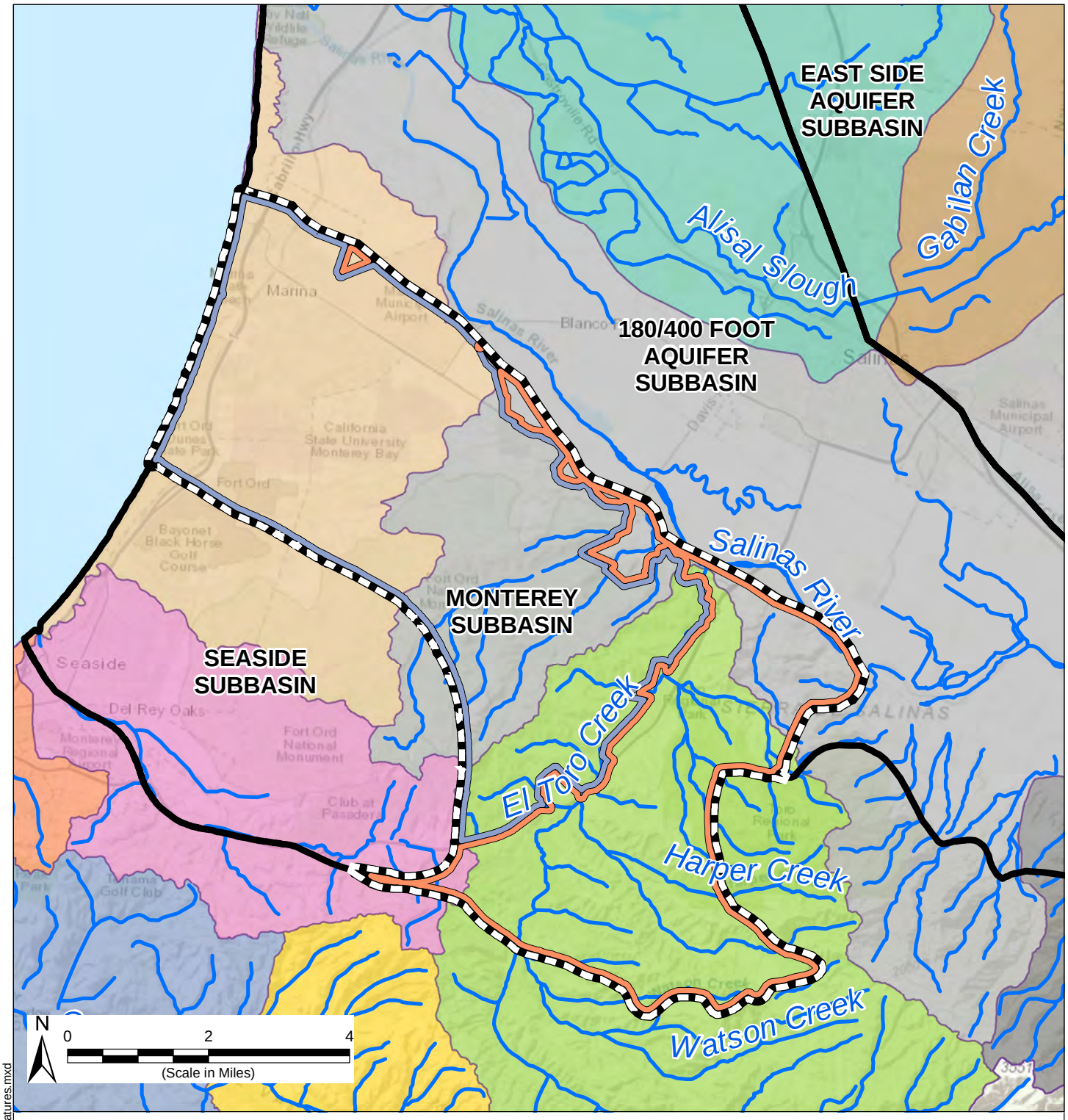
Coastal areas of the Subbasin drain toward Monterey Bay. Runoff is minimal due to the high rate of surface water infiltration into the permeable dune sand and local stormwater management policies (see Section 9.5.2). Consequently, well-developed natural drainages are absent throughout much of this area (Harding, 2004).

El Toro Creek is a perennial stream below the confluence with Watson Creek below the Corral de Tierra golf course (Feikert, 2001). El Toro Creek flows northeastward and is a tributary to the Salinas River. Recorded streamflows at USGS gage 11152540 from 1961 to 2001 indicate a mean annual streamflow of 1,590 AFY (Geosyntec, 2007). This mean annual streamflow was calculated for the entire record from 1961 to 2001. However, El Toro Creek did not record flow every year, with notable dry periods from 1985 to 1992 (Figure 4-20).

Small intermittent streams found in the Corral de Tierra Management Area of the Subbasin include the San Benancio Gulch, Watson Creek, and Calera Creek, which are tributaries to Toro Creek and generally flow northeastward toward the Salinas River (Geosyntec, 2007). Flows in these creeks respond rapidly to rainfall, and they are usually dry in the summer months. These creeks have a "flashy" nature and readily lose water to streambed seepage. (HydroMetrics, 2009). These streams flow less than 25 percent of the year (Geosyntec, 2007).

Yates and others (2005) concluded that local streams (i.e., El Toro Creek and smaller streams) contribute insignificantly to groundwater recharge. Along limited reaches, these streams gain streamflow from groundwater discharge. However, the stream-aquifer exchanges are not thought to be significant to either the groundwater budget or to the response of the groundwater basin to pumping (Durbin, 2007).

Due to the intermittent nature and minimal amount of streamflow, there are no surface water rights registered with the SWRCB within the Subbasin.



Path: X:\B60094\Maps\2021\09\Fig4-23_NaturalSurfaceWaterFeatures.mxd

Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Natural Surface Water Features

- Stream/River

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Watersheds (HUC 12)

- 180600051507
- Alisal Creek-Salinas River
- Alisal Slough-Tembladero Slough
- Canyon Del Rey
- El Toro Creek
- Las Gazas Creek-Carmel River
- Nativdad Creek-Gabilan Creek
- Parker Flats-Frontal Monterey Bay
- Potrero Canyon-Carmel River
- Seal Rock Creek-Frontal Monterey Bay

Notes

1. Watersheds with a 12-digit hydrologic unit code (HUC 12) are shown. HUC 12 is generally a local sub-watershed level that captures tributary systems.

Sources

1. Surface water features and watersheds from NHD website: (https://viewer.nationalmap.gov/basic/).

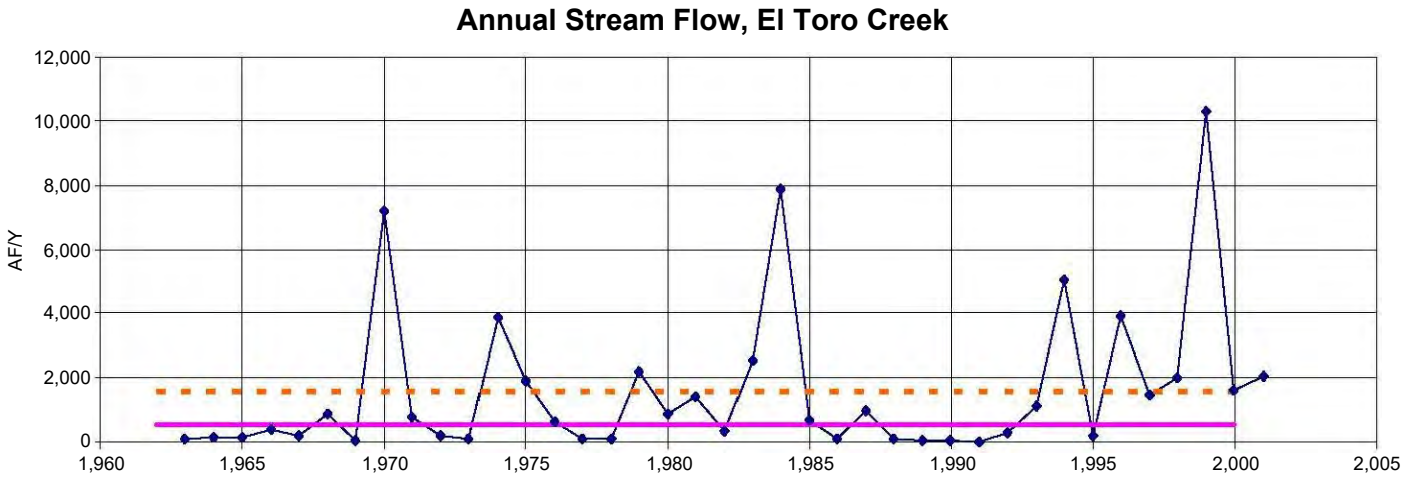
Abbreviations

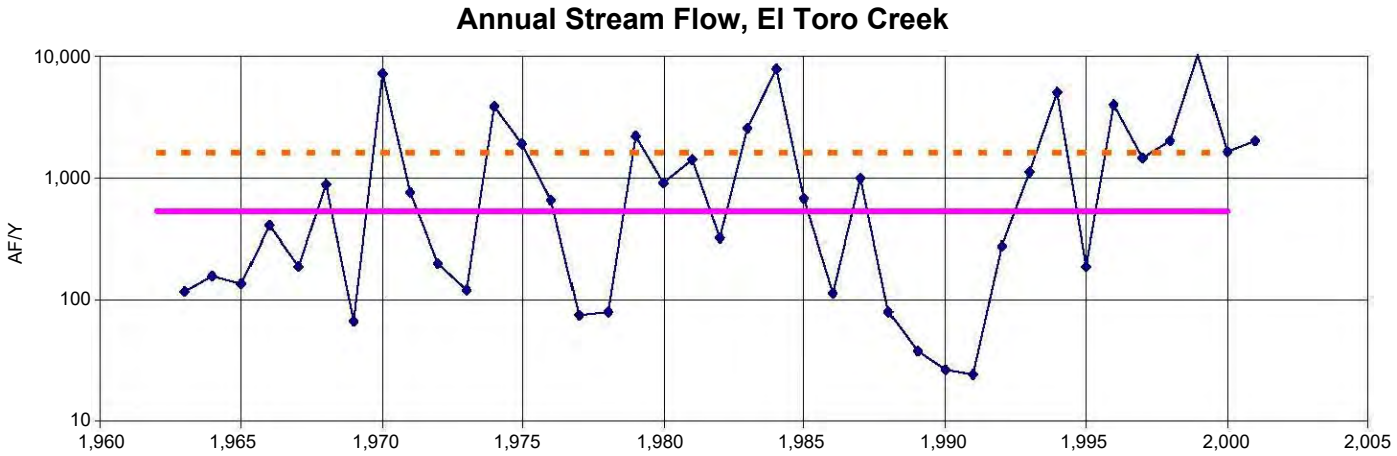
HUC = Hydrologic Unit Code
NHD = National Hydrography Dataset

Natural Surface Water Features

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 4-19





Legend:

- Mean Annual Flow (AF/Y)
- Mean Annual Log Q = 525 AF/Y
- Mean Annual Q = 1,590 AF/Y

Source:

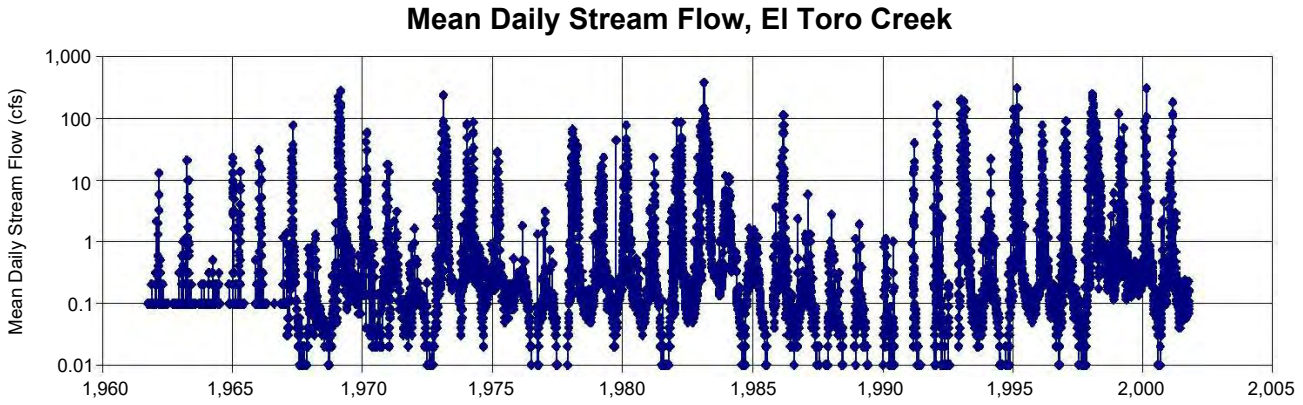
Adapted from GeoSyntec (2007).

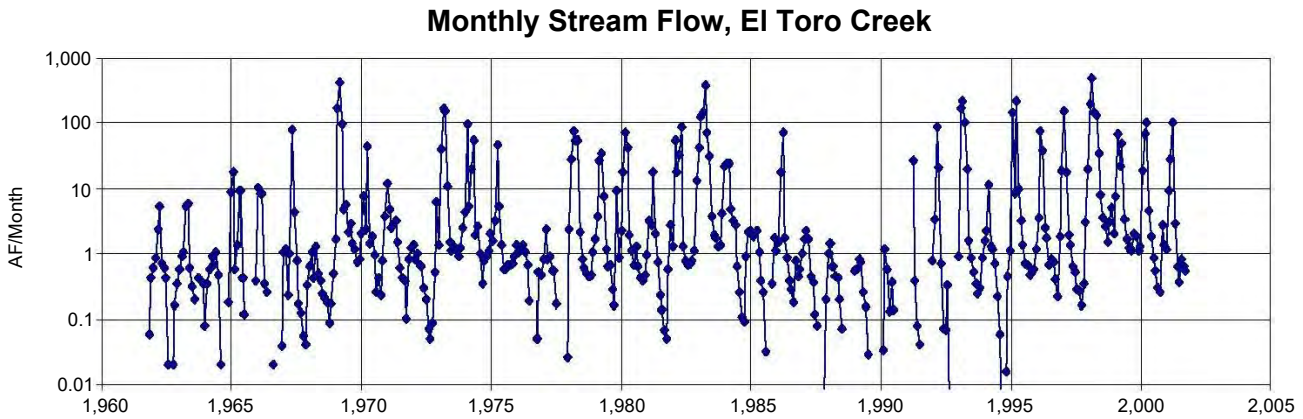
Annual Stream Flow, El Toro Creek

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 4-20

20200623.121603 G:\B60094.03\2020-06\Figure 4-18 through 4-31.dwg Fig 4-18





Legend:

Mean Daily and Monthly Flow

Source:

Adapted from GeoSyntec (2007).

Daily and Monthly Stream Flow, El Toro Creek

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 4-21

20200623.121603 G:\B60094.03\2020-06\Figure 4-18 through 4-31.dwg Fig 4-18

4.3.1 Source and Point of Delivery for Imported Water Supplies

There are no known sources of imported water for this subbasin. Groundwater is the only source of water for this subbasin.

4.4 Data Gaps

A significant portion of the Subbasin remains undeveloped, which includes federal lands located in the Fort Ord hills area and lands in the lower El Toro Creek area (i.e., northern portion of the Corral de Tierra Area). As such, limited to no subsurface information is available in these areas. Recent data collection and HCM updates have significantly improved the understanding of these previously data-limited areas; however, some uncertainties remain.

One area of remaining uncertainty is the hydrostratigraphic designation of certain Paso Robles Formation wells located in the southeastern portion of the Marina-Ord Area (i.e., Fort Ord hills area), including MPWMD#FO-11S and two new MCWDGSA monitoring wells completed in spring 2026. While these wells are screened at elevations above the 400/Deep Aquitard based on findings of the Deep Aquifers Study, groundwater elevations and trends observed in these wells are more similar to conditions in the Deep Aquifers than in the 400-Foot Aquifer. At the time of this draft, MCWDGSA is reviewing well construction, screened intervals, geophysical logs, and soil cuttings to refine the depth and extent of the 400/Deep Aquitard in this area and confirm the hydrostratigraphic designation of these wells.

An additional uncertainty is whether the Fort Ord hills area may provide recharge to the Marina-Ord principal aquifers. Chapter 7 describes ongoing data collection and monitoring that will allow continued refinement and quantification of the groundwater system. Chapter 10 includes activities to address the identified data gaps and improve the hydrogeologic conceptual model.

5 CURRENT AND HISTORICAL GROUNDWATER CONDITIONS

This section presents information on historical and baseline groundwater conditions within the Subbasin based on available data. The Groundwater Sustainability Agencies (GSAs) gathered information from multiple monitoring agencies within the Subbasin to establish the best comprehensive understanding of the Subbasin's groundwater conditions. Sources of data used to inform this assessment include data from Marina Coast Water District (MCWD), Monterey County Water Resources Agency (MCWRA), the U.S. Army for the former Fort Ord area, Monterey Peninsula Water Management District (MPWMD), DWR, USGS, ReGen Monterey (Monterey Regional Waste Management District), and Seaside Groundwater Basin Watermaster records, various state and federal databases, and other reports.

For the purposes of this chapter:

(a) "Baseline Conditions" or "Baseline Period" refers to the set of baseline conditions used to establish groundwater management conditions for the GSP. The Baseline Period generally represents conditions from WY 2015-2020 (i.e., October 2014 through September 2020); however, the specific period evaluated varies by sustainability indicator and data availability. Where data gaps exist during these periods, more recent data may be used to supplement the assessment.

(b) "Historical Conditions" or "Historical Period" refers to WY 2004-2018 (i.e., October 2003 through September 2018). This 15-year period is used to evaluate historical groundwater condition trends and is the same period used for the historical water budget in Chapter 6. This period is climatically close to long-term average rainfall conditions measured in the vicinity of the Subbasin since 1895. It includes a significant drought period between 2012 and 2015, as well as other drier and wetter than normal years.

In some cases, other periods of record are also discussed in this section when either (a) the discussion is constrained by the time periods of available datasets, or (b) characterization of groundwater conditions is improved by incorporation of data from other time periods.

This chapter summarizes information related to the six sustainability indicators defined under the SGMA, including:

1. Chronic lowering of groundwater levels;
2. Changes in groundwater storage;
3. Seawater intrusion;
4. Groundwater quality;
5. Land subsidence; and
6. Depletion of interconnected surface waters.

In addition, the chapter discusses GDEs. GDEs are not a SGMA-defined sustainability indicator but are an important part of GSPs.

As discussed in the Hydrogeological Conceptual Model (HCM; Chapter 4), the principal aquifers of the Marina-Ord Area are mostly the same as the layered principal aquifers in the 180/400-Foot Aquifer Subbasin (180/400 Subbasin). The principal aquifer in the Corral de Tierra Area is the El Toro Primary Aquifer System, which combines the water-bearing geologic units into one functional aquifer. These geologic formations are present across the Subbasin and include the Paso Robles Formation and the Santa Margarita Sandstone. The Dune Sand, 180-Foot, and 400-Foot Aquifers and their unique geology are not present in the Corral de Tierra/San Benancio bowl portion of the Corral de Tierra Area. Additionally, the Laguna Seca Anticline, which comprises a major portion of the Marina-Ord/Corral de Tierra boundary, raises the Monterey Formation as bedrock and reduces the hydraulic connectivity between the two Management Areas. The groundwater conditions outlined below are the best attempt to describe both the unique areas as well as the hydraulic connection across the geologic units that exist in both areas, despite some uncertainty within the Fort Ord hills.

Groundwater conditions shown herein have been updated since the 2022 GSP to reflect the following:

- Updates to the Subbasin HCM.
- Groundwater elevation and quality data collected in new monitoring wells that provide a better understanding of historical and baseline conditions.
- An updated assessment of water quality constituents, interconnected surface water, and groundwater dependent ecosystems.

5.1 Groundwater Elevations and Flow Direction

Subbasin groundwater elevations are presented using the following methodologies:

- Maps of groundwater elevation contours that show the geographic distribution of groundwater elevations at a specific time. The contours represent lines of equal groundwater elevation in feet above the NAVD88 vertical datum.
- Hydrographs that present groundwater elevations measured over time in individual wells.
- Vertical hydraulic gradients at individual locations to assess the potential for vertical groundwater flow between aquifers.

5.1.1 Data Sources

Groundwater elevations have been assessed based on data collected and compiled from various agencies, including MCWD, MCWRA, Fort Ord, MPWMD, DWR's California Statewide CASGEM database, USGS, ReGen Monterey, and Seaside Groundwater Basin Watermaster. Multiple datasets were reconciled and processed for quality assurance/quality control prior to analysis of groundwater conditions. These "data cleaning" efforts included the identification and removal of potentially erroneous data points through examination of hydrographs and recorded information. For the purposes of this analysis, August 2017 and Spring 2018 are used to represent

seasonal low and high conditions during the Baseline Period. They are also considered representative of current land and water use conditions.

5.1.2 Baseline Groundwater Elevation Contours and Horizontal Groundwater Gradients

Groundwater elevation contours for each principal aquifer during August 2017 and Spring (February and March) 2018 are presented on Figure 5-1 through Figure 5-12. August and Spring periods reflect seasonal low and seasonal high groundwater conditions, respectively. Groundwater flow directions and groundwater levels observed during these periods in the Marina-Ord Area and Corral de Tierra Area are summarized below.

The spring contours presented for the Corral de Tierra Area are based on limited data because few wells were monitored in the spring season in the SVBGSA subbasins and in the Corral de Tierra Area. SVBGSA and MCWRA are working together to register additional wells into the monitoring program and increase the frequency of monitoring throughout these areas to improve monitoring during the seasonal high.

5.1.2.1 Marina-Ord Area

The principal aquifers in the Marina-Ord Area include: the Dune Sand Aquifer, 180-Foot Aquifer, 400-Foot Aquifer, and Deep Aquifers. In the Marina-Ord Area, the 180-Foot Aquifer and Deep Aquifers each contain two distinct layers, known as the upper 180-Foot Aquifer, lower 180-Foot Aquifer, upper Deep Aquifer, and lower Deep Aquifer. Conditions in each of these layers are described herein.

Dune Sand Aquifer

As discussed in Chapter 4 and shown in Figure 5-1 and Figure 5-6, the Dune Sand Aquifer only exists in the Marina-Ord Area within the dune sand deposits located in the western portion of the Subbasin.

- Groundwater elevations in the Dune Sand Aquifer are highest in the central portion of the Marina-Ord Area, where a groundwater divide exists. Groundwater elevations were lowest at the coast where the Dune Sand Aquifer merges with the upper 180-Foot Aquifer west of the SVA. There is minimal seasonal variation of groundwater elevations in the Dune Sand Aquifer. Flow directions are similar between seasonal low and seasonal high conditions.
- At the top of the divide, groundwater elevations were approximately 90 ft NAVD 88 during August 2017 and 90 ft NAVD 88 during Spring 2018. Near the coast, groundwater elevations were 7 ft NAVD88 in August 2017 and 8 ft NAVD 88 in Spring 2018. Groundwater level data for the Dune Sand Aquifer are limited in the southern portion of the Marina-Ord Area near the Monterey-Seaside Subbasin boundary and at the eastern extent of the Dune Sand Aquifer.
- West of the groundwater divide, groundwater in the Dune Sand Aquifer flows westward toward the Pacific Ocean and recharges the 180-Foot Aquifer where the SVA pinches out.

Upon entering the 180-Foot Aquifer, groundwater abruptly reverses direction and flows eastward (i.e., inland). East of the groundwater divide, groundwater in the Dune Sand Aquifer flows to the northeast toward the 180/400 Subbasin and the Salinas River.

- During the Baseline Period, the average magnitude of the horizontal gradient in the Dune Sand Aquifer was approximately 0.011 foot per foot (ft/ft) west of the groundwater divide and 0.007 ft/ft east of the groundwater divide.

180-Foot Aquifer

In the coastal portion of the Marina-Ord Area, the 180-Foot Aquifer is subdivided into the upper 180-Foot Aquifer and the lower 180-Foot Aquifer. This subdivision is based on the stratigraphy described in multiple studies focused on this area (Ahtna Engineering, 2013; Harding ESE, 2001; detailed in Chapter 4). Groundwater elevations and gradients observed in these two zones of the 180-Foot Aquifer during August 2017 (seasonal low) and Spring 2018 (seasonal high) of the Baseline Period are described below.

Upper 180-Foot Aquifer

- Groundwater elevations in the upper 180-Foot Aquifer are highest at the coastline and generally decrease inland to the east/northeast. Flow directions are generally to the northeast toward the 180/400 Subbasin and are similar between seasonal-low and seasonal-high conditions (Figure 5-2 and Figure 5-7).
- Groundwater elevations range from 5 to 8 ft NAVD88 at the coastline and approximately -2 to -5 ft NAVD88 on the Monterey-180/400 Subbasin boundary. Seasonal variation in groundwater levels within the upper 180-Foot Aquifer is generally limited to a few feet .
- Groundwater elevations are slightly higher than sea level at the coastline and are below sea level further inland. This inland gradient allows high-salinity water to flow into the northwestern portion of the Subbasin in the lower 180-Foot Aquifer. However, inflow from the Dune Sand Aquifer near the coastline protects the upper 180-Foot Aquifer from seawater intrusion in the Marina-Ord Area.
- The average horizontal gradient in the upper 180-Foot Aquifer was 0.0012 ft/ft in Fall 2017 and 0.0008 ft/ft in Spring 2018.

Lower 180-Foot Aquifer

As discussed in Chapter 4, the lower 180-Foot Aquifer is hydraulically connected to the 400-Foot Aquifer in the Marina-Ord Area due to the discontinuous nature of the 180/400-Foot Aquitard within this region. As such, groundwater elevations and gradients in the lower 180-Foot Aquifer are similar to those in the 400-Foot Aquifer in the Marina-Ord Area of the Subbasin, which is further described below.

400-Foot Aquifer

In the original GSP, groundwater elevations in the 400-Foot Aquifer of the Monterey Subbasin were plotted in combination with those from the Paso Robles Aquifer of the Seaside Subbasin. However, the recent HCM update (Section 4.2) indicates that wells screened in the Paso Robles

Aquifer of the Seaside Subbasin are hydraulically connected to and part of the upper Deep Aquifer in the Monterey Subbasin. As a result, groundwater elevations from wells previously designated to the Paso Robles Aquifer have been removed from 400-Foot Aquifer contour maps and have been incorporated into upper Deep Aquifer contour maps.

Figure 5-3 and Figure 5-8 show groundwater elevation contours within the 400-Foot Aquifer in the Marina-Ord Area for August 2017 and Spring 2018, respectively. These groundwater elevations and gradients are consistent with those observed in the lower 180-Foot Aquifer.

- Similar to those in the upper 180-Foot Aquifer, groundwater elevations in the lower 180-Foot Aquifer and 400-Foot Aquifer are highest at the coastline and generally decrease inland to the east/northeast. The direction of the hydraulic gradient is generally toward the 180/400 Subbasin and is northeasterly during seasonal-low conditions and easterly during seasonal-high conditions.
- Groundwater elevations range from 3 to 4 ft NAVD88 at the coastline and approximately -11 to -5 ft NAVD88 at the Monterey-180/400 Subbasin boundary. Seasonal variations in groundwater levels within the 400-Foot Aquifer are generally within 10 feet. These seasonal variations reflect increased recharge during the winter season and seasonal variations in agricultural pumping in the Salinas Valley Basin.
- Groundwater elevations in the 400-Foot Aquifer are at or below sea level at the coastline, which is 2.97 ft NAVD88 in the vicinity of Monterey, California; and further below sea level inland. As discussed in *Section 4* of the Monterey GSP, the geologic formations that make up this aquifer extend offshore below Monterey Bay and outcrop beneath a veneer of Pleistocene or Holocene marine sediments that are thin (i.e., less than 5 meters) across much of the offshore shelf but thicker (i.e., up to 32 meters) near the Salinas River Delta (Johnson et al., 2016). The combination of groundwater levels in this aquifer, which are below sea level in the northern portion of the Monterey Subbasin, and offshore outcrops below Monterey Bay allows high-salinity water to flow into this aquifer within the Subbasin.
- Groundwater elevation contours for the 400-Foot Aquifer do not include data from MPWMD#FO-11S (see Figure 5-15 for its location). As discussed in Section 4.4,uncertainty remains as to whether this well is screened in the 400-Foot Aquifer or the upper Deep Aquifer.
- During the Baseline Period, the average magnitude of the horizontal gradient in the 400-Foot Aquifer was 0.0011 ft/ft in Fall 2017 and 0.0006 ft/ft in Spring 2018.

Deep Aquifers

Groundwater elevation contours for the Deep Aquifers presented in this GSP Amendment 1 have been updated in accordance with the HCM update (Section 4.2). Separate groundwater level

contours have been prepared for the upper and lower portions of the Deep Aquifers, as nested wells show that groundwater levels in these aquifers differ by tens of feet.

Upper Deep Aquifer

- Figure 5-4 and Figure 5-9 show groundwater elevation contours within the upper Deep Aquifer in August 2017 and Spring 2018, respectively. These figures also incorporate groundwater level elevations from the Seaside Subbasin Paso Robles Aquifer, which is hydraulically connected to the upper Deep Aquifer.
- Groundwater elevations in the upper Deep Aquifer are highest in the southeastern portion of the Marina-Ord Area and generally decrease toward the northwest. The Monterey-Seaside groundwater divide in the upper Deep Aquifer is located close to the Seaside /Monterey Subbasin boundary. South of this groundwater divide, groundwater flows toward the pumping depression in the Seaside Subbasin, while to the north of the divide, groundwater flows northward across the Monterey Subbasin toward a pumping trough located in the 180/400 Subbasin.
- Groundwater elevations in the upper Deep Aquifer are highest at the Laguna Seca Anticline (232 ft NAVD 88) and lowest to the north near the Monterey-180/400 Subbasin boundary (-75 ft to -56 ft NAVD 88). Groundwater elevations are up to 30 ft higher during seasonal-high conditions compared to seasonal-low conditions.
- During the Baseline Period, the average magnitude of horizontal gradients in the upper Deep Aquifer, identified on the basis of contours shown on Figure 5-4 and Figure 5-9, ranged from 0.004 ft/ft in August 2017 to 0.002 ft/ft in Spring 2018 in the Marina-Ord Area.

Lower Deep Aquifer

- Figure 5-5 and Figure 5-10 show groundwater elevation contours within the lower Deep Aquifer in August 2017 and Spring 2018, respectively. These maps incorporate groundwater elevation data from the Seaside Subbasin Santa Margarita Aquifer, which is hydraulically connected to the lower Deep Aquifer.
- The natural northerly direction of groundwater flow in the lower Deep Aquifer is similar to that in the upper Deep Aquifer. However, significant groundwater extraction occurs from the Santa Margarita Aquifer in the Seaside Subbasin, which causes groundwater to flow southward in the southern portion of the Monterey Subbasin toward the pumping depression in the Seaside Subbasin. As such, an east/west groundwater divide exists in the center of the Monterey Subbasin within the lower Deep Aquifer.
- Groundwater elevations in the lower Deep Aquifer are highest at the Laguna Seca Anticline (223 ft NAVD 88) and lowest to the north near the Monterey-180/400 Subbasin boundary (-20 ft NAVD 88). Groundwater elevations are up to 2 ft higher during seasonal-high conditions compared to seasonal-low conditions.
- During the Baseline Period, the average magnitude of horizontal gradients in the lower

Deep Aquifer, identified on the basis of contours shown on Figure 5-5 and Figure 5-10, ranged from 0.003 ft/ft in August 2017 to 0.002 ft/ft in Spring 2018 in the Marina-Ord Area.

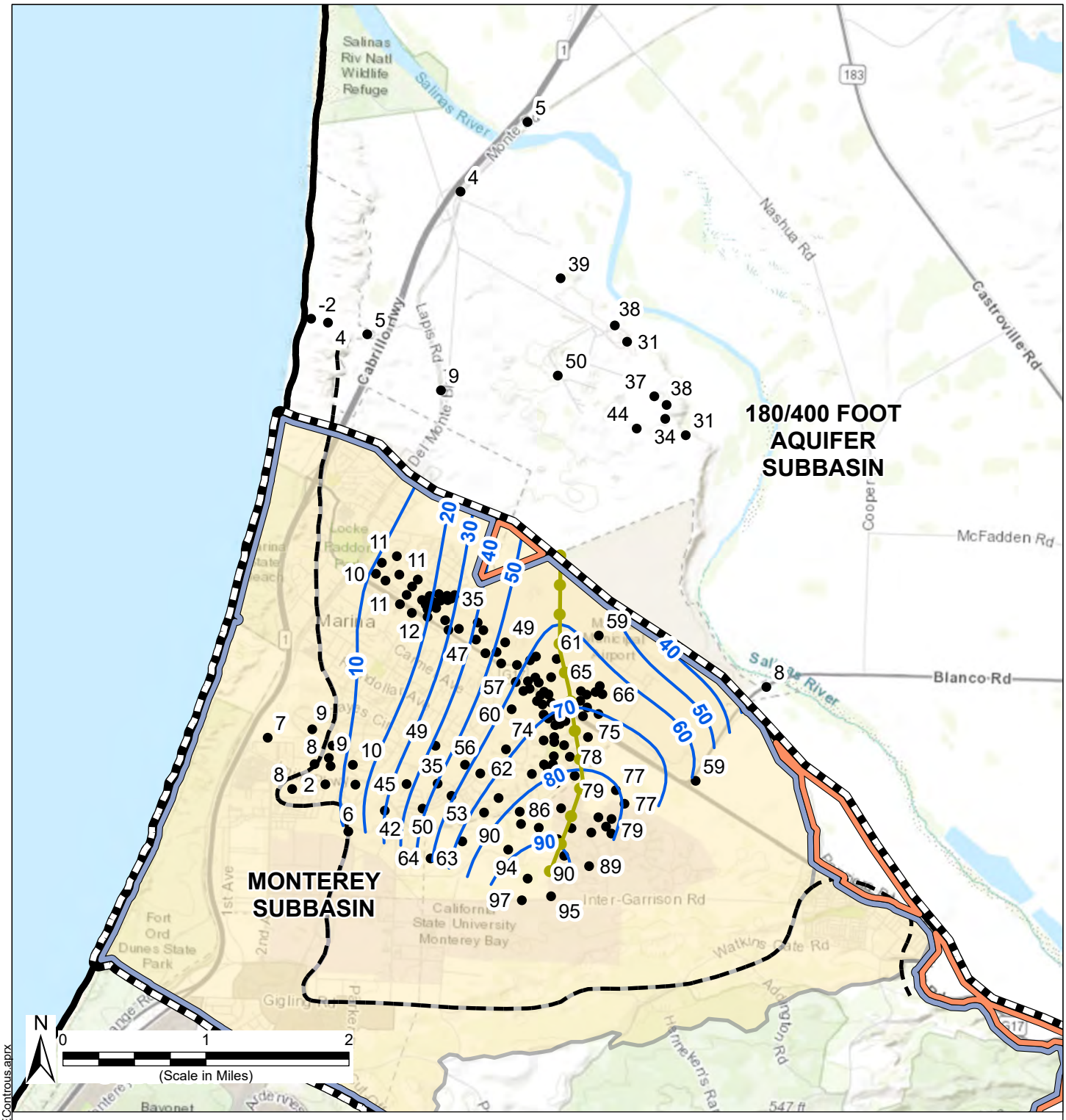
Groundwater elevations in the Deep Aquifers are significantly lower than those in the 400-Foot Aquifer and have been consistently below sea level since the late 1980s. These data suggest that the Deep Aquifers are at risk of seawater intrusion from locations where these formations outcrop on the ocean floor near the rim of the Monterey Canyon (Hartwell et al., 2016; Johnson et al., 2016) and from leakage from the overlying seawater intruded aquifers.

5.1.2.2 Corral de Tierra Area

Figure 5-11 through Figure 5-12 show groundwater elevation contours within the El Toro Primary Aquifer System in the Corral de Tierra Area. Separate contours were developed for the eastern Highway 68 and Corral de Tierra/San Benancio bowls due to the limited hydraulic connectivity between the two bowls.

In the eastern Highway 68 bowl, groundwater generally flows from the south toward the north. In the Corral de Tierra/San Benancio Bowl, groundwater generally flows southeast to northwest toward a pumping depression near the Monterey-Seaside Subbasin boundary. Groundwater elevation contours indicate a potential groundwater divide near the boundary in the Laguna Seca area. However, the revised bedrock-surface interpretation indicates that the Laguna Seca and Corral de Tierra/San Benancio areas occupy a common bedrock bowl, and prior studies indicate hydraulic connectivity between them. Therefore, the apparent divide may be influenced by groundwater pumping and associated potentiometric conditions rather than by a persistent hydrostratigraphic barrier. Additionally, the uplift in the top of the Monterey Formation east of the Highway 68 intersection with San Benancio Road, which separates the Corral de Tierra/San Benancio and eastern Highway 68 bowls, likely restricts flow northward from the Corral de Tierra/San Benancio bowl toward the 180/400 Subbasin.

In August 2017, the groundwater elevations ranged from approximately 230 ft to 920 ft NAVD 88 in the Corral de Tierra/San Benancio bowl and -15 ft to 30 ft NAVD 88 in the eastern Highway 68 bowl.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Dune Sand Groundwater Divide
- Extent of Dune Sand Geologic Unit
- 2017 August Groundwater Elevation Contours in the Dune Sand Aquifer (ft NAVD 88)
- Southern Extent of FO-SVA (Harding ESE, 2001)
- Groundwater Level Measurement Locations

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Notes

1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88.
3. Some GWE labels are omitted in crowded areas for clarity; all measurements are included in contouring.
4. Groundwater contours are drawn with groundwater elevation measurements collected during August 2017. Only static water levels are plotted.

Abbreviations

ft = foot
NAVD 88 = North American Vertical Datum of 1988

Sources

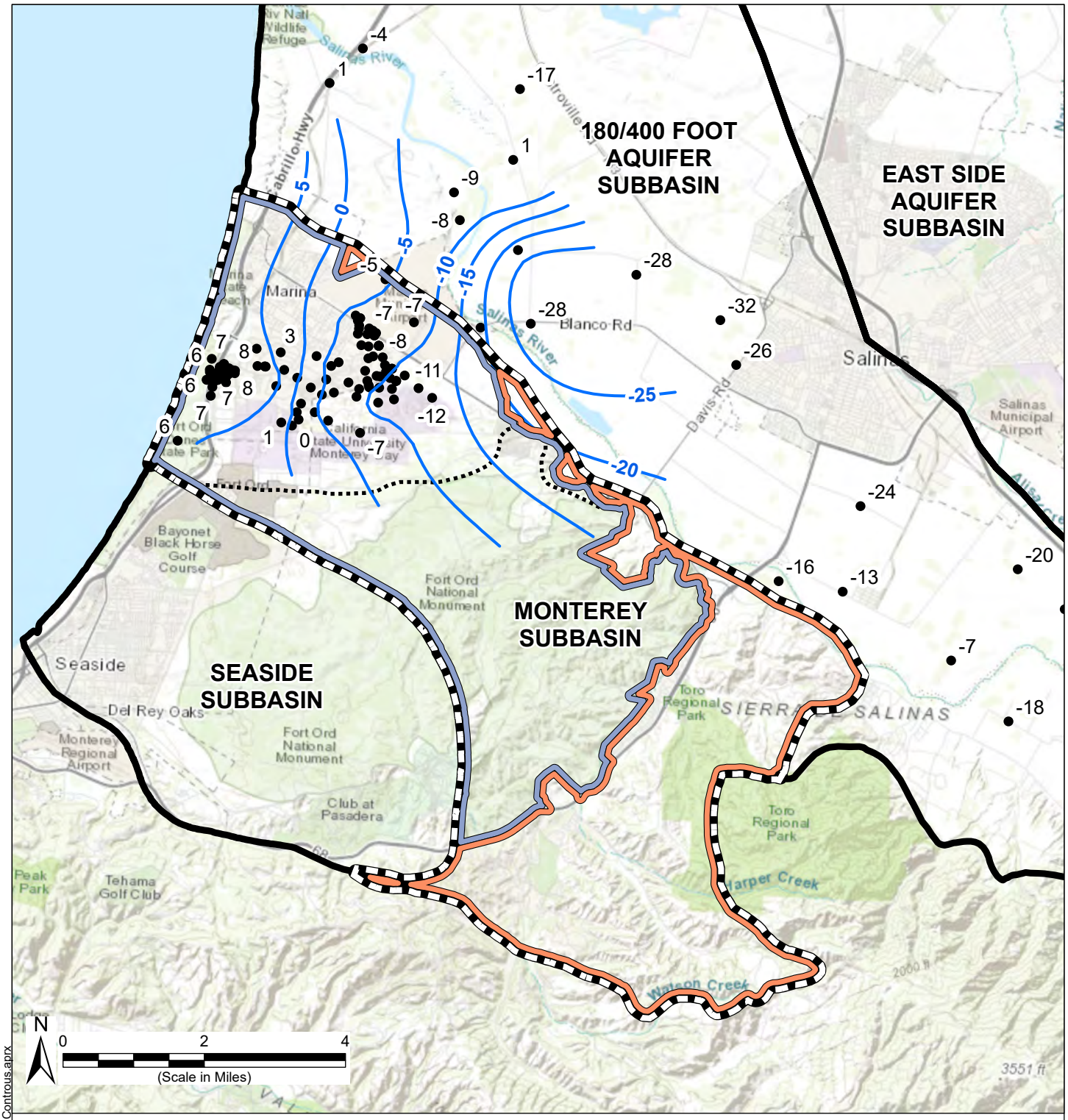
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 October 2026.

Groundwater Level Contours in the Dune Sand Aquifer - August 2017

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 5-1

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_1256_GWEControus.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Southern Extent of Valley Fill Deposits (Harding ESE, 2001)
- Groundwater Level Measurement Locations
- 2017 August Groundwater Contours in the Upper 180-Foot Aquifer (NAVD 88)

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Notes

1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88.
3. Some GWE labels are omitted in crowded areas for clarity; all measurements are included in contouring.
4. Groundwater contours are drawn with groundwater elevation measurements collected during August 2017. Only static water levels are plotted.
4. Upper 180-Foot Aquifer water levels are plotted with those from the 180/400 Subbasin due to the lack of distinct aquifer separation north of the Salinas River. MPWSP wells are excluded because they screen both the upper and lower portions of the aquifer.

Abbreviations

ft = foot
NAVD 88 = North American Vertical Datum of 1988

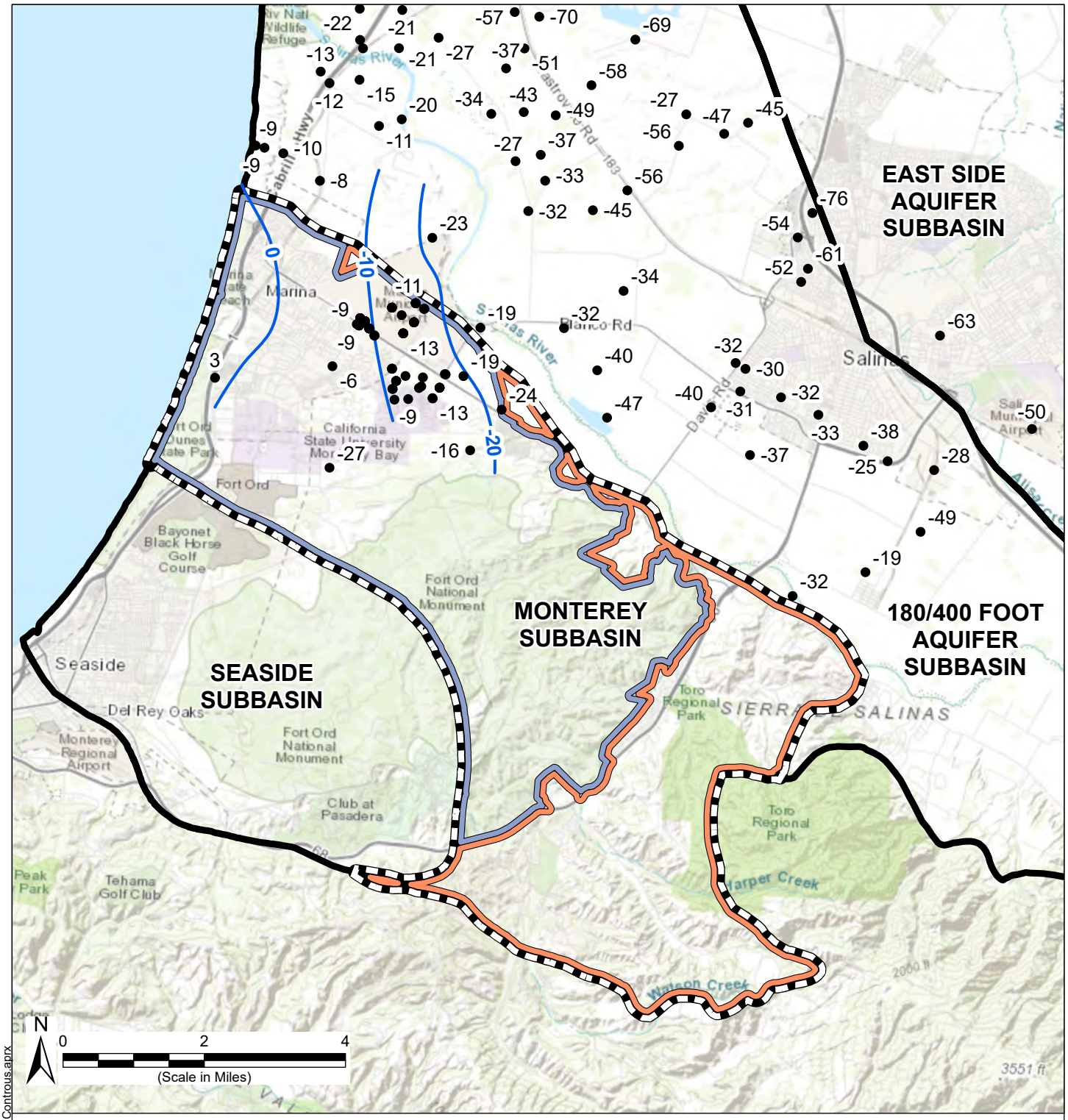
Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 October 2026.

Groundwater Level Contours in the Upper 180-Foot Aquifer - August 2017

Monterey Subbasin
Groundwater Sustainability Plan
October 2026
Figure 5-2

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_1256_GWEControus.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- August 2017 Groundwater Contours
- Groundwater Measurement Locations

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Abbreviations

ft = foot
NAVD 88 = North American Vertical Datum of 1988

Notes

1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88.
3. MPWMD#FO-11S is shown on both 400-Foot Aquifer and Upper Deep Aquifer maps due to the stratigraphic uncertainty in this area. See Figure 5-15 for its specific location.
4. Groundwater contours are drawn with groundwater elevation measurements collected during August 2017. Only static water levels are plotted.
5. Some GWE labels are omitted in crowded areas for clarity; all measurements are included in contouring.

Sources

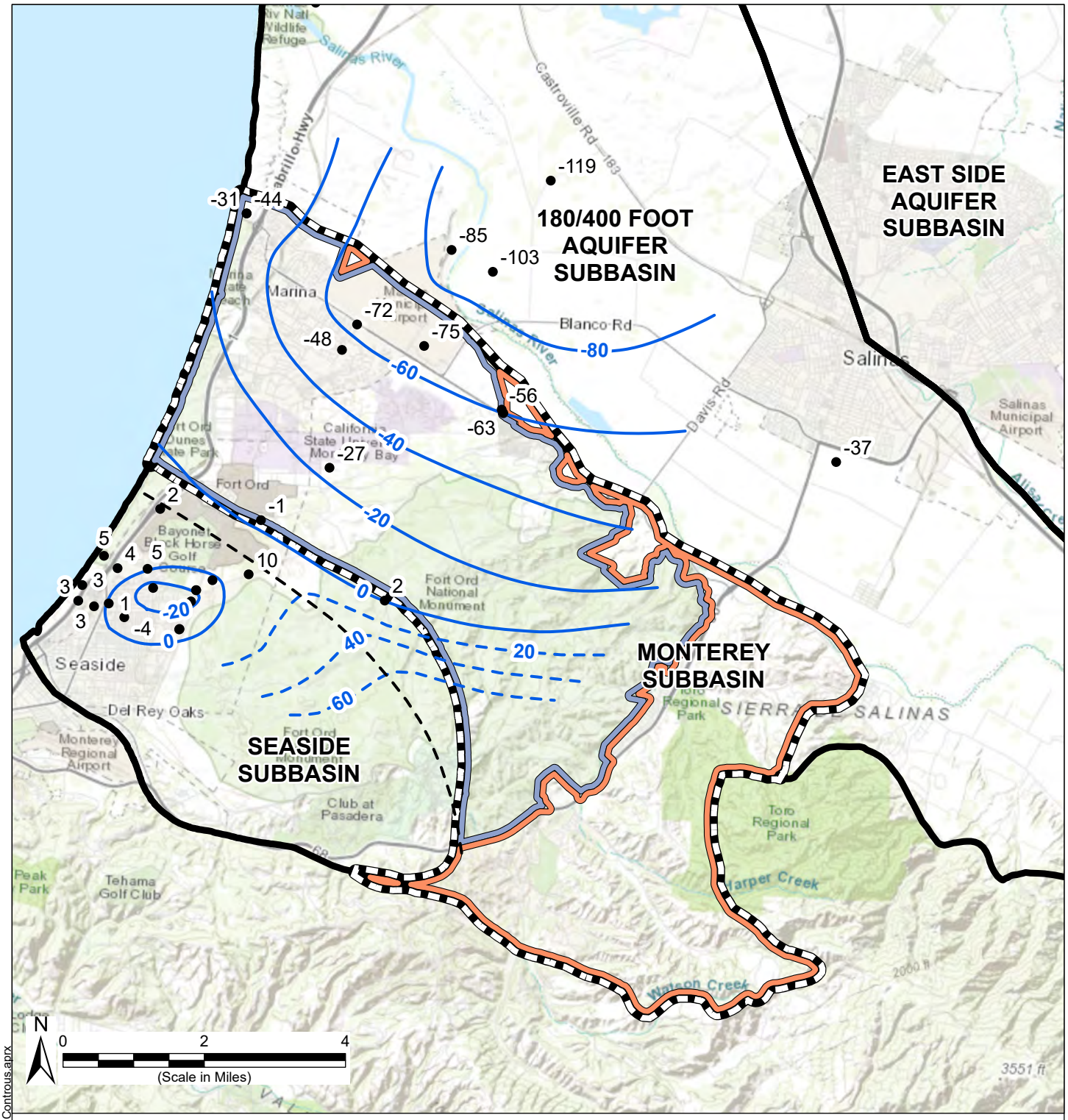
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 October 2026.

Groundwater Level Contours in the Lower 180-Foot, 400-Foot Aquifers August 2017

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 5-3

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_3478_GWEControus.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- August 2017 Groundwater Contours
- Groundwater Measurement Locations
- Groundwater Divide

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Abbreviations

ft = foot
NAVD 88 = North American Vertical Datum of 1988

Notes

1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88 and dashed where uncertain.
3. MPWMD#FO-11S is shown on both 400-Foot Aquifer and Upper Deep Aquifer maps due to the stratigraphic uncertainty in this area. See Figure 5-15 for its specific location.
4. Groundwater contours are drawn with groundwater elevation measurements collected during August 2017. Only static water levels are plotted.
5. Some GWE labels are omitted in crowded areas for clarity; all measurements are included in contouring.

Sources

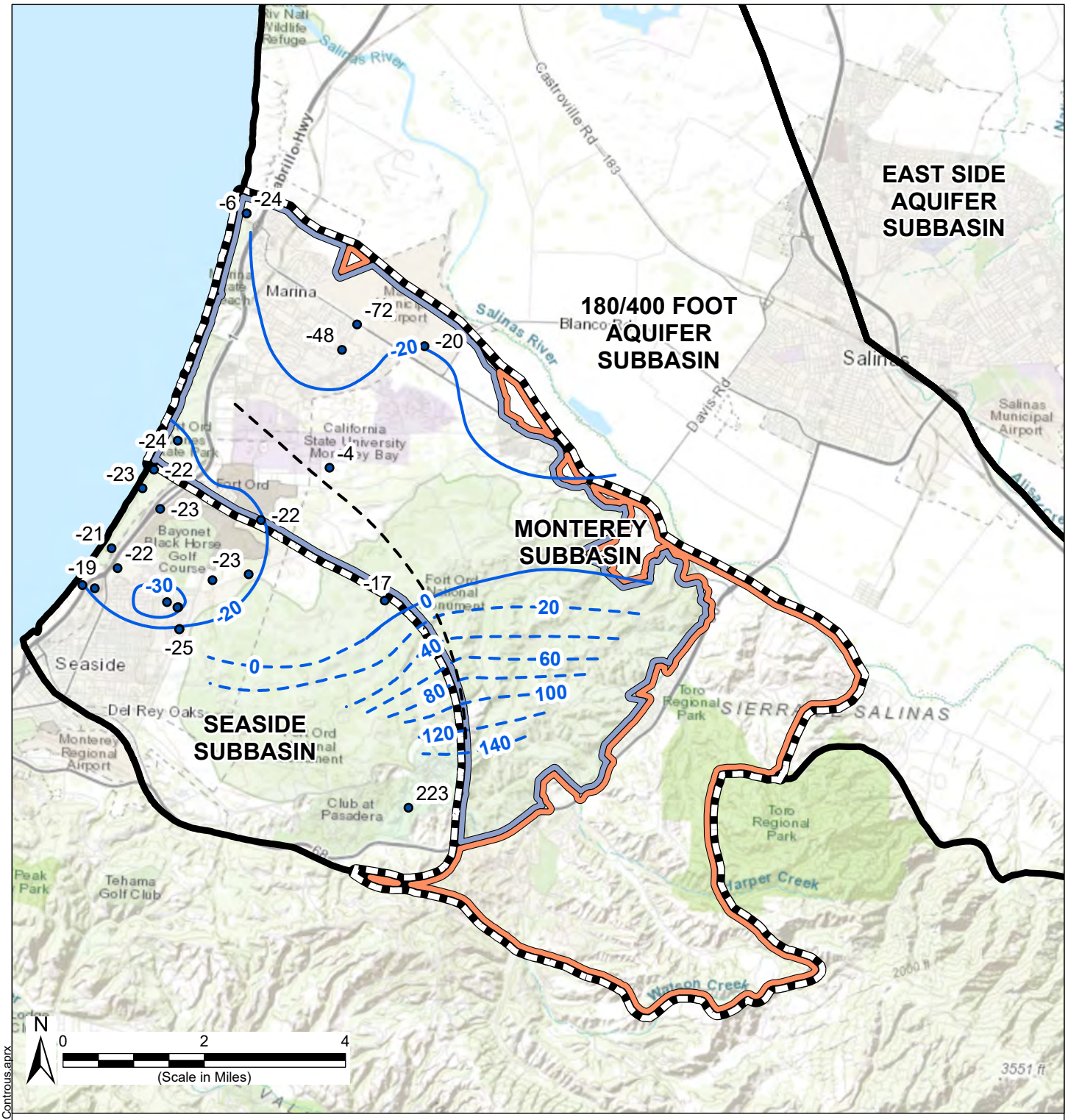
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 October 2026.

Groundwater Level Contours in the Upper Deep Aquifer Zone August 2017

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 5-4

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_3478_GWEControus.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- August 2017 Groundwater Contours
- Groundwater Measurement Locations
- Groundwater Divide

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Abbreviations

ft = foot
NAVD 88 = North American Vertical Datum of 1988

Notes

1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88 and dashed where uncertain.
3. Groundwater contours are drawn with groundwater elevation measurements collected during August 2017. Only static water levels are plotted.
4. Some GWE labels are omitted in crowded areas for clarity; all measurements are included in contouring.

Sources

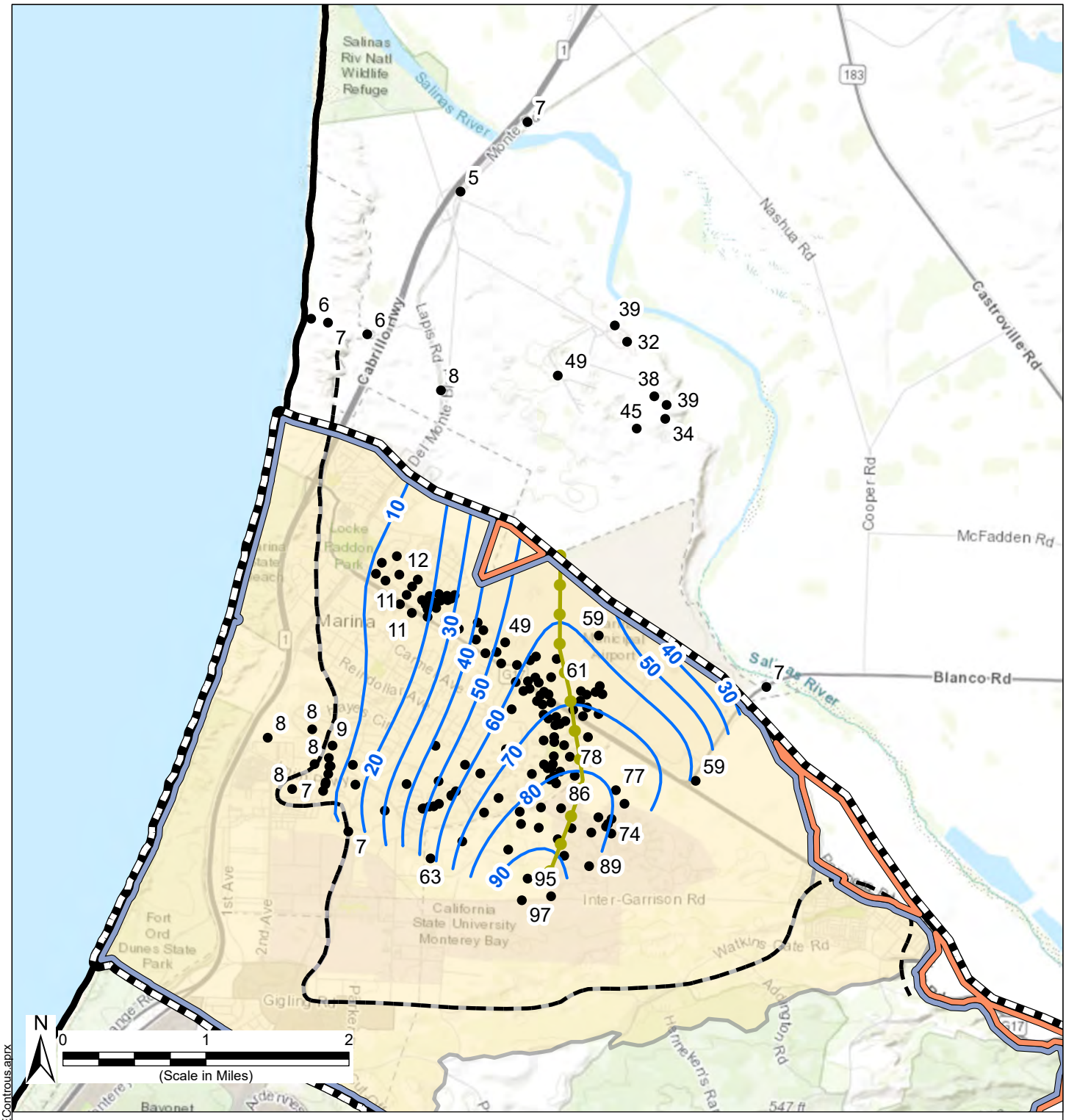
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 October 2026.

Groundwater Level Contours in the Lower Deep Aquifer Zone August 2017

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 5-5

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_3478_GWEControus.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Dune Sand Groundwater Divide
- Extent of Dune Sand Geologic Unit
- 2018 Spring Groundwater Elevation Contours in the Dune Sand Aquifer (ft NAVD 88)
- Southern Extent of FO-SVA (Harding ESE, 2001)
- Groundwater Level Measurement Locations

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Notes

1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88.
3. Some GWE labels are omitted in crowded areas for clarity; all measurements are included in contouring.
4. Groundwater contours are drawn with groundwater elevation measurements collected during Spring 2018. Only static water levels are plotted.

Abbreviations

ft = foot
NAVD 88 = North American Vertical Datum of 1988

Sources

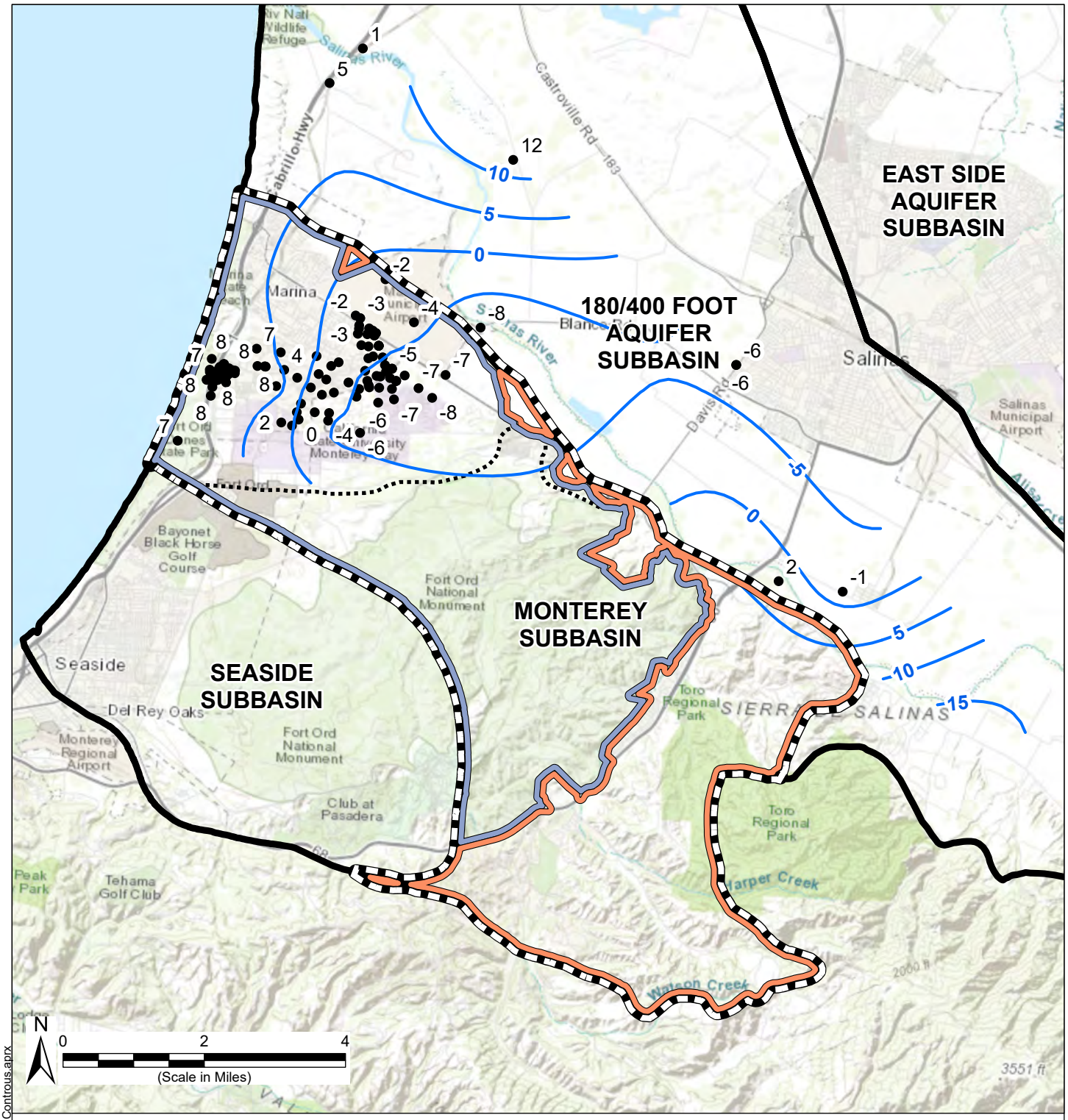
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 October 2026.

Groundwater Level Contours in the Dune Sand Aquifer - Spring 2018

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 5-6

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_1256_GWEControus.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- 2018 Spring Groundwater Contours in the Upper 180-Foot Aquifer (NAVD 88)
- Southern Extent of Valley Fill Deposits (Harding ESE, 2001)
- Groundwater Level Measurement Locations

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Notes

1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88.
3. Some GWE labels are omitted in crowded areas for clarity; all measurements are included in contouring.
4. Groundwater contours are drawn with groundwater elevation measurements collected during Spring 2018. Only static water levels are plotted.
4. Upper 180-Foot Aquifer water levels are plotted with those from the 180/400 Subbasin due to the lack of distinct aquifer separation north of the Salinas River. MPWSP wells are excluded because they screen both the upper and lower portions of the aquifer.

Abbreviations

ft = foot
NAVD 88 = North American Vertical Datum of 1988

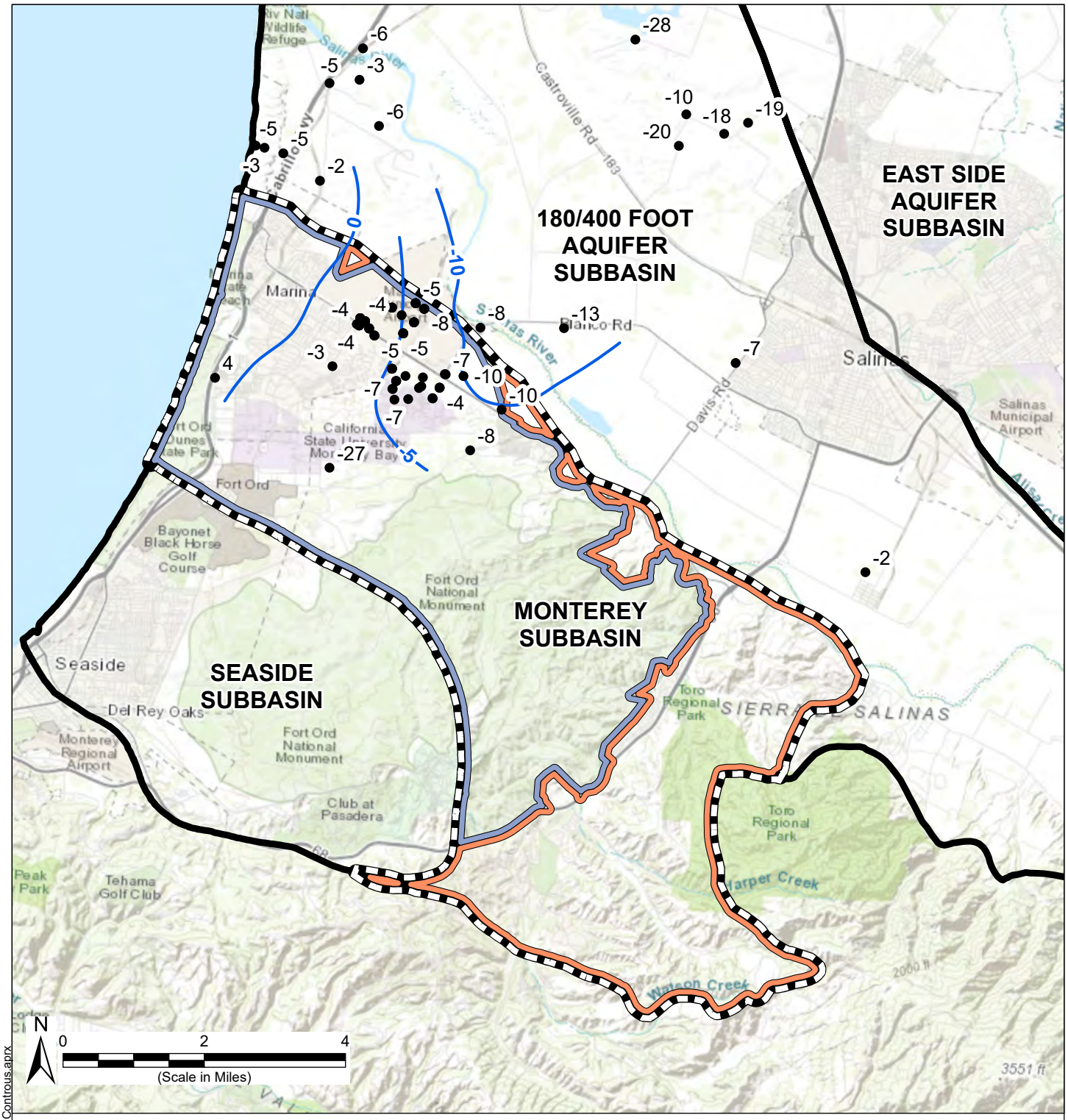
Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 October 2026.

Groundwater Level Contours in the Upper 180-Foot Aquifer - Spring 2018

Monterey Subbasin
Groundwater Sustainability Plan
October 2026
Figure 5-7

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_1256_GWEControus.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Spring 2018 Groundwater Contours
- Groundwater Measurement Locations

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Notes

1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88.
3. MPWMD#FO-11S is shown on both 400-Foot Aquifer and Upper Deep Aquifer maps due to the stratigraphic uncertainty in this area.
4. Groundwater contours are drawn with groundwater elevation measurements collected during Spring 2018. Only static water levels are plotted.
5. Some GWE labels are omitted in crowded areas for clarity; all measurements are included in contouring.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 October 2026.

Abbreviations

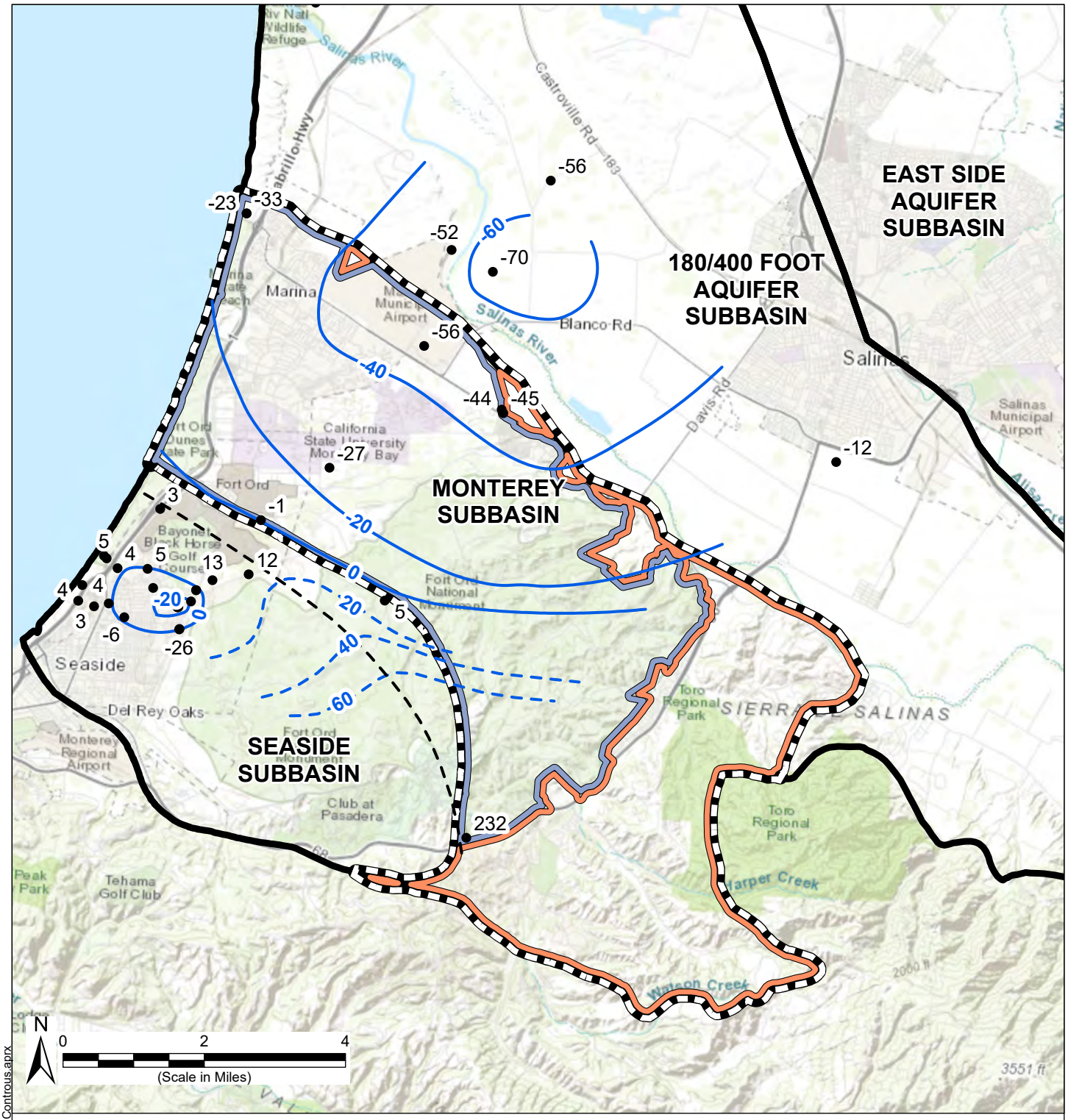
ft = foot
NAVD 88 = North American Vertical Datum of 1988

Groundwater Level Contours in the Lower 180-Foot, 400-Foot Aquifers Spring 2018

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 5-8

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_3478_GWEControus.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Spring 2018 Groundwater Contours
- Groundwater Measurement Locations
- Groundwater Divide

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Abbreviations

ft = foot
NAVD 88 = North American Vertical Datum of 1988

Notes

1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88 and dashed where uncertain.
3. MPWMD#FO-11S is shown on both 400-Foot Aquifer and Upper Deep Aquifer maps due to the stratigraphic uncertainty in this area. See Figure 5-15 for its specific location.
4. Groundwater contours are drawn with groundwater elevation measurements collected during Spring 2018. Only static water levels are plotted.
5. Some GWE labels are omitted in crowded areas for clarity; all measurements are included in contouring.

Sources

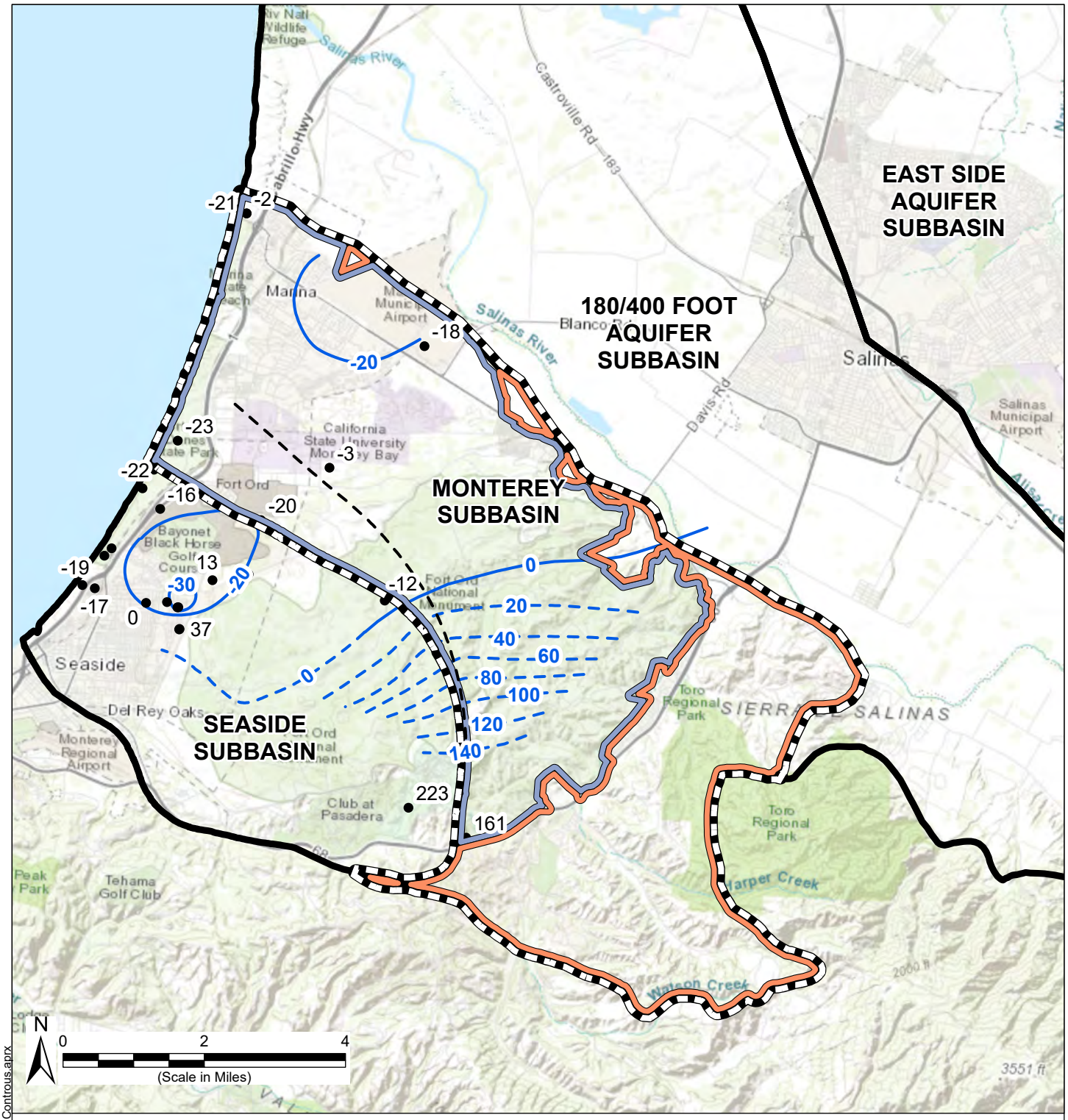
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 October 2026.

Groundwater Level Contours in the Upper Deep Aquifer Zone Spring 2018

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 5-9

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_3478_GWEControus.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Spring 2018 Groundwater Contours
- Groundwater Measurement Locations
- Groundwater Divide

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Abbreviations

ft = foot
NAVD 88 = North American Vertical Datum of 1988

Notes

1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88 and dashed where uncertain.
3. Groundwater contours are drawn with groundwater elevation measurements collected during Spring 2018. Only static water levels are plotted.
4. Some GWE labels are omitted in crowded areas for clarity; all measurements are included in contouring.

Sources

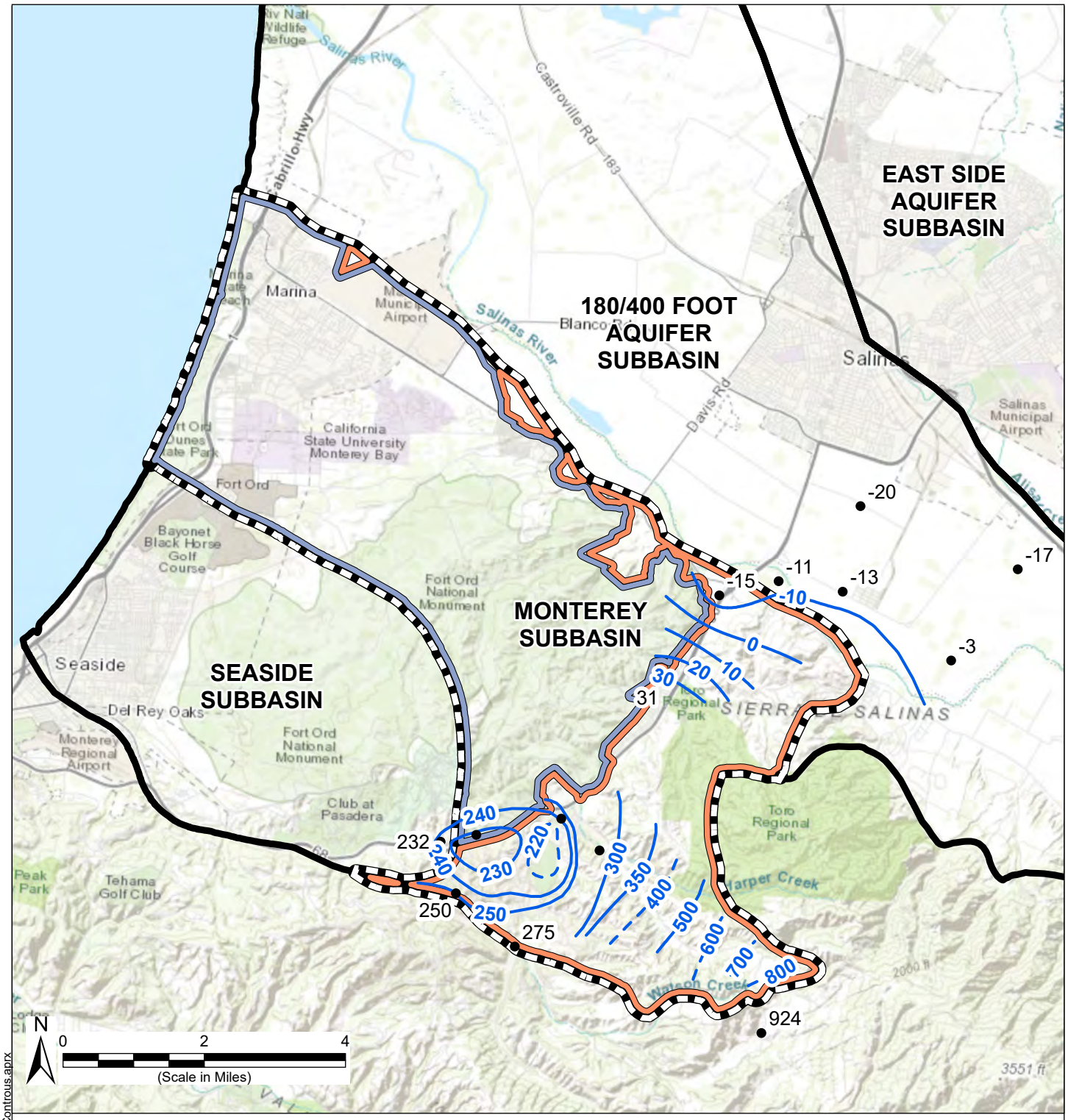
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 October 2026.

Groundwater Level Contours in the Lower Deep Aquifer Zone Spring 2018

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 5-10

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_3478_GWEControus.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- August 2017 Groundwater Contours
- Groundwater Measurement Locations

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Abbreviations

ft = foot
NAVD 88 = North American Vertical Datum of 1988

Notes

1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88 and dashed where uncertain.
3. Groundwater contours are drawn with groundwater elevation measurements collected during August 2017. Only static water levels are plotted.
4. Some GWE labels are omitted in crowded areas for clarity; all measurements are included in contouring.

Sources

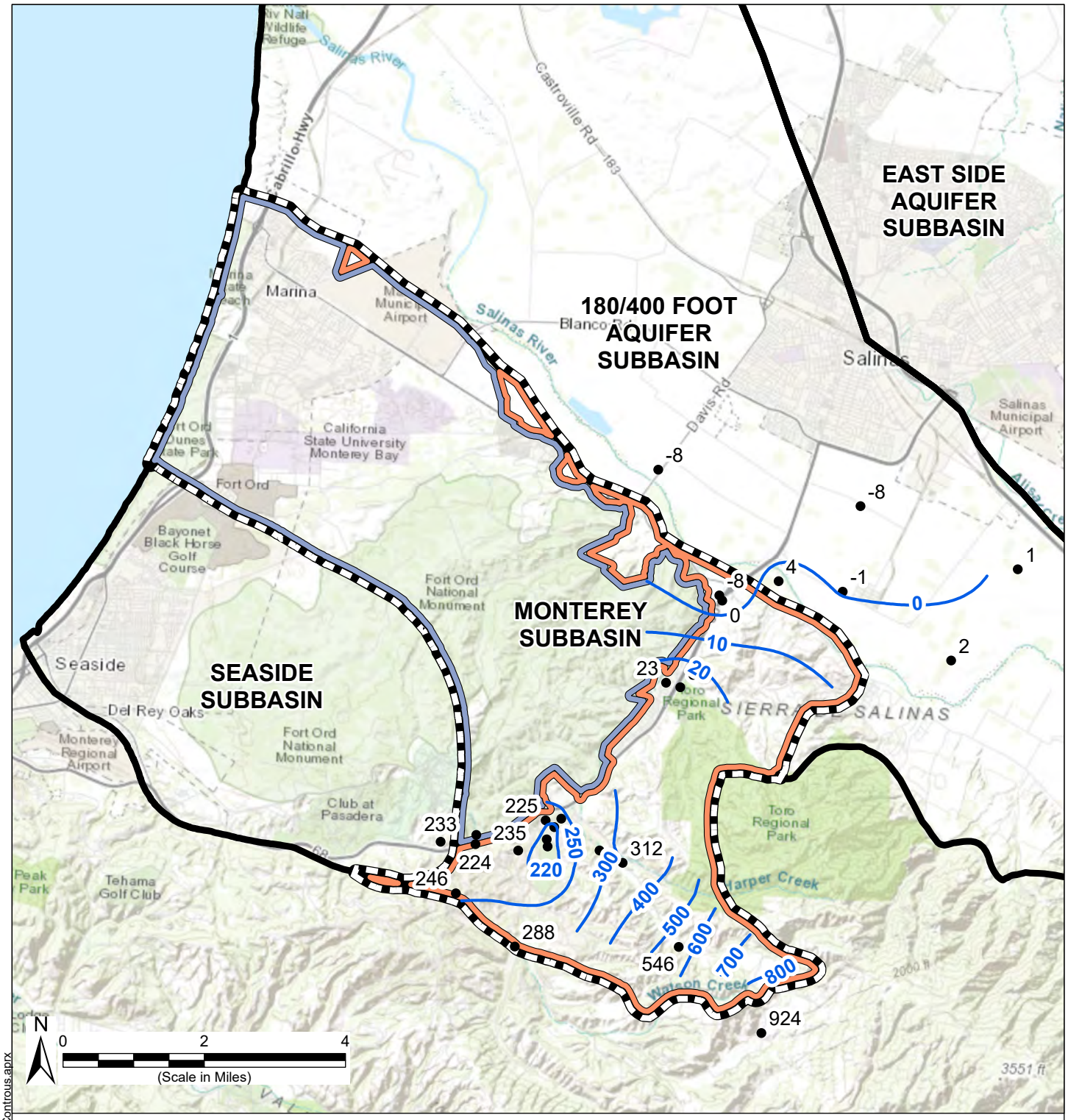
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 October 2026.

Groundwater Level Contours in the El Toro Primary Aquifer - August 2017

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 5-11

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_910_GWEControus.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Spring 2018 Groundwater Contours
- Groundwater Measurement Locations

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Abbreviations

ft = foot
NAVD 88 = North American Vertical Datum of 1988

Notes

1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88.
2. Groundwater contours are drawn with groundwater elevation measurements collected during Spring 2018. Only static water levels are plotted.
3. Some GWE labels are omitted in crowded areas for clarity; all measurements are included in contouring.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 9 October 2026.

Groundwater Level Contours in the El Toro Primary Aquifer - Spring 2018

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 5-12

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_910_GWEControus.aprx

5.1.3 Long-Term Groundwater Elevation Trends over Historical Period

Representative temporal trends in groundwater elevations can be assessed with hydrographs that plot changes over time. Wells were selected for hydrograph analysis based on their length of record and location. Wells believed to be representative of conditions across various areas of the Subbasin were selected. Additionally, a linear regression of the water level data over the 15-year Historical Period (i.e., 2004 through 2018) was used to evaluate long-term groundwater elevation trends for selected wells.

Figure 5-13 through Figure 5-17 and Figure 5-19 depict the locations and hydrographs of representative wells within each principal aquifer and their hydrographs over the Historical Period. The large versions of the hydrographs for these wells, as well as other representative monitoring wells, are included in Appendix 8-A. The following sections summarize trends in groundwater elevations over the Historical Period within each principal aquifer within the Marina-Ord Area and the Corral de Tierra Area.

5.1.3.1 Marina-Ord Area

Dune Sand Aquifer

- Groundwater elevations in the Dune Sand Aquifer have been generally stable for over three decades and do not show large seasonal variations, unlike the groundwater elevations in the 180-Foot, 400-Foot and Deep Aquifers which show large seasonal variations due to agricultural pumping in the neighboring Salinas Valley groundwater subbasins. Consistent with most shallow unconfined aquifers that receive direct recharge from rainfall, water levels in the Dune Sand Aquifer increase and decrease during extended wet and dry periods. Most wells in this aquifer show slightly decreasing trends over the Historical Period following a prior period of increasing water levels. Linear trendline slopes of groundwater levels in this aquifer over this period ranged from -0.761 feet per year (ft/yr) to 0.0222 ft/yr (Figure 5-13).

180-Foot Aquifer

Upper 180-Foot Aquifer

- Groundwater elevations have been stable in the upper 180-Foot Aquifer in the past thirty years. During the Historical Period, wells in this aquifer have shown no significant trend. Linear trendline slopes of groundwater levels over this period ranged from -0.0363 ft/yr to 0.0161 ft/yr (Figure 5-14). Seasonal fluctuations in this aquifer have been as large as 10 ft.

Lower 180-Foot Aquifer

- Groundwater elevations in the lower 180-Foot Aquifer are generally equivalent to those observed in the 400-Foot Aquifer, which is described below.

400-Foot Aquifer

- Groundwater elevations have been stable for over three decades in wells in this aquifer. During the Historical Period, groundwater elevation trends in wells screened in the 400-Foot Aquifer have been generally flat. Linear trendline slopes over the last 15-year period ranged from -0.054 ft/yr to 0.108 ft/yr (Figure 5-15). Seasonal fluctuations in this aquifer have been as large as 30 ft.
- The description of long-term groundwater trends above does not include data from MPWMD#FO-11S because of its hydrostratigraphic uncertainty. As shown on Figure 5-15, groundwater elevations in this well are significantly lower than those to the north near the City of Marina. The well demonstrates consistent decreasing trends over the Historical Period, unlike those measured in the 400-Foot Aquifer but similar to those measured in the Deep Aquifers. Although outside the Historical and Baseline Periods, 2026 monitoring data collected from new monitoring wells MCWD-MW-C2(S) and MCWD-MW-DB(S) show similar groundwater elevations. Data suggest that (1) these wells are screened within sediments that connect directly to the Deep Aquifers, rather than the 400-Foot Aquifer; or (2) leakage is occurring from the 400-Foot Aquifer into the Deep Aquifers in the vicinity of these wells. MCWDGSA is reviewing data collected from these wells to determine whether a local update of the HCM and model layers is necessary, particularly related to the depth and the effectiveness of the 400/Deep Aquitard in this area.

Deep Aquifers

- Groundwater production from the Deep Aquifers in the 180/400 Subbasin began in the mid-1970s. Within the Monterey Subbasin, MCWD's production in the Deep Aquifers began in 1985. At this time, groundwater elevations were close to sea level in the Deep Aquifers within the Marina-Ord Area of the Monterey Subbasin (Feeney and Rosenberg, 2003).
- Groundwater elevations in the Deep Aquifers within the Marina-Ord Area declined rapidly in the first few years of MCWD's extraction from the Deep Aquifers, but stabilized beginning in the early 1990s, and stayed stable through the mid-2000s. During this time period, rates of groundwater extraction from the Deep Aquifers ranged from 2,000 AFY to 2,300 AFY from MCWD wells. Rates of groundwater extraction from agricultural production wells screened in the Deep Aquifers in the 180/400 Subbasin were approximately 2,000 AFY during this period, resulting in a combined production rate of approximately 4,000 AFY from the Deep Aquifers (Figure 5-18)[11].
- Groundwater elevations in the Deep Aquifers have shown a consistent decline since the mid-2000s. Linear trendline slopes in representative wells within the Marina-Ord Area

[11] During this period, MCWD and MCWRA entered into the 1996 Annexation Agreement (see Section 3.2.2.2) where the parties agreed *"… that the '900-foot' aquifer* (aka the Deep Aquifers) *should be managed to provide safe, sustained use of the water resource, and to preserve to MCWD the continued availability of water from the '900-foot' aquifer."*

over the Historical Period have ranged from -2.84 ft/yr to 0.749 ft/yr (Figure 5-16 and Figure 5-17).

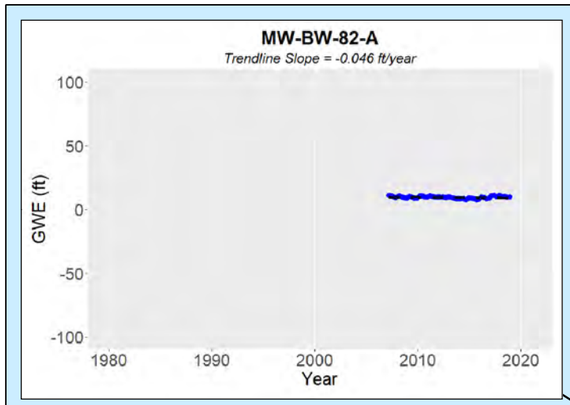
- Multi-completion wells (014S001E24L and 14S02E33E) show varying potentiometric heads between screen intervals with similar long-term trends. These data indicate that the Deep Aquifers are comprised of a series of aquifer zones and aquitards that are influenced by groundwater production within these zones. The updated HCM identified two distinct zones within the Deep Aquifers within the Monterey Subbasin, these zones have been identified at the upper Deep Aquifer, which is located at a depth of approximately 900 ft bgs, and the lower Deep Aquifer, which is located at approximately 1,500 ft bgs. Groundwater elevations in the upper Deep Aquifer in the Monterey Subbasin are lower than groundwater elevations in the lower Deep Aquifer. Groundwater elevation trends in the upper Deep Aquifer also show a steeper decline over the Historical Period than in the lower Deep Aquifer.
- Similar declines in groundwater elevations over the Historical Period are observed in Deep Aquifer wells located in the adjacent 180/400 Subbasin near Cooper Road and Blanco Road. Figure 5-17 shows long-term hydrographs for wells located near the Monterey-180/400 Subbasin boundary. As shown on these hydrographs, groundwater elevations in wells located near Cooper Road and Blanco Road have declined more than 5 ft/year over the Historical Period.
- The observed decline in groundwater elevations in the Deep Aquifers is the result of increased groundwater production from the Deep Aquifers. Groundwater production information collected by the MCWRA (Figure 5-18) for the 180/400 Subbasin shows that groundwater production from the Deep Aquifers increased from approximately 2,500 AFY in 2008 to over 10,000 AFY in 2019 (MCWRA, 2020). Approximately 30 new Deep Aquifers production wells were permitted and constructed within the 180/400 Subbasin during this period (MCWRA, 2020). Groundwater pumping from the Deep Aquifers within the Monterey Subbasin is limited to MCWD's municipal production, which has been relatively stable at quantities ranging from 2,000 AFY to 2,500 AFY since 1990 and is well within the limit established within the Annexation Agreements with MCWRA as detailed in Chapter 3. Increases in groundwater production from the Deep Aquifers are primarily occurring in the 180/400 Subbasin immediately north of the Monterey Subbasin. The 180-Foot and 400-Foot Aquifers are seawater intruded in this area and no alternative water source is available, i.e., it is outside the existing Castroville Seawater Intrusion Project (CSIP) service area.

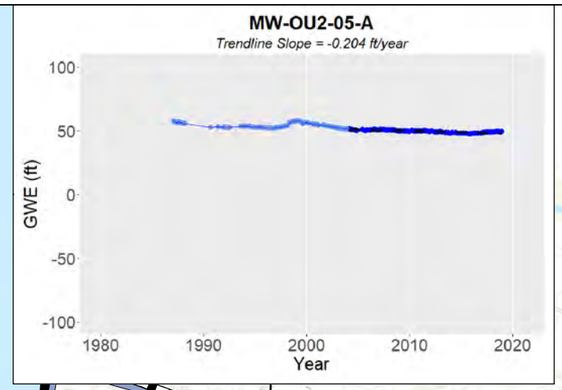
5.1.3.2 Corral de Tierra Area

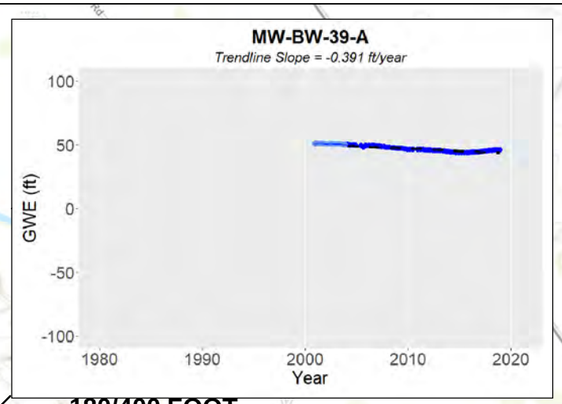
Groundwater elevations have been monitored since the 1960s in several wells, which are screened in the El Toro Primary Aquifer System in the Corral de Tierra Area. Some of these wells show groundwater elevation declines of up to 60 to 80 feet since the 1960s. On average, long-term groundwater elevations declines are 40 to 50 feet over the Historical Period (Figure 5-19)

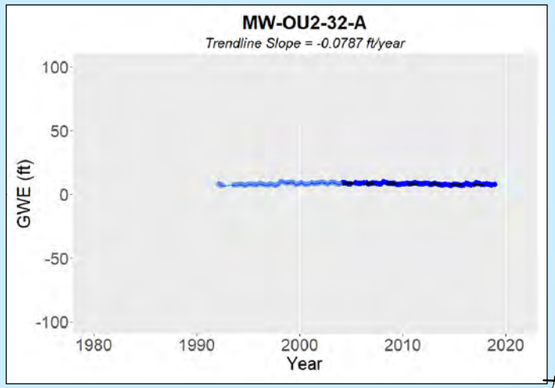
(Geosyntec, 2007). Generally, groundwater elevations in the Corral de Tierra have consistently experienced declines for decades despite interannual changes in precipitation.

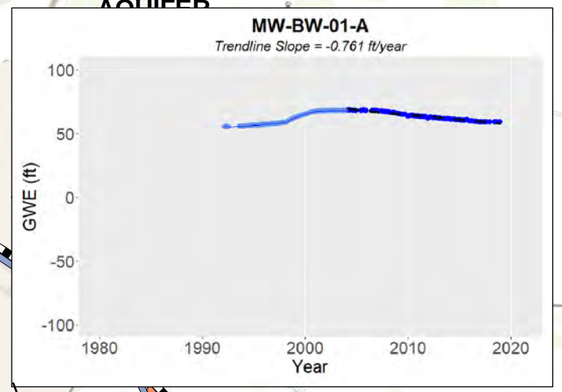
According to the 2007 *El Toro Groundwater Study* report, the majority of long-term hydrographs exhibit a downward trend in groundwater elevations with an average rate of decline of -0.6 ft/yr (Geosyntec, 2007). Since 1999, some hydrographs show larger rates of groundwater elevation decline, averaging 1.8 feet per year (Geosyntec, 2007). The Laguna Seca area, which is in the Seaside Subbasin west of the Corral de Tierra Area, shows similar groundwater elevation declines and has been demonstrated to be hydrogeologically connected to the El Toro area (Geosyntec, 2007; HydroMetrics, 2009).











Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Dune Sand Aquifer Wells

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Single Completion Wells

- GWE Measurements Between 2004 and 2018 (15 Years)
- GWE Measurements Before 2004
- Trendline (Note 1)

Abbreviations

DWR	= California Department of Water Resources
ft	= foot
ft/year	= foot per year
GWE	= groundwater elevation
NAVD 88	= North American Vertical Datum of 1988

Notes

1. Trendline analysis was performed for the period from 1 January 2004 to 31 December 2018 for single completion wells that have three or more GWE measurements during that period.
2. Groundwater elevations are in ft NAVD 88.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 6 August 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

N

0 0.75 1.5

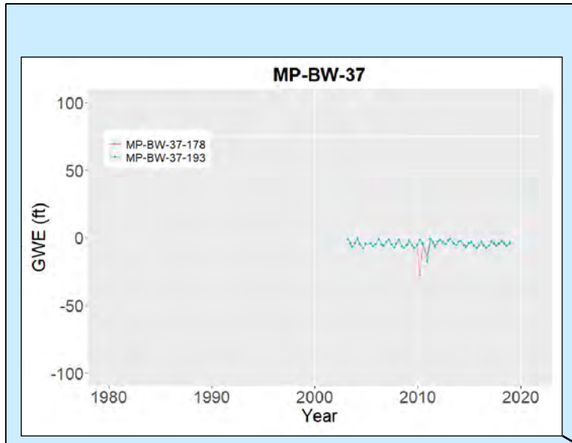
(Scale in Miles)

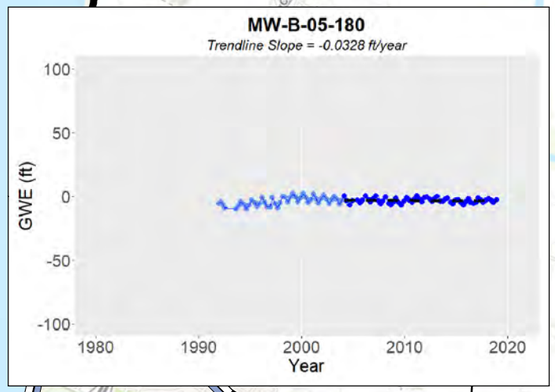
Representative Groundwater Elevation Hydrographs in the Dune Sand Aquifer

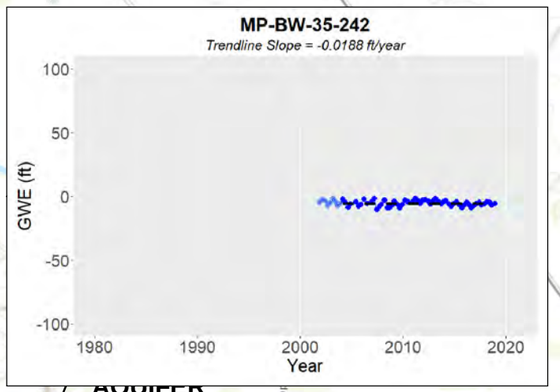
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November 2021

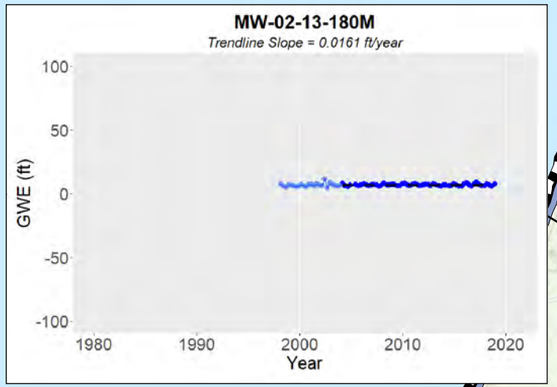
Figure 5-13

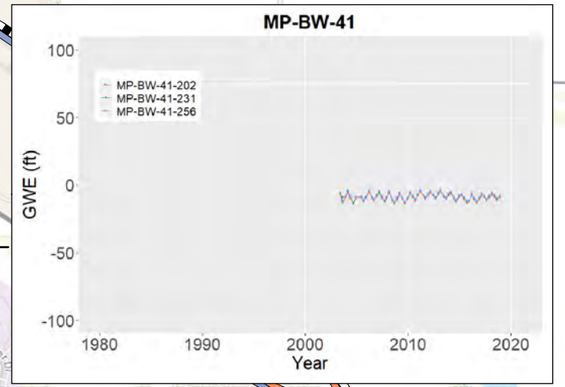
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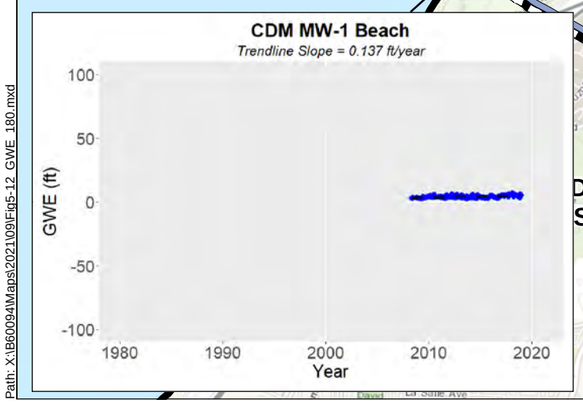


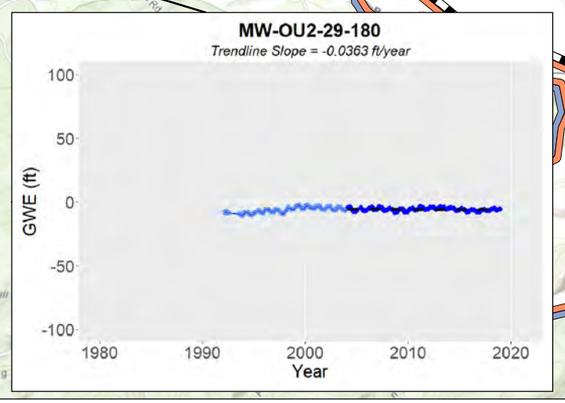












Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Upper 180-Foot Aquifer Wells

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Single Completion Wells

- GWE Measurements Between 2004 and 2018 (15 Years)
- GWE Measurements Before 2004
- Trendline (Note 1)

Multi-Completion Monitoring Wells

- GWE Measurements (Note 2)

Abbreviations

DWR	= California Department of Water Resources
ft	= foot
ft/year	= foot per year
GWE	= groundwater elevation
NAVD 88	= North American Vertical Datum of 1988

Notes

1. Trendline analysis was performed for the period from 1 January 2004 to 31 December 2018 for single completion wells that have three or more GWE measurements during that period.
2. GWE measurements are shown in different colors for multi-completion wells, and no trendline analysis was performed for these wells.
3. Groundwater elevations are in ft NAVD 88.
4. Hydrographs herein present conditions in the upper 180-Foot Aquifer.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 6 August 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

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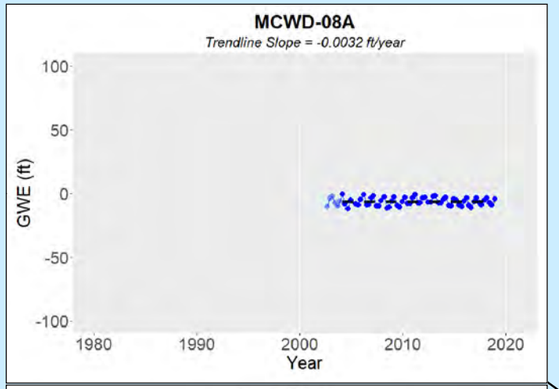
0 0.75 1.5

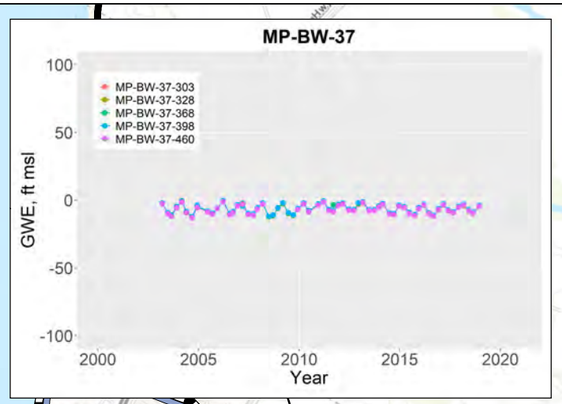
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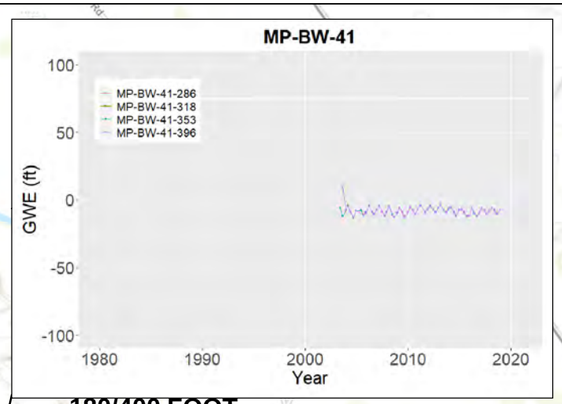
Representative Groundwater Elevation Hydrographs in the 180-Foot Aquifer

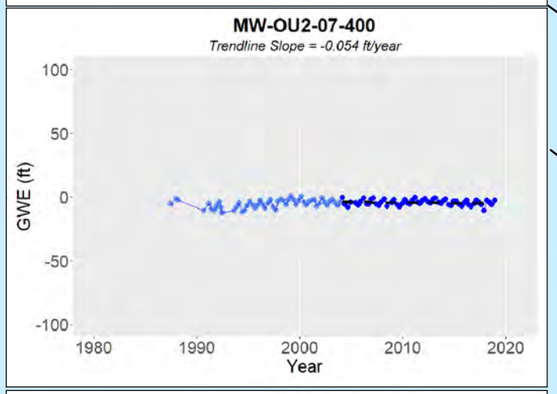
Monterey Subbasin
Groundwater Sustainability Plan
November 2021

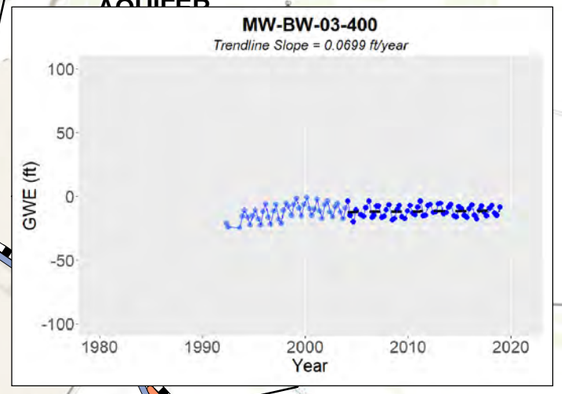
Figure 5-14

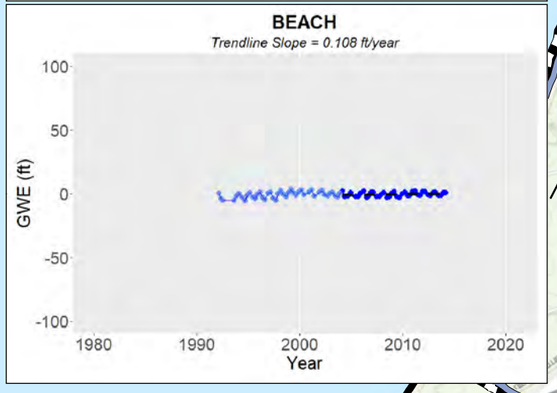


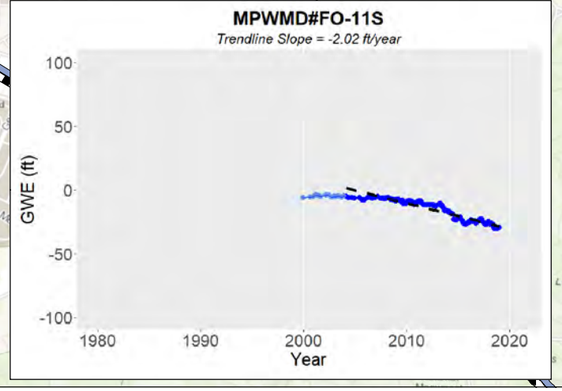


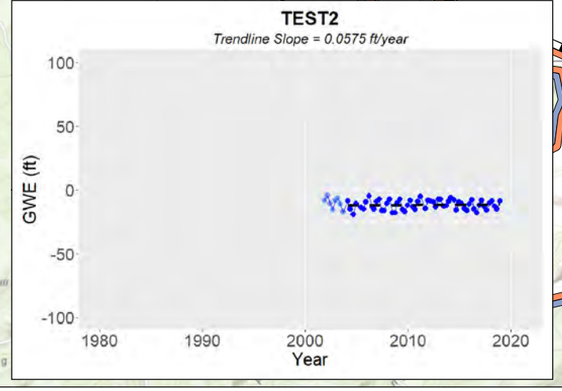












Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Lower 180-Foot, 400-Foot Aquifer Wells

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Single Completion Wells

- GWE Measurements Between 2004 and 2018 (15 Years)
- GWE Measurements Before 2004
- Trendline (Note 1)

Multi-Completion Monitoring Wells

- GWE Measurements (Note 2)

Abbreviations

DWR	= California Department of Water Resources
ft	= foot
ft/year	= foot per year
GWE	= groundwater elevation
NAVD 88	= North American Vertical Datum of 1988

Notes

1. Trendline analysis was performed for the period from 1 January 2004 to 31 December 2018 for single completion wells that have three or more GWE measurements during that period.
2. GWE measurements are shown in different colors for multi-completion wells, and no trendline analysis was performed for these wells.
3. Groundwater elevations are in ft NAVD 88.
4. Conditions in the lower 180-Foot Aquifer are consistent with those observed in the 400-Foot Aquifer.
5. Stratigraphic uncertainty remains near MPWMD#FO-11S, and whether the well is screened in the 400-Foot Aquifer or the Deep Aquifers.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 12 August 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

N

0 0.75 1.5

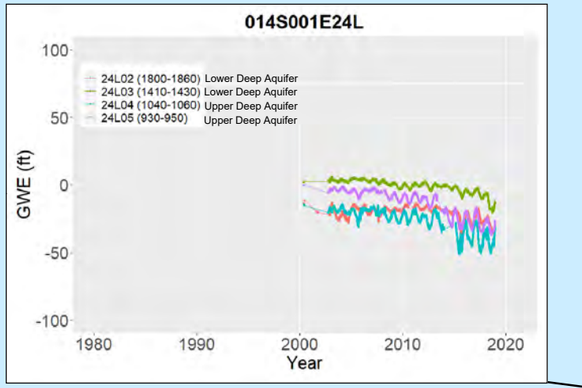
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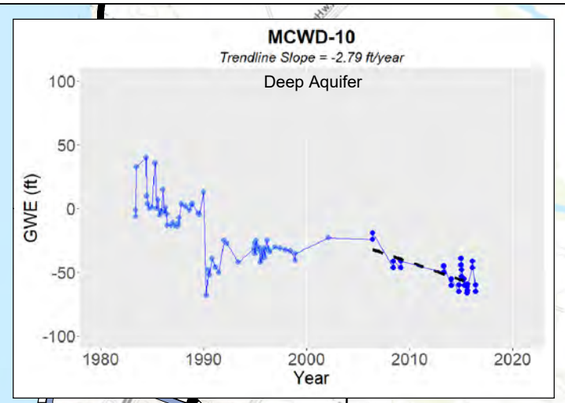
Representative Groundwater Elevation Hydrographs in the 400-Foot Aquifer

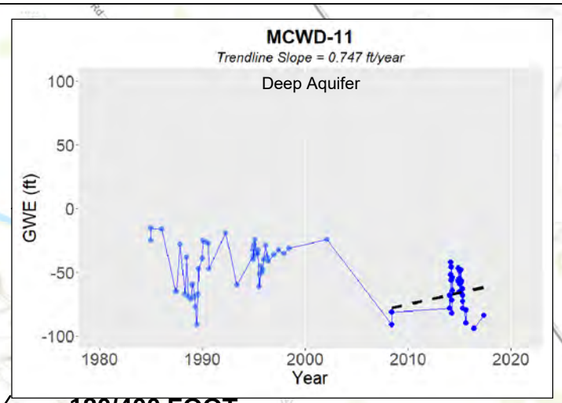
Monterey Subbasin
Groundwater Sustainability Plan
November 2021

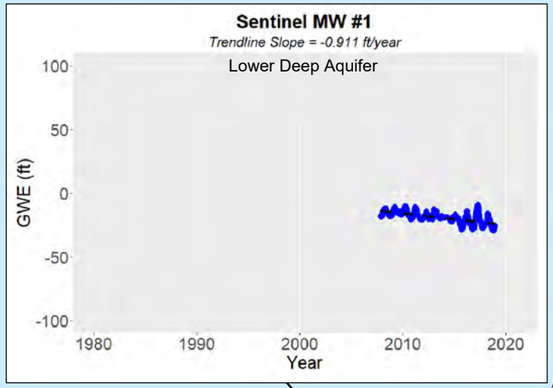
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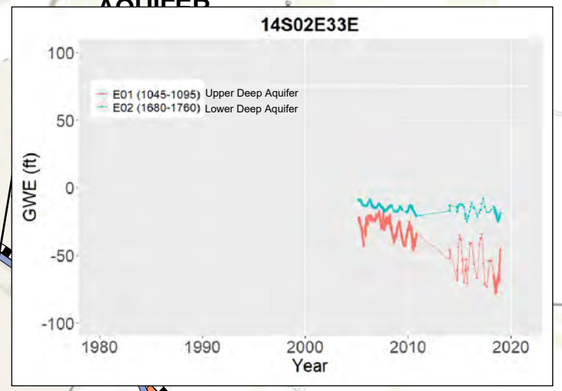
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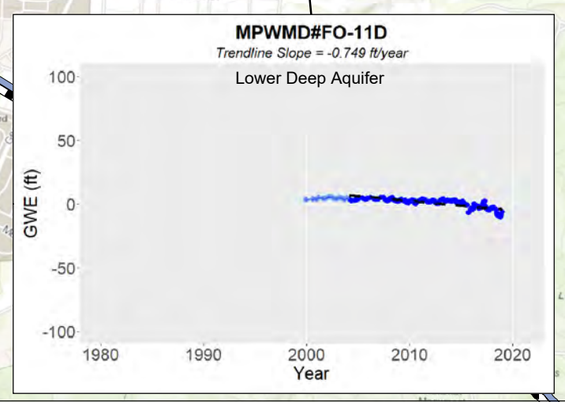


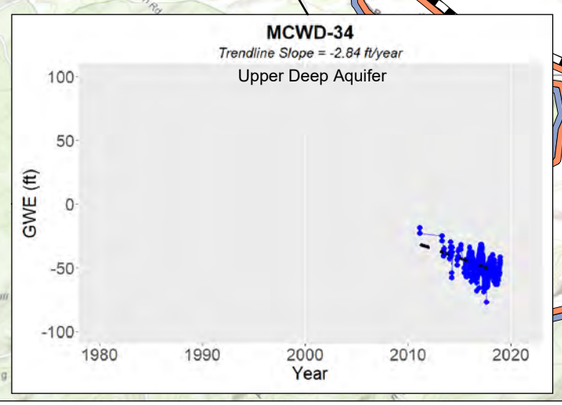












014S001E24L

MCWD-11

MCWD-10

14S02E33E

MCWD-34

Sentinel MW #1

MPWMD#FO-11D

180/400 FOOT AQUIFER

MONTEREY SUBBASIN

SEASIDE SUBBASIN

Marina

Reservation Rd

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Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Deep Aquifer Wells

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Single Completion Wells

- GWE Measurements Between 2004 and 2018 (15 Years)
- GWE Measurements Before 2004
- Trendline (Note 1)

Multi-Completion Monitoring Wells

- GWE Measurements (Note 2)

Abbreviations

DWR	= California Department of Water Resources
ft	= foot
ft/year	= foot per year
GWE	= groundwater elevation
NAVD 88	= North American Vertical Datum of 1988

Notes

1. Trendline analysis was performed for the period from 1 January 2004 to 31 December 2018 for single completion wells that have three or more GWE measurements during that period.
2. GWE measurements are shown in different colors for multi-completion wells, and no trendline analysis was performed for these wells.
3. Groundwater elevations are in ft NAVD 88.

Sources

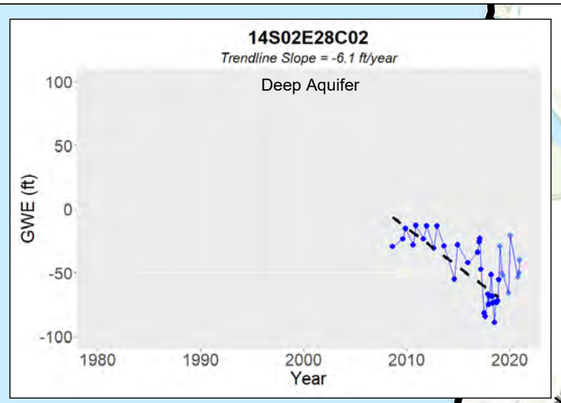
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 6 August 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

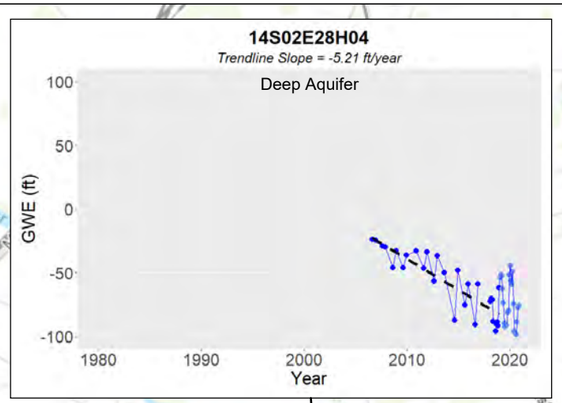
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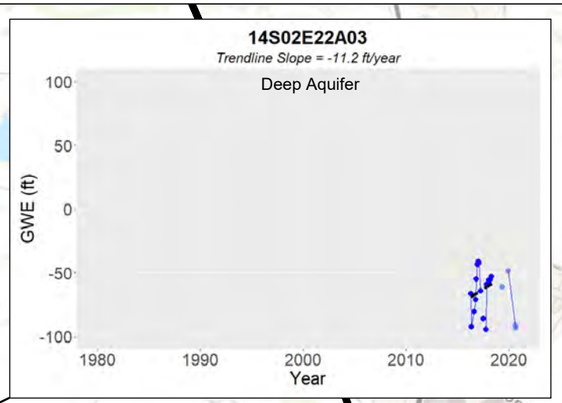
Representative Groundwater Elevation Hydrographs in the Deep Aquifers

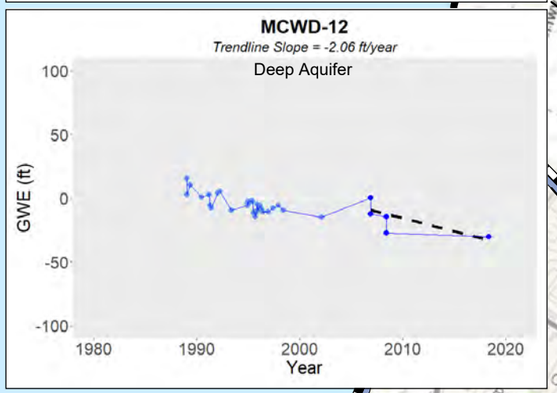
Monterey Subbasin
Groundwater Sustainability Plan
November 2021

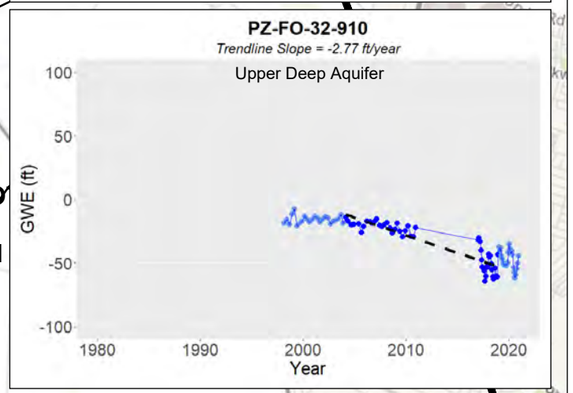
Figure 5-16

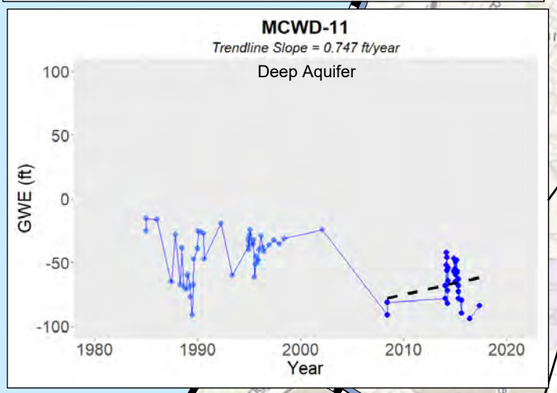


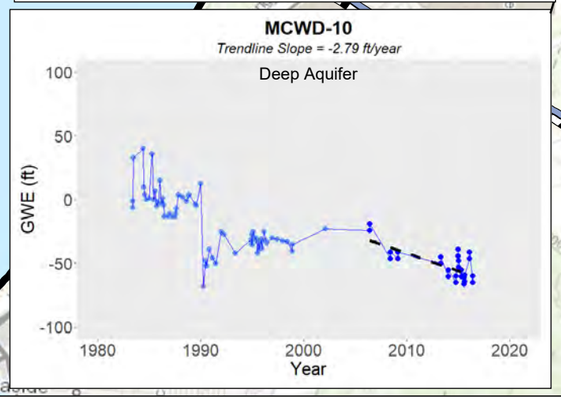


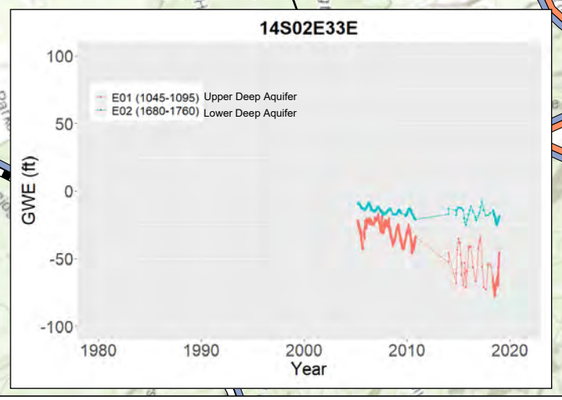


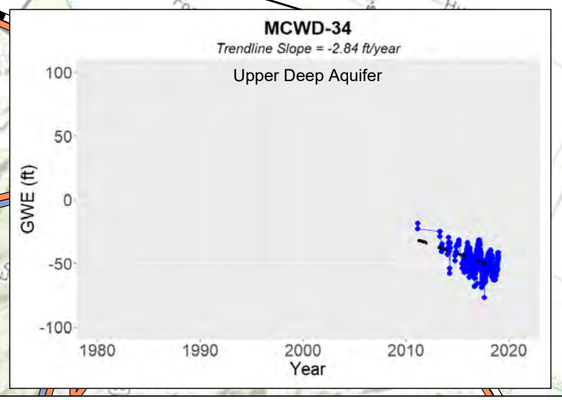












Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Deep Aquifer Wells with Hydrographs

- Production / Public Supply Well
- Monitoring Well

Single Completion Wells

- GWE Measurements Between 2004 and 2018 (15 Years)
- GWE Measurements Before 2004 or after 2018
- Trendline (Note 1)

Multi-Completion Monitoring Wells

- GWE Measurements (Note 2)

Abbreviations

DWR	= California Department of Water Resources
ft	= foot
ft/year	= foot per year
GWE	= groundwater elevation
NAVD 88	= North American Vertical Datum of 1988

Notes

1. Trendline analysis was performed for the period from 1 January 2004 to 31 December 2018 for single completion wells that have three or more GWE measurements during that period.
2. GWE measurements are shown in different colors for multi-completion wells, and no trendline analysis was performed for these wells.
3. Groundwater elevations are in ft NAVD 88.

Sources

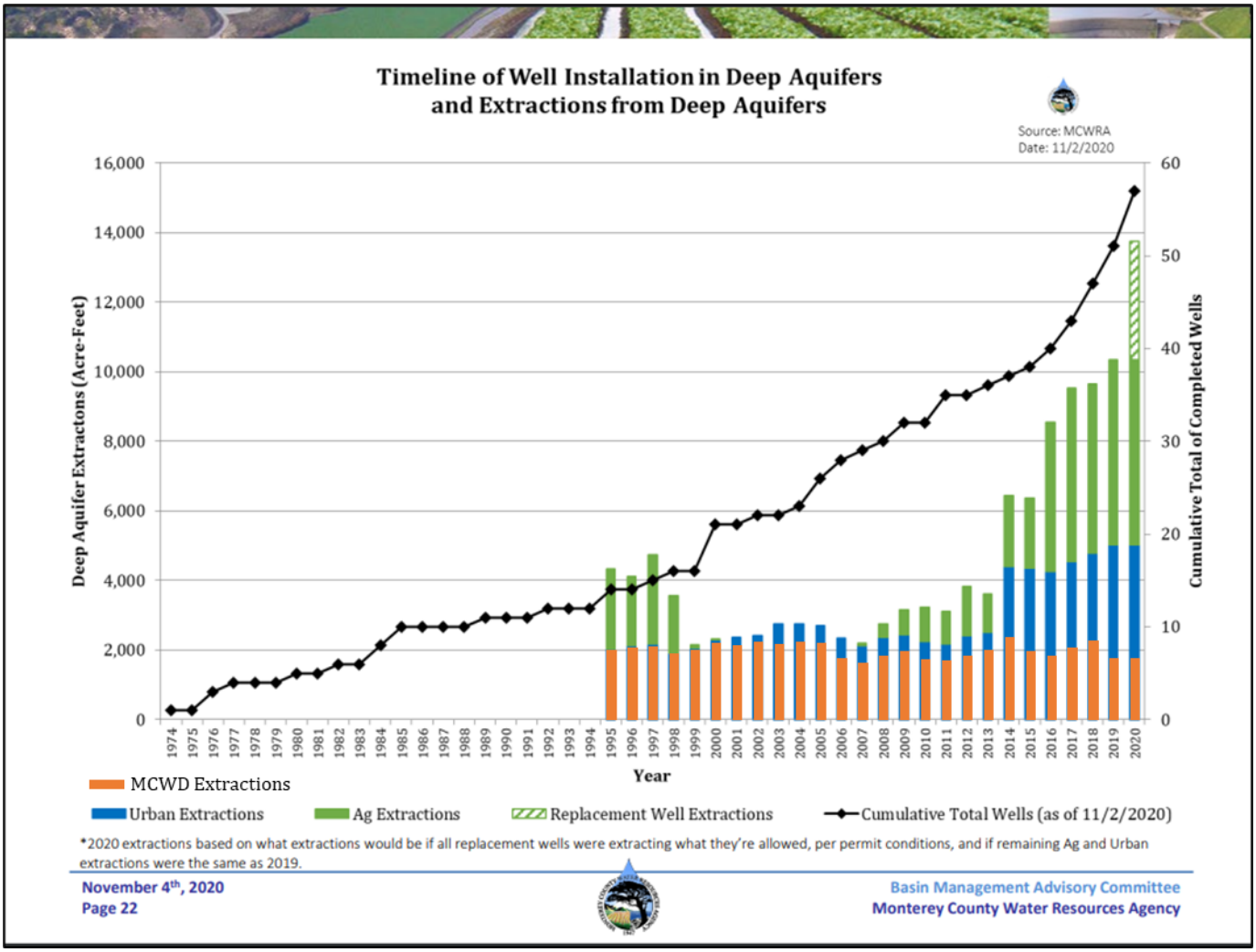
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 6 August 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

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(Scale in Miles)

Representative Groundwater Elevation Hydrographs in the Deep Aquifers near Subbasin Boundary

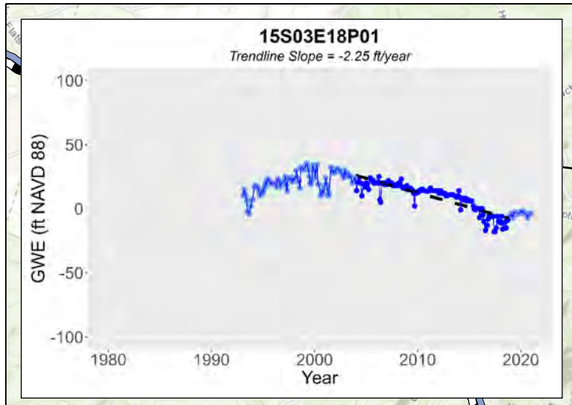
Monterey Subbasin
Groundwater Sustainability Plan
November 2021
Figure 5-17

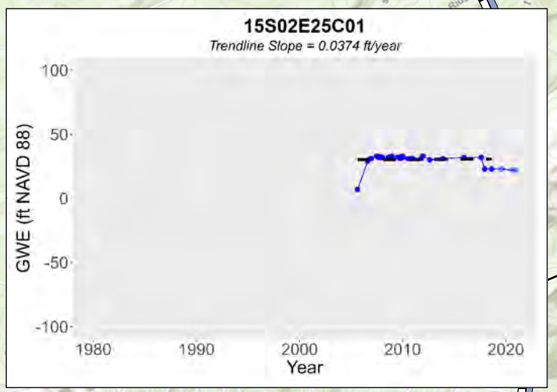
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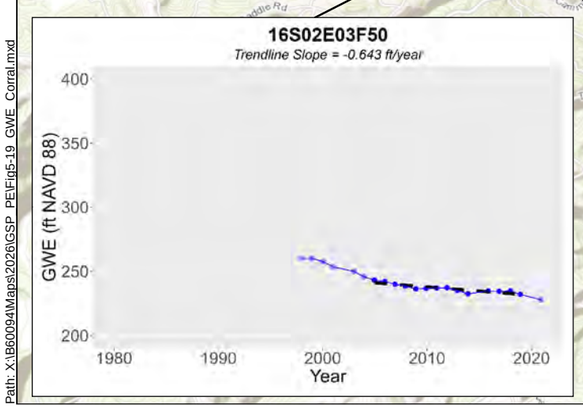


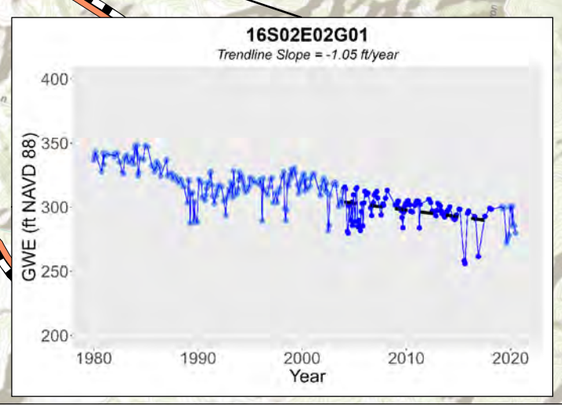
Note: This figure is adapted from MCWRA's Basin Management Advisory Committee presentation on November 4, 2020. This figure represents groundwater extraction from the Deep Aquifers within the area defined by the Groundwater Extraction Management System (GEMS) ordinance in place at that time. The figure was adapted to show the portion of Deep Aquifers extraction within the Monterey Subbasin, which is primarily by MCWD (orange) vs. other agricultural and urban Deep Aquifers extraction (blue and green) located in the 180/400-Foot Aquifer Subbasin.

Figure 5-18 Timeline of Well Installation in Deep Aquifer and Extraction from Deep Aquifers









15S/03E-18P01

15S/02E-25C01

16S/02E-03F50

16S/02E-02G01

180/400 FOOT AQUIFER SUBBASIN

MONTEREY SUBBASIN

Legend

- Well Locations
- Monterey Subbasin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area
- Other Groundwater Subbasins within Salinas Valley Basin

Single Completion Wells

- GWE Measurements Between 2004 and 2018 (15 Years)
- GWE Measurements Before 2004
- Trendline (Note 1)

Abbreviations

DWR	= California Department of Water Resources
ft	= foot
NAVD 88	= North American Vertical Datum of 1988
ft/year	= feet per year
GWE	= groundwater elevation

Notes

1. Trendline analysis was performed for the period from 1 January 2004 to 31 December 2018 for single completion wells that have three or more GWE measurements during that period..
2. Groundwater elevations are in ft NAVD 88.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 6 October 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

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0 0.75 1.5

(Scale in Miles)

Representative Groundwater Elevation Hydrographs in the El Toro Primary Aquifer

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 5-19

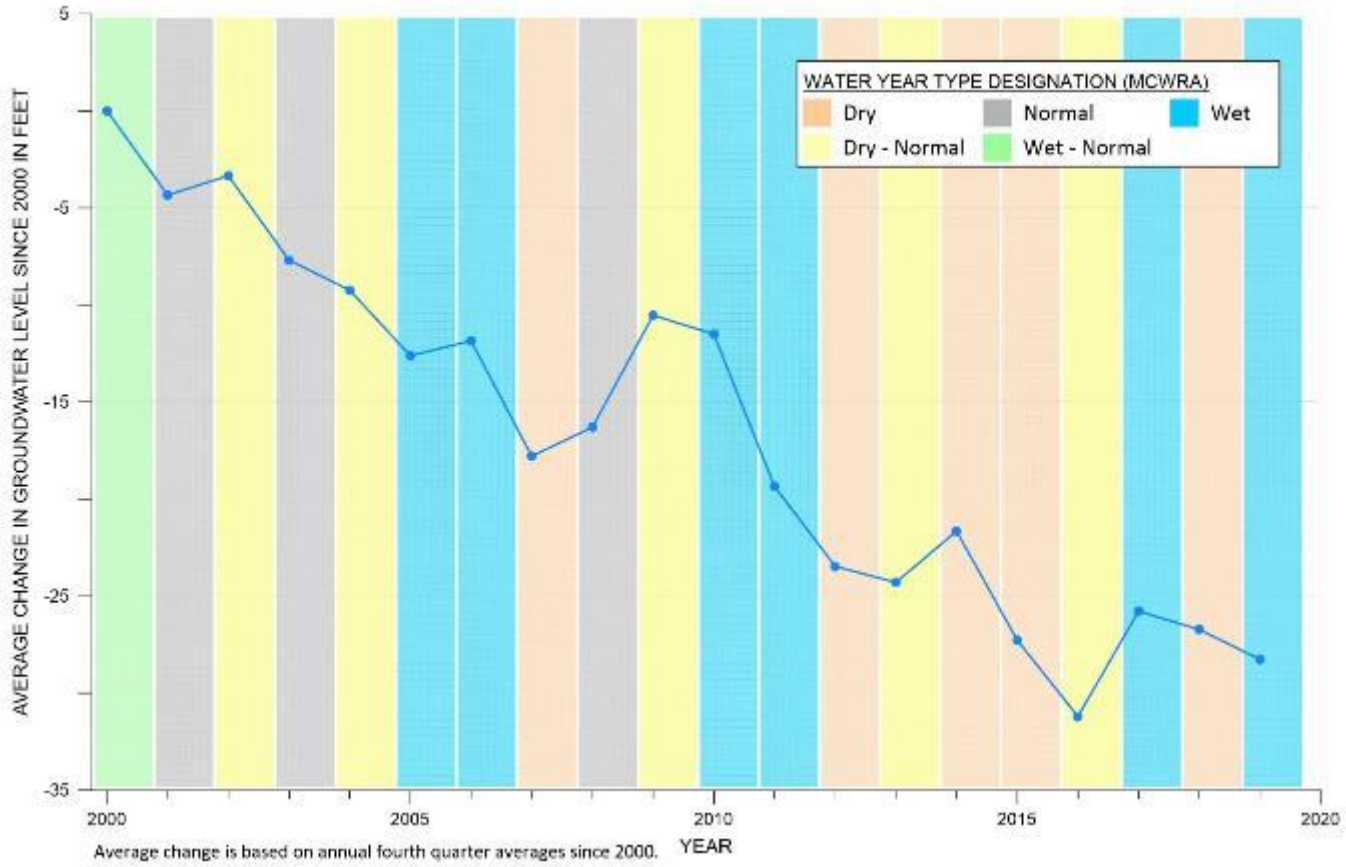
Path: X:\B60094\Maps\2026GSP_PEIFig5-19_GWE_Corral.mxd

Another way of looking at temporal groundwater elevation trends is shown on Figure 5-20 Cumulative Groundwater Elevation Change for the Corral de Tierra Area

, which presents a graph of cumulative groundwater elevation change for the El Toro Primary Aquifer System. The graph of cumulative change in groundwater elevation is based on the average change in Fall groundwater elevations for designated wells in the subarea each year. The average decline since 2000 is approximately -27 feet. MCWRA uses Fall groundwater elevations because these measurements are taken after the end of the irrigation season and before seasonal recharge from winter precipitation increases in groundwater levels. The cumulative groundwater elevation change plot is therefore an estimated average hydrograph for wells in this area. Although this plot does not reflect the groundwater elevation change at any specific location, it provides a general illustration of how the average groundwater elevation in the subarea changes in response to climatic cycles, groundwater extraction, and water-resources management at the Subbasin scale.

The graph of cumulative elevation change and the specific hydrographs presented in Appendix 8-B show a long-term decline in groundwater elevations in the Subbasin over time.

Figure 5-20 Cumulative Groundwater Elevation Change for the Corral de Tierra Area



5.1.4 Vertical Hydraulic Groundwater Gradients

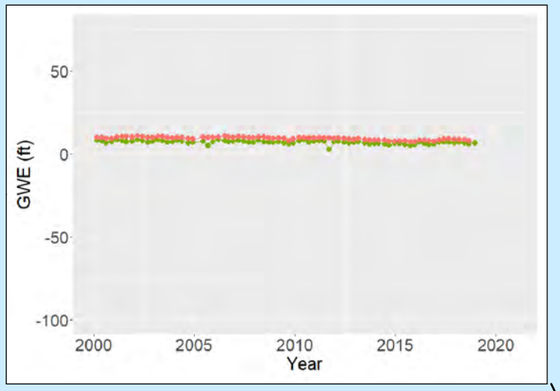
Downward vertical hydraulic gradients exist in many portions of the Subbasin. These downward vertical gradients are caused by areal surface recharge, groundwater extraction from deeper aquifers, and laterally extensive aquitards, which exist in the Marina-Ord Area. These vertical hydraulic gradients can impact the magnitude and direction of groundwater flow between principal aquifers and increase the potential for downward migration of highly saline water in seawater intruded areas, if pathways exist between aquifers.

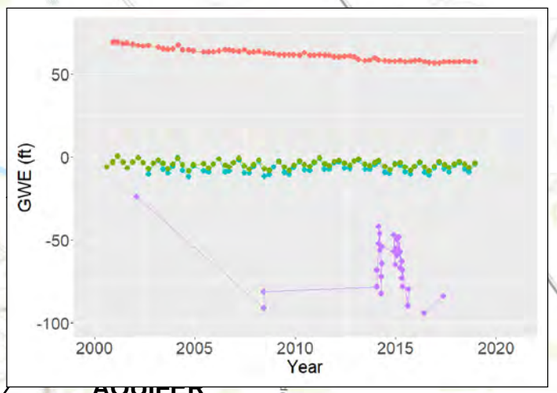
Evaluation of vertical gradients can be accomplished by examination of groundwater elevations measured in collocated wells screened in different aquifers. This approach requires water level information from wells that: (a) have known well construction information, (b) are only screened in one Principal Aquifer, (c) have contemporaneous measurements (i.e., water levels measured at least in the same year and season), and (d) are in close spatial proximity to each other. It is important to note that a difference in groundwater elevation between principal aquifers does not, in and of itself, establish a vertical flow.

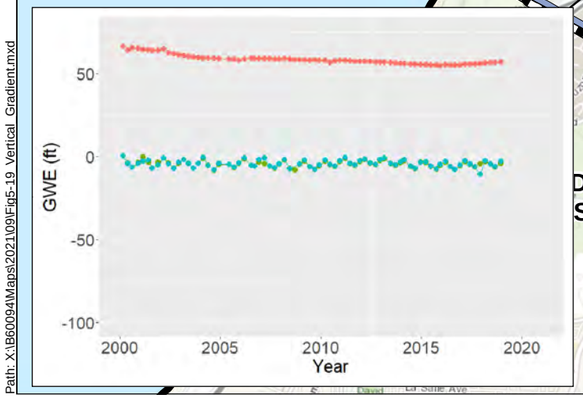
Figure 5-21 shows four sets of wells located in the central portion of the Marina-Ord Area and one set of wells located near the coast that meet the identified criteria. The hydrographs for each set of wells illustrate the difference in groundwater elevations between Principal Aquifers. In the central Marina-Ord Area, groundwater elevations are approximately 70 ft lower in the 180-Foot Aquifer and 400-Foot Aquifer than in the Dune Sand Aquifer. Groundwater elevations are approximately 60 ft lower in Deep Aquifers than in the 180-Foot and 400-Foot Aquifers. Near the Monterey Coast, there is no appreciable groundwater elevation difference between the Dune Sand Aquifer and the 180-Foot Aquifer.

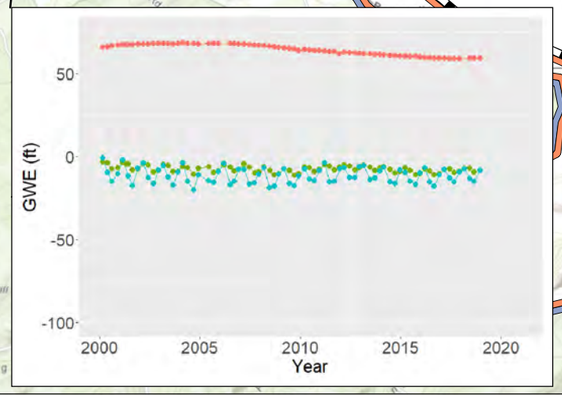
Figure 5-22 shows estimated vertical gradients between the 400-Foot Aquifer and the Deep Aquifers in the Fall of 2017. These estimated vertical gradients are calculated based on the difference groundwater elevation contours for the 400-Foot Aquifer and Deep Aquifers shown on Figure 5-3 and Figure 5-4, respectively. As shown on Figure 5-22, groundwater elevations in the Deep Aquifers are 20 to 60 ft lower than those in the 400-Foot Aquifer in the northwestern portion of the Subbasin where the lower 180-Foot/400-Foot Aquifer is seawater intruded.

While many wells in the Corral de Tierra Area are screened in both the Paso Robles Formation and the Santa Margarita Sandstone, some wells are screened more in the Paso Robles Formation and some are screened more in the Santa Margarita Sandstone. Downward vertical hydraulic gradients have been recorded in the Laguna Seca subarea of the adjacent Seaside Subbasin (Yates et al., 2002). Therefore, there is an expectation that downward vertical gradients exist between the Paso Robles Formation and the Santa Margarita Sandstone within the El Toro Primary Aquifer System (Geosyntec, 2007). Figure 5-23 shows hydrographs between wells screened exclusively in the Paso Robles Formation (shallow) and the Santa Margarita Sandstone (deep) in the Corral de Tierra Area near the Laguna Seca region. There is an approximate 75-foot difference in the water levels between the two water-bearing formations. Due to the sediments that comprise these water-bearing formations, there is likely downward vertical flow between the formations as a result of these gradients.









MW-OU2-36-180
MW-OU2-36-A
MW-OU2-07-180R
MW-OU2-07-A
MW-OU2-07-400
MW-BW-30-A
MCWD-08A
MCWD-11
MW-BW-26-180
MW-BW-01-A
MW-BW-03-400
MW-BW-02-180
MONTEREY SUBBASIN
Marina
Reservation Rd
Del Monte Blvd
Cabrillo Hwy
Locke Paddon Park
Marina Municipal Airport
Salinas River
Blanco Rd
McFadden Rd
Fort Ord Dunes State Park
California State University Monterey Bay
Owen Durham St
Gigling Rd
Parker Flats Rd
Eucalyptus Rd
Grant Ewing Ridge
Artillery Hill
Leary Hill
Fort Ord National Monument
Inter-Garrison Rd
Engineer Equipment Rd
Garrison Rd
Watkins Gate Rd
Addington Rd
Lincoln Park
Sherman Blvd
Beach Range Rd
Neponset Rd
Laloma Rd
Charlie Benson Ln
Armstrong Rd

Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Dune Sand Aquifer Wells
- Upper 180-Foot Aquifer Wells
- Lower 180-Foot, 400-Foot Aquifer Wells
- Deep Aquifer Wells

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Groundwater Levels in ft NAVD 88

- Dune Sand Aquifer
- Upper 180-Foot Aquifer
- Lower 180-Foot, 400-Foot Aquifer
- Deep Aquifers

Abbreviations

DWR = California Department of Water Resources
ft = foot
GWE = groundwater elevation
NAVD 88 = North American Vertical Datum of 1988

Notes

1. Groundwater elevations are in ft NAVD 88.

Sources

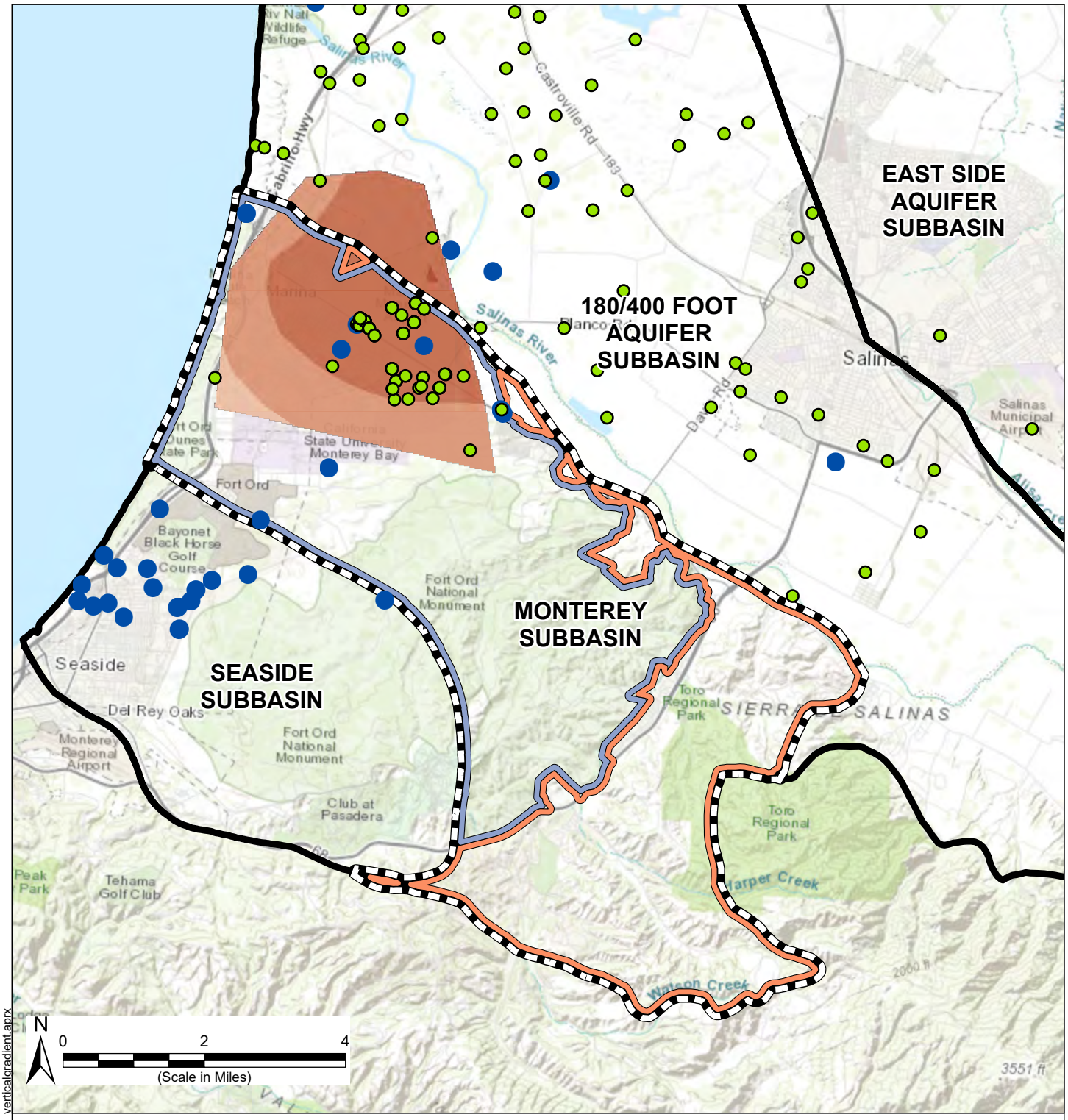
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 6 August 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

N
0 0.75 1.5
(Scale in Miles)

Vertical Gradients
Marina-Ord Area

Monterey Subbasin
Groundwater Sustainability Plan
November 2021
Figure 5-21

Path: X:\860094\Maps\2021\09\Fig5-19_Vertical_Gradient.mxd



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Groundwater Level Measurement Locations (400-Foot Aquifer)
- Groundwater Level Measurement Locations (Deep Aquifers)

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Vertical Gradients between the 400-Foot Aquifer and Deep Aquifer (ft)

- 1 - 20
- 21 - 40
- 41 - 60
- 61 - 75

Abbreviations

ft = foot

Notes

1. Vertical gradients are calculated by subtracting the Lower 180-Foot, 400-Foot Aquifer Contours in 2017 August from the Deep Aquifer Contours in 2017 August.

Sources

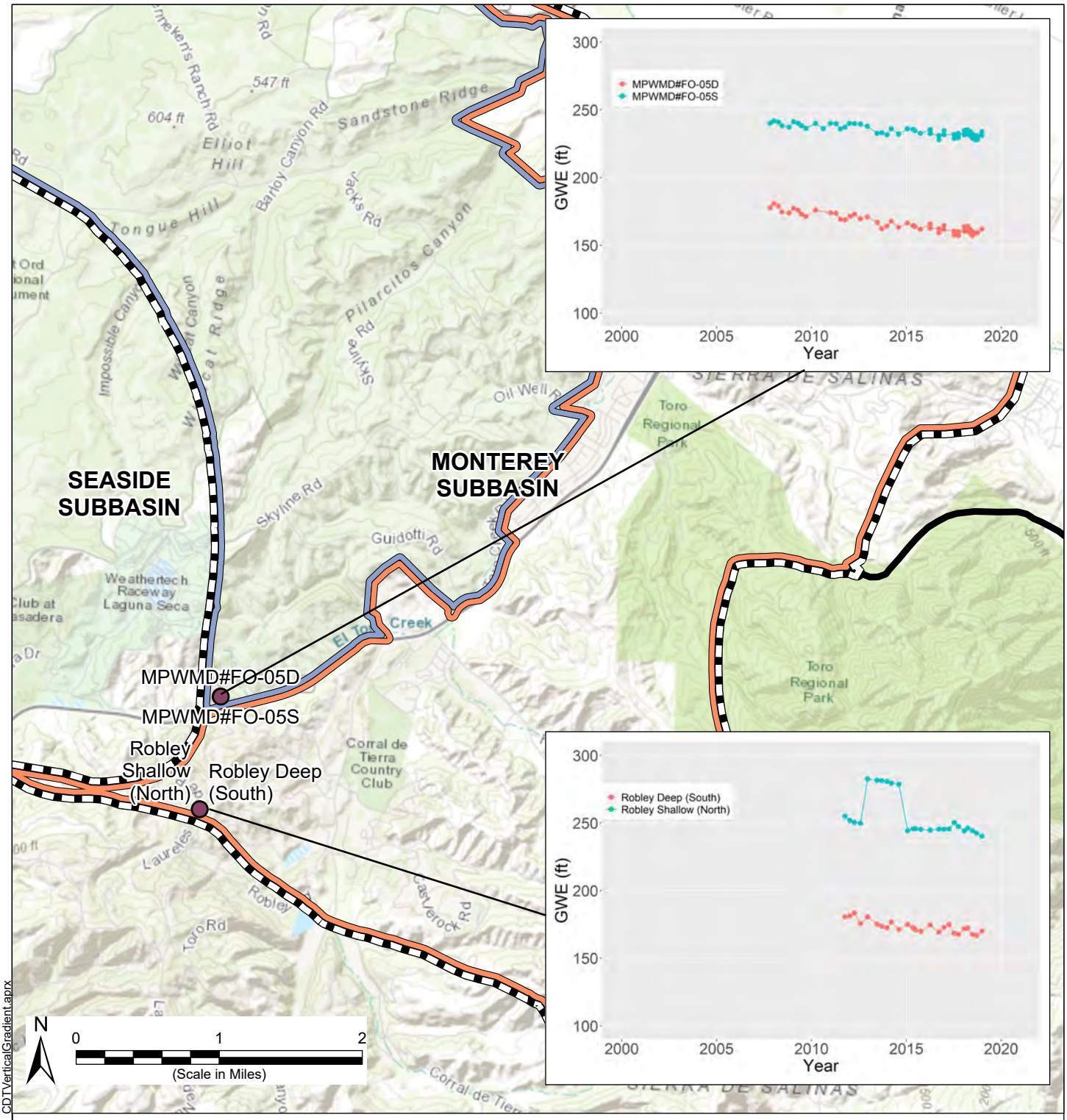
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 16 August 2026.

August 2017 Vertical Gradients Between 400-Foot Aquifer and Deep Aquifers

Monterey Subbasin
Groundwater Sustainability Plan
August 2026

Figure 5-22

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Amendment_fig5-22_verticalgradient.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Well Locations

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Groundwater Levels in ft msl

- GWE in Paso Robles Formation
- GWE in Santa Margarita Sandstone

Abbreviations

DWR	=	California Department of Water Resources
ft	=	foot
NAVD 88	=	North American Vertical Datum of 1988
GWE	=	groundwater level elevation

Notes

1. Groundwater elevations are in ft NAVD 88.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 17 August 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Vertical Gradients between the Paso Robles Formation and the Santa Margarita Sandstone, near the Laguna Seca Subarea

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 5-23

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Amendment_fig5-23_CDTVerticalGradient.aprx

5.2 Change in Groundwater Storage

The estimated change in storage for the Monterey Subbasin was simulated for the historical period (i.e., WY 2004-2018) using the numerical model developed for the Monterey Subbasin. A description of the numerical model and results are detailed in Chapter 6. Changes of storage estimates for the historical period are summarized below.

Annual average change in storage within the Monterey Subbasin was estimated to be -2,939 AFY during WY 2004-2018. The cumulative change in storage over this 15-year period was estimated to be -44,086 AF. Seawater inflow to the Monterey Subbasin across the ocean boundary during the historical period is presumed to leave the Subbasin across the 180/400-Foot Aquifer Subbasin boundary, given that there has been negligible expansion of the seawater intrusion front during the historical period (Section 5.3.4).

Change of storage estimates were additionally calculated for three water budget zones (WBZs), one for the Marina-Ord Area and two within the Corral de Tierra Area.

- Within the Marina-Ord Area WBZ, the annual average change in storage over the historical period was estimated at -1,500 AFY for a cumulative change in storage of -22,500 AF.
- Within the Corral de Tierra Area / San Benancio WBZ which generally represents the El Toro Bowl, the annual average change in storage over the historical period was estimated to be -767 AFY for a cumulative change in storage of -11,505 AF.
- Within the Toro Park / Serra Village WBZ which generally presents the Highway 68 Bowl, the annual average change in storage over the historical period was estimated to be -672 AFY for a cumulative change in storage of -10,080 AF.

The reduction in groundwater storage is consistent with recent groundwater elevation trends described in Section 5.1.3 above.

There are inherent uncertainties using numerical models as they can only approximate physical systems and have limitations in how they compute data. The uncertainty associated with the model estimates is explored further in Section 6.7. However, the groundwater model selected to perform this analysis represents the best available tool for estimating water budget and change in storage. A detailed discussion of data input and assumptions into the regional Seawater Intrusion Model (SWIM) is included in Sections 6.1 and 6.2 and Appendix 6-A. As additional groundwater elevation, aquifer properties, and groundwater extraction data become available, they will be used to refine the representation of these aquifers as part of future modeling efforts.

5.3 Seawater Intrusion

Groundwater overdraft in the larger Salinas Valley Basin has resulted in landward groundwater gradients near the coast and created an influx of highly saline water in the coastal aquifers. Seawater intrusion has been documented in the Salinas Valley Basin since the 1940s (DWR,

1946). Within the Monterey Subbasin, seawater intrusion has been documented in the northern portion of the lower 180-Foot and 400-Foot Aquifers.

The negative impact of seawater intrusion on local water resources and the agricultural economy has motivated many studies dating back to 1946 (DWR, 1946). MCWRA and others have implemented a series of engineering and management projects, including well construction moratoriums, developing the CSIP system, and implementing the SVWP, among other actions to halt seawater intrusion. Although these actions have slowed the advance of intrusion , seawater intrusion remains an ongoing threat.

5.3.1 Data Sources

Water quality data discussed in this section were obtained from various local monitoring agencies, including MCWD, MCWRA, Fort Ord, MPWMD, and the Seaside Groundwater Basin Watermaster. These data are augmented by results from two AEM surveys conducted by MCWD in 2017 and 2019.

5.3.1.1 Water Quality Data

The extent and advancement of seawater intrusion within the Subbasin have been monitored by local agencies. The following TDS, chloride, as well as specific conductivity data are analyzed herein:

- Water quality data collected by MCWRA, MPWMD, and the Seaside Basin Watermaster during the Historical and Baseline Periods; and
- Water quality data collected by MCWDGSA in December 2018 from MCWD wells and Fort Ord monitoring wells (EKI, 2019) during the Baseline Period.

Additionally, MCWDGSA water quality data collected in 2026 from newly completed monitoring wells in areas with no prior data are considered when evaluating Baseline Conditions. These wells were constructed to fill major data gaps identified in the 2022 GSP and are located in areas where prior water level and water quality data are not available. Water quality data obtained from these wells provide additional information regarding the extent of seawater intrusion within the Subbasin. These water quality data are included on Figure 5-26 and Figure 5-30, which depict the magnitude of chloride and TDS concentrations in each Principal Aquifer, and identify the estimated extent of the seawater intrusion front during the beginning of the Baseline Period (2015-2018). Further discussion of this data is provided in Section 5.3.3.

5.3.1.2 Geophysical Data

Geophysical data considered in this GSP include AEM data obtained for the northern Salinas Valley and induction logging data obtained from Sentinel Wells installed along the Monterey and Seaside Subbasin coastline.

In 2017 and 2019, MCWD retained geophysical consultants (Aqua Geo Frameworks [AGF]) and Stanford University researchers to obtain and analyze AEM data within the northern Salinas

Valley Basin (Stanford/Aqua Geo Frameworks; Aqua Geo Frameworks, 2019). During these surveys, a helicopter carrying electronic geophysical equipment surveyed resistivity of subsurface geology over an approximately 15-mile by 7-mile area along the coastal 180/400-Foot Aquifer and Monterey Subbasins. The studies' goal was to evaluate the understanding of the hydrostratigraphy in the study area and to interpret the distribution of groundwater quality indicated by available well data. A first round of AEM data were collected in April 2017, shortly after the 2014-2016 drought. A second round of AEM data were collected in May 2019, which is more representative of a wetter hydrologic condition. The data collected during each round of AEM were "inverted" to develop a three-dimensional picture of the distribution of electrical resistivity.

The AEM survey measures the resistivity of a volume of subsurface material composed of sediments containing air and/or water (Stanford/Aqua Geo Frameworks, 2018). While measurement of the electrical resistivity of the water alone (typically reported as the inverse parameter, electrical conductivity) can be a direct indicator of the salinity of the water (i.e., the more salts in the water, the lower the electrical resistivity), the electrical resistivity of a volume of subsurface material is determined not just by the salinity of the water, but is also affected by the texture and mineralogy of the sediments and the volume of water present. Very simply, increasing the amount of clay, the amount of water, and/or the salinity of the water all decrease the electrical resistivity.

A part of the studies' scope was to investigate the relationship between inverted AEM data and water quality. The following interpretation of AEM data has been experimentally developed for the study area.

Table 5-1 Experimental Interpretation of AEM Resistivity Data in the Northern Salinas Valley

TDS Concentration in Groundwater	**AEM Resistivity** Within general or unknown aquifer materials (Stanford/Aqua Geo Frameworks, 2018)	**AEM Resistivity** Within the sandy/gravelly 180-Foot and 400-Foot Aquifers (Aqua Geo Frameworks, 2019)
Greater than 10,000 mg/L	Less than 5 ohm/cm	Less than 7.2 ohm/cm
Less than 3,000 mg/L	Greater than 25 ohm/cm	Greater than 13.2 ohm/cm

The Stanford study found that very high resistivity (greater than 25 ohms centimeter [ohm/cm]) or very low resistivity (smaller than 5 ohm/cm) are indicative of fresh groundwater and high salinity groundwater, respectively. Moderate AEM resistively in the range of 5 to 25 ohm/cm can be indicative of either higher salinity or higher amount of clay in subsurface materials, thus the exact water quality associated with these resistivity values is more difficult to discern. In the

known extents of sandy and gravelly 180-Foot and 400-Foot Aquifers, AGF has developed an experimental relationship whereby AEM resistivity of greater than 13.2 ohm/cm and less than 7.2 ohm/cm are indicative of fresh groundwater and high salinity groundwater, respectively.

The AEM surveys have found that high salinity groundwater as a result of seawater intrusion exists within the lower 180-Foot Aquifer and 400-Foot Aquifers of the Monterey Subbasin. This volume of high salinity groundwater is overlain by fresh groundwater in the Dune Sand and upper 180-Foot Aquifers. The results of the AEM study are consistent with water quality data collected within the Subbasin (EKI, 2019). No significant difference was found between seawater intrusion conditions in 2017 and 2019 within the Subbasin.

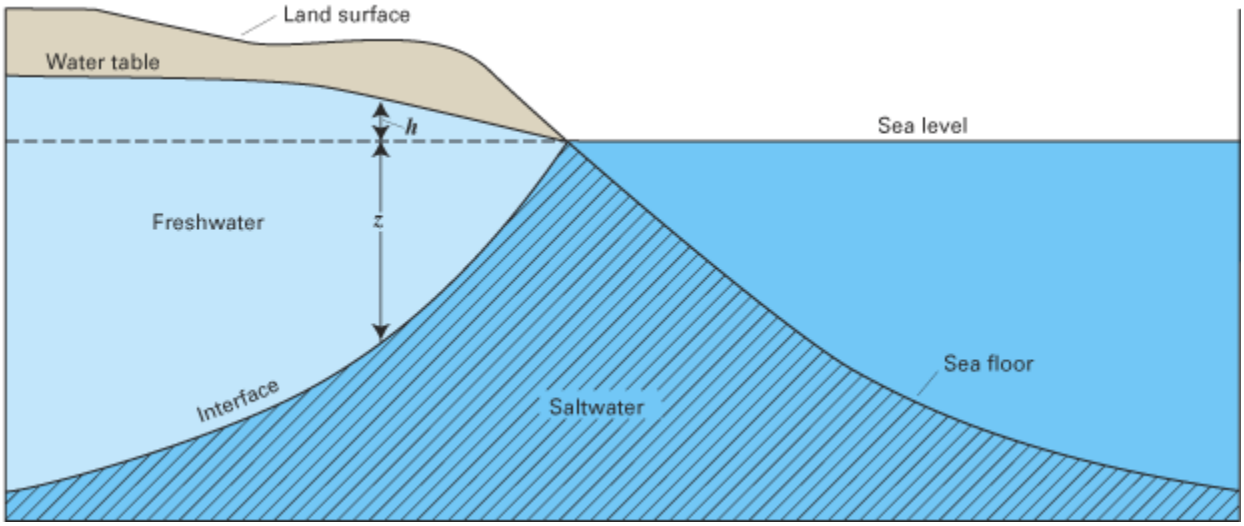
Induction logging within a well measures the fluid conductivity within the adjacent formation. Although this method does not provide exact measurements of water quality, it can be used to monitor changes in conductivity (i.e., groundwater salinity) over time. The Seaside Basin Watermaster constructed and maintains four Sentinel Wells along the coast to detect potential seawater intrusion. The northern-most well, SBMW-1, is located within the Monterey Subbasin. The Watermaster conducts semi-annual induction logging within these wells. During baseline monitoring of SBMW-1 in 2007, it has been documented that very high conductivity values indicative of saline groundwater were observed at depths of 125 feet to approximately 350-400 feet (Feeney, 2007). No significant changes in salinity was observed in this well through the Historical and Baseline Periods (Montgomery & Associates, 2019).

5.3.2 Defining Seawater Intrusion

Coastal aquifers usually contain two sets of flow going in opposite directions: lower-density freshwater flowing seaward and higher-density seawater flowing inland. When groundwater levels in aquifers connected to the ocean fall to near or below sea level, flows across the ocean/land boundary become predominantly onshore flows (Barlow, 2003). As higher density seawater flows inland, it forms a seawater wedge beneath the less dense fresh groundwater until the water table achieves equilibrium, as shown on Figure 5-24.

The freshwater depth above sea level and the freshwater depth below the sea level in the wedge are related to each other through the Ghyben-Herzberg Relation, which states that for every foot of freshwater above sea level there is approximately 40 feet of freshwater below sea level (Barlow, 2003). For a given depth within the subsurface, therefore, the potentiometric head must be at least 1/40 of that depth above sea level in order for freshwater to be present at that depth. For example, for freshwater to be present within the 180-Foot Aquifer and 400-Foot Aquifer (i.e., with bottom depths of approximately -250 ft NAVD88 and -500 ft NVAD88, respectively), the potentiometric surface in those aquifers needs to be maintained at an elevation of at least 6.3 ft NVAD88 and 12.5 ft NAVD88, respectively. In a complexly layered aquifer system like in the Salinas Valley, each aquifer may have its own seawater wedge, with a seawater front at different horizontal distances from the shoreline, depending on each aquifer' relative hydraulic connection to pumping wells and the Pacific Ocean (Yates and Wiese, 1988).

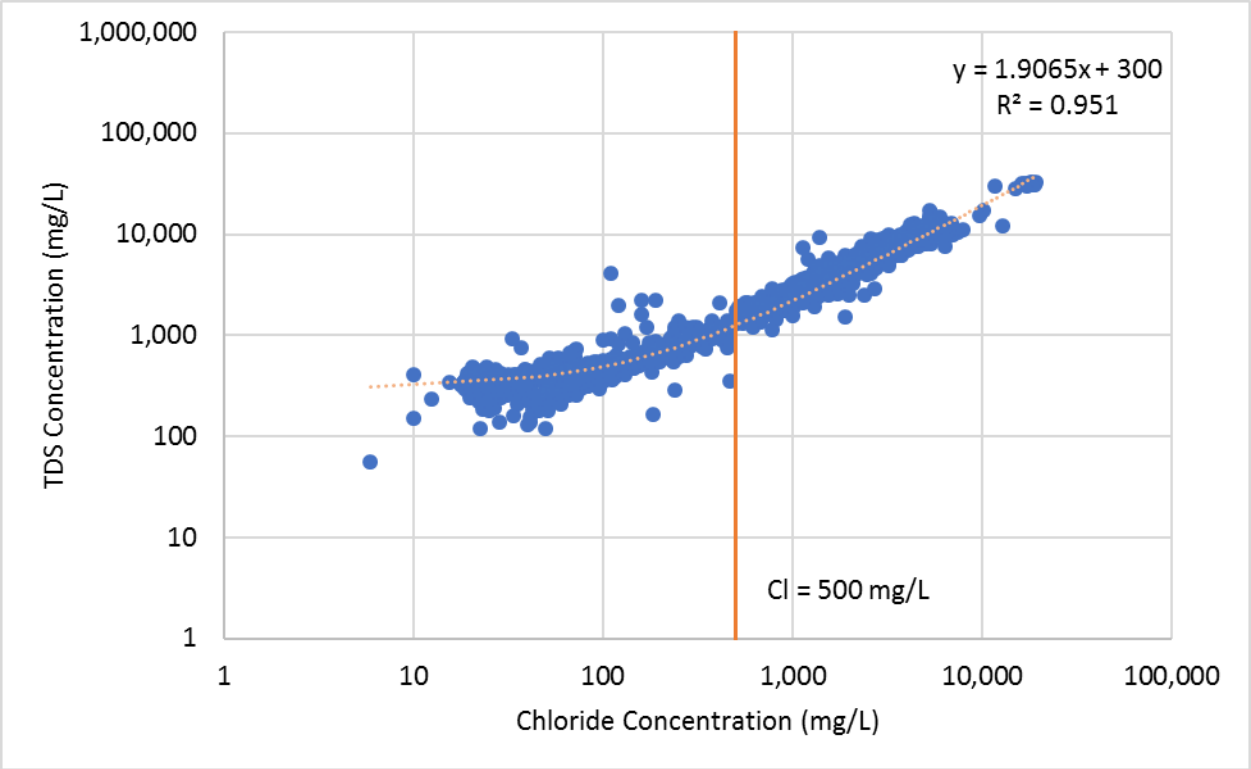
Figure 5-24 Ghyben-Herzberg Relation (Barlow, 2003)



The definition of seawater intrusion is generally based on a TDS or chloride concentration threshold and is dependent on local beneficial uses and groundwater protection strategies. In the larger Salinas Valley Basin, MCWRA has defined the seawater intrusion threshold as 500 milligram per liter (mg/L) of chloride. This chloride concentration is significantly lower than the 19,000 mg/L chloride concentration typical of seawater, but it represents a concentration that impacts use of the water. Additionally, groundwater in the Marina-Ord aquifers has low natural TDS generally less than 500 mg/L, and the primary source of salinity in this area is seawater intrusion. Therefore, this GSP adopts the seawater intrusion threshold as 500 mg/L of chloride, or 1,000 mg/L of TDS as a surrogate where chloride data are unavailable.

TDS has been identified as a surrogate for chloride to define seawater intrusion due to the scarcity of actual chloride measurements within the Subbasin and the excellent correlation between these two parameters in the Marina-Ord aquifers. Groundwater in the Marina-Ord aquifers has low natural TDS generally less than 500 mg/L and the primary source of salinity in this area is seawater intrusion. The strong correlation between these water quality parameters within the seawater intruded lower 180-Foot/400-Foot Aquifer is shown on Figure 5-25 below. Appendix 5-A further examines this correlation and establishes a quantitative relationship to allow conversion between TDS and chloride concentrations detected in this aquifer.

Figure 5-25 Relationship Between TDS and Chloride Concentrations in the Lower 180-Foot, 400-Foot Aquifer



It should be noted that the seawater-affected groundwater quality may well be sufficient for many beneficial uses. In other words, while the definition of seawater intrusion front as the 500 mg/L chloride threshold (or 1,000 mg/L of TDS as a surrogate) is a useful guideline for identifying when some seawater intrusion effect may be detected, this does not necessarily mean that the groundwater within the affected region is no longer suitable for current or potential beneficial uses. Specifically, the following beneficial use standards on TDS apply to groundwater within the seawater intruded area of the Subbasin:

- The State of California has adopted an upper SMCL for TDS of 1,000 mg/L, and a short-term maximum SMCL of 1,500 mg/L for drinking water.
- Under SWRCB Resolution 88-63, the state considers all groundwater containing TDS at concentrations less than 3,000 mg/L as having potential beneficial use as a domestic and municipal supply. This Resolution is adopted as part of the Regional Water Quality Control Board's (RWQCB) Water Quality Protection Plan for the region.
- The Federal Clean Water Act defines groundwater containing less than 10,000 mg/L TDS as an Underground Source of Drinking Water.

- SWRCB Resolution 68-16, also known as the Antidegradation Policy, requires that the existing high quality of waters be maintained to the maximum extent possible, and allows degradation only if it is consistent with maximum benefit to the people of the state, will not unreasonably affect present and potential beneficial uses, and will not result in water quality lower than applicable standards.

5.3.3 Seawater Intrusion Maps and Cross-Sections

Figure 5-26 shows 2015-2018 TDS concentrations detected in each of the coastal aquifers during the beginning of the Baseline Period. As shown on Figure 5-26, TDS concentrations measured in the Dune Sand, upper 180-Foot, and Deep Aquifers monitoring locations are generally below 1,000 mg/L, indicating that there is no or minimal seawater intrusion in these aquifers. In the lower 180-Foot and 400-Foot Aquifers, TDS concentrations of over 10,000 mg/L are observed up to four miles inland.

5.3.3.1 Seawater Intrusion Cross-Sections

As shown onFigure 5-27 , cross-sections A-A' and B-B' (Figure 5-28 and Figure 5-29) run perpendicular to the coastline and show relevant TDS data (measured at designed well screen intervals) and 2019 AEM survey data along these transects. Cross-section B-B' is located within the Monterey Subbasin; however, AEM data along this cross-section are sporadic due to the absence of AEM data in urban areas where high density of utilities interferes with AEM data collection. Cross-section A-A' runs immediately north of the Monterey Subbasin and provides insight regarding the vertical delineation of seawater intrusion within the coastal areas of the Monterey Subbasin.

TDS and AEM data shown on these cross-sections confirm that seawater intrusion in the Monterey Subbasin primarily exists in the lower 180-Foot Aquifer and 400-Foot Aquifer, whereas groundwater in the Dune Sand and upper 180-Foot Aquifers remains fresh. TDS concentrations differ dramatically across depths in the multi-completion wells (e.g., MP-BW-37), with the highest TDS occurring at approximately 360 to 400 ft bgs. It appears that seawater intrusion in these two aquifers forms a unified intrusion wedge due to the discontinuity of the 180/400-Foot Aquitard near the coast. The data are consistent with the Ghyben-Herzberg Relation, which accounts for the downward movement of high-density seawater, overlain by lighter freshwater.

5.3.3.2 Extent of Seawater Intrusion in the Lower 180-Foot, 400-Foot Aquifers at the Beginning of the Baseline Period (2015-2018)

Figure 5-30 depicts the estimated extent of seawater intrusion in the lower 180-Foot, 400-Foot Aquifer during the beginning of the Baseline Period (2014-2018). As shown on Figure 5-30, seawater intrusion in the lower 180-Foot, 400-Foot Aquifer extends as far as four miles inland. This estimated extent of seawater intrusion is consistent with available AEM, chloride, specific conductance and TDS data. No salinity data exist between MCWD production well MCWD-30 and the cluster of wells located northwest of MCWD's production wells, where TDS concentrations exceed 10,000 mg/L. Therefore, the actual location of the seawater intrusion front where

groundwater TDS concentrations exceed 1,000 mg/L and/or chloride concentrations exceed 500 mg/L in this area is unknown.

The original GSP identified a data gap in water level and salinity data within the 400-Foot Aquifer near the central coastline between wells MCWD-09 and MPWMD#FO-10S and proposed the installation of new monitoring wells to fill this data gap. A new 400-Foot Aquifer monitoring well MCWD-MW-4AVE(S), was constructed in this area. TDS concentrations exceeding 11,000 mg/L and chloride concentrations of 4,900 mg/L were detected in groundwater samples collected from this well in 2026. This well is located approximately 4,000 feet inland of the previously mapped extent of seawater intrusion in the 400-Foot Aquifer, in an area where no prior salinity data (e.g., AEM, TDS, chloride, or specific conductivity) exist.

The location of MCWD-MW-4AVE(S) is shown on Figure 5-30. Salinity data detected in groundwater samples collected from this well in 2026 are included on these figures which present salinity data obtained from wells during the beginning of the Baseline Period (approximately 2015-2018). The magnitude of TDS and chloride concentrations detected in groundwater samples collected from this well in 2026, indicate that seawater intrusion likely occurred over a decade ago in this area. TDS and chloride concentrations in pure seawater are approximately 33,500 mg/L and 19,000 mg/L, respectively. Therefore, salinity data from MCWD-MW-4AVE(S) indicates that groundwater in this area is composed of more than 25% seawater. This magnitude of seawater intrusion is only observed in areas of the Salinas Valley Basin, which have been intruded for many years (see wells with TDS concentration at or close to 10,000 mg/L on Figure 5-31, including MP-BW-35-402, MP-BW-35-366, MP-BW-37-368, and MP-BW-37-398).

The magnitude of TDS and chloride concentrations observed at this location suggests that the extent of seawater intrusion in the 400-Foot Aquifer was greater than previously understood based on available data[12]. MCWDGSA is collecting additional data to verify these findings, characterize the temporal progression of seawater intrusion at this location, and delineate the current inland extent of seawater intrusion beyond MCWD-MW-4AVE(S) in the 400-Foot Aquifer.

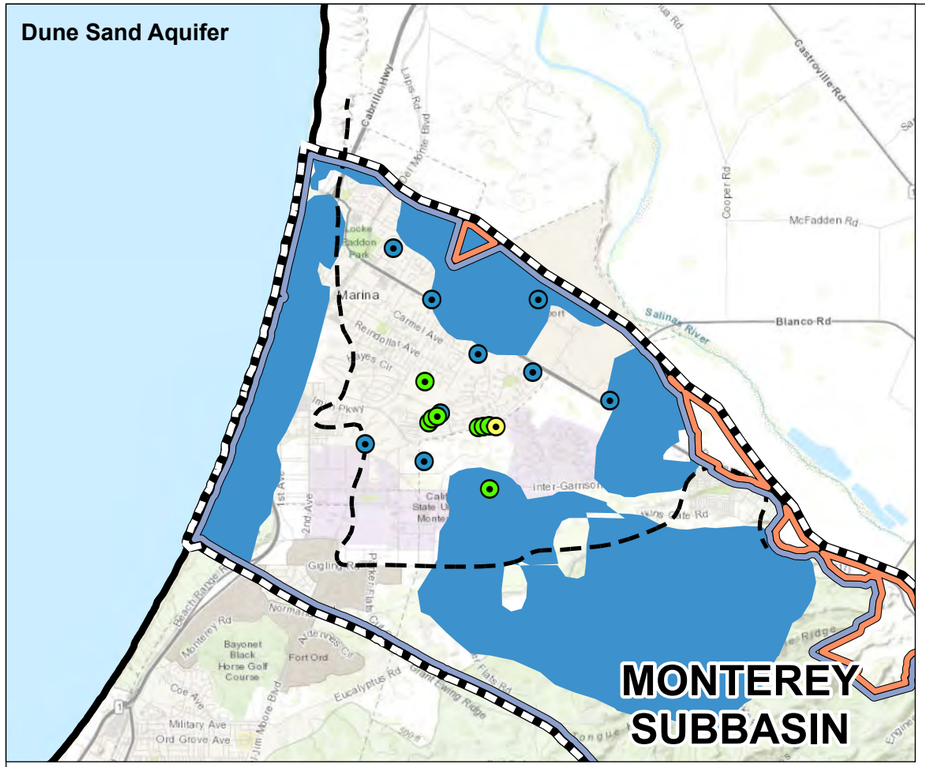
The estimated extent of seawater intrusion shown on Figure 5-30 is generally consistent with MCWRA's mapped extent of the 2019 seawater intrusion front in the 400-Foot Aquifer (see Appendix 5-B). MCWRA also maps a similar seawater intrusion front in the 180-Foot Aquifer in the Monterey Subbasin. However, as discussed Chapter 4 and shown above, the 180-Foot Aquifer in the Subbasin is divided by an intermediate aquitard into an upper zone and a lower aquifer zone. There is no observed seawater intrusion in the upper portion of the 180-Foot Aquifer. Therefore, MCWRA's maps are only consistent with data collected from the lower 180-Foot Aquifer.

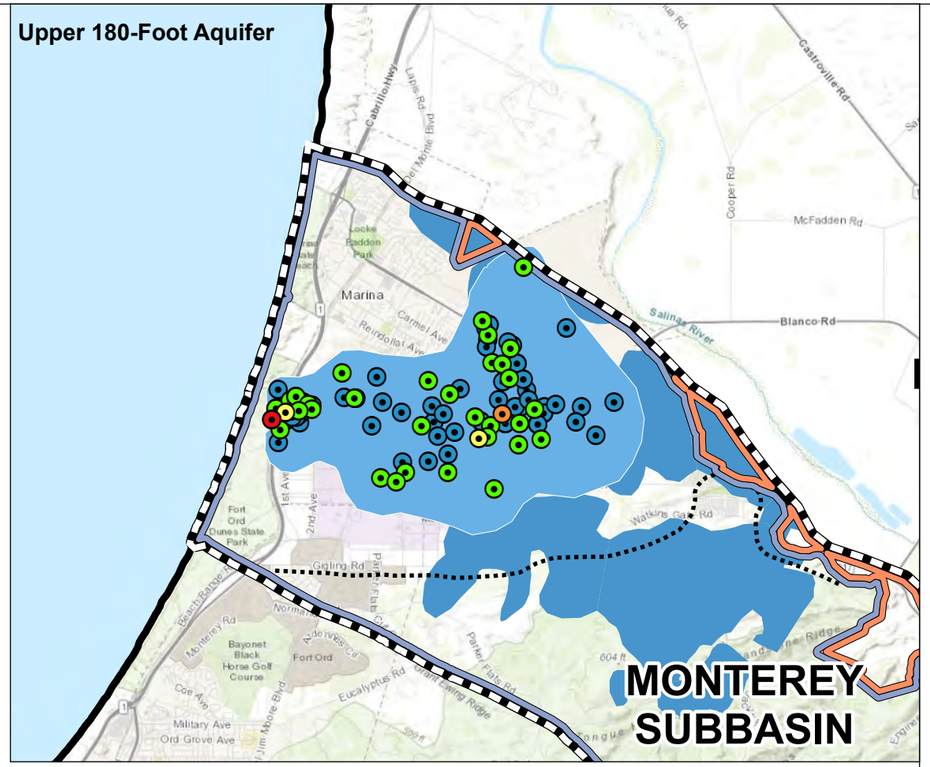
[12] The extent of seawater intrusion depicted in the 2022 GSP near the central Marina-Ord coastline is based on data collected from MW-OU2-07-400, screened in the 400-Foot Aquifer to the north, and MW-12-12-180L, screened in the lower 180-Foot Aquifer closer to the coast. Both wells exhibit low TDS and chloride concentrations during the Current Period. It is possible that MW-12-12-180L was screened above the advancement of seawater intrusion now indicated by data from MCWD-MW-4AVE(S).

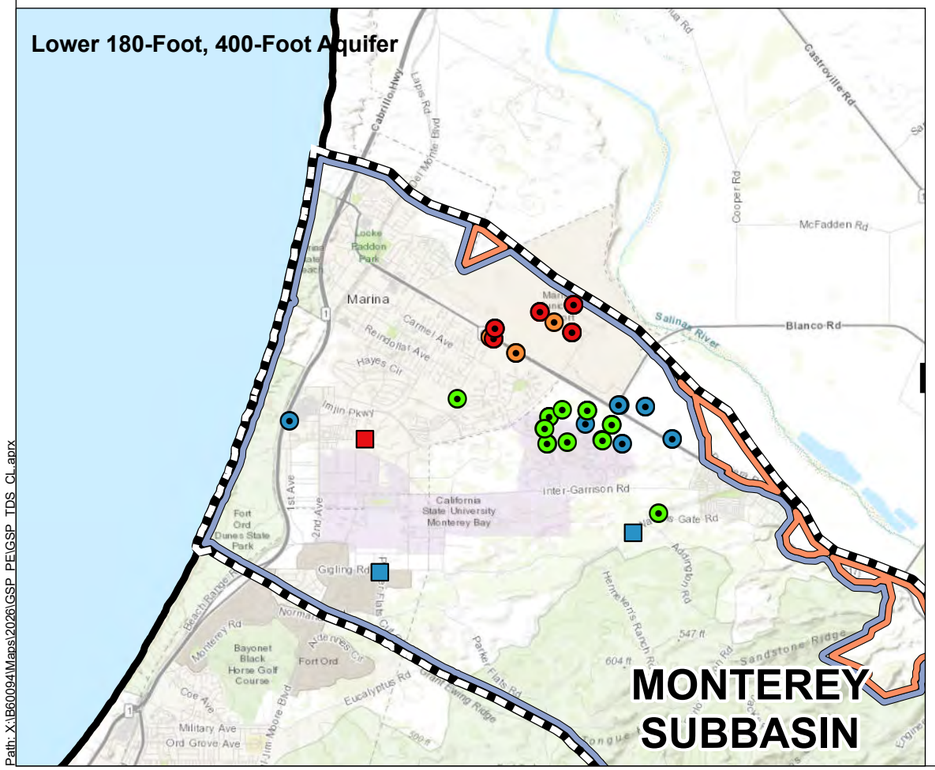
5.3.3.3 Potential for Lateral and Vertical Migration

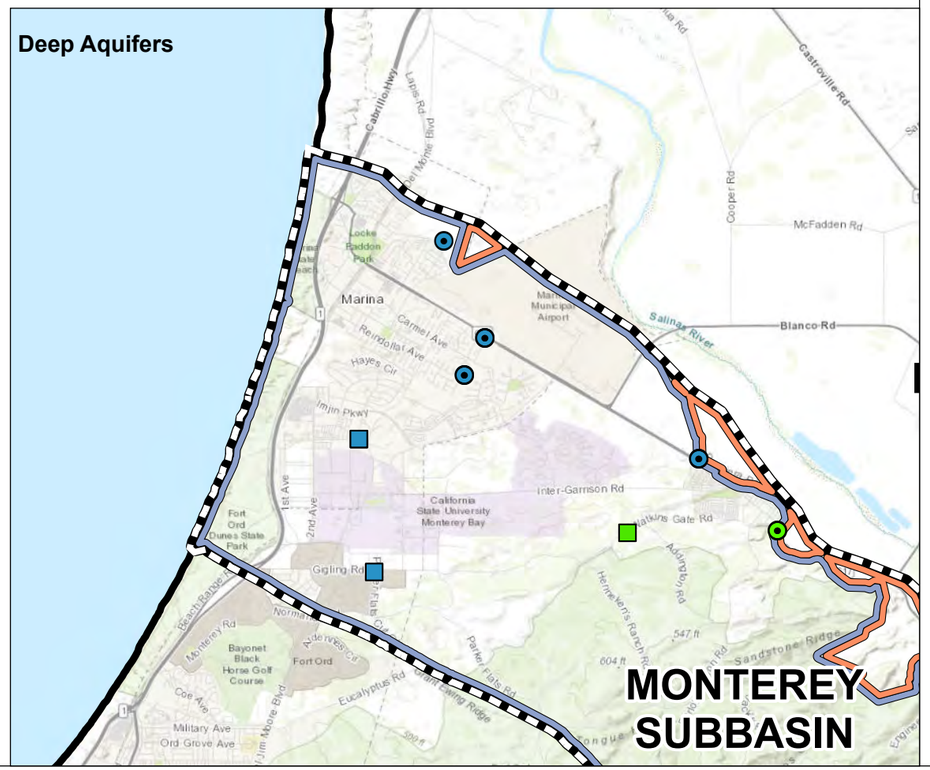
Figure 5-30 also presents the mapped Fall 2017 groundwater elevations for the lower 180-Foot Aquifer and the 400-Foot Aquifer. The figure shows that depressed groundwater elevations in the 180/400 Subbasin are creating inland groundwater gradients that are contributing to seawater intrusion within the Monterey Subbasin. This observed inland gradient is generally parallel to the current seawater intrusion front, which supports the observation that lateral migration of seawater intrusion in the Monterey Subbasin was minimal over the Historical Period (Section 5.3.4).

Since groundwater elevations in the Deep Aquifers are lower than sea level and also lower than groundwater elevations within the 400-Foot Aquifer, there is a significant risk that seawater intrusion will occur in this aquifer. Such seawater intrusion could either occur from lateral migration of seawater within the Deep Aquifers from subsea outcrops located further off-shore or and/or downward vertical migration from the intruded 400-Foot Aquifer. The likelihood of and potential timeframe for seawater intrusion in this aquifer is unknown.









Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Freshwater Extent Identified by AEM Survey (Stanford/ Aqua Geo Frameworks, 2018)
- Groundwater with TDS <1,000 mg/L (Note 2)
- Southern Extent of FO-SVA (Harding ESE, 2001)
- Southern Extent of Valley Fill Deposits (Harding ESE, 2001)

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

2015-2018 TDS Concentrations

- ≤ 500 mg/L
- 500 - 1,000 mg/L
- 1,000 - 3,000 mg/L
- 3,000 - 10,000 mg/L
- >10,000 mg/L

2026 TDS Concentrations (Note 3)

- ≤ 500 mg/L
- 500 - 1,000 mg/L
- > 10,000 mg/L

Abbreviations

AEM = airborne electromagnetic
mg/L = milligram per liter
MW = monitoring well
TDS = total dissolved solids

Notes

1. All locations are approximate.
2. Results of TDS and specific conductance are shown herein. Specific conductance to TDS conversion is based on a derived slope of 0.7025 mg/L per uS /cm from a linear regression model with existing data.
3. Samples collected from monitoring wells constructed in 2026 are included on the map to supplement the 2015-2018 dataset in areas with data gaps.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 11 August 2026.
2. TDS and specific conductance concentration measurements are obtained from various public agencies.

N

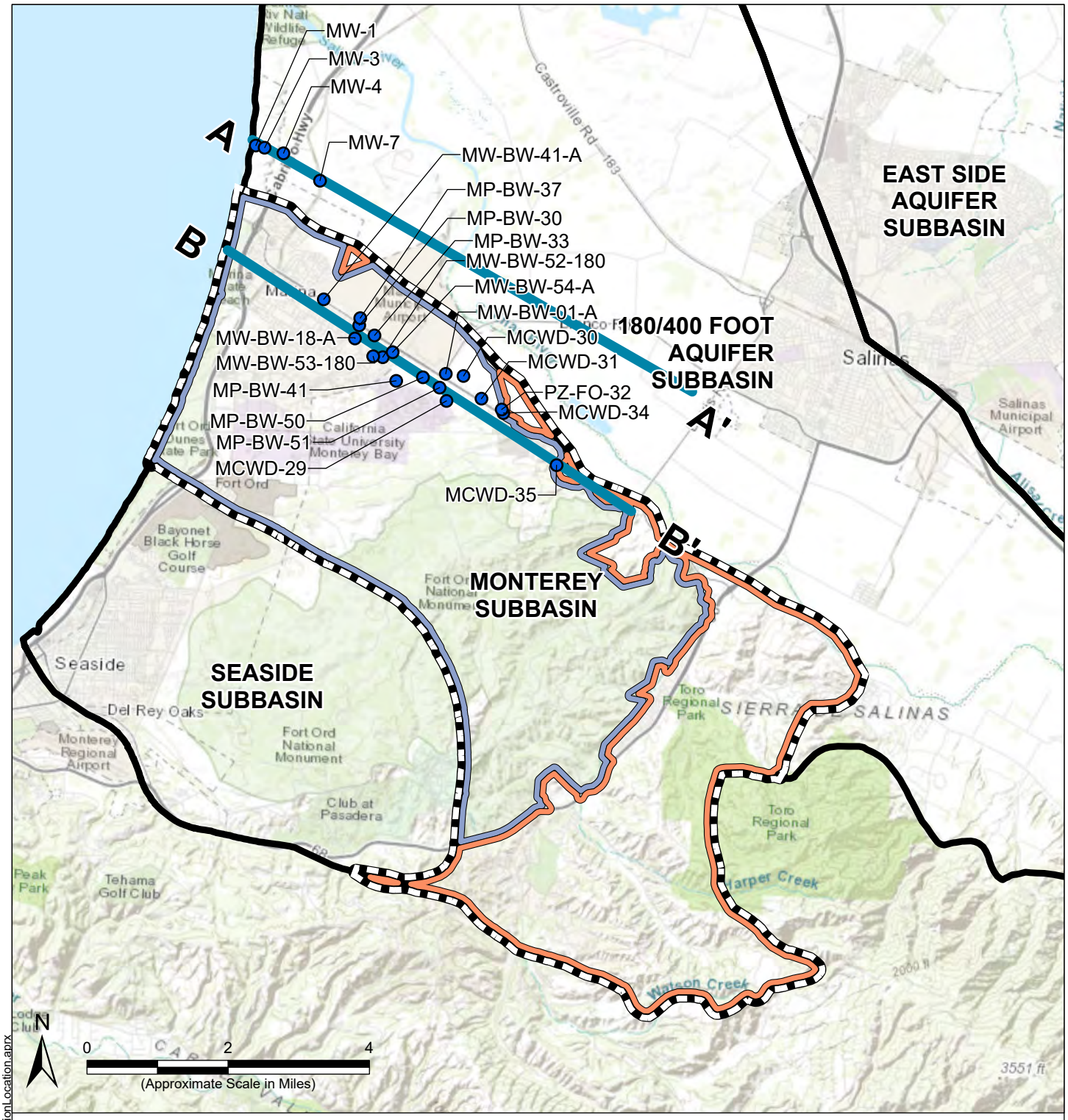
0 1.5 3

(Scale in Miles)

2015-2018 Total Dissolved Solids Concentration Marina-Ord Area

Monterey Subbasin
Groundwater Sustainability Plan
August 2026
Figure 5-26

Path: X:\B60094\Maps\2026\GSP_PEIGSP_TDS_CL.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Well Locations
- Cross-Section Locations

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Notes

1. All locations are approximate.

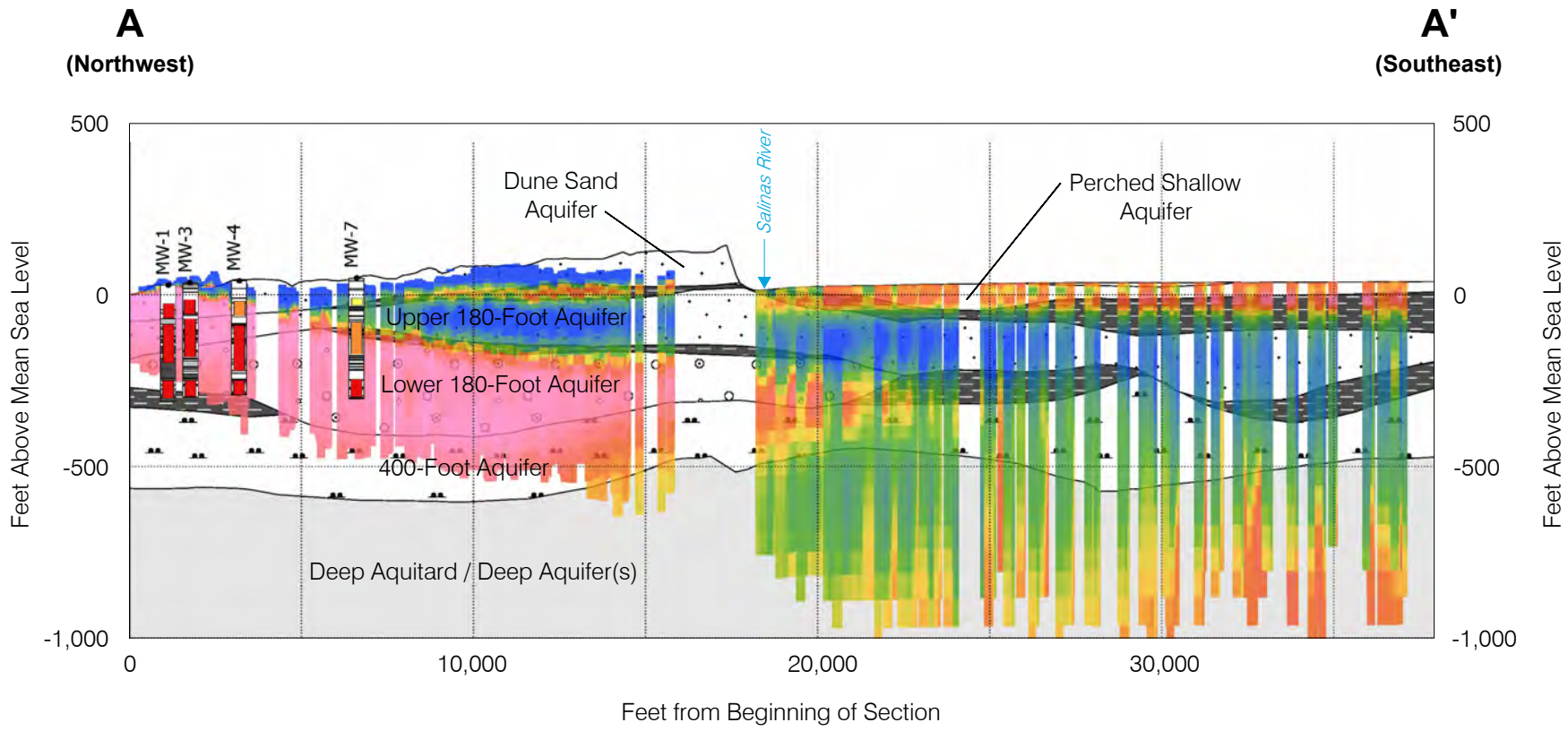
Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 6 August 2026.

Seawater Intrusion
Cross-Section Locations

Monterey Subbasin
Groundwater Sustainability Plan
November 2021
Figure 5-27

Path: X:\B60094\Maps\2021\09\Fig5-25_SeawaterIntrusion_SectionLocation.aprx



Legend:

Hydrostratigraphy Model
- Aquifers
- Aquitards
- Deep Aquitard / Deep Aquifer(s)

Logged Borehole Soil Category
- Coarse
- Medium
- Unknown
- Fine
- Top Soil

Screen Interval by TDS (mg/L)
- < 500
- ≤ 3000
- > 10000
- ≤ 1000
- ≤ 10000

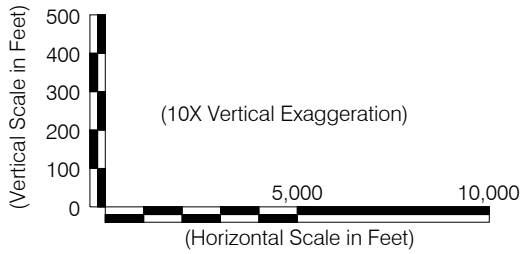
AEM Resistivity (ohm-m)
0.3 7.7 15.1 22.6 30

Abbreviations:

AEM	= airborne electromagnetic
mg/L	= milligrams per liter
TDS	= total dissolved solids

Notes:

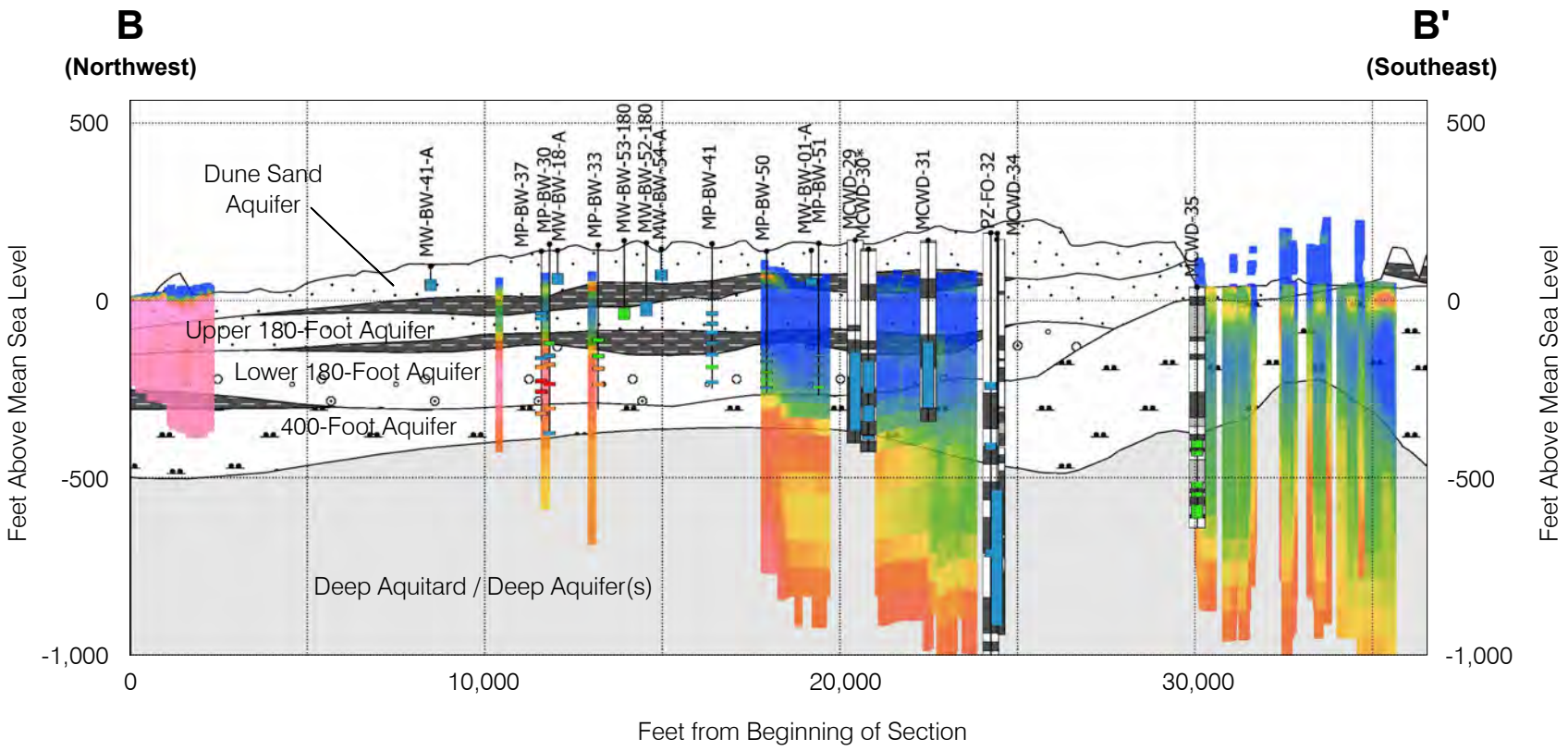
1. All locations are approximate.
2. AEM data shown are from the 2019 AEM survey (Aqua Geo Frameworks, 2019). AEM resistivity of below 75 ohm-m is used to identify saturated groundwater zones. Within sandy and gravelly aquifers, AEM resistivities of above 13.2 and below 7.2 is associated with groundwater with TDS below 3,000 mg/L and above 10,000 mg/L, respectively, per the TDS-AEM Resistivity relationship developed by Aqua Geo Frameworks (2019).
3. The hydrostratigraphy model is Model A obtained from Stanford/Aqua Geo Frameworks (2018), developed based on cross-sections from previously published reports, borehole lithology logs, and 2017 AEM survey data. The hydrostratigraphy model is approximate.



Seawater Intrusion Cross-Section A-A'

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 5-28



Legend:

Hydrostratigraphy Model
- Aquifers
- Aquitards
- Deep Aquitard / Deep Aquifer(s)

Logged Borehole Soil Category
- Coarse
- Medium
- Unknown
- Fine
- Top Soil

Screen Interval by TDS (mg/L)
- < 500
- ≤ 3000
- > 10000
- ≤ 1000
- ≤ 10000

AEM Resistivity (ohm-m)

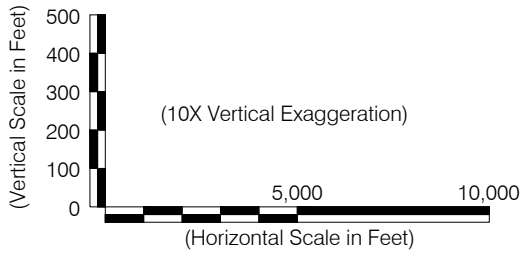
0.3 7.7 15.1 22.6 30

Abbreviations:

AEM	= airborne electromagnetic
mg/L	= milligrams per liter
TDS	= total dissolved solids

Notes:

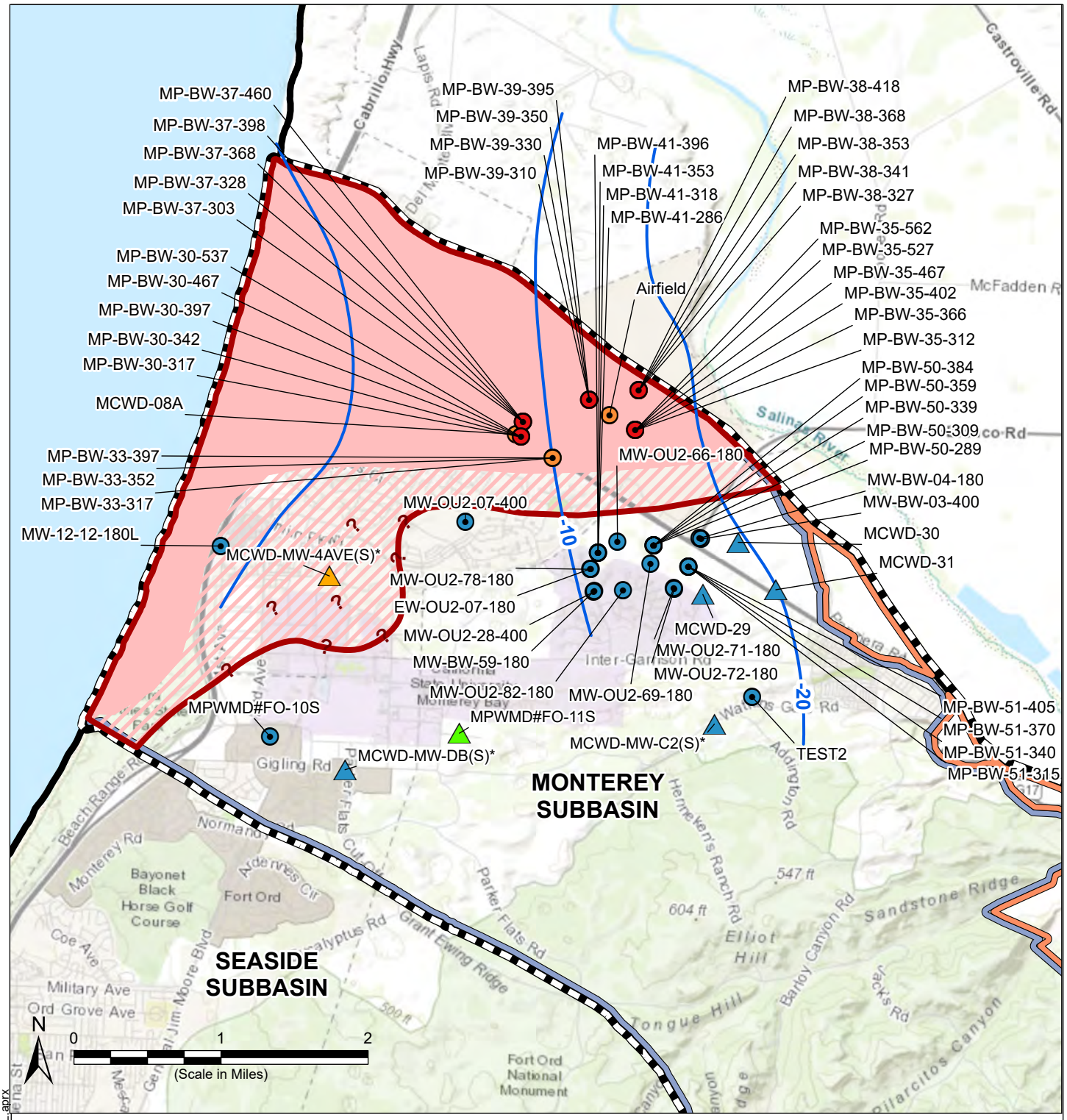
1. All locations are approximate.
2. AEM data shown are from the 2019 AEM survey (Aqua Geo Frameworks, 2019). AEM resistivity of below 75 ohm-m is used to identify saturated groundwater zones. Within sandy and gravelly aquifers, AEM resistivities of above 13.2 and below 7.2 is associated with groundwater with TDS below 3,000 mg/L and above 10,000 mg/L, respectively, per the TDS-AEM Resistivity relationship developed by Aqua Geo Frameworks (2019).
3. The hydrostratigraphy model is Model A obtained from Stanford/Aqua Geo Frameworks (2018), developed based on cross-sections from previously published reports, borehole lithology logs, and 2017 AEM survey data. The hydrostratigraphy model is approximate.



Seawater Intrusion Cross-Section B-B'

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 5-29



Legend

2017 August Groundwater Contours in the 400-Foot Aquifers

Estimated 2015 Seawater Intrusion (Note 2)

- Area of Known Seawater Intrusion
- Area of Potential Seawater Intrusion

2015-2018 TDS Concentrations

- ≤ 780 mg/L
- 781 - 1,250 mg/L
- 1,251 - 3,000 mg/L
- 3,001 - 10,000 mg/L
- >10,000 mg/L

2015-2018 Chloride Concentrations (Note 3)

- ≤ 250 mg/L
- 251 - 500 mg/L
- 3,001 - 10,000 mg/L

Notes

1. All locations are approximate.
2. Extent of seawater intrusion estimated for areas with TDS >1,250 mg/L based on AEM survey and groundwater monitoring data.
3. Samples collected from monitoring wells constructed in 2026 are included on the map to supplement the 2015–2018 dataset in areas with data gaps. Monitoring wells constructed in 2026 are denoted by an asterisk (*).

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 11 October 2026
2. TDS and chloride measurements are obtained from various agencies.

Abbreviations

mg/L = milligram per liter
TDS = total dissolved solids

Seawater Intrusion Extent in the Lower 180-Foot, 400-Foot Aquifer

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 5-30

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_30_TDS_CL.aprx

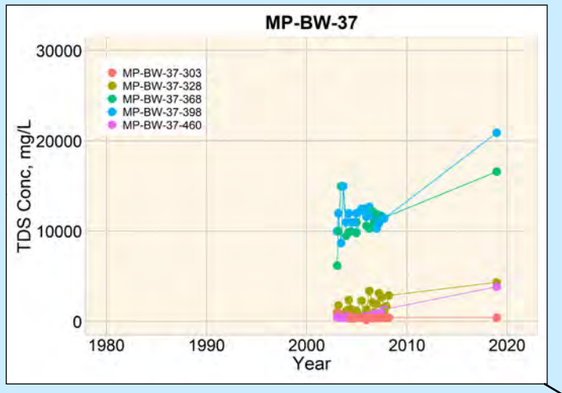
5.3.4 Historical Progression of Seawater Intrusion

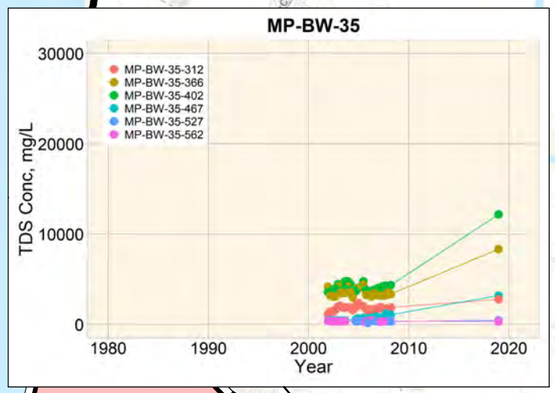
Seawater intrusion has been documented in the Salinas Valley Basin since the 1940s (DWR, 1946; Appendix 6-A). However, consistent records of the water quality indicators related to seawater intrusion within the Monterey Subbasin are only available back to the 2000s and at selected locations. Thus, the spatial variability of water quality data is insufficient to access the historical rate of seawater intrusion within the Monterey Subbasin prior to this time period. In this section, TDS trends in selected wells near the seawater intrusion front are presented to evaluate historical seawater intrusion rates during the Historical Period.

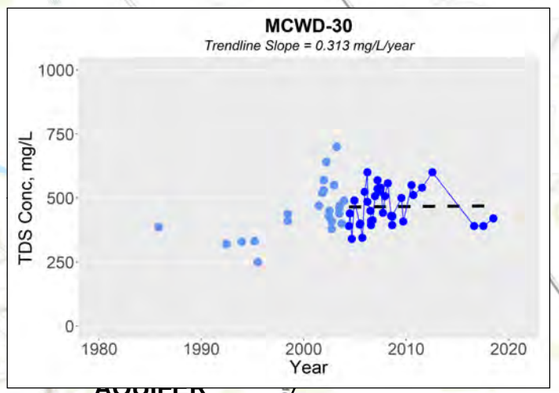
Seven wells screened within the lower 180-Foot and 400-Foot Aquifers with relatively long TDS records are shown on Figure 5-31. Increasing long-term trends in TDS concentrations are observed in areas that are seawater intruded. Additionally, high TDS groundwater has migrated downward within the seawater intruded area. TDS concentrations have increased in wells screens MP-BW-35-467 (i.e., screened 467 ft bgs at MP-BW-35) and MP-BW-37-460 (screened 460 ft bgs at MP-BW-37) between 2008 and 2018. Also, TDS concentrations detected in wells MCWD-30 and MCWD-09 fluctuate significantly, which indicates that saline groundwater exists in close proximity to these wells.

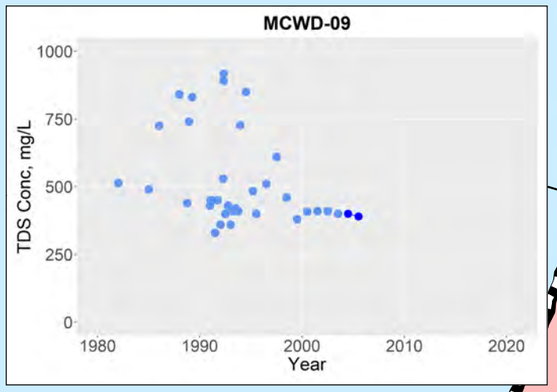
Available data suggest that the lateral extent of seawater intrusion within the Subbasin was relatively stable over the Historical Period. Specifically, immediately northwest of the seawater intrusion front, screens located from approximately 300 ft bgs to 400 ft bgs in multi-port wells MP-BW-37 and MP-BW-35 have been seawater intruded since 2001 when the wells were installed and records were available. Immediately southeast of the seawater intrusion front, wells MCWD-30, MCWD-29, and the multi-port wells MP-BW-42 have shown relatively stable TDS concentrations at or below 1,000 mg/L over the Historical Period. Although there was some increase in TDS concentration in wells that were previously seawater intruded, there was no observed expansion of the seawater intrusion front over the Historical Period.

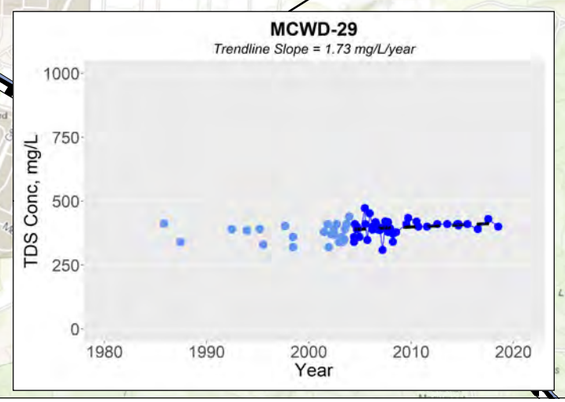
One CASGEM well in the southwestern portion of the Marina-Ord Area, MPWMD#FO-10S, showed an increase in TDS concentration in 2020. The well was found to have compromised construction and cross-connections between its multiple screens. As such, the exact source of the elevated TDS/chloride concentration cannot be identified. The MCWD-MW-DB cluster was constructed in 2026 to replace the MPWMD#FO-10 cluster. The location of the MCWD-MW-DB cluster is shown on Figure 5-30. It is located approximately 0.5 miles inland of MPWMD#FO-10. TDS and chloride concentrations detected in groundwater samples collected from wells in this cluster are consistent with background levels and well below seawater intrusion threshold concentrations of 1,000 mg/L and 500 mg/L, respectively.

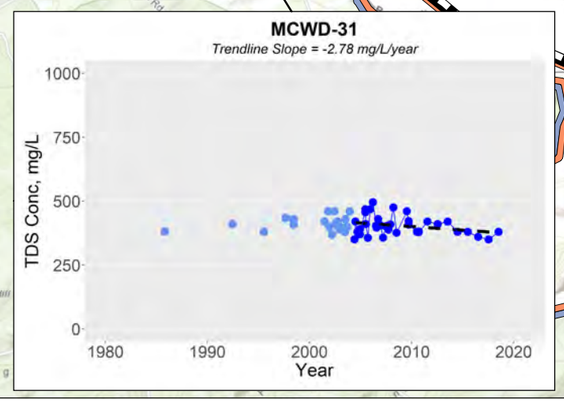












Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Lower 180-Foot, 400-Foot Aquifer Wells

Estimated 2015 Seawater Intrusion Extent

- Area of Known Seawater Intrusion
- Area of Potential Seawater Intrusion

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Single Completion Wells

- TDS Measurements Between 2004 and 2018 (15 Years)
- TDS Measurements Before 2004
- Trendline (Note 1)

Multi-Completion Monitoring Wells

- TDS Measurements (Note 2)

Abbreviations

Conc.	= Concentration
DWR	= California Department of Water Resources
mg/L	= miligram per liter
TDS	= total dissolved solids

Notes

1. Trendline analysis was performed for the period from 1 January 2004 to 31 December 2018 for single completion wells that have three or more TDS measurements during that period.
2. TDS measurements are shown in different colors for multi-completion wells, and no trendline analysis was performed for these wells.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 11 October 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

N

0 0.75 1.5

(Scale in Miles)

Total Dissolved Solid Concentration Trends in the Lower 180-Foot, 400-Foot Aquifer

Monterey Subbasin
Groundwater Sustainability Plan
Augsut 2026

Figure 5-31

Path: X:\B60094\Maps\2026\GSP PE\GSP Amendment Fig5-31 TDS 400 ft.mxd

5.4 Groundwater Quality Concerns

This section presents a summary of current groundwater quality conditions. The GSAs do not have regulatory authority over groundwater quality that is under the purview of other state and federal agencies (e.g., the Regional Water Quality Control Board). Projects and management actions implemented by MCWDGSA and SVBGSA, and groundwater extraction, must not further degrade groundwater quality.

The known groundwater quality concerns in the Marina-Ord Area aquifers are elevated chloride and TDS concentrations and point-source contaminants such as Volatile Organic Compounds (VOCs) and per- and poly-fluoroalkyl substances (PFAS). The primary source of high TDS and chloride concentrations in groundwater within the Marina-Ord Area is seawater intrusion, as described above in Section 5.3.

In the Corral de Tierra Area, the most prevalent water quality concern is naturally occurring arsenic.

5.4.1 Data Sources

The assessment of groundwater quality conditions is based on comparing data compiled from various monitoring agencies to applicable screening levels for the various beneficial uses (i.e., MCLs for domestic/municipal and industrial (M&I) use and various thresholds for irrigated agricultural use).

Groundwater quality samples are collected within the Monterey Subbasin on a regular basis for various studies and programs. Groundwater quality samples have also been collected on a regular basis for compliance with regulatory programs, including drinking water and contamination cleanup programs. Groundwater quality data for this assessment were collected from:

- The US Army Corps of Engineers Fort Ord Data Integration System;
- State Water Resources Control Board's GAMA website (SWRCB, 2020a);
- Central Coast Regional Water Quality Control Board Irrigated Lands Program Data (CCRWQCB, 2024);

5.4.2 Distribution and Concentrations of Point-Source Contamination

Clean-up and monitoring of point source pollutants are generally under the responsibility of either State or Federal regulatory agencies such as the CCRWQCB, California State DTSC, the U.S. EPA, and/or the United States Armed Forces. There are a number of active point-source contamination sites within the Subbasin, as identified on the SWRCB GeoTracker website[13] and

[13] http://geotracker.waterboards.ca.gov

the DTSC EnviroStor website[14]. These sites, shown on Figure 5-32 and listed in Table 5-2, are primarily located within the former Fort Ord and are a part of Fort Ord's environmental cleanup program.

The former Fort Ord was placed on EPA's NPL in 1990 following environmental investigations conducted in 1984 and 1986. The same year, an FFA was signed by the Army, U.S. EPA, DTSC, and the CCRWQCB. The FFA established schedules for performing remedial investigations and feasibility studies and required remedial actions to be completed as expeditiously as possible. The base-wide Remedial Investigation Feasibility Study commenced in 1991. The Army performs these activities pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) also known as Superfund.

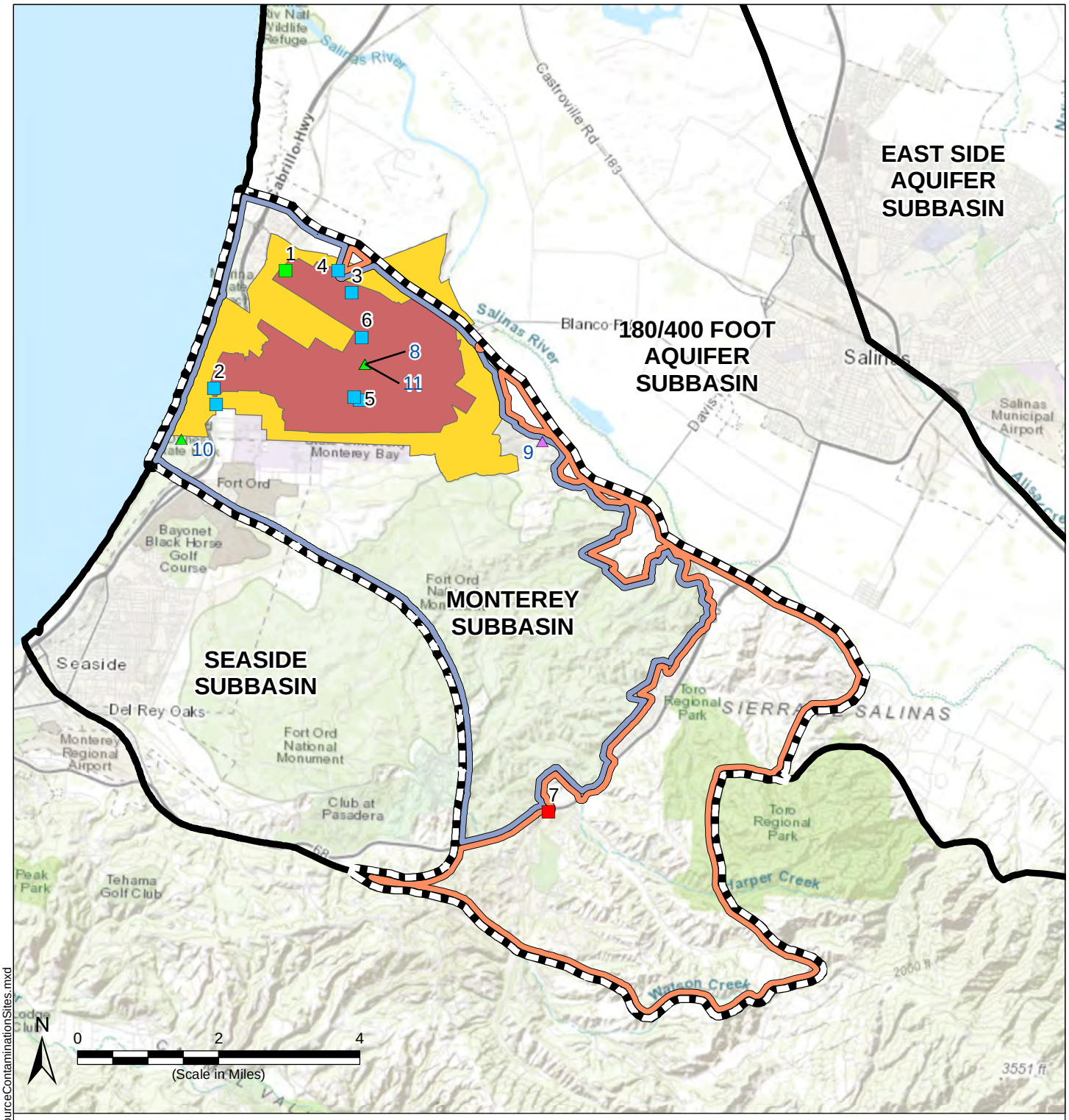
Groundwater remedial action objectives and aquifer cleanup goals at Fort Ord are established within the Records of Decision (ROD) and subsequent Explanations of Significant Difference prepared for each operable unit where groundwater impacts have been detected. These documents are part of the administrative record and have been endorsed by state and federal agencies. The ROD documents selected remedy and cleanup levels that comply with the federal and state requirements that are applicable or relevant and appropriate (ARAS) to the site, such as drinking water MCLs and CCRWQCB Basin Plan Water Quality Objectives.

The approximate extent of contamination plumes that have historically been identified in groundwater within former Fort Ord are delineated by the location of the well prohibition area, also shown on Figure 5-32 and described in detail in Chapter 3. These contamination plumes are primarily located within the Dune Sand and 180-Foot Aquifers. No contamination has been detected in the 400-Foot Aquifer and the Deep Aquifers. The most frequently detected chemicals in these areas are trichloroethylene (TCE) and carbon tetrachloride (CT). In addition, there is one cleanup site located within the City of Marina and a Leaking Underground Storage Tank (LUST) cleanup site located by Highway 68.

[14] https://www.envirostor.dtsc.ca.gov/public/

Table 5-2 List of Active Point Source Contamination Sites

Label	Site Name	Site Type	Status	Constituents Found at Site
1	Don's One Hour Dry Cleaners	Cleanup Program Site	Open - Verification Monitoring	Other Chlorinated Hydrocarbons, Tetrachloroethylene
2	Fort Ord - Fort Ord - Sites 2 and 12	Military Cleanup Site	Open - Remediation	Chlorinated Hydrocarbons
3	Fort Ord - Fort Ord OU1 (Fritzsche Army Airfield Fire Drill Area, On-Site Plume)	Military Cleanup Site	Open - Remediation	Gasoline, Chlorinated Hydrocarbons
4	Fort Ord - Fort Ord OU1 (Off-Site Plume)	Military Cleanup Site	Open - Remediation	Gasoline, Chlorinated Hydrocarbons
5	Fort Ord - Fort Ord - OU2	Military Cleanup Site	Open - Remediation	Gasoline, Chlorinated Hydrocarbons
6	Fort Ord - Fort Ord - OUCTP	Military Cleanup Site	Open - Remediation	Chlorinated Hydrocarbons
7	Former Exxon - Corral De Tierra	LUST Cleanup Site	Open - Eligible for Closure	Gasoline, MTBE/TBA/Other Fuel Oxygenates
8	Fort Ord Reuse Authority (Early Transfer)	Federal Superfund	Active	--
9	Fort Ord - East Garrison (VCA)	Federal Superfund	Certified	--
10	Fort Ord State Park-MOU with DPR	Federal Superfund	Active	--
11	Fort Ord Reuse Authority MOA	Federal Superfund	Active	--



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

GeoTrackerSites

- Cleanup Program Site, Open
- LUST Cleanup Site, Open
- Military Cleanup Site, Open

EnviroStor Sites

- Certified Federal Superfund
- Active Federal Superfund

Fort Ord Special Groundwater Protection Zones Related to Contamination Within the Former Fort Ord (Note 2)

- Prohibition Zone
- Consultation Zone

Management Areas

- Marina-Ord Area
- Corral de Tierra

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 6 August 2026.
2. Locations of contamination sites from SWRCB GeoTracker website (http://geotracker.waterboards.ca.gov/datadownload) accessed 27 February 2018 and Department of Toxic Substances Control EnviroStor website (https://www.envirostor.dtsc.ca.gov/public/) accessed 11 May 2018.

Location of Active Point Source Contamination Sites

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 5-32

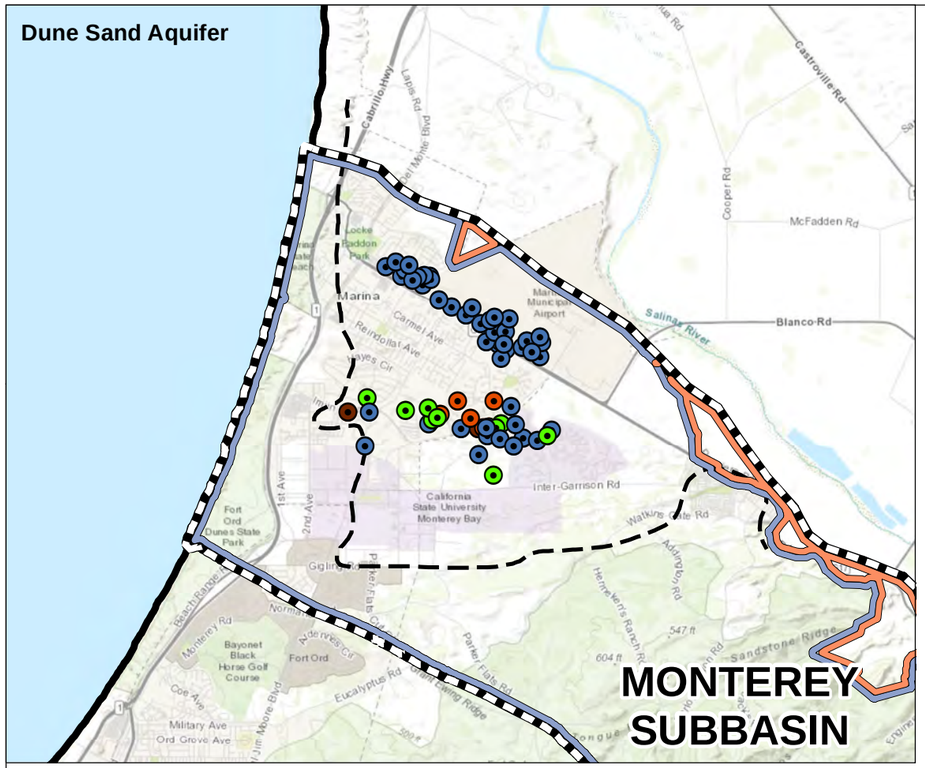
Path: X:\B60094\Maps\2021\09\Fig5-30_LocationofActivePointSourceContaminationSites.mxd

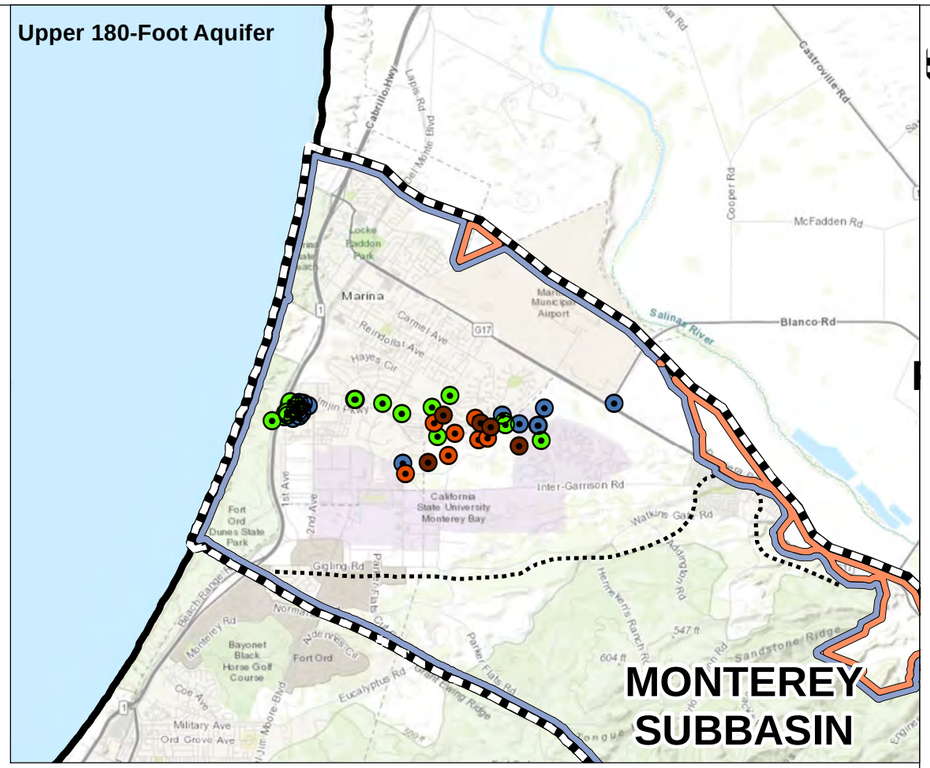
To date, no point-source contaminants have been detected above MCLs in domestic/M&I supply wells within the Subbasin. However, as of June 2019, TCE, CT, perfluorobutanesulfonic acid (PFBS), and perfluorohexanoic acid (PFHxA) have been detected above their respective detection limits in MCWD supply wells that are screened in the 180- and 400-Foot Aquifers.

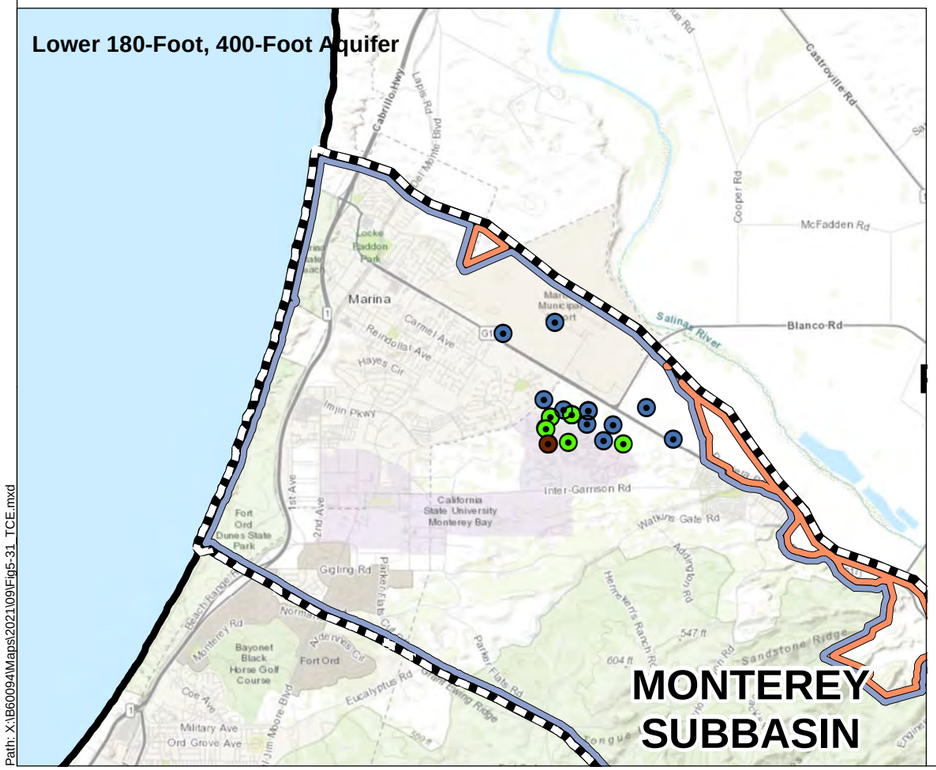
- Trichloroethylene and carbon tetrachloride: TCE and CT are among the major chemicals of concern detected in groundwater within Fort Ord Operable Unit 2 (OU2) and Operable Unit Carbon Tetrachloride Plume (OUCTP). These operable units are located in the center of the Marina-Ord Area southeast of MCWD production wells. TCE was detected in MCWD production wells screened in the lower 180-Foot, 400-Foot Aquifers since the 2000s and was most recently detected at concentrations ranging from 0.57 micrograms per liter (ug/L) in MCWD-30 to 1.80 ug/L in MCWD-29 in June 2019. CT was also recently detected in these wells at low concentrations. Figure 5-33 illustrates TCE concentrations detected in Fort Ord monitoring wells and MCWD production wells in June 2019. As shown on Figure 5-33, within the former Fort Ord, TCE exceeding the MCL (5 ug/L) was detected in monitoring wells in the Dune Sand Aquifer as well as the upper and lower 180-Foot Aquifers. Discontinuity of aquitards and the downward vertical groundwater gradient have contributed to the downward migration of contamination. The closest monitoring well with a TCE concentration above the MCL is located in the lower 180-Foot Aquifer one-mile upgradient of MCWD production wells.

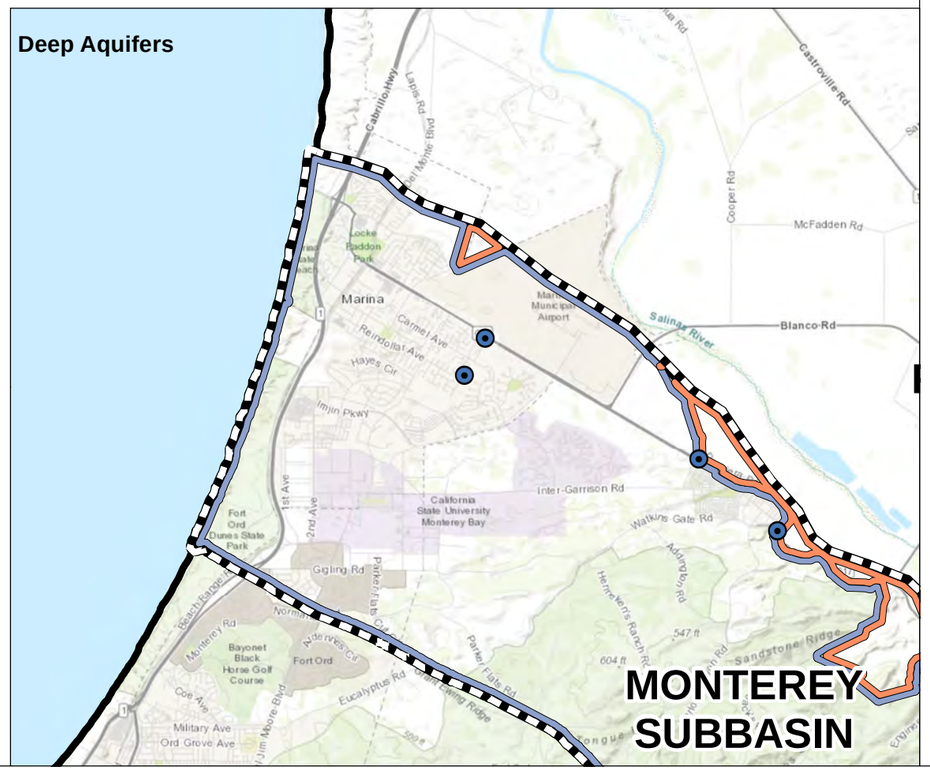
- Perfluorobutanesulfonic acid and perfluorohexanoic acid: PFBS and PFHxA are PFASs, which is a group of emerging man-made contaminants that were used in firefighting foam, protective coatings, and stain and water-resistant products until the 2000s. During MCWD's January 2020 PFAS sampling event, PFBS and PFHxA were detected in lower 180-Foot, 400-Foot Aquifer production well MCWD-29. There are no current drinking water regulations in California for these two substances. To date, no sampling of PFBS and PFHxA has been conducted in non-MCWD wells.

  In 2019, the United States Army Corps of Engineers (USACE) conducted a review of historical activities with the potential to cause PFAS contamination at the Fort Ord (USACE, 2019a). The study identified that the primary mechanism for release of PFAS was through the historical use of Aqueous Film-Forming Foam in former fire drill areas, aviation areas, and subsequent transport to landfill and sewage treatment areas. Additionally, groundwater sampling for the two PFAS contaminants with established regulatory limits (Perfluorooctanoic acid [PFOA] and perfluorooctanesulfonic acid [PFOS]) was conducted as part of the study. The U.S. EPA issued a lifetime health advisory for PFOA and PFOS in drinking water at a total concentration of 0.07 ug/L. Even though no MCLs have been promulgated, the California SWRCB established notification levels (NLs) for PFOA and PFOS at 0.0051 ug/L and 0.0065 ug/L, respectively. PFOA and PFOS were measured above their respective NLs in the Dune Sand 180-Foot Aquifers that are adjacent to the Fort Ord OU2 Landfill.









Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Southern Extent of FO-SVA (Harding ESE, 2001)
- Southern Extent of Valley Fill Deposits (Harding ESE, 2001)

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

June 2019 TCE Sampling Locations

- < 1.5 ug/L or Not Detected
- 1.5 - 5 ug/L
- 5 - 10 ug/L
- > 10 ug/L

Abbreviations

AEM = airborne electromagnetic
mg/L = miligram per liter
TCE = Trichloroethylene

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 6 August 2026.
2. TCE measurements are obtained from SWRCB GAMA Online Tool, Fort Ord, California Public Water Systems, and USGS.

N

0 1.5 3

(Scale in Miles)

Recent Trichloroethylene Concentration Within the Former Fort Ord

Monterey Subbasin
Groundwater Sustainability Plan
November 2021
Figure 5-33

Path: X:\B60094\Maps\2021\09\Fig5-31_TCE.mxd

5.4.3 Distribution and Concentrations of Diffuse or Natural Groundwater Constituents

In addition to the single point source of groundwater contamination described above, the CCRWQCB monitors and regulates activities and discharges that can contribute to non-point source pollutants, which are constituents released to groundwater over large areas.

In the El Toro Primary Aquifer System, the most prevalent non-point source water quality concern is arsenic. It has been reported that primary and secondary MCLs are exceeded in several wells in the area, with arsenic being a constituent of concern (COC) for additional groundwater development (Geosyntec, 2007). In addition, nitrate and coliform bacteria may present problems in areas with more dense occurrences of septic tanks and shallow wells (Geosyntec, 2007). Concentrations of TDS range from 355 to 1,650 mg/L (DWR, 2004b; Geosyntec, 2007). However, there is some variability between hydrostratigraphic units.

Groundwater quality conditions in the Subbasin were summarized in two USGS water quality studies. The USGS 2005 GAMA study in the Salinas Valley characterized deeper groundwater resources used for public water supply (Kulongoski and Belitz, 2005). The USGS 2018 GAMA study in the Salinas Valley focused on domestic well water quality (Burton and Wright, 2018). All quality-assured data collected for these two studies and the GAMA Program are publicly available through the SWRCB GAMA and GeoTracker groundwater information systems (SWRCB, 2020a; SWRCB, 2020b).

5.4.4 Water Quality Constituent Assessment

Table 5-3 reports the constituents of concern in the Monterey Subbasin and identifies the number of supply wells with concentrations exceeding applicable screening levels, based on GAMA and CCRWQCB data. The supply wells for which data are provided include on-farm domestic wells monitored under the Irrigation Lands Program (ILP), irrigation supply wells sampled under ILP, and public supply wells monitored under the DDW.

In response to the DWR's recommended corrective actions, the methodology utilized to identify chemicals of concern, water quality criteria, and SMC have been revised. The original 2022 GSP evaluated ILP well results against thresholds for irrigated agricultural use from the CCRWQCB's 2019 Basin Plan and DDW well results against Title 22 MCLs or SMCLs. For this amendment, concentrations of identified chemicals of concern will be evaluated relative to the following criteria:

- Within the Marina-Ord area, the concentration level of concern for a given constituent will be based on Title 22 MCLs and SMCLs, because the only groundwater production wells in this management area are MCWD's municipal supply wells;
- Within the Corral de Tierra Area, concentration level of concern for a given constituent will be based on both Title 22 MCLs and SMCLs and Basin Plan water quality limits; the more stringent threshold of the two will be applied, regardless of well type. The Basin Plan has more stringent limits for chloride, sodium, and boron.

The number of wells that exceed the concentration level of concern for any given constituent is based on the most recent sample collected from each well in the monitoring network through September 2019. Because not all wells have been sampled for every constituent, the percentage of wells with exceedances is calculated as the number of wells whose most recent sample exceeds the concentration level of concern divided by the total number of wells that have ever been sampled for that constituent through September 2019.

Table 5-3 reports only the constituents that historically exceeded a concentration of concern in active wells in the Monterey Subbasin; it does not report all of the constituents that are monitored by the various programs. The locations of wells that exceeded the level of concern for one or more of the constituents listed in Table 5-3 are provided in Appendix 5-C.

Table 5-3 shows that groundwater quality concerns varied considerably between the Marina-Ord and Corral de Tierra Areas. In the Marina-Ord Area, no constituents exceeded their concentration level of concern in any samples collected through WY 2019.

In the Corral de Tierra Area, chloride had the highest rate of exceedance, occurring in 19 of 22 wells (86%), based on the Basin Plan's more stringent threshold for chloride for agricultural water use; however, most users in the Corral de Tierra are domestic. Elevated concentrations of arsenic and manganese were also common, with arsenic exceeding the level of concern in 9 of 22 wells (41%), followed by iron in 8 of 22 wells (36%). Exceedances of radium-226 plus radium-228 were less frequent, occurring in 1 of 14 wells (7%). Chromium, specific conductance, total dissolved solids, and zinc each exceeded their respective levels of concern in 1 of 21-22 wells (5%). Overall, salinity-related constituents (chloride, specific conductance, and total dissolved solids) and naturally occurring metals (arsenic, iron, and manganese) represent the primary groundwater quality concerns in the Corral de Tierra Area. In the ILP wells on-farm domestic or irrigation wells sampled in the Corral de Tierra Area, no constituent exceeded the level of concern in the last sample up to WY 2019.

This GSP relies on data from existing monitoring programs to measure changes in groundwater quality. Therefore, the GSA is dependent on the monitoring density and frequency of the DDW and ILP. The monitoring system is further defined in Chapter 7.

Table 5-3 Water Quality Constituents and Exceedances

Constituent	Concentration Level of Concern	Standard Units	Historical Number of Monitoring Wells Sampled	Number of Wells Exceeding Level of Concern from latest sample	Percentage of Wells with Exceedances
Marina-Ord Area					
DDW Wells (Data from August 1986 to September 2019)					
No constituents exceed their concentration levels of concern.					
Corral de Tierra Area					
DDW Wells (Data from August 1986 to September 2019)					
Arsenic	10	µg/L	22	9	41%
Chloride	106	mg/L	22	19	86%
Chromium	50	µg/L	21	1	5%
Iron	300	µg/L	22	8	36%
Manganese	50	µg/L	22	9	41%
Radium 226 + Radium 228	100	pCi/L	14	1	7%
Specific Conductance	1600	µmhos/cm	22	1	5%
Total Dissolved Solids	1000	mg/L	22	1	5%
Zinc	5	mg/L	22	1	5%
Irrigation Supply ILP Wells (June 2017 to September 2019)					
Specific Conductance	1000	µmhos/cm	7	1	0%

5.5 Land Subsidence

Land subsidence, or the lowering of ground surface, can be caused by excessive groundwater withdrawal that lowers the potentiometric head in compressible fine-grained layers, resulting in depressurization and compaction of those fine grain layers. Land subsidence can be elastic or inelastic. Elastic subsidence is reversible (i.e., the land surface rises again after the potentiometric head increases), whereas inelastic subsidence is irreversible (i.e., the compaction of fine-grained layers is permanent). Inelastic subsidence is considered an undesirable result.

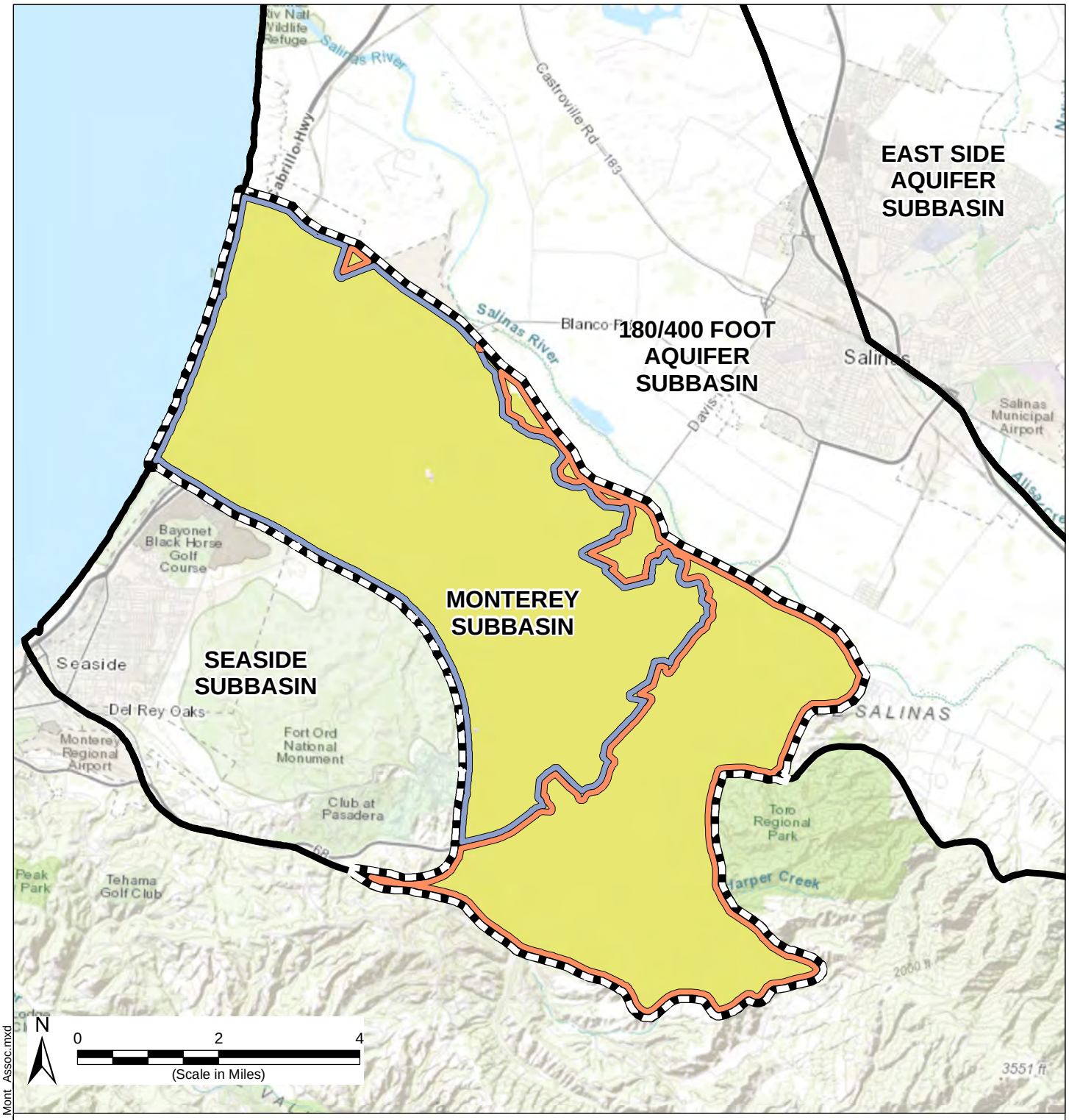
5.5.1 Data Sources

This assessment uses Interferometric Synthetic Aperture Radar (InSAR) satellite data[15] from June 2015 to September 2019, which is within the Baseline Period. These are the only available data used for estimating subsidence in this GSP.

5.5.2 Subsidence Mapping

Figure 5-34 presents a map showing the average annual subsidence rate in the Monterey Subbasin over the period from June 2015 and September 2019. The yellow area on the map is the area with measured average annual changes in ground elevation of between -0.1 and 0.1 feet per year. As discussed further in Chapter 8, because of inherent error in the InSAR measurement methodology, any measured ground level changes between -0.1 and 0.1 foot per year are not considered subsidence. The map shows that no measurable subsidence has been recorded anywhere in the Monterey Subbasin.

[15] https://gis.water.ca.gov/arcgisimg/rest/services/SAR/Vertical_Displacement_TRE_ALTAMIRA_v2019_Total_Since_20150613_Mosaic/ImageServer



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra

Annual Rate of Land Subsidence

- -0.1 to 0.1 ft/yr

Abbreviations

ft/yr = foot per year

Notes

1. All locations are approximate.
2. This figure shows the annual land subsidence rate between June of 2015 and September of 2019.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 7 August 2026.
2. InSAR subsidence data, "SAR/Vertical_Displacement_TRE_ALTAMIRA_v2019_Total_Since_20150613_Mosaic (ImageServer)." Created by DWR and and obtained from ArcGIS REST Services Directory.

Estimated InSAR Subsidence

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

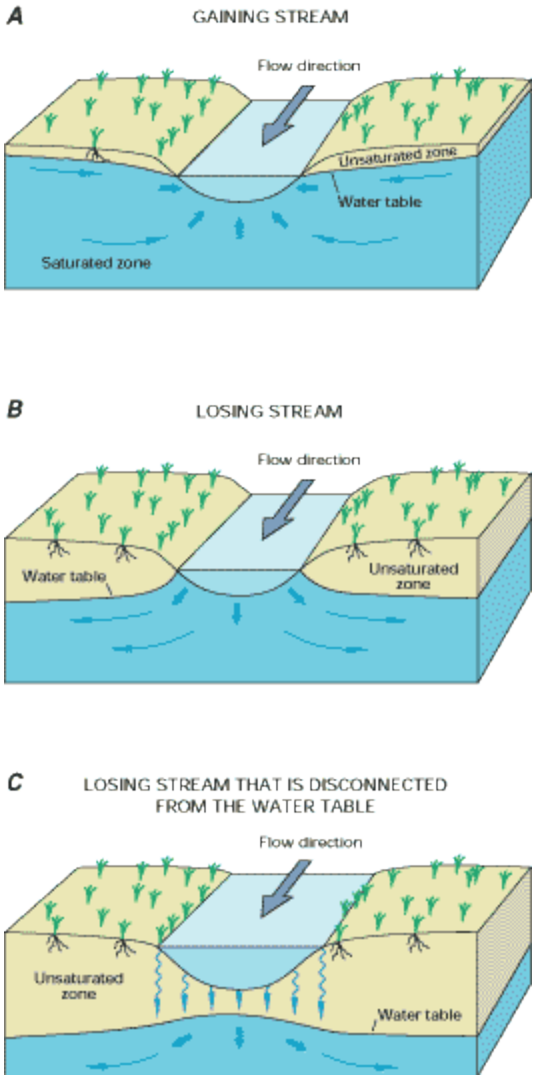
Figure 5-34

Path: X:\B60094\Maps\2021\09\Fig5-33_InSAR Landsubsidence_Mont_Assoc.mxd

5.6 Interconnected Surface Water Systems

Surface water that is connected to the groundwater flow system is referred to as interconnected surface water (ISW). If the groundwater elevation in an aquifer that is hydraulically connected to a stream (or other surface water body) is higher than the water level in the stream, the stream is said to be a gaining stream because it gains water from the surrounding underlying groundwater. If the groundwater elevation is lower than the water level in the stream, it is termed a losing stream because it loses water to the surrounding groundwater flow system. If the groundwater elevation is well below the streambed elevation and there is an unsaturated zone between the stream and the groundwater, the stream and groundwater are considered to be disconnected. These concepts are illustrated in Figure 5-35. This section discusses (1) identification of ISW and (2) estimation of pumping-related depletion of interconnected surface water.

Figure 5-35 Conceptual Representation of Interconnected Surface Water (Winter et al., 1999)



5.6.1 Data Sources and Methods

This assessment of hydraulic connection between surface water and groundwater is based on the best available data but is subject to uncertainty associated with the availability of shallow groundwater data and, where applicable, groundwater-model resolution and assumptions.

As described in Section 4.3, surface water streams within the Subbasin are generally small intermittent streams that flow only after storm events. The permeable dune sand of the coastal Marina-Ord Area generally precludes the development of surface drainages. However, vernal ponds and lakes occur within the City of Marina and within the Fort Ord federal land area. Potential groundwater connection to ponds in the Marina-Ord Area was evaluated using measured groundwater elevations in the Dune Sand Aquifer and measured or observed pond surface-water elevations. Shallow groundwater data are limited near ponded surface-water features on former Fort Ord lands; additional monitoring may be needed to better characterize groundwater conditions in those areas.

The assessment of potential groundwater connection with surface water in the Corral de Tierra Area uses simulated historical groundwater elevations from the SVIHM, which is calibrated to measured groundwater elevations and streamflows (M&A, 2025a). For this analysis, the Corral de Tierra Area includes portions of the Monterey Subbasin where the Salinas River is present. Segments of ISW are identified where reaches of the river are connected to groundwater more than 10% of time over the SVIHM simulation period from WY 1980 to WY 2022. A 10% threshold was selected as a conservative assumption because the number of interconnected reaches is similar using either a 10% or 50% time-connected threshold.

Salinas River and tributary reaches overlying the SVA are not included in this analysis because the aquitard prevents recharge of surface water to the principal aquifers in the Subbasin, where pumping occurs. Subject to limitations related to model resolution and overall accuracy, the models provide a detailed picture of the distribution of hydraulically connected surface water and groundwater in the Subbasin. Additional shallow groundwater and surface-water monitoring may be used during GSP implementation to refine the assessment.

5.6.2 Identification of Potential Interconnected Surface Water

The original GSP identified the Marina ponds, lower El Toro Creek, and two locations along the Salinas River as potential ISW settings within the Subbasin. Since completion of the original GSP, simulated historical groundwater elevations from the SVIHM have provided additional information to evaluate potential hydraulic connection along El Toro Creek and the Salinas River. Based on the available measured and simulated data, ISW is identified at the City of Marina vernal ponds and along two short reaches of the Salinas River where it crosses into the Monterey Subbasin. No ISW is identified along El Toro Creek.

5.6.2.1 Marina-Ord Area Vernal Ponds

Another type of surface water that exists within the Subbasin includes ponds and lakes located within the City of Marina and within the Fort Ord federal land area. These surface water features includes vernal ponds within the City of Marina, some of which are known to contain open water well into the dry season (WRA, 2020). As shown on Figure 5-36 and discussed in Section 5.7 below, groundwater elevations in the Dune Sand Aquifer in the vicinity of the City of Marina are within 20 ft of ground surface and are at similar levels in nearby Dune Sand Aquifer wells. Several shallow groundwater wells are located within 1,500 feet of the Marina Ponds. Therefore, the ponds in the vicinity of City of Marina may be supported by groundwater in the Dune Sand Aquifer. Shallow groundwater data are not available near the ponded features on former Fort Ord federal lands.

5.6.2.2 El Toro Creek

El Toro Creek is reported as a perennial stream below the confluence with Watson Creek below the Corral de Tierra golf course, and runoff-dependent above this point (Feikhart, 2001). Recorded streamflows at USGS gage 11152540 from 1961 to 2001 indicate a mean annual streamflow of 1,590 AFY (Geosyntec, 2007). This mean annual streamflow was calculated for the entire record from 1961 to 2001. However, El Toro Creek did not record flow every year and measured groundwater levels in nearby wells are generally tens of feet below land surface, well below the creek bed elevation. Consistently, measured groundwater levels in nearby wells and historical SVIHM simulations indicate that groundwater elevations were not high enough for hydraulic connection; no reaches along El Toro Creek meet the criterion for hydraulic connection to groundwater. This indicates that streamflow in El Toro Creek is disconnected from groundwater in the principal aquifer.

5.6.2.3 Salinas River Reaches

The main channel of the Salinas River is located in the 180/400-Foot Aquifer Subbasin and other adjacent Salinas Valley subbasins. The river crosses the Monterey Subbasin only in short reaches in the Corral de Tierra Area near the Monterey-180/400-Foot Aquifer Subbasin boundary.

Two relatively short reaches of the Salinas River are identified as being an ISW within the Corral de Tierra Area, as shown on Figure 5-37. The identified ISW locations are the best estimates of where persistent hydrologic connections occur along the Salinas River within the Subbasin. Although seepage along the ISW reaches is based on assumed channel and aquifer parameters incorporated into the SVIHM, the SVIHM is the best available tool for estimating ISW locations in this area. The model construction and uncertainty are described in the model summary report by Montgomery & Associates (M&A; 2025a).

5.6.3 Pumping-Related Depletion of Interconnected Surface Water

ISW depletion is the reduction in streamflow due to groundwater pumping. Groundwater pumping can alter flows between surface water and groundwater. Flow changes related to interconnected surface and groundwater could be due to reductions in groundwater discharge to surface water or increases in surface water recharge to groundwater. These two changes together constitute the change in the amount of surface water depletion due to pumping.

ISW depletion is evaluated only for the interconnected Salinas River reaches. No depletion estimate was developed for the Marina-Ord Area ponds because they are ponded, rather than flowing, surface-water features and there is no groundwater pumping from the connected Dune Sand Aquifer. The principal beneficial use associated with these ponds is support of GDEs. Accordingly, the evaluation of groundwater elevation and potential effects on GDEs is provided in Section 5.7.

For this GSP, depletion of ISW is estimated by evaluating the change in the modeled stream leakage (loss or gain in river flow) with and without pumping. A model simulation without any groundwater pumping (i.e., SVIHM with no pumping) was compared to the model simulation with groundwater pumping (i.e., SVIHM with pumping). The difference in stream leakage between the two simulations is the depletion attributed to groundwater pumping. However, this can be misleading because stream leakage, and thus depletion, along the Salinas River is dynamic and depends on both pumping and reservoir releases.

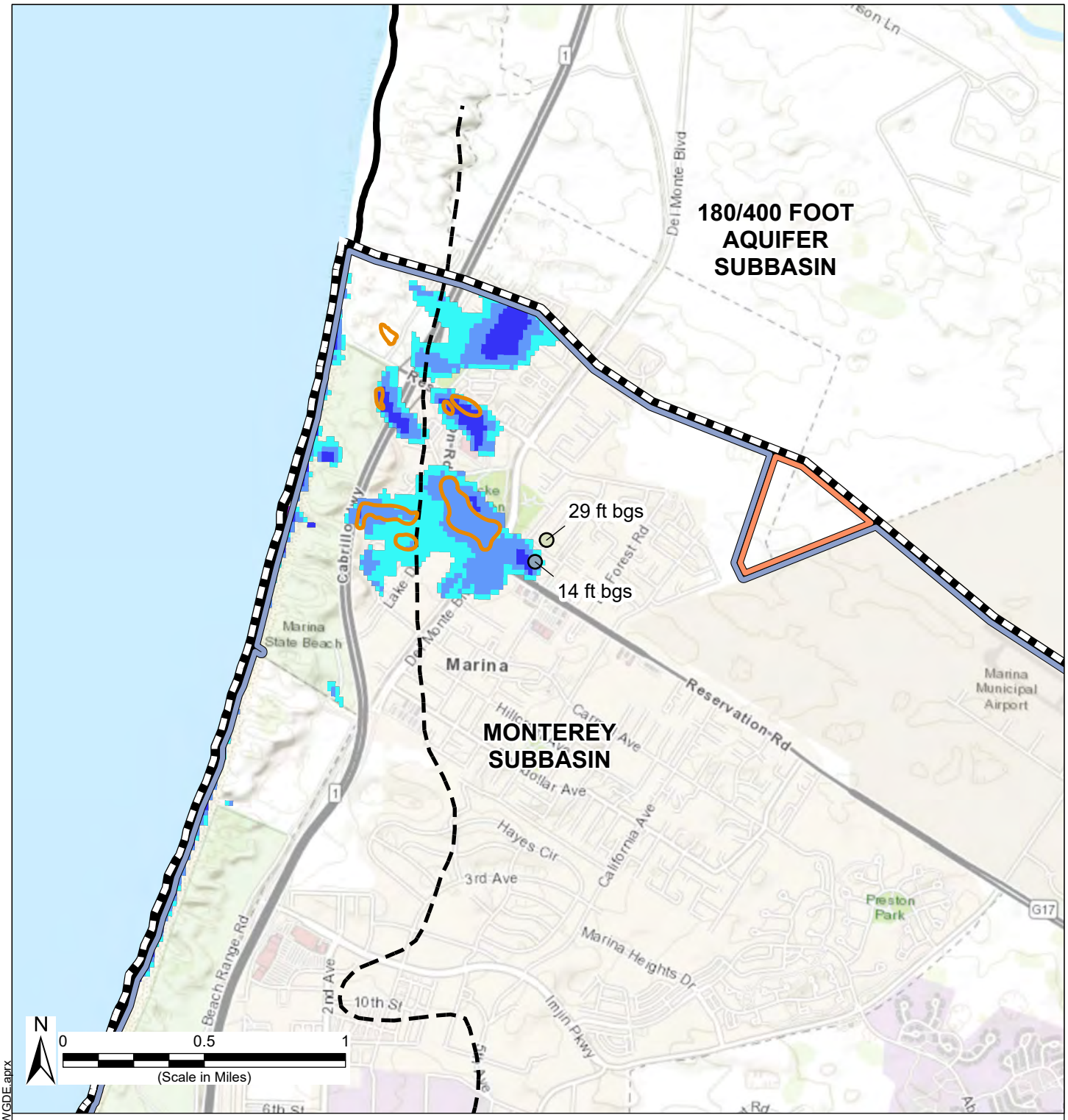
Releases from the reservoirs during the MCWRA conservation release period ensure water is available in downstream reaches for diversion, environmental purposes, and groundwater recharge. Recharge from reservoir releases is an expected and planned result of reservoir operations. During the conservation release period when reservoir releases provide water in the river, ISW depletion represents the pumping-related change in flow exchange between surface water and groundwater under those managed flow conditions. Less water is present along the river during drought years, especially in the summer, when little or no water is released from the reservoirs. This results in less recharge (seepage from stream to groundwater) as well. Without the releases, and under the same pumping conditions, there would be less interconnection between surface water and groundwater along the river. Because reservoir releases affect the amount and timing of water available in the river, they also influence the timing and magnitude of simulated stream leakage and surface water depletions.

ISW depletions were evaluated on an annual and seasonal basis. Simulated annual depletions vary from year to year, with large, short-term changes related to droughts. According to model results, ISW depletions sharply declined during drought periods (1990, 2015, 2022) even though groundwater pumping increased slightly during the same time. The expectation is that depletions would increase during droughts due to increased pumping. However, the opposite occurs. This is likely the result of little or no reservoir releases occurring during droughts, leaving very little or no water on the river which results in less leakage (recharge) to the aquifer. Depletions decline because the decrease in surface water availability overwhelms the effects of increased groundwater pumping. Depletions increase dramatically immediately after drought periods

when reservoir releases resume and streamflow recovers, the lower groundwater levels can increase the downward gradient between stream and aquifer and thus result in more recharge and ultimately more depletions. This relationship illustrates the important role that reservoir releases have on ISW and depletions along the Salinas River. Annual average rate of depletion due to pumping is estimated to be 2,900 AFY in the Monterey Subbasin.

ISW depletions along the identified reaches decrease and fluctuate during the MCWRA conservation release period, which roughly coincides with the irrigation pumping season in the Valley. Estimated monthly average depletion rates are about 400-500 AF/month during non-conservation release period (November to March) and about 300 AF/month during the conservation release period (April to October). This seasonal pattern indicates that depletion is influenced by both groundwater pumping and the availability of streamflow during managed reservoir release periods. The increase in surface water availability during the release period mitigates the impacts on streamflow from pumping.

The depletion estimates were developed in SVIHM for interconnected river reaches throughout the broader Salinas Valley model domain. Accordingly, the modeled stream leakage and depletion results reflect valley-wide groundwater pumping and reservoir releases. Because the Salinas River occurs within the Monterey Subbasin along only two short reaches, the modeled depletion estimate should not be interpreted as an effect caused solely by groundwater management within the Monterey Subbasin.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Depth to Water in Selected Wells (ft bgs)

- 11 - 20
- 21 - 30
- Outline of Marina Vernal Ponds
- Extent of FO-SVA (Harding ESE, 2001)

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Areas of Groundwater Within 20 feet of land Surface (ft bgs)

- 0 - 5
- 5.1 - 10
- 10.1 - 15
- 15.1 - 20

Abbreviations

ft bgs = foot below ground surface

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 20 October 2026.

Notes

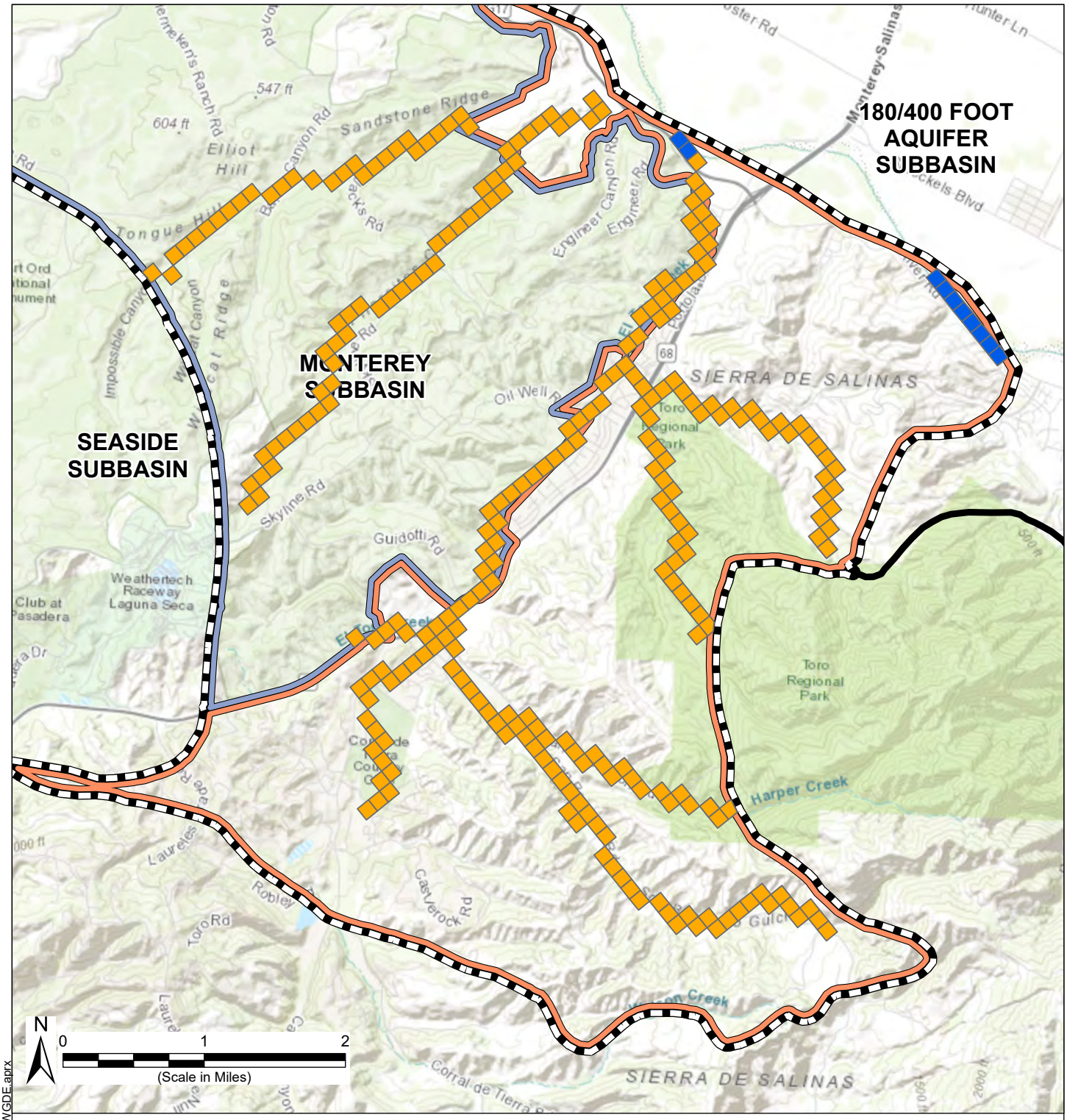
1. All locations are approximate.
2. Depth to water data are calculated by subtracting the 2017 August Dune Sand Aquifer contour from land surface in the Marina Ord Area and subtracting the 2017 August Paso Robles Aquifer contour from land surface in the Corral de Tierra Area.

Interconnected Surface Water Locations Marina-Ord Area

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 5-36

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_363738_ISWGDE.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Model Grid Stream Cells Connected to Groundwater for More Than 10% of the Model Period
- Model Grid Stream Cells Connected to Groundwater for Less Than 10% of the Model Period

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Abbreviations

ft bgs = foot below ground surface

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 18 August 2026.

Interconnected Surface Water Locations, Corral de Tierra Area

Monterey Subbasin
Groundwater Sustainability Plan
August 2026

Figure 5-37

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_363738_ISWGDE.aprx

5.7 Groundwater Dependent Ecosystems

GDEs are natural communities (flora and fauna) that depend on near-surface groundwater as a source of water. While GDEs are not a sustainability indicator as defined by SGMA, they are considered a beneficial use of groundwater and are potentially affected by other sustainability indicators such as chronic lowering of groundwater levels, and therefore must be considered in GSPs. Two main types of ecosystems are commonly associated with groundwater: wetlands associated with the surface expression of groundwater and vegetation that typically draws water from a shallow water table.

5.7.1 Sensitive Species Considerations

GDEs may provide critical habitat for threatened or endangered species. Areas designated as critical habitats for threatened or endangered species contain the physical or biological features that are essential to the conservation of these species, and may need special management or protection (USFWS, 2017). A list of threatened and endangered species that might rely on GDEs in the Subbasin was compiled using information from the U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), and The Nature Conservancy (TNC). Several steps were taken to determine which threatened and endangered species could be found in the Subbasin and of those, which could potentially rely on the GDE habitat. A list of threatened and endangered species for Monterey County was downloaded from the USFWS website and cross-referenced to species identified in the CDFW California Natural Diversity Database. The threatened and endangered species for Monterey County was further cross-referenced with the TNC Critical Species LookBook to identify which species are likely to directly depend on groundwater, and some species with unknown dependence on groundwater, as indicated in Table 5-4. Species with an indirect potential dependence on groundwater were not included.

Five threatened and endangered species, including the South-central Coast Steelhead, and the California Red-legged Frog, were identified as likely to rely directly on groundwater in Monterey County, several of which may be found in the Subbasin. While the species might rely directly on groundwater, the identification of potential GDEs in the Salinas Valley does not distinguish between groundwater and surface water sources. Four species identified have an unknown dependence on GDEs or groundwater.

Table 5-4 Federal and State Listed Threatened and Endangered Species with Direct or Unknown Groundwater Dependence for Monterey Subbasin

Groundwater Dependence*	Common Name	Habitat	Federal Status	State Status
Direct	California Black rail	Yearlong resident of saline, brackish, and fresh emergent wetlands		Threatened
Direct	California red-legged frog	Quiet pools of streams, marshes, and occasionally ponds	Threatened	
Direct	California Ridgeway's rail	Saltwater marshes, freshwater marshes, and mangrove swamps	Endangered	Endangered
Direct	Steelhead: south-central Coast distinct population segment	Rivers and large streams from Watsonville to Arroyo Grande	Threatened	
Direct	Tidewater goby	Brackish water lagoons, estuaries, and marshes along the California coast	Endangered	
Unknown	California tiger salamander	Tiger salamanders breed and lay eggs primarily in vernal pools and other temporary rainwater ponds	Threatened	Threatened
Unknown	Short-tailed albatross	Marine-dependent, feeding in continental shelf areas and breeding on remote islands	Endangered	
Unknown	Smith's blue butterfly	Only exists near the coasts of Monterey County and northern San Luis Obispo County. “Habitat” specifically means just two plants: coast buckwheat (Eriogonum latifolium) and seacliff buckwheat (Eriogonum parvifolium)	Endangered	
Unknown	Vernal pool fairy shrimp	Vernal pools in California	Threatened	

* Groundwater Dependence as defined by TNC is related to species type. The distinction between groundwater and surface water dependence is not determined in the Salinas Valley GDE identification where the groundwater level is close enough to the ground surface to reasonably support the overlying ecosystem.

5.7.2 GDE Units Within the Subbasin

This GSP amendment presents an updated assessment of confirmed and potential GDEs in the Monterey Subbasin. The original GSP consolidated assessment of GDEs from (1) the City of Marina hydrologic and biological evaluations of the vernal ponds, (2) hydrologic dataset, habitat conservation plan (HCP), and HMP of the former Fort Ord, and (3) the Natural Communities Commonly Associated with Groundwater (NCCAG) Dataset (DWR, 2020). In 2025, the subbasin GSAs partnered with the Central Coast Wetlands Group (CCWG) to refine potential GDEs previously mapped by the NCCAG dataset, in an effort coordinated across the Salinas Valley Basin (CCWG, 2026).

The process for identifying and mapping potential GDEs in the Salinas Valley was developed by CCWG with guidance from documents developed by The Nature Conservancy (TNC) (Rohde et al. 2018, Rohde et al. 2020), TNC staff and San Francisco Estuary Institute (SFEI) staff with subject matter expertise, and Dr. Melissa Rohde. Additionally, feedback from local stakeholders was incorporated from the GDE Working Group. The goal of the identification and mapping process was not to identify endangered animal species, or every plant and waterbody dependent on groundwater, but rather ensure there was representative identification of potential GDEs across the Monterey Subbasin.

The NCCAG dataset maps vegetation, wetlands, springs, and seeps in California that are commonly associated with groundwater. These include: (1) wetland features commonly associated with the surface expression of groundwater under natural, unmodified conditions; and (2) phreatophytes. The CCWG methodology further verifies the NCCAG dataset against groundwater elevation data, which determines that if the groundwater table is greater than 30 ft bgs, the ecosystem at the surface is likely not reliant on groundwater. This is because most vegetation does not have roots deep enough to reach the water table below 30 ft bgs (9.14 meters) (Rohde et al. 2018). In the Monterey Subbasin, oak trees are an exception to this generalized rule, as oak trees have been shown to have roots that reach up to 80 ft bgs (24.38 meters) (Howard 1992). For this reason, in areas mapped as having oak trees as the dominant plant species, the depth to groundwater cutoff for including the ecosystem as a potential GDE was 80 ft bgs (24.38 meters). For all other areas, the cutoff was 30 ft bgs. In the Corral de Tierra Area near the Monterey-180/400 Subbasin boundary, the Salinas Valley Aquitard and other shallow clays may limit or prevent connection of GDEs to the underlying principal aquifer.

The CCWG study also provided the basis for monitoring and assessment and established a monitoring methodology within the Corral de Tierra Area based on a combination of desktop and field assessments. The monitoring methodology for GDEs in the Corral de Tierra Area and along the Salinas River is described in Section 7.9.3. Monitoring approach for coastal vernal ponds in the City of Marina are being developed in coordination with the City, which is responsible for management of these resources as Environmentally Sensitive Habitat Areas (ESHA) under the California Coastal Act.

Figure 5-38 shows the distribution of confirmed and potential GDEs grouped into units based on shared hydrology and association with the same aquifer. https://gis.water.ca.gov/app/NCDatasetViewer/The areas in the Monterey Subbasin where GDEs may be found are (1) in the Marina-Ord Area, near the City of Marina vernal ponds and (2) in the Corral de Tierra Area, along local streams, creeks, and the Salinas River where Salinas Valley Aquitard is not present.

5.7.2.1 Coastal Vernal Ponds within the City of Marina

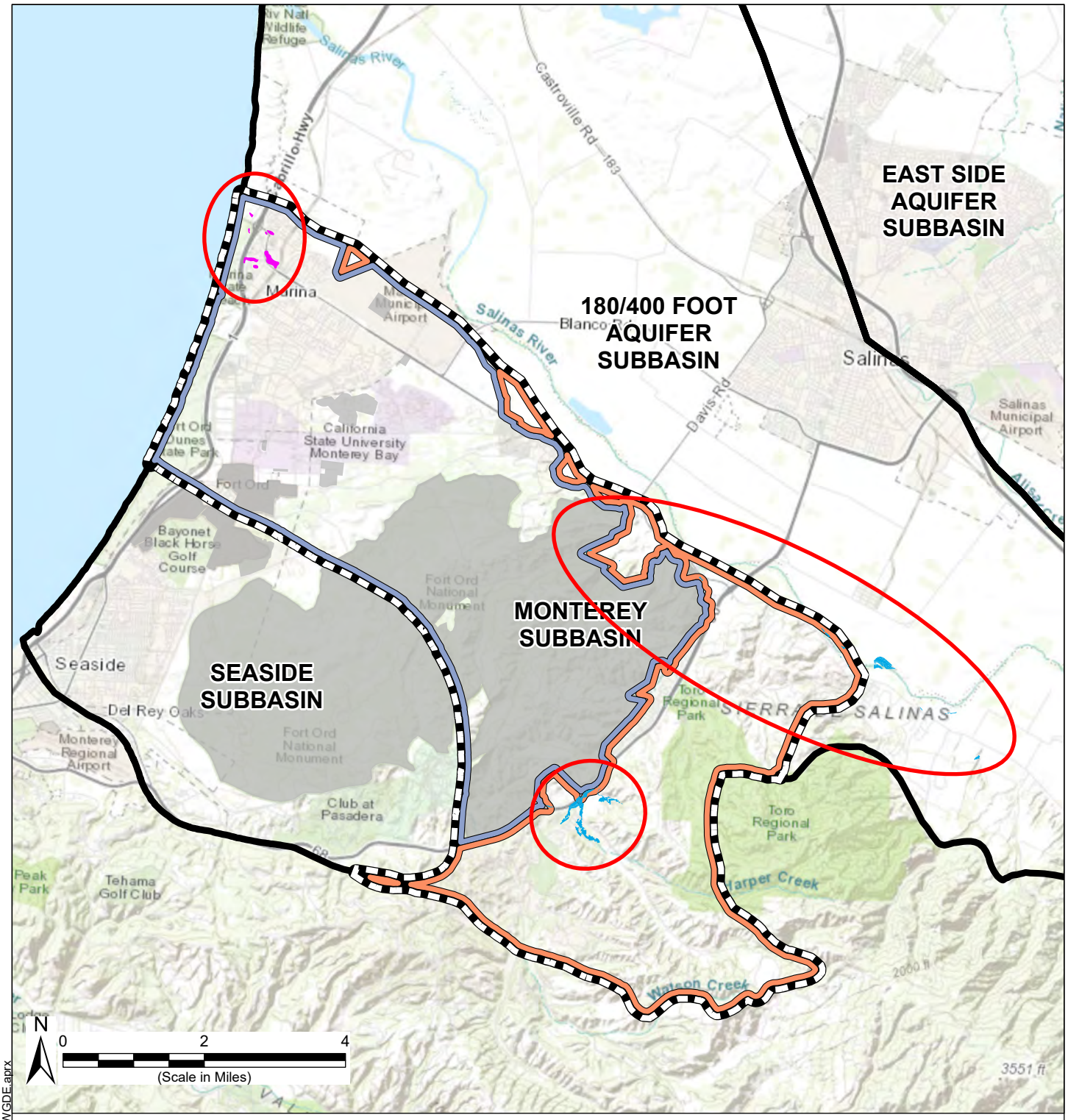
Vernal ponds are located in the northwestern portion of the Subbasin within the City of Marina are required to be managed by the City as ESHA under the Local Coastal Plan and have been extensively studied. These vernal ponds are "seasonal ponds which expand during the wet season and support marshy wetlands much of the years" (City of Marina, 2025a). A hydrogeologic evaluation of Locke Paddon Pond was completed by Balance Hydrologics in 2012 and found that the pond and surrounding vegetation are sustained by groundwater (Balance Hydrologics, 2012). A study conducted by the WRA Environmental Consultants (2020) identified the hydrologic and biological conditions of the Marina vernal ponds and associated wetlands and included site visits in June 2020. The study concluded that the ponds rely upon groundwater and should therefore be considered GDEs (WRA, 2020). Recent evaluations by Formation Environmental (Formation, 2022; Tietze, 2026; Richards, 2026) indicate the ponds and associated vegetation are connected to and reliant on groundwater in the Dune Sand Aquifer.

WRA observed five aquatic and three upland biological communities at the six ponds. Among those communities were Willow Riparian Forest, Coastal Freshwater Marsh, and Costal Saltwater Marsh communities totaling 19.51 acres. These communities were observed with features that are dependent upon groundwater. Specifically, species that rely on a source of year-round water supply were identified within each pond. In 2025, Dr. Jim Richards of Formation Environmental observed Coastal Freshwater habitats consisting of rush, saltgrass, tule, marsh, and willow species, and Coastal Saltwater Marsh consisting of marsh, saltgrass, and marsh species (Richards, 2026). Based on analysis of the species present, their rooting depths and stress tolerances, it was concluded they are highly sensitive to potential drawdown. A high-water level was observed at each pond similar to the groundwater elevations in the Dune Sand Aquifer. All ponds except for Pond 5 contained open water at the time of the site visit in June 2020.

The studies concluded that vegetation associated with the GDEs at these ponds was in good condition.

5.7.2.2 Riparian Wetlands and Vegetations

Areas of riparian wetlands and vegetation near local streams and creeks have been identified based on the NCCAG Dataset (DWR, 2020) where the depth to groundwater table is high enough to support the above ecosystems. In the Corral de Tierra Area, the assessment also eliminates areas where the Salinas Valley Aquitard is present (CCWG, 2026). GDE units are identified in the area where Watson and Harper Creeks converge into El Toro Creek and in scattered areas near the Salinas River.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Federal Land

Marina-Ord Management Area GDEs

- Marina Vernal Ponds

Corral de Tierra Management Area Potential GDEs

- Riparian Wetlands and Vegetations

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Abbreviations

GDE = Groundwater Dependent Ecosystem

Notes

1. All locations are approximate.
2. Potential GDEs are due to inherent uncertainty in extent of groundwater reliance.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 20 October 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Potential GDEs within the Monterey Subbasin

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 5-38

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6 WATER BUDGET INFORMATION

This section presents information on the water budget for the Monterey Subbasin (Subbasin). Consistent with the GSP Emergency Regulations §354.18 (23-California Code of Regulations Division 2 Chapter 1.5 Subchapter 2) and DWR's Water Budget Best Management Practices (BMP) (DWR, 2016b), this water budget provides an accounting of the total annual volume of water entering and leaving the Subbasin for historical, current, and projected future conditions.

Three water budget time periods are presented herein:

- A historical water budget period representing 15 years of historical hydrology for the period Water Year[16] (WY) 2004 – 2018 and calibrated to historical data;
- A current conditions water budget period representing average conditions over a recent five-year period (WY 2018 – 2022), validated against recent data; and
- A 50-year projected water budget period (WY 2023 – 2072), which results presented as averages for comparison to historical and current conditions.

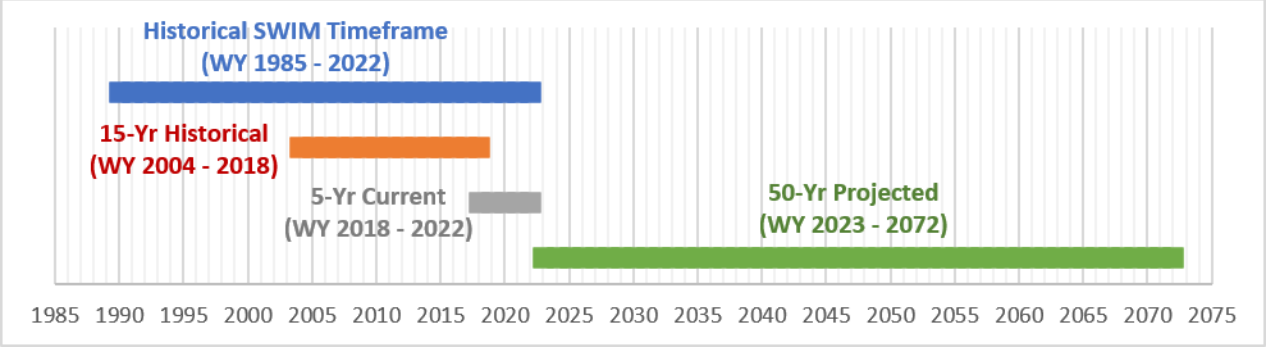


Figure 6-1 Water Budget Time Periods

As discussed in Section 6.1 below, detailed historical and current water budgets are presented for both the land surface system (e.g., precipitation, applied water, and plant evapotranspiration [ET]) and groundwater system (e.g., pumping, cross-boundary flows). To facilitate planning for future sustainability, this GSP also assesses potential future groundwater conditions under various scenarios.

Water budgets for each timeframe are presented for the Subbasin as a whole. In addition, zone budgets are presented for three unique water budget zones (WBZ) that generally align with the management areas defined for the Basin, with two notable exceptions:

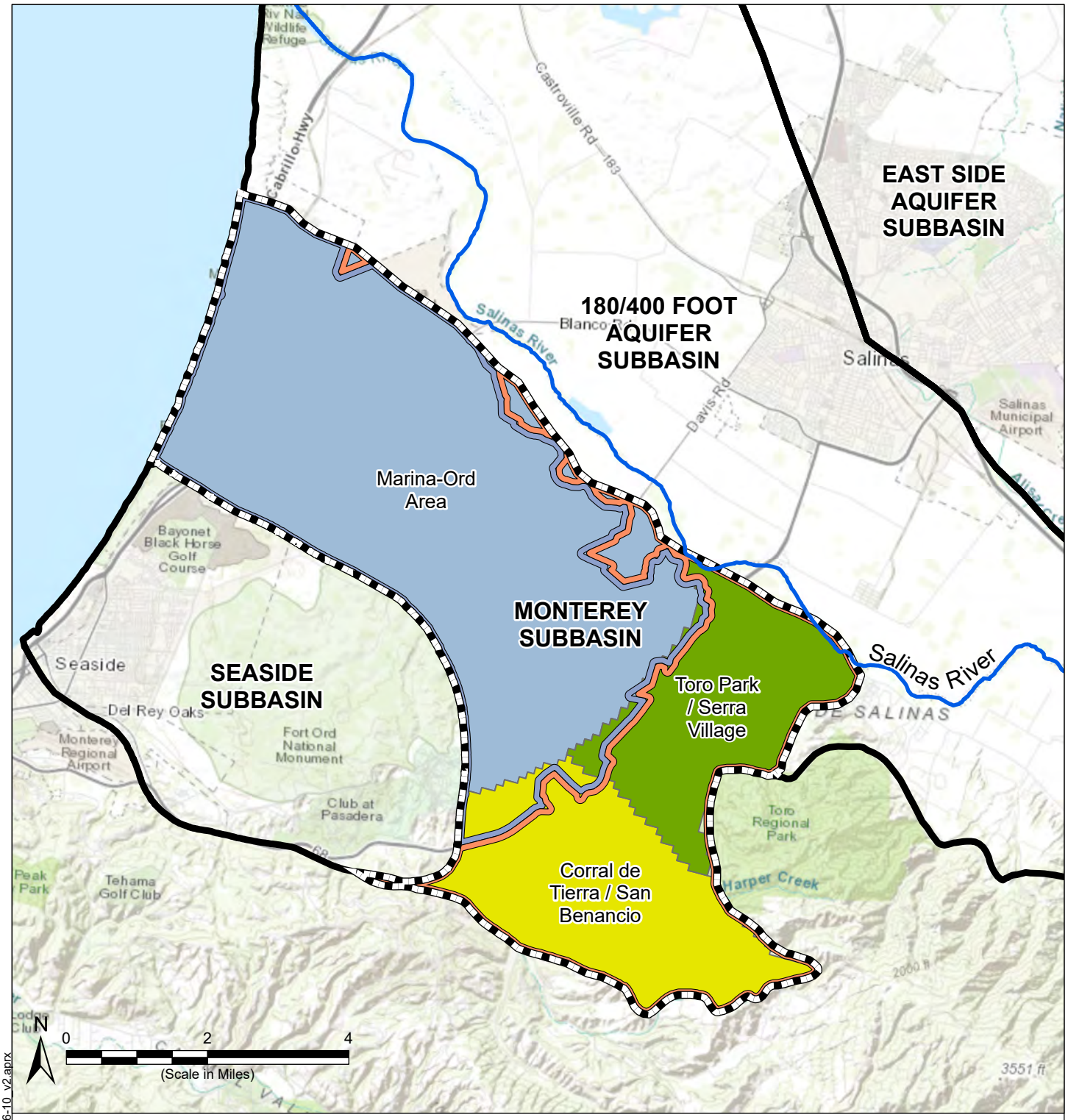
- The Marina-Ord Area WBZ includes the Marina-Ord Area as well as the Reservation Road portion of the Corral de Tierra Area, as they share the same principal aquifers and

[16] The DWR-defined Water Year runs from October of the previous year to September of the current year (e.g. Water Year 2015 is October 1, 2014 – September 30, 2015.

groundwater from the Marina-Ord Area flows through this area into the 180/400-Foot Aquifer subbasin, without a significant change in storage;

- The Corral de Tierra Management Area has been broken in two WBZ that generally align with the bedrock high mapped within the El Toro Primary Aquifer System along Toro Creek described in Section 4.2.2.2 – the "Corral de Tierra / San Benancio WBZ" and the "Toro Park / Serra Village WBZ."

The three WBZ used for water budget reporting in this GSP are shown in Figure 6-2 below.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Salinas River

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Water Budget Zones

- Marina-Ord Area
- Corral de Tierra / San Benancio
- Toro Park / Serra Village

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 20 October 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Water Budget Zones

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 6-2

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6.1 Water Budget Method and Data Sources

6.1.1 Overview of Methodology

The water budget information presented herein is based on the use of a numerical groundwater flow and chloride transport model developed for the coastal portion of the regional Salinas Valley Groundwater Basin, referred to herein as the Salinas Valley Seawater Intrusion Model (SWIM). The SWIM is a variable-density groundwater flow and chloride transport model developed by Montgomery and Associates (M&A) on behalf of the SVBGSA (M&A, 2023a, 2023b, 2024b, 2025b, 2026a) whose active extent covers the coastal and offshore portions of the Salinas Valley Basin affected by seawater intrusion (see Figure 6-2). The SWIM uses the MODFLOW-USG block centered transport (BCT) functionality (GSI, 2025) to simulate transient variable density groundwater flow and chloride transport conditions within the coastal Salinas Valley Basin and is calibrated to historical groundwater levels and chloride concentrations collected throughout the Basin from water years (WY) 1985 – 2022.

The SWIM was originally developed in 2023 (M&A, 2023a) as a tool to assess the effectiveness of projects and management actions that address seawater intrusion in the coastal portions of the Salinas Valley. SVBGSA modeling consultants updated the model in 2023 and 2024 (M&A, 2023b, 2024b) in coordination with MCWDGSA to reflect the most current understanding of the hydrostratigraphy of the Monterey Subbasin (M&A, 2025b), resulting in SWIM Version 2 (SWIM v2). The HCM updates were reviewed by representatives and consultants to SVBGSA, MCWRA, Seaside Basin Watermaster and MCWDGSA (M&A, 2025b).

During 2025, SVBGSA and MCWDGSA modeling consultants completed an additional round of updates to the SWIM (M&A, 2025c) to ensure consistency between the SWIM and existing adjacent and overlapping groundwater flow models such as the Salinas Valley Integrated Hydrologic Model (SVIHM) (M&A, 2025a; Henson et al., 2026), the Monterey Subbasin Groundwater Flow Model (MBGWFM) (EKI, 2022a), and the Seaside Subbasin Watermaster Model (SSWM) (HydroMetrics, 2018), resulting in SWIM Version 3 (SWIM v3). Refinements to the SWIM primarily focused on updating boundary conditions, hydraulic conductivity, and storage model parameters to match the latest version of the SVIHM (M&A, 2025a), including:

- Updating the model hydrogeologic parameter zonation and active extent
- Adjusting recharge assumptions
- Updating well locations, screen intervals, and pumping data to most recent information available as reflected in the SVIHM and the Monterey County Water Resources Agency (MCWRA) Groundwater Extraction Management System (GEMS) database
- Adding flow barriers to represent faults in Monterey and Seaside subbasins
- Implementing hydraulic conductivity and storage parameters consistent with the SVIHM
- Extending the simulation period to October 2022

During the update to SWIM v3, it became clear that achieving a tighter water-level calibration across the Deep Aquifers, particularly within the southern Monterey and Seaside Subbasins, and in the Corral de Tierra Area was more challenging than expected. Upon further review and analysis of model outputs, it was determined that more in-depth collaboration with the Seaside Basin Watermaster and MCWDGSA modeling consultants would be beneficial to focus on the hydrogeologic representation of the Paso Robles and Santa Margarita Formations to further improve model calibration in these areas.

During late 2025 and early 2026, EKI and M&A collaborated with the Seaside Watermaster's modeling consultant to complete another round of updates to the SWIM in attempts to address the shortcomings described above, resulting in SWIM Version 4 (SWIM v4) (M&A, 2026a). These revisions focused on improving groundwater level calibration in the Monterey and Seaside Subbasins and in the Deep Aquifers across the entire domain. Refinements to the SWIM v4 included:

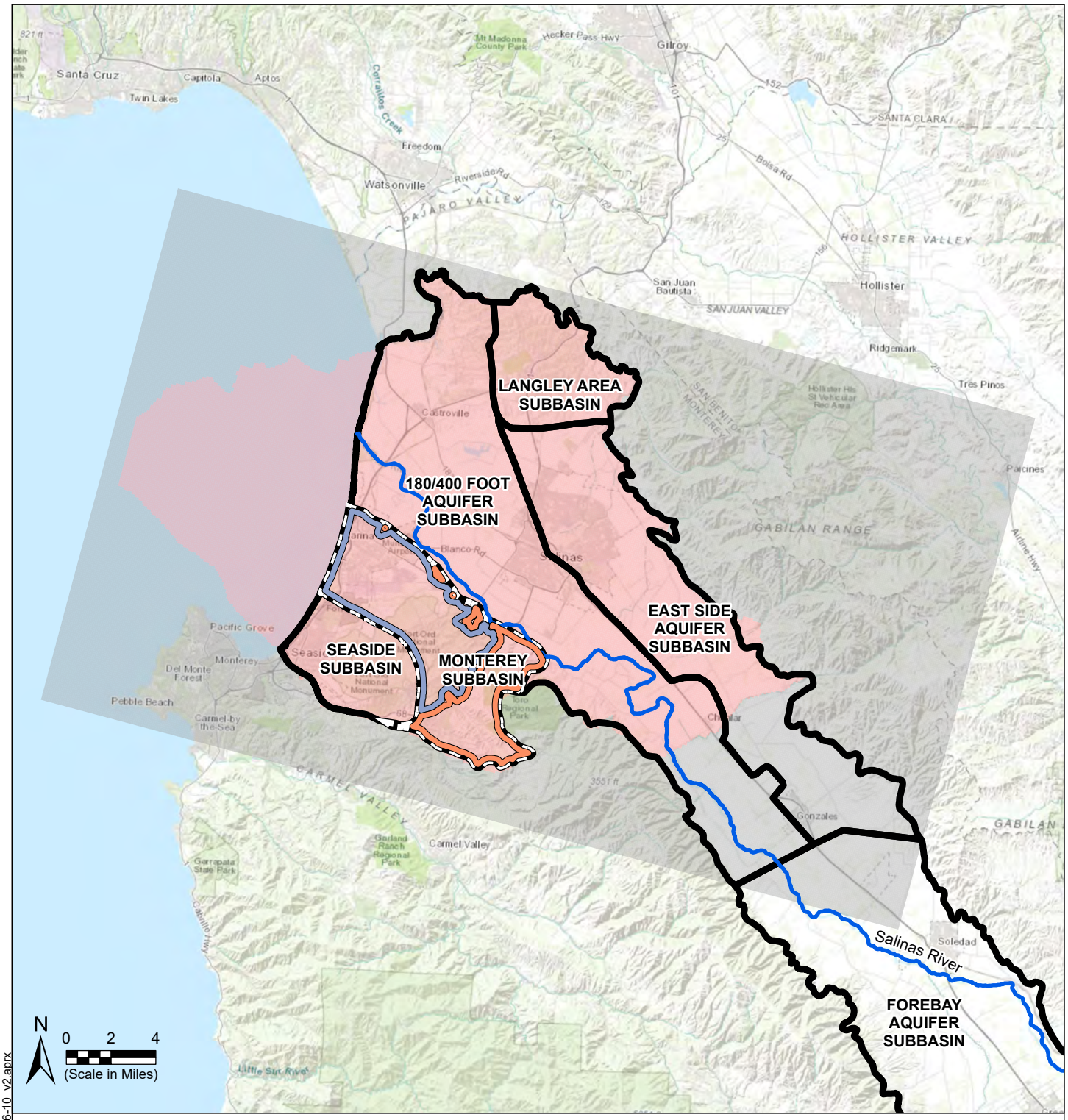
- Updating the model's hydrogeologic parameter zonation in the Seaside Subbasin and Corral de Tierra area based on the existing Seaside Watermaster's model
- Adjusting recharge assumptions in the Seaside Subbasin to conform with the Seaside Watermaster's model, and in the Corral de Tierra area
- Updating well locations, screen intervals, and pumping data based on additional data and feedback provided by MCWD and Seaside Watermaster
- Modifying the general head boundary condition representing the aquifer/ocean interface
- Modifying streambed leakance properties in the Seaside Subbasin and Corral de Tierra area
- Recalibrating hydraulic conductivity and storage parameters

The updated SWIM v4 reflects a significant improvement in groundwater level calibration within the Deep Aquifers and in the southern Monterey and Seaside Subbasins and continues to meet acceptable water level and chloride calibration criteria throughout the rest of the model domain. The SWIM v4 is intended to serve as the primary tool for groundwater modeling of regional projects in the coastal subbasins in support of SGMA planning and implementation objectives moving forward. Therefore, it is appropriate to use the SWIM to estimate water budgets for the Monterey Subbasin. Detailed documentation of the SWIM v4 updates and calibration is provided in M&A, 2026a, included herein as Appendix 6-A.

As further described in SWIM V3 documentation (M&A, 2025c), land surface processes (e.g., precipitation, applied water, and plant ET) contributing to aerial recharge rates within the SWIM are simulated by the accompanying SVIHM (M&A, 2025a; Henson et al., 2026). The SVIHM calculates land surface processes and resulting recharge estimates on a grid cell basis for each semi-monthly timestep using the Farm Process (FMP) package of MODFLOW-OWHM, which is then specified as recharge in the SWIM. Similarly, the SVHIM calculates private irrigation pumping as the residual ET demand on irrigated lands that is unmet by precipitation and deliveries of municipal water. Private irrigation pumping reflects the demand of the private well

owners located in North of Reservation Road portion of the Corral de Tierra Area. Therefore, the land surface processes are integrated into the groundwater system processes. Detailed documentation of the SVIHM methods and calibration is provided in M&A, 2025a and accompanying references, included herein as Appendix 6-A.

Figure 6-3 shows the active extent of the SWIM grid. Water budget information is extracted from simulated model results for the spatial and temporal domain of interest. To quantify all required water budget components as specified in the GSP Emergency Regulations (CCR §354.18(b), this GSP presents results from both the SVIHM for the land surface system and the SWIM for the groundwater system.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Salinas River

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Monterey Subbasin Groundwater Flow Model

- Active Model Grids
- Inactive Model Grids

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 20 October 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Monterey Subbasin Groundwater Flow Model Grid Extent

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 6-3

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Amendment_fig6-1_6-10_v2.aprx

6.1.2 Data Sources

Per 23-CCR §354.18(e), the best-available data were used as input to the SVIHM and SWIM models, for calibration of the SVIHM and SWIM, and to inform water budget evaluations for the Monterey Subbasin. Data sources and methodologies for each of the models are detailed in Appendix 6-A, and include the following key datasets within the Monterey Subbasin:

- Precipitation data, using all available climate stations in the Remote Automatic Weather Stations (RAWS; Desert Research Institute, 2020), COOP (National Oceanic and Atmospheric Administration, 2020), and CIMIS (California Irrigation Management Information System, 2020) networks, and supplemented with spatially distributed Parameter- elevation Relationships on Independent Slopes Model (PRISM) (Daly et al., 2008; PRISM Climate Group, 2020) data (Henson et al., 2022c; Hevesi et al., 2022)
- Reference Evapotranspiration (ET) Data, from the CIMIS network, supplemented with rasterized crop ET data provided by the California Polytechnic State University, San Luis Obispo (CalPoly) Irrigation Training & Research Center (ITRC-METRIC) (personal communication, Daniel Howes, 2024);
- Spatial Land Use Data, estimated using a composite of multiple land use datasets (see Henson et al., 2026; M&A, 2025c) including:
    - MCWD current land use survey from MCWD's 2020 UWMP (MCWD, 2021)
    - DWR historical land use surveys[17]
    - U.S. Department of Agriculture (USDA) Forest Service Region 5 Classification and Assessment with Landsat of Visible Ecological Groupings (CALVEG)[18] dataset for Zone 5 (Central Valley)
    - Information from the California Pesticide Use Reporting Database (California Department of Pesticide Regulation, 2018)
- Pumping Records including:
    - MCWD pumping data from District-owned production wells from the District's internal operations records
    - Historical production and remediation pumping data from Fort Ord production wells provided by the US Army Corps of Engineers (UCACE);
    - Historical pumping data from agricultural, M&I, and domestic production wells within the 180/400-Foot Aquifer Subbasin based off the MCWRA GEMS database

[17] Available online at https://gis.water.ca.gov/app/CADWRLandUseViewer/
[18] Available online at https://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5347192

  - Corral de Tierra public water system pumping was based on extraction data provided by MCWRA, SWRCB, and Seaside Watermaster.
  - Corral de Tierra domestic pumping was based on extraction reported to the SWRCB or estimated based on number of parcels.
  - Seaside well pumping volumes provided by the Seaside Watermaster

- Delivery Records including:
  - MCWD delivery volumes from internal operations records
  - Delivery volumes for the California American Water (Cal Am) service area within the Monterey Subbasin, as reported to the SWRCB.

- Salinas River Flow Data include observations used to calibrate the SVIHM including: measured monthly surface water data available at 6 USGS streamflow gages within the model area; measured flows at the Arroyo Seco near Soledad gage used as a SVIHM inflow; stream flow seepage surveys; seepage time-series computed using gage data; and reservoir operations data (see Appendix 6-A).

- Various soil and land use property data as further described in the SVIHM model documentation (M&A, 2025a; Henson et al., 2026) including:
  - Soil properties that include the FMP soil type reclassified from United States Department of Agriculture (USDA) SSURGO and capillary fringe.
  - Crop coefficients, root depths, and efficiency properties for native, agricultural, and urban land use types from CIMIS, ITRC, and other local studies (see Henson et al., 2026)

- Historical Groundwater Level Monitoring Data, including 76,654 water level observations collected from 1,276 unique wells within the coastal Salinas Valley Basin

- Historical Seawater Intrusion Mapping Data, including selected 500 mg/L chloride isocontour maps prepared by MCWRA and MCWD to identify the historical extent and migration of seawater intrusion within the 180-Foot and 400-foot Aquifers.

6.2 Water Budget Components

Principal components of the Subbasin water budget have been classified into (1) land surface system and (2) groundwater system categories and are described in detail below.

6.2.1 Land Surface System Water Budget Components

As further described in M&A, 2025a (see Appendix 6-A), the SVIHM uses the MODFLOW-OWHM FMP package to dynamically account for most processes relevant to the land surface system budget quantification, including the following:

Precipitation, which serves to wet the near-surface soil and then either evaporates, contributes to runoff, contributes to crop or natural vegetation water demand, or when intense enough, percolates through the root zone to eventually recharge groundwater. The SVIHM simulates precipitation and ET uptake processes across the entire extent of the Monterey Subbasin.

Applied Water, which in the Monterey Subbasin is a combination of (1) MCWD deliveries of groundwater pumped from MCWD-owned wells into their distribution system, (2) CWS and Cal Am deliveries of groundwater pumped from CWS and Cal Am wells into their distribution systems, and (3) applied water from private irrigation wells which provide groundwater directly to crops and/or golf courses. MCWD, CWS, and Cal Am deliveries comprise a large majority of total applied water in the Subbasin and are estimated from the water agencies' local operations records. As outdoor deliveries were not specifically tabulated in the operations records, it was assumed that 25% of total deliveries during the summer irrigation period (i.e., April through September) were used to meet outdoor demands, consistent with information provided in the 2020 MCWD UWMP (MCWD, 2021). Private irrigation within the subbasin is limited to the small strip of agricultural lands located in the North of the Reservation Road portion of the Corral de Tierra Area and is calculated by the SVIHM as the residual crop water demand during the summer irrigation period after accounting for contributions from precipitation.

Evapotranspiration (ET) is estimated by the SVIHM for all land uses using a crop coefficient method, where reference ET data inputs into the SVIHM are scaled by land-use specific, monthly crop coefficients. The ET computed in the SVIHM FMP also includes the contribution to ET from the root zone. Direct uptake of groundwater from the root zone to meet land use water demands can occur when simulated water levels are above the bottom of the root zone. This reduces the amount of water required to be diverted or pumped to meet land use water demands (Henson et al., 2026; See Appendix 6-A for details).

Runoff is calculated as the amount of precipitation and applied water that does not infiltrate the soil but rather drains off the land. The SVIHM calculates runoff from rainfall excess and irrigation inefficiency as further described in Henson et al., 2026. Runoff events in the Dune Sands are extremely rare due to its high infiltration capacity as documented in previous reports prepared by MCWD and the City of Marina (City of Marina, 2025a).

Aerial Recharge to the groundwater system is calculated by the SVIHM based on a specified fraction of excess water after all demands have been satisfied. Recharge is reduced by evapotranspiration from groundwater. As further described in the SVIHM documentation (M&A, 2025a; see Appendix 6-A), aerial recharge rates within the MCWD delivery area and in the Dune Sands regions of the Monterey Subbasin were calibrated to reasonably align with prior estimates developed by MCWD, including within the MBGWFM used to develop water budgets for the prior (2022) Monterey GSP.

Streamflow recharge is calculated by the SWIM dynamically using the Connected Linear Network (CLN) package of MODFLOW-USG. The CLN package estimates streamflow-groundwater

interactions for all simulated reaches within the model domain using simulated streamflow, assumed streambed properties, and simulated groundwater levels at underlying model cells. As further discussed in Section 6.2.2 below, stream reaches within the Monterey Subbasin explicitly simulated by the SWIM include the Salinas River and the El Toro Creek.

6.2.2 Groundwater System Water Budget Components

The SWIM accounts for all water flow processes relevant to groundwater system budget quantification. Some values originate from the SVIHM, whereas others are direct inputs to or outputs from the SWIM.

Aerial recharge from excess precipitation and applied water is calculated by the SVIHM, as described above. Additionally, calibration accounted for leakage from water distribution systems that contributes to groundwater recharge. Consistent with information provided in the MCWD UWMP (MCWD, 2021), leakage is estimated as 5% of the total water delivered to MCWD, CWS, and Cal Am service areas, which are entirely supplied by groundwater.

Groundwater pumping includes pumping from MCWD-owned wells and other water systems and private wells in the Corral de Tierra Area. MCWD municipal groundwater extraction rates were assigned by MCWDGSA using metered extraction data. Urban and domestic groundwater extractions from wells in the Corral de Tierra Area was assigned by SVBGSA using a combination of data reported in the MCWRA GEMS database, reported to the SWRCB, estimated by the Seaside Watermaster, or estimated based on parcels. Private irrigation pumping is limited to the small strip of agricultural lands located in the North of the Reservation Road portion of the Corral de Tierra Area and in the North of the Reservation Road portion of the Corral de Tierra Area, and is calculated by the SVIHM as the residual crop water demand during the summer irrigation period after accounting for contributions from precipitation. Figure 6-4 shows SWIM simulated groundwater pumping by WBZ and management area throughout the historical water budget period.

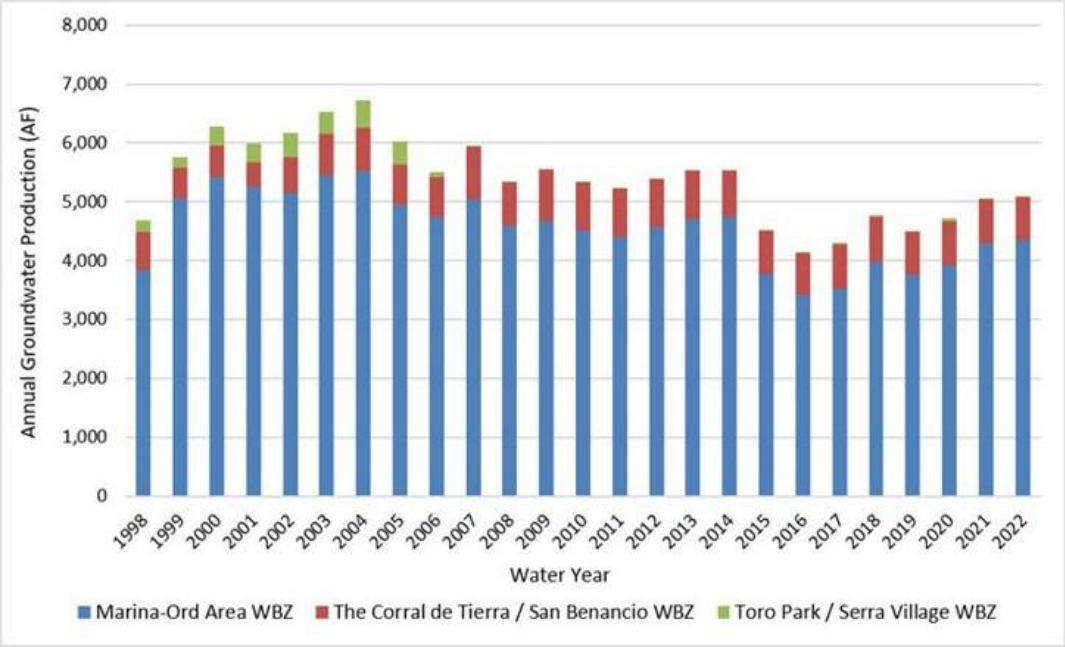


Figure 6-4 SWIM Simulated Historical Period Groundwater Pumping

Inter-Basin Cross-Boundary Flows between the Monterey Subbasin and the neighboring Seaside Subbasin to the south and 180/400-Foot Aquifer Subbasin to the north are calculated dynamically by the SWIM based on simulated groundwater gradients and aquifer transmissivity assignments within active model cells across the subbasin boundary interface. As shown in Figure 6-3**,** the SWIM actively simulates groundwater flow and transport conditions within each of these neighboring subbasins using the same methods, data sources, and physical processes as outlined for the Monterey Subbasin above and thus serves as a valuable tool for estimating inter-basin cross-boundary flows and their spatiotemporal variability.

Similarly, subsurface exchanges with the **Pacific Ocean** are calculated dynamically by the SWIM based on a combination of simulated groundwater gradients and aquifer transmissivity assignments within active model cells across the Monterey Subbasin coastline and nearby conductance properties assigned to general head boundary cells representing the offshore ocean-aquifer interface. As shown in and further described in the SWIM documentation (M&A, 2026a; see Appendix 6-A), the active model domain extends offshore and simulates exchanges at the ocean-aquifer interface using general-head boundary condition assignments at offshore model cells representing the Pacific seafloor. General head cells are assigned both a potentiometric head equivalent to mean sea level (based on historical tidal data provided by National Oceanic & Atmospheric Administration [NOAA]), and a chloride concentration equivalent to pure seawater (18,537 mg/L). Corresponding exchanges between the offshore aquifers and the Monterey Subbasin are calculated by the model at the coastal boundary and, depending on the simulated chloride concentration within a particular model cell and layer, can reflect a mix of freshwater and seawater. Corresponding estimates of net seawater intrusion inflows to the Monterey Subbasin are further described below.

Because the Subbasin is bounded on the east and southeast by mostly metamorphic bedrock formations, they are treated as no-flow boundaries and therefore it is assumed that the Subbasin does not receive subsurface inflows from these areas.

Groundwater-surface water interactions are calculated by the SWIM using the CLN package of MODFLOW-USG as further described in Section 6.2.1 above. The CLN package estimates streamflow-aquifer interactions for all simulated reaches within the model domain using simulated streamflows, assumed streambed geometry and conductance properties, and corresponding simulated hydraulic gradients between the streambed and underlying groundwater model cells. As further described in the SWIM documentation (see Appendix 6-A), stream reaches within the Monterey Subbasin explicitly simulated by the SWIM include the Salinas River and the El Toro Creek. Within the Salinas River, simulated stages are calibrated to the USGS streamflow gages, estimated streambed leakage profiles, and reservoir operations, focusing mainly on low-flow months. Stream gaging data was available up to 2001 to constrain streamflow and associated stream-groundwater interactions within El Toro Creek.

Change in groundwater storage due to groundwater elevations is calculated by the SWIM by solving the groundwater flow equation. The groundwater storage inflows and outflows extracted from the SWIM are referenced to the groundwater storage domain instead of the groundwater system domain. For the purposes of this GSP, change in groundwater storage is calculated as the groundwater system inflows minus the groundwater system outflows. Therefore, a positive change in storage indicates an increase in groundwater storage, and a negative change in storage indicates a decrease in groundwater storage.

Change in groundwater storage due to seawater intrusion is calculated as the total aquifer volume located between the initial and final extent of the 500 mg/L chloride isocontour line over the specified water budget timeframe within each principal aquifer based on historical monitoring data (for historical/current water budgets) or estimated by SWIM v4 (for projected water budgets). As further described in Sections 6.4 and 6.5, change in groundwater storage due to seawater intrusion estimates are provided using both effective porosity (0.15) and total porosity (0.3) estimates, consistent with prior estimation methods used in the 180/400-Foot Aquifer Subbasin GSP (SVBGSA, 2025) and the Monterey Subbasin GSP Annual Reports (MCWDGSA and SVBGSA, 2026).

Water budget information for the historical and current water budget periods is presented in Section 6.4 below and water budget information for the projected future scenarios is presented in Section 6.5 below.

6.3 Water Budget Time Frames

Time periods must be specified for each of the three required water budgets. The GSP Emergency Regulations require water budgets for historical conditions, current conditions, and projected conditions.

6.3.1 Historical Water Budget Time Period

The historical water budget is intended to evaluate how past land use and water supply availability has affected aquifer conditions and the ability of groundwater users to operate within the sustainable yield. 23-CCR §354.18(c)(2) requires quantification of historical water budget components for at least the past ten years. Additionally, per DWR's Water Budget BMP, the water budget should represent average hydrology, with both wet and dry years (DWR, 2016b). DWR's Water Budget BMP document further states that the historical water budget should help develop an understanding of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability to operate the Subbasin within the sustainable yield. Accordingly, historical conditions should include the most reliable historical data that are available for GSP development and water budget calculations.

As shown on Figure 6-5, the long-term average precipitation on subbasin lands based on PRISM records was 15.35 inches per year (in/yr) between the period of WY 1896 – 2022. Using these historical rainfall records, a 15-year period representing WY 2004 – 2018 was defined as the historical water budget period. The average precipitation based on PRISM data over the historical water budget period (WY 2004 – 2018) is 15.51 in/yr and is similar to the long-term average. This historical water budget time period contains a variety of water year types and therefore adequately represents average hydrologic conditions and their interannual variability for purposes of quantifying the historical water budget for the Monterey Subbasin.

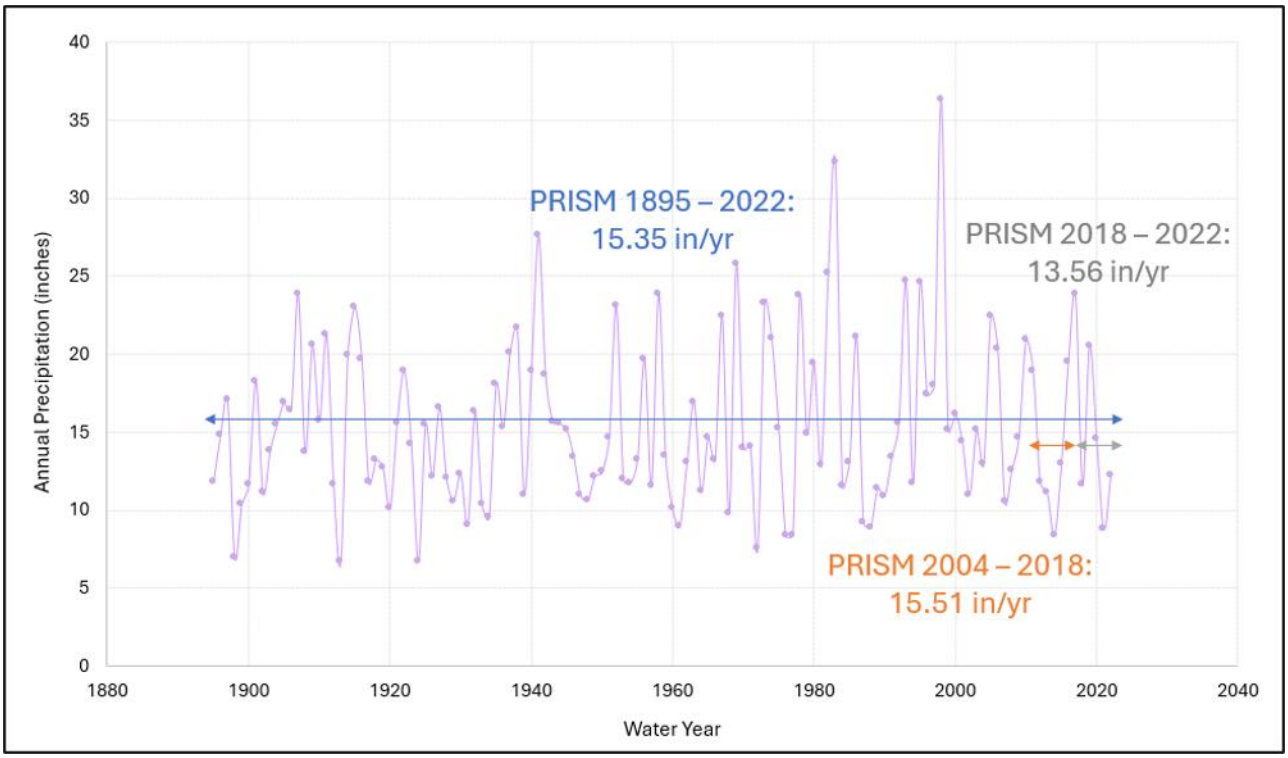


Figure 6-5 Monterey Subbasin Long-Term Annual Precipitation Records

6.3.2 Current Water Budget Time Period

The current water budget is intended to quantify existing supply, demand, and change in storage conditions within the Basin under the most recent population, land use, and hydrologic conditions. Current conditions are generally the most recent conditions for which adequate data are available and that represent recent climatic and hydrologic conditions.

The five-year period of WY 2018 – 2022 was defined as the current water budget period, which represents the last five years of the SWIM v4 historical simulation timeframe and is reflective of recent patterns of climate, groundwater use, and boundary conditions. As shown on Figure 6-5, the average precipitation falling on subbasin lands based on PRISM data between WY 2018 – 2022 was 13.56 in/yr. This represents a generally drier hydrologic period than both the historical model and long term average conditions described above.

6.3.3 Projected Water Budget Time Period

Per 23-CCR §354.18(c)(3), projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to GSP implementation over the 50-year SGMA planning and implementation horizon. Projected hydrology must utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline conditions for evaluating future hydrologic uncertainty and climate modified scenarios against.

In addition to updating the historical SWIM v4, in 2026 SVBGSA developed a revised baseline 50-year predictive SWIM v4 modeling scenario to support MCWDGSA and SVBGSA's ongoing SGMA planning and implementation activities (M&A, 2026b). The SWIM v4 baseline predictive model scenario (i.e. the "baseline scenario") simulates 50-years of transient future groundwater level and chloride conditions within the coastal Salinas Valley Basin using the most recent water level and chloride monitoring data and the latest available information regarding future hydrology, sea level rise, land use, Salinas River reservoir operations, water supply, and groundwater demand projects provided by MCWD, SVBGSA, the Seaside Basin Watermaster, and associated stakeholders within the Basin. The baseline scenario does not include any SGMA implementation activities and is intended to establish a "baseline" of future conditions over the 50-year SGMA planning and implementation horizon for which the GSAs can design and develop SGMA PMAs against, per the GSP requirements outlined in 23-CCR §354.18. Further description of the methods and assumptions used to develop the baseline scenario l is provided in M&A, 2026b, attached herein as Appendix 6-A**.**

As further described in Appendix 6-A, to develop the required 50 years-worth of hydrologic input information for the baseline scenario, first an "analog period" was created from 25 years-worth of historical climate inputs by combining the years in a specific way that, on average, maintained the long-term average hydrologic conditions. Each 25-year climate sequence first starts with the climate of WY 1993, 2019, and then 1975; these years were selected as proxy years that closely match observed annual precipitation at the King City and Salinas Airport weather stations in WY 2023, 2024, and 2025, respectively. The simulated climate from these initial three years is

followed by the simulated climate of the 22 years of WY 1999 – 2020, for a total of 25 years of climate data.

The above mapping of actual years to analog years within the required 50-year projected water budget period applies to precipitation and ET datasets. This approach allowed for the creation of a complete 50-year period to inform the projected water budget analysis, even when certain component datasets were not available for that length of time.

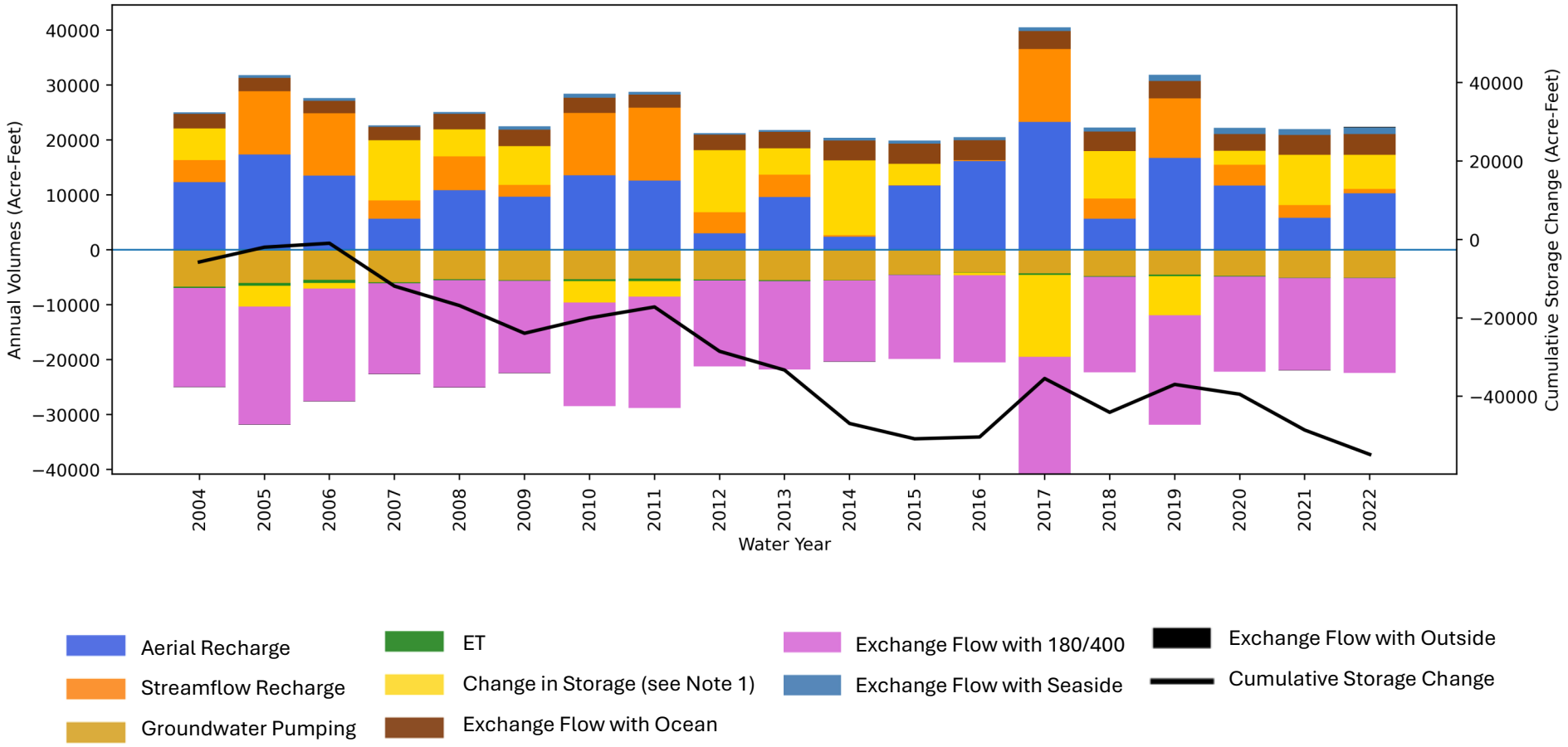
6.4 Historical and Current Water Budget

This section presents groundwater budget results from the calibrated SWIM v4 over the historical water budget period (WY 2004 – 2018) and the current water budget period (WY 2018 – 2022). Historical and current water budget information is reported for the Monterey Subbasin as a whole (Section 6.4.1) and for three water budget zones (WBZ) delineated for the Subbasin (see Figure 6-2).

6.4.1 Basin-wide Water Budget

Figure 6-6 presents an annual summary of Subbasin-wide inflows to and outflows from the groundwater system by water source type throughout the combined historical and current water budget period (WY 2004 – 2022). Water budget components include: aerial recharge, streamflow recharge, well pumping, and net inter-basin cross boundary exchanges with the neighboring from each. Positive values indicate a net inflow to the Monterey Subbasin and negative values indicate a net outflow from the Subbasin. Annual change in groundwater storage values are reflected on the bar charts as the residual of all other groundwater inflow and outflow components; where positive, they indicate a net loss in storage from the basin for that year and vice versa. Also shown is the cumulative change in storage throughout the entire historical and current water budget period.

Annual average inflow and outflow components for both the historical water budget period (WY 2004 – 2018) and the current water budget period (WY 2018 – 2022) are summarized in Table 6-1. Further descriptions of these each of these water budget components are provided Section 6.2 and detailed in Appendix 6-A. Change in groundwater storage due to seawater intrusion estimates are separately tabulated in Table 6-1 using the methodology described in Section 6.2 above.



Notes:

1. Annual change in groundwater storage values are reflected on the bar charts as the residual of all other groundwater inflow and outflow components; where positive, they indicate a net loss in storage from the basin for that year, and vice versa.

2. Bar charts reflect annual water budgets and cumulative storage change over the combined historical (WY 2004-2018) and current (WY2018-2022) water budget periods.

3. All values expressed in units of acre-feet.

Abbreviations

ET = evapotranspiration

WY = Water Year

Annual Historical and Current Groundwater Budget, Monterey Subbasin

Monterey Subbasin
Groundwater Sustainability Plan
September 2026
B60094.30

eki environment & water

Figure 6-6

Table 6-1 Average Annual Historical and Current Groundwater Budget, Monterey Subbasin

Water Budget Components	Net Annual Groundwater Flows (AFY) (a)	
	Historical Period WY 2004 - 2018	Current Period WY 2018 - 2022
Recharge		
● Aerial Recharge	11,152	10,034
● Streamflow Recharge (b)	5,899	4,293
	17,051	**14,327**
Well Pumping		
● Well Pumping	-5,321	-4,828
	-5,321	**-4,828**
Net Inter-Basin Flow		
● Ocean (c)	2,946	3,428
● Seaside Subbasin	501	1,057
● 180/400 Foot Aquifer Subbasin (b,c)	-17,889	-17,742
● Outside Basin	-27	22
	-14,469	**-13,235**
Groundwater Evapotranspiration Uptake		
● Groundwater ET Uptake	-225	-140
	-225	**-140**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO GROUNDWATER ELEVATIONS (GWE)	**-2,939**	**-3,872**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO SEAWATER INTRUSION (SWI) (d)	*0*	*-292 to -585*

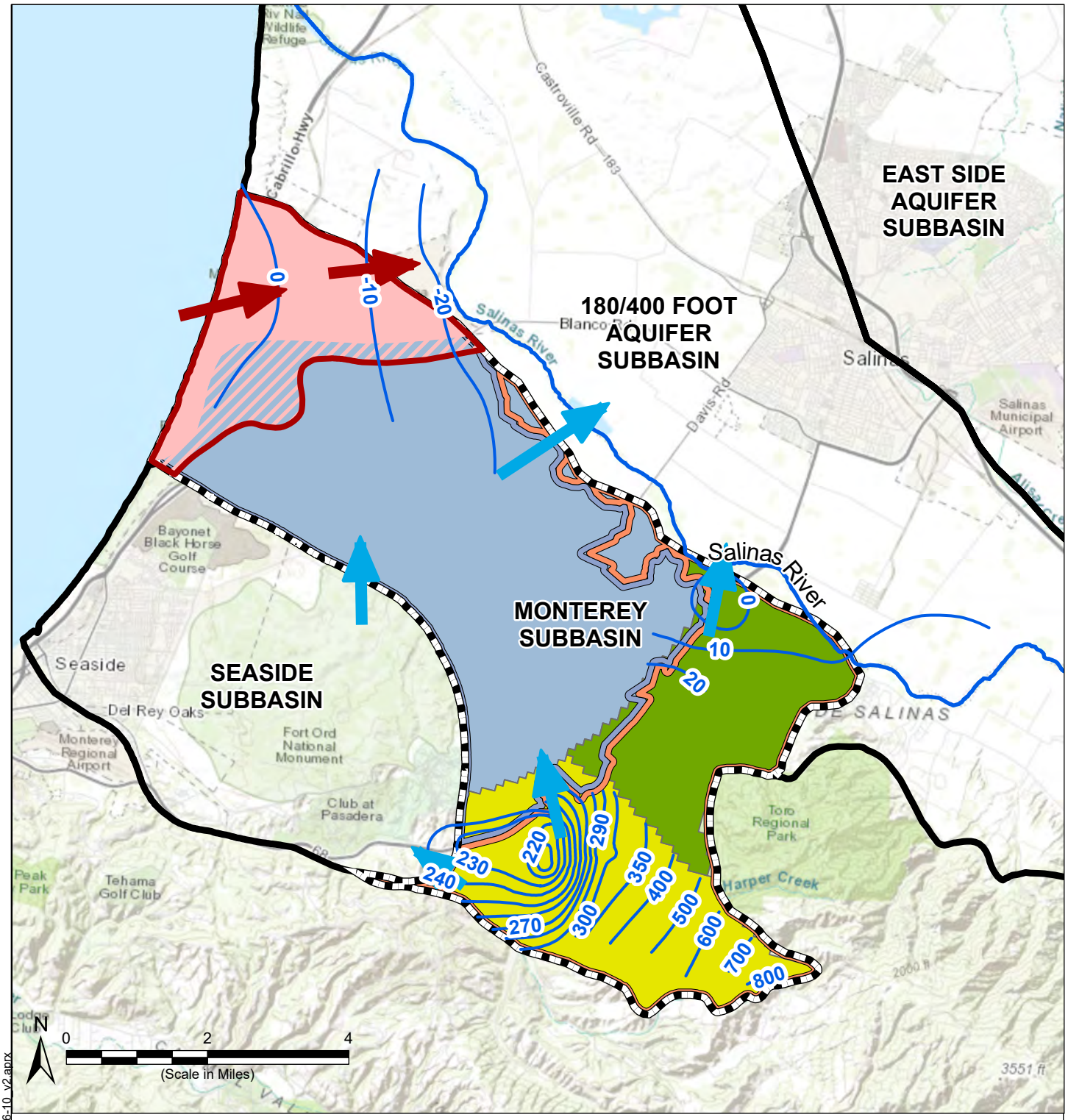
Notes:

(a) Positive values indicate a net inflow and negative values indicate a net outflow.

(b) SWIM v4 estimates of Salinas River flows into and out of the Monterey Subbasin are uncertain due to lack of streamflow gaging data within the subbasin and will directly influence corresponding estimates of cross-boundary outflows to the 180/400-Foot Aquifer Subbasin.

(c) Cross boundary flows to/from ocean and 180/400-Foot Aquifer include both seawater and freshwater. Net seawater inflows to the Monterey Subbasin are reflected in the Change in Groundwater Storage due to Seawater Intrusion term (see Note d).

(d) Change in Groundwater Storage due to Seawater Intrusion is calculated as the annualized total aquifer volume located between the initial and final extent of the 500 mg/L chloride isocontour line over the water budget timeframe based on historical monitoring data (for historical/current water budgets) or estimated by SWIM v4 (for projected water budget). Ranges reflect the use of either effective porosity (0.15) or total porosity (0.3) in the aquifer volume calculation.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Salinas River

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Groundwater Flow Direction

- Freshwater
- Seawater

Water Budget Zones

- Marina-Ord Area
- Corral de Tierra / San Benancio
- Toro Park / Serra Village

- 2017 Fall Groundwater Contours 400-Foot Aquifer
- 2017 Fall Groundwater Contours El Toro Bowl
- 2017 Fall Groundwater Contours Corral de Tierra Aquifer

Estimated 2015 Seawater Intrusion

- Area of Known Seawater Intrusion
- Area of Potential Seawater Intrusion

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 20 October 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Example Schematic of Groundwater Flow Components, Monterey Subbasin

Monterey Subbasin
Groundwater Sustainability Plan
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Figure 6-7

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Amendment_fig6-1_6-10_v2.aprx

6.4.1.1 Historical Water Budget

6.4.1.1.1 Aerial Recharge

Estimated average annual aerial recharge to the Subbasin during the historical period was 11,152 AFY. This recharge was estimated utilizing the SVIHM and incorporates land surface system processes and estimated leakage of total delivered water by MCWD. Outputs from the SVIHM are detailed by subbasin in the SVIHM documentation included in Appendix 6-A.

6.4.1.1.2 Well Pumping

The estimated average annual well pumping in the Subbasin during the historical period was 5,321 AFY. It includes pumping from MCWD-owned wells and pumping from other water systems and private wells in the Corral de Tierra Area.

This value is significantly less than the estimated annual aerial recharge to the Subbasin (11,152 AFY) during the historical period. The annual well pumping value is negative in Table 6-1 as it represents an outflow from the groundwater domain.

6.4.1.1.3 Net Inter-Basin Flows

Figure 6-7 depicts the general direction of presumed freshwater and seawater inter-basin flows to and from the Monterey Subbasin. Net annual inter-basin flows represent the aggregate sum of groundwater inflows and outflows across the subbasin boundaries within each principal aquifer. The basis for calculating these flows and calibrating conditions along each of the model boundaries during the historical and current period is outlined in Section 6.2.2 and further detailed in Appendix 6-A.

Estimated annual net inter-basin flows averaged -14,469 AFY across the Subbasin over the historical period. Inter-basin flow components include[19]:

- 17,889 AFY net outflows from the Monterey Subbasin into the adjacent 180/400-Foot Aquifer Subbasin;
- 501 AFY net inflows from the adjacent Seaside Subbasin into the Monterey Subbasin; and
- 2,946 AFY net inflows from offshore aquifers underlying the Pacific Ocean into the Monterey Subbasin.

As demonstrated in Table 6-1, inter-basin outflows accounted for the majority of the Subbasin's groundwater outflow over the historical period. Net inter-basin outflows (-14,469 AFY) exceeded total groundwater pumping and nearly amounted to total combined aerial and streamflow recharge estimates for the Subbasin. These estimated outflows are reflective of the large inland gradients that exist between the Monterey Subbasin and the 180/400 Subbasin. As discussed in Chapter 5, groundwater levels in the are generally highest near the coastline and decrease inland

[19] SWIM v4 additionally estimates a net 27 AFY outflow from the Monterey Subbasin to active model layers located outside any groundwater basin domain. These values are included in **Error! Reference source not found.** for comprehensiveness.

toward the east and northeast to as low as 40 feet below sea level in the 180-Foot and 400-Foot Aquifers and 80 feet below sea level in the Deep Aquifers within the 180/400-Foot Aquifer Subbasin, resulting in significant groundwater outflow from the Monterey Subbasin to the 180/400-Foot Aquifer Subbasin under both seasonal-low and seasonal-high conditions. Although there are also areas of the Monterey Subbasin where groundwater levels are below sea level, groundwater levels in the 180/400-Foot Aquifer Subbasin are significantly lower and draw groundwater inland. Meanwhile, groundwater levels in the southern Corral de Tierra Area, which lies in the upland portions of the Monterey Subbasin can be as high as 800 ft above sea level.

As mentioned above and in Section 6.2.2, cross boundary flows to/from the Pacific Ocean and the 180/400 Subbasin include both seawater and freshwater. Net seawater inflows to the Monterey Subbasin over the historical water budget are reflected in the Change in Groundwater Storage due to Seawater Intrusion term as further discussed in Section 6.4.1.1.6.

6.4.1.1.4 Groundwater-Surface Water Interactions and Evapotranspiration Uptake

Groundwater-surface water interactions simulated by the SWIM v4 resulted in a net estimated streamflow recharge (i.e., inflow) to the subbasin of 5,899 AFY over the historical period. A large majority of streamflow recharge occurs along the Salinas River, which intersects the Subbasin in a small portion of the Toro Park / Serra Village WBZ of the Corral de Tierra Management Area. It is important to note that SWIM v4 estimates of Salinas River inflows and outflows to the Monterey Subbasin are uncertain due to lack of streamflow gaging data within the Subbasin and will directly influence corresponding estimates of cross-boundary outflows to the 180/400 Subbasin as nearly all streamflow recharge from the Salinas River immediately flows northward across the Subbasin boundary. Streamflow recharge estimates will be further evaluated and updated as more information becomes available in future GSP updates.

Groundwater ET uptake occurs in minor amounts within the Monterey Subbasin and is generally limited to areas where shallow or perched groundwater conditions exist and where GDEs or riparian vegetative communities are subsequently able to access the groundwater table to meet a portion of their specified ET demands. Subbasin-wide groundwater ET uptake rates averaged approximately 225 AFY over the historical water budget period and were generally limited to model cells immediately adjacent to simulated interconnected surface water bodies (i.e., the Salinas River) and in mapped GDE areas of the subbasin such as within the coastal vernal ponds in the City of Marina and riparian habitats (see Section 5.7).

6.4.1.1.5 Net Annual Change in Groundwater Storage due to Groundwater Elevations

Change in groundwater storage due to groundwater levels reflects the residual of all groundwater inflow and outflow components to the Subbasin included in Table 6-1. Although estimated groundwater recharge (11,152 AFY) exceeded pumping in the Monterey Subbasin (5,321 AFY) during the historical period, the net estimated annual change in groundwater storage in the Monterey Subbasin was -2,939 AFY. This value is negative, indicating the Monterey Subbasin experienced a net loss of groundwater storage due to water level declines and was in conditions of overdraft during the historical period. The loss in storage is reflected in the

groundwater level declines that have been observed in the 400-Foot Aquifer and Deep Aquifers within the Marina-Ord Area and within the El Toro Primary Aquifer in the Corral de Tierra Area.

As mentioned in Section 6.4.1.1.3 above, inter-basin outflows accounted for the majority of the Subbasin's groundwater outflow over the historical period. These water budget results demonstrate the relationship and interdependence between inter-basin inflows, outflows, and the Subbasin water budget and the need for coordinated sustainable groundwater management in all of these subbasins.

6.4.1.1.6 Net Annual Change in Groundwater Storage due to Seawater Intrusion

As further described in Section 5.3.4, historical seawater intrusion has been documented to occur within the coastal Salinas Valley including in portions of the Lower 180-Foot and 400-Foot Aquifers within the Monterey Subbasin. However, the lateral extent of seawater intrusion within the Subbasin has been relatively stable over the historical period.

While the SWIM v4 model indicates a net annual historical inter-basin inflow of 2,946 AFY from offshore aquifers underlying the Pacific Ocean into the Monterey Subbasin, it is assumed that associated seawater inflows into the Monterey Subbasin were equivalent to seawater outflows to the 180/400 Subbasin over this time period. This logic is supported by the fact that: (1) there has been negligible expansion of the seawater intrusion front within the Monterey Subbasin over the historical period, as evidenced by the lack of inland advancement in the mapped 500 mg/L chloride isocontour line within the 180-Foot and 400-Foot Aquifers by MCWD over WY 2004 – 2018; and (2) groundwater from the coastal portion of the Monterey Subbasin flows toward the 180/400-Foot Aquifer Subbasin in the lower 180-and 400-Foot aquifers where seawater intrusion has been observed. Therefore, it is assumed there was zero net annual change in groundwater storage due to seawater intrusion over the historical water budget period.

6.4.1.2 Current Water Budget

Annual average inflow and outflow components for the current water budget period (WY 2018 – 2022) are summarized in Table 6-1. Although the current water budget includes both dry and wet years, average precipitation during this period (13.56 in/yr) was lower than the historical period (15.51 in/yr). Accordingly, aerial recharge was comparatively lower (10,034 AFY) and reductions in groundwater storage due to water level declines were greater (-3,872 AFY) even though groundwater pumping rates (-4,828 AFY) were reduced by approximately 10% relative to the historical period.

6.4.1.2.1 Recent Change in Groundwater Storage due to Seawater Intrusion

As further described in the WY 2025 GSP Annual Report for the Monterey Subbasin (MCWDGSA & SVBGSA, 2026), chloride sampling data collected in WY 2025 indicates some additional inland advancement of the seawater intrusion front has recently occurred within the lower 180-Foot and 400-Foot Aquifers of the Monterey Subbasin since the publication of the original GSP. Due to the sporadic nature and general paucity of historical chloride sampling data, very little

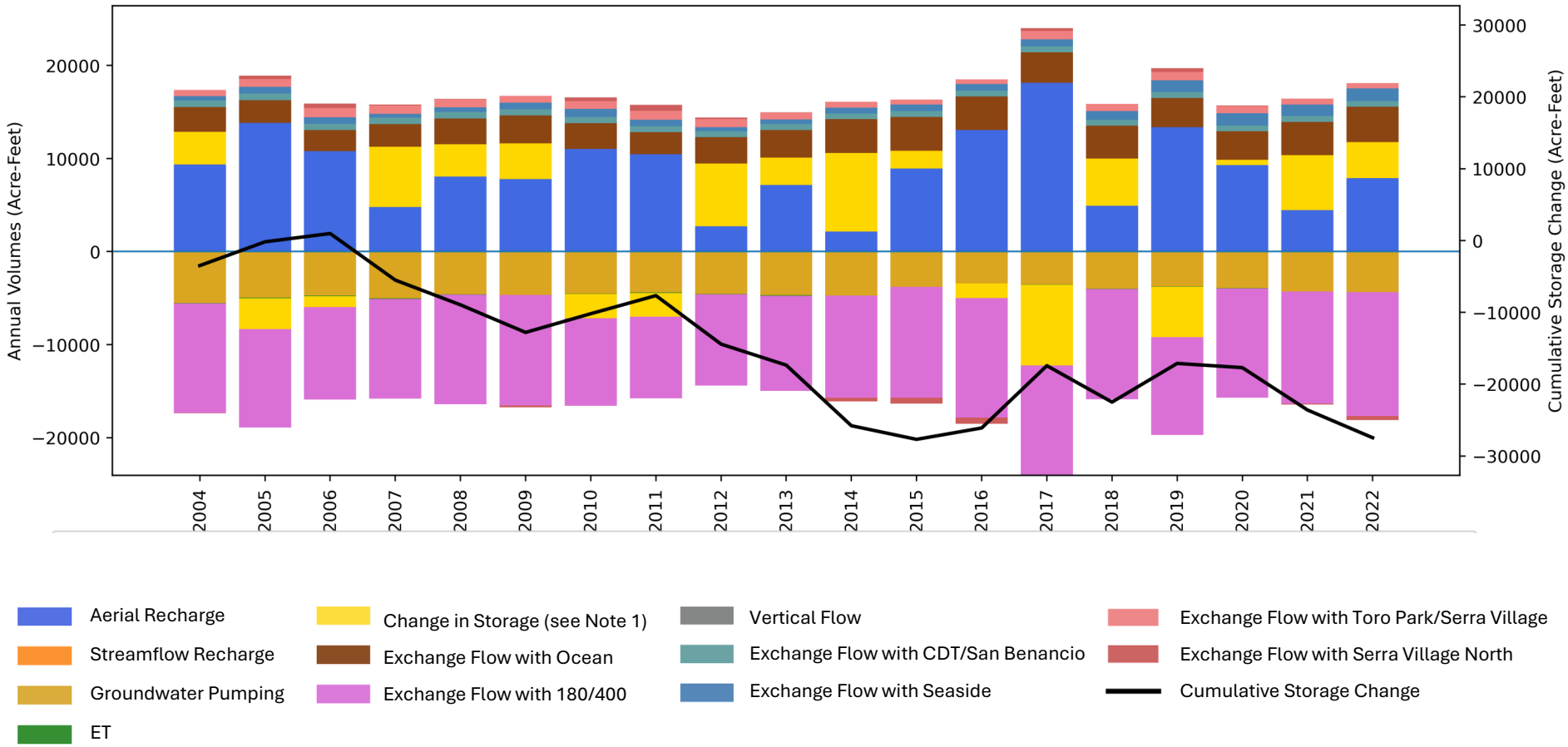
information exists regarding the rate and timing of recent migration of the seawater intrusion front.

Therefore, for the purposes of this GSP, the net annual change in storage due to seawater intrusion through the current water budget period reported in Table 6-1 was estimated by annualizing the total additional volume of seawater intrusion reported in the WY 2025 Annual Report (i.e., -2,047 AF to -4,093 AF; see *Section 4.3.1.2* of MCWDGSA & SVBGSA, 2026) over the 7-year period spanning the beginning of the current water budget period (WY 2018) through the end of WY 2025. This amounts to a recent net loss in storage due to seawater intrusion of -292 AFY to -585 AFY over the current water budget period, depending on porosity assumptions.

6.4.2 Marina-Ord Area WBZ

Figure 6-8 presents an annual summary of inflows to and outflows from the groundwater system within the Marina-Ord Area WBZ by water source type throughout the combined historical and current water budget period (WY 2004 – 2022). Annual average inflow and outflow components for both the historical water budget period (WY 2004 – 2018) and the current water budget period (WY 2018 – 2022) are summarized in Table 6-2

Similar to the basin-wide budget, water budget components included in the Marina-Ord Area WBZ include: aerial recharge, well pumping, and net inter-basin flows. In addition, the Marina-Ord Area WBZ includes estimated net intra-basin flows from the Corral de Tierra / San Benancio WBZ and the Toro Park / Serra Village WBZ. There is no surface water exchange component as the Salinas River does not extend into the Marina-Ord Area WBZ. Further descriptions of these each of these water budget components are provided Section 6.2 and detailed in Appendix 6-A. Change in groundwater storage due to seawater intrusion estimates are separately tabulated in Table 6-2 using the methodology described in Section 6.2 above.



Notes:

1. Annual change in groundwater storage values are reflected on the bar charts as the residual of all other groundwater inflow and outflow components; where positive, they indicate a net loss in storage from the basin for that year, and vice versa.

2. Bar charts reflect annual water budgets and cumulative storage change over the combined historical (WY 2004-2018) and current (WY2018-2022) water budget periods.

3. All values expressed in units of acre-feet.

Abbreviations

ET = evapotranspiration

WY = Water Year

Annual Historical and Current Groundwater Budget, Marina-Ord Area WBZ

Monterey Subbasin
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Figure 6-8

Table 6-2 Average Annual Historical and Current Groundwater Water Budget, Marina-Ord Area WBZ

Water Budget Components	Net Annual Groundwater Flows (AFY) (a)	
	Historical Period WY 2004 - 2018	Current Period WY 2018 - 2022
Recharge		
● Aerial Recharge	8,882	7,982
● Streamflow Recharge	0	0
	8,882	**7,982**
Well Pumping		
● Well Pumping	-4,472	-4,057
	-4,472	**-4,057**
Net Inter-Basin Flow		
● Ocean (c)	2,946	3,428
● Seaside Subbasin	654	1,231
● 180/400 Foot Aquifer Subbasin (c)	-10,959	-11,904
	-7,359	**-7,245**
Net Intra-Basin Flow (d)		
● Corral de Tierra (Toro Park / Serra Village WBZ)	831	723
● Corral de Tierra (CDT / San Benancio WBZ)	653	616
	1,484	**1,339**
Groundwater Evapotranspiration Uptake		
● Groundwater ET Uptake	-38	-26
	-38	**-26**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO GROUNDWATER ELEVATIONS (GWE)	**-1,500**	**-2,005**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO SEAWATER INTRUSION (SWI) (e)	*0*	*-292 to -585*

Notes:

(a) The Marina-Ord Area WBZ includes inflows to and outflows from the portion of Corral de Tierra that is north of Reservation Rd.

(b) Positive values indicate a net inflow and negative values indicate a net outflow.

(c) Cross boundary flows to/from ocean and 180/400-Foot Aquifer include both seawater and freshwater. Net seawater inflows to the Subbasin are reflected in the Change in Groundwater Storage due to Seawater Intrusion term (see Note e).

(d) Corral de Tierra Management Area is subdivided into CDT / Sen Benancio and Toro Park / Serra Village WBZ.

(e) Change in Groundwater Storage due to Seawater Intrusion is calculated as the annualized total aquifer volume located between the initial and final extent of the 500 mg/L chloride isocontour line over the water budget timeframe based on historical monitoring data (for historical/current water budgets) or estimated

by SWIM v4 (for projected water budget). Ranges reflect the use of either effective porosity (0.15) or total porosity (0.3) in the aquifer volume calculation.

6.4.2.1 Historical Water Budget

6.4.2.1.1 Aerial Recharge

Estimated average annual recharge to the Marina-Ord Area WBZ during the historical period was 8,882 AFY. This recharge was estimated utilizing the SVIHM and incorporates land surface system processes and estimated leakage of total delivered water by MCWD. Outputs from the SVIHM are detailed by subbasin in the SVIHM documentation included in Appendix 6-A.

6.4.2.1.2 Well Pumping

Estimated average annual well pumping in the Marina-Ord Area WBZ was 4,472 AFY and included:

- 1,796 AFY by MCWD from the 180- and 400-Foot Aquifers;
- 2,188 AFY by MCWD from the Deep Aquifers; and
- 488 AFY from wells located North of Reservation Rd within the Corral de Tierra Management Area.

The estimated well pumping in the Marina-Ord Area WBZ was significantly lower than the average annual recharge during the historical period. The well pumping values are negative in Table 6-2 as they represent an outflow from the Marina-Ord Area WBZ.

6.4.2.1.3 Net Inter-Basin and Intra-Basin Flows

Figure 6-7 depicts the general direction of presumed freshwater and seawater inter-basin and intra-basin cross-boundary flows to and from the Marina-Ord Area WBZ. The estimated magnitude of each of these net inter- and intra- basin cross boundary flows are itemized in Table 6-2 and described below. These net inter- and intra- basin cross boundary flows represent the aggregate flow in all principal aquifers across each subbasin and management area boundary.

Estimated annual net inter-basin flows averaged -7,359 AFY across the Marina Ord WBZ over the historical period. Inter-basin flow components include[20]:

- 10,959 AFY net outflows from the Marina Ord Area WBZ into the adjacent 180/400-Foot Aquifer Subbasin;
- 654 AFY net inflows from the adjacent Seaside Subbasin into the Marina Ord Area WBZ; and

[20] SWIM v4 additionally estimates a net 27 AFY outflow from the Monterey Subbasin to active model cells located outside any mapped DWR Bulletin-118 groundwater basin. These values are included in **Error! Reference source not found.** for comprehensiveness.

- 2,946 AFY net inflows from offshore aquifers underlying the Pacific Ocean into the Marina Ord Area WBZ.

As demonstrated in Table 6-2, inter-basin outflows accounted for the majority of Marina-Ord Area WBZ groundwater outflows over the historical period. Net inter-basin outflows (-7,359 AFY) exceeded groundwater pumping and amounted to 83% of the total recharge estimates for the Marina-Ord Area WBZ. These estimated outflows are reflective of the large inland gradients that exist between the Marina-Ord Area WBZ and the 180/400-Foot Aquifer Subbasin.

Estimated annual net intra-basin inflows averaged +1,484 AFY across the Marina-Ord Area WBZ over the historical period. Intra-basin flow components include a net inflow of +831 AFY from the Toro Park / Serra Village WBZ and a net inflow of +653 AFY from the Corral de Tierra / San Benancio WBZ. As shown on Figure 4-5, the Marina-Ord WBZ is located within the lower-lying coastal portions of the Monterey Subbasin and generally receives groundwater inflow from the higher-elevation Corral de Tierra / San Benancio WBZ and Toro Park / Serra Village WBZ to the east where groundwater elevations are several hundred feet higher on average.

As mentioned above and in Section 6.2.2, cross boundary flows to/from the Pacific Ocean and the 180/400-Foot Aquifer Subbasin include both seawater and freshwater sources. Net seawater inflows to the Marina-Ord Area WBZ over the historical water budget are reflected in the Change in Groundwater Storage due to Seawater Intrusion term as further discussed in Section 6.4.2.1.6.

6.4.2.1.4 Groundwater-Surface Water Interactions and Evapotranspiration Uptake

SWIM v4 simulations indicate zero groundwater-surface water interactions occur within the Marina-Ord WBZ due to a general lack of surface water features intersecting the Marina Ord Management Area. This is consistent with the description of interconnected surface water features within the Marina Ord area presented in Section 5.6.

Estimated groundwater ET uptake rates within the Marina Ord WBZ averaged 38 AFY over the historical period and were generally limited to the coastal vernal ponds within the City of Marina (see Section 5.7).

6.4.2.1.5 Net Annual Change in Groundwater Storage due to Groundwater Elevations

Similar to basin-wide water budget results, groundwater recharge (8,882 AFY) exceeded pumping in the Marina-Ord Area WBZ (4,472 AFY) during the historical period. However, the net estimated annual change in groundwater storage due to groundwater level declines within the Marina-Ord Area WBZ was -1,500 AFY over the historical period. Net inter-basin outflows from the Marina-Ord Area WBZ (7,359 AFY) were very significant and accounted for the majority of Marina-Ord Area WBZ's groundwater outflow over the historical period. These results demonstrate the relationship and interdependence between inter-basin inflows, outflows, and the Marina-Ord Area WBZ water budget and the need for coordinated sustainable groundwater management in all subbasins.

6.4.2.1.6 Net Annual Change in Groundwater Storage due to Seawater Intrusion

The Marina-Ord Area WBZ and Monterey Subbasin share the same boundary with the Pacific Ocean. Therefore, the seawater intrusion results described in Section 6.4.1.1.6 directly apply to the Marina-Ord Area WBZ. As shown in Table 6-2, it is assumed there was zero net annual change in groundwater storage due to seawater intrusion over the historical water budget period.

6.4.2.2 Current Water Budget

Annual average inflow and outflow components for the current water budget period (WY 2018 – 2022) are summarized in Table 6-2. Although the current water budget includes both dry and wet years, average precipitation during this period (13.56 in/yr) was lower than the historical period (15.51 in/yr). Accordingly, aerial recharge was comparatively lower (7,982 AFY) and reductions in groundwater storage due to water level declines were greater (-2,005 AFY) even though groundwater pumping rates (-4,057 AFY) were reduced by approximately 10% relative to the historical period.

6.4.2.2.1 Recent Change in Groundwater Storage due to Seawater Intrusion

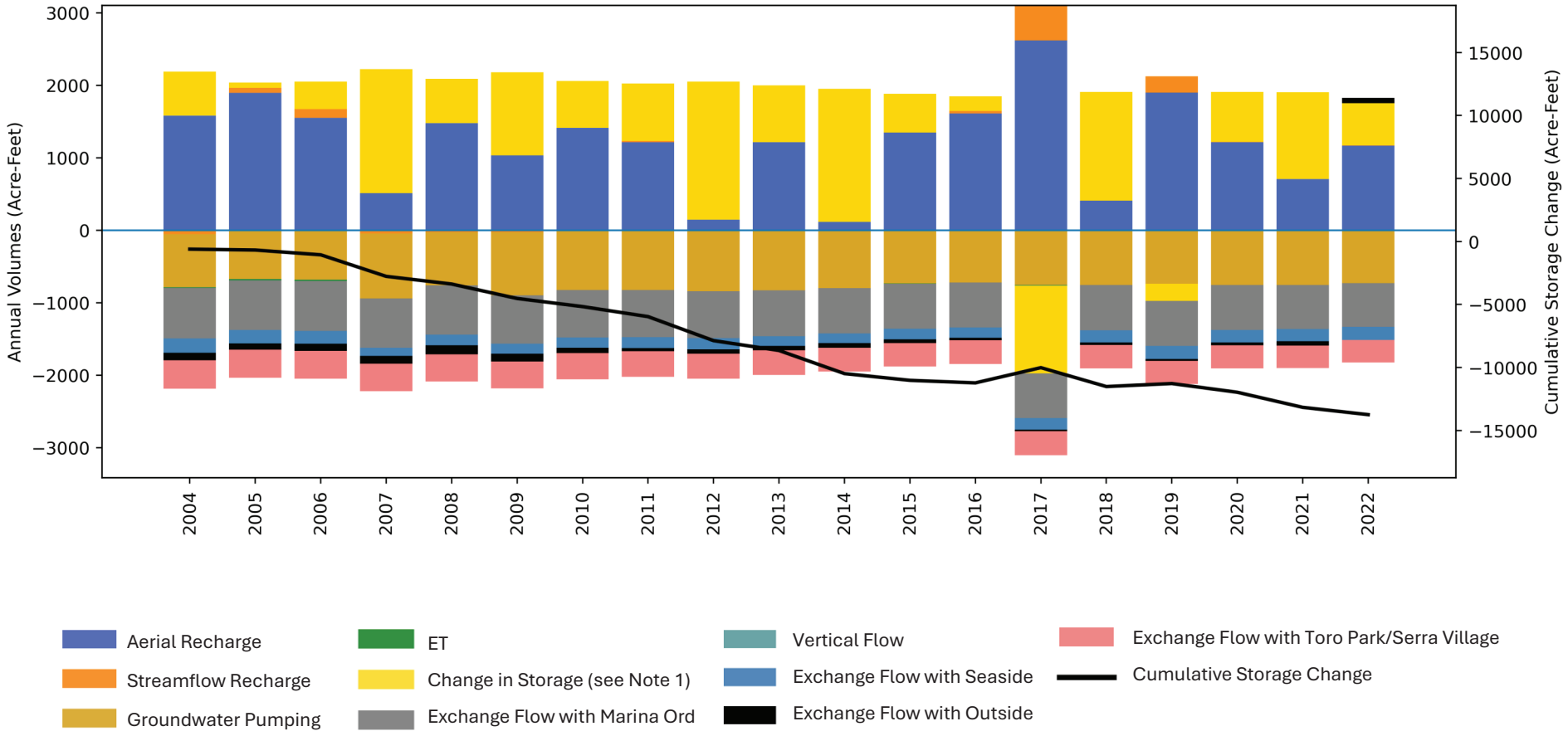
The Marina-Ord Area WBZ and Monterey Subbasin share the same boundary with the Pacific Ocean. Therefore, the recent change in groundwater storage due to seawater intrusion results described in Section 6.4.1.2.1 directly apply to the Marina-Ord Area WBZ. As shown in Table 6-2, Marina-Ord Area WBZ has a recent net loss in storage due to seawater intrusion of -292 AFY to -585 AFY over the current water budget period, depending on porosity assumptions.

6.4.3 The Corral de Tierra / San Benancio WBZ

Figure 6-9 presents an annual summary of inflows to and outflows from the groundwater system within the Corral de Tierra / San Benancio WBZ by water source type throughout the combined historical and current water budget period (WY 2004 – 2022). Annual average inflow and outflow components for both the historical water budget period (WY 2004 – 2018) and the current water budget period (WY 2018 – 2022) are summarized in Table 6-3.

Similar to the basin-wide budget, water budget components included in the Corral de Tierra / San Benancio WBZ include: recharge, well pumping, net inter-basin flow, and net river exchange[21]. In addition, the Corral de Tierra / San Benancio WBZ includes estimated net intra-basin flows to the Marina-Ord Area WBZ and the Toro Park / Serra Village WBZ. Further description regarding the modeling of each of these water budget components is described Section 6.2 and provided in Appendix 6-A.

[21] Stream gauge data was unavailable from El Toro Creek for the historical period, and thus El Toro Creek was not directly simulated in the model. The net river exchange values are based on the estimated Salinas River exchange.



Notes:

1. Annual change in groundwater storage values are reflected on the bar charts as the residual of all other groundwater inflow and outflow components; where positive, they indicate a net loss in storage from the basin for that year, and vice versa.

2. Bar charts reflect annual water budgets and cumulative storage change over the combined historical (WY 2004-2018) and current (WY2018-2022) water budget periods.

3. All values expressed in units of acre-feet.

Abbreviations

ET = evapotranspiration

WY = Water Year

Annual Historical and Current Groundwater Budget, Corral de Tierra/San Benancio WBZ

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Figure 6-9

Table 6-3 Average Annual Historical and Current Groundwater Water Budget Results, Corral de Tierra/San Benancio WBZ

Water Budget Components	Net Annual Groundwater Flows (AFY) (b)	
	Historical Period WY 2004 - 2018	Current Period WY 2018 - 2022
Recharge		
● Aerial Recharge	1,208	1,079
● Streamflow Recharge	37	46
	1,245	**1,125**
Well Pumping		
● Well Pumping	-777	-746
	-777	**-746**
Net Inter-Basin Flow		
● Ocean	0	0
● Seaside Subbasin	-153	-174
● 180/400 Foot Aquifer Subbasin	0	0
● Outside Basin	-71	-16
	-224	**-190**
Net Intra-Basin Flow		
● Corral de Tierra (Toro Park / Serra Village WBZ) (a)	-355	-318
● Marina Ord WBZ (c)	-653	-616
	-1,008	**-934**
Groundwater Evapotranspiration Uptake		
● Groundwater ET Uptake	-4	-1
	-4	**-1**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO GROUNDWATER ELEVATIONS (GWE)	**-767**	**-746**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO SEAWATER INTRUSION (SWI)	*0*	*0*

Notes:

(a) Corral de Tierra (CDT) Management Area is subdivided into Corral de Tierra / Sen Benancio and Toro Park / Serra Village water budget zones (WBZ).
(b) Positive values indicate a net inflow and negative values indicate a net outflow.
(c) The Marina-Ord Area WBZ includes inflows to and outflows from the portion of Corral de Tierra that is north of Reservation Rd.

6.4.3.1 Historical Water Budget

6.4.3.1.1 Aerial Recharge

Estimated aerial average annual recharge to the Corral de Tierra / San Benancio WBZ during the historical period was 1,208 AFY. This recharge was estimated utilizing the SVIHM utilizing the SVIHM which uses the MODFLOW One Water Hydrologic Model (OWHM) Farm Process (FMP) to simulate a landscape water budget. Outputs from the SVIHM are detailed by subbasin in the SVIHM documentation included in Appendix 6-A.

6.4.3.1.2 Well Pumping

Estimated average annual well pumping in the Corral de Tierra / San Benancio WBZ during the historical period was 777 AFY. The well pumping values are negative in Table 6-3 and represent an outflow from the Corral de Tierra / San Benancio WBZ. It is important to note this area is characterized by many domestic wells and small water systems, which have different reporting requirements. Pumping that was not reported to MCWRA or SWRCB, or estimated by the Seaside Watermaster, was estimated based on the number of parcels.

6.4.3.1.3 Net Inter-Basin and Intra-Basin Flows

Figure 6-7 depicts the general direction of groundwater cross-boundary flows to and from the Corral de Tierra / San Benancio WBZ. The estimated magnitude of each of these inter- and intra-basin cross boundary flows are itemized in Table 6-3 and described below. These flows represent the net flow in all aquifer layers.

Estimated net annual inter-basin flows averaged -244 AFY across the Corral de Tierra / San Benancio WBZ over the historical period, or which 153 AFY flowed into the Seaside Subbasin and 71 AFY to outside the mapped DWR Bulletin-118 groundwater basin. Negative values indicate these are net outflows from the WBZ.

Estimated net annual intra-basin flows averaged -1,008 AFY across the Corral de Tierra / San Benancio WBZ over the historical period. Intra-basin flow components include a net outflow of -653 AFY to the Marina-Ord WBZ and a net outflow of -355 to the Toro Park / Serra Village WBZ. As shown on Figure 6-7, groundwater gradients typically flow from the higher-elevation areas of the Corral de Tierra / San Benancio WBZ into the Toro Park / Serra Village WBZ through the El Toro Creek Canyon and towards the Laguna Seca area of the Seaside Subbasin.

6.4.3.1.4 Groundwater-Surface Water Interactions and Evapotranspiration Uptake

SWIM v4 simulations indicate very limited groundwater-surface water interactions and groundwater ET uptake occurs within the Corral de Tierra / San Benancio WBZ, with total net streamflow recharge rates and associated groundwater ET uptake rates within the El Toro Creek bed averaging 38 AFY and 4 AFY, respectively, over the historical water budget period.

6.4.3.1.5 Net Annual Change in Groundwater Storage due to Groundwater Elevations

Similar to basin-wide water budget results, groundwater recharge (1,245 AFY) exceeded pumping in the Corral de Tierra / San Benancio WBZ (777 AFY) during the historical period, yet the SWIM v4 results project a net groundwater storage decline of approximately -767 AFY due to pumping and resulting groundwater level declines over the historical period.

It is important to note that aerial and streamflow recharge is not immediately available to the locations and depths of the principal aquifer that are experiencing the most pumping within the El Toro Primary Aquifer System, and that recharge and pumping are also not always occurring within the same time periods. For example, the net estimated annual change in groundwater storage in the Corral de Tierra / San Benancio Area WBZ (-767) AFY is nearly the same amount of groundwater pumping during this period, indicating almost no recharge is available to meet pumping demands within the area. Additionally, net inter-basin and intra-basin outflows from the Corral de Tierra / San Benancio WBZ (-1,232 AFY) were very significant and nearly equal to the area's groundwater recharge (1,245 AFY) over the historical period. These results demonstrate the relationship and interdependence between change in groundwater storage trends within the Corral de Tierra / San Benancio WBZ and cross-boundary outflows to the neighboring Seaside Subbasin, Marina-Ord Area WBZ, and Toro Park / Serra Villa WBZ, and illustrate the ongoing need for coordinated sustainable groundwater management in all of these areas.

6.4.3.1.6 Net Annual Change in Groundwater Storage due to Seawater Intrusion

The Corral de Tiera / San Benancio WBZ is entirely outside the mapped SWI extent within the Basin, and therefore no changes in groundwater storage due to seawater intrusion were observed within the historical water budget period.

6.4.3.2 Current Water Budget

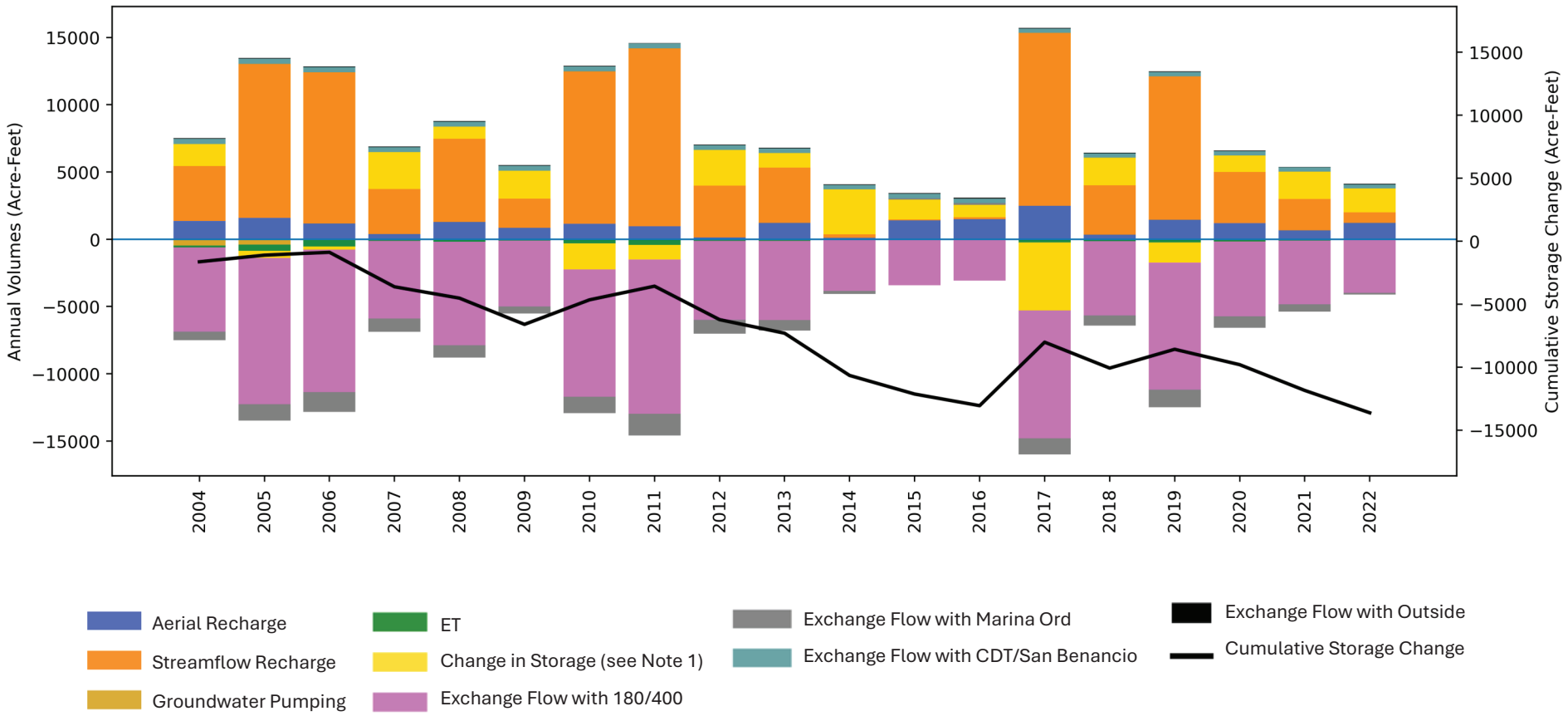
Annual average inflow and outflow components for the current water budget period (WY 2018 – 2022) are summarized in Table 6-3. Although the current water budget includes both dry and wet years, average precipitation during this period (13.56 in/yr) was lower than the historical period (15.51 in/yr). Accordingly, aerial recharge was comparatively lower (1,079 AFY) and reductions in groundwater storage due to water level declines within the Corra de Tierra / San Benancio WBZ were slightly less (-746 AFY) because of slightly reduced groundwater pumping (746 AFY) and decreased inter-basin and intra-basin outflows (1,124 AFY).

6.4.4 Toro Park / Serra Village WBZ

Figure 6-10 presents an annual summary of inflows to and outflows from the groundwater system within the Toro Park / Serra Village WBZ by water source type throughout the combined historical and current water budget period (WY 2004 – 2022). Annual average inflow and outflow components for both the historical water budget period (WY 2004 – 2018) and the current water budget period (WY 2018 – 2022) are summarized in Table 6-4.

Similar to the basin-wide budget, water budget components included in the Toro Park / Serra Village WBZ include: recharge, well pumping, net inter-basin flow, and net river exchange[22]. In addition, the Toro Park / Serra Village WBZ includes estimated net intra-basin flows to and from the Marina-Ord Area WBZ and the Corral de Tierra / San Benancio WBZ. Further description regarding the modeling of each of these water budget components is described Section 6.2 and provided in Appendix 6-A.

[22] Stream gauge data was unavailable from El Toro Creek for the historical period, and thus El Toro Creek was not directly simulated in the model. The net river exchange values are based on the estimated Salinas River exchange.



Notes:

1. Annual change in groundwater storage values are reflected on the bar charts as the residual of all other groundwater inflow and outflow components; where positive, they indicate a net loss in storage from the basin for that year, and vice versa.

2. Bar charts reflect annual water budgets and cumulative storage change over the combined historical (WY 2004-2018) and current (WY2018-2022) water budget periods.

3. All values expressed in units of acre-feet.

Abbreviations

ET = evapotranspiration

WY = Water Year

Annual Historical and Current Groundwater Budget, Toro Park/Serra Village WBZ

Monterey Subbasin
Groundwater Sustainability Plan
September 2026
B60094.30

eki environment & water

Figure 6-10

Table 6-4 Average Annual Historical and Current Groundwater Water Budget Results, Toro Park/Serra Village WBZ

Water Budget Components	Net Annual Groundwater Flows (AFY) (b)	
	Historical Period WY 2004 - 2018	Current Period WY 2018 - 2022
Recharge		
● Aerial Recharge	1,062	974
● Streamflow Recharge (c)	5,862	4,247
	6,924	**5,221**
Well Pumping		
● Well Pumping	-72	-25
	-72	**-25**
Net Inter-Basin Flow		
● Ocean	0	0
● Seaside Subbasin	0	0
● 180/400 Foot Aquifer Subbasin (c)	-6,931	-5,838
● Outside Basin	44	38
	-6,887	**-5,800**
Net Intra-Basin Flow		
● Corral de Tierra / San Benancio WBZ (a)	355	318
● Marina Ord WBZ (d)	-831	-723
	-476	**-405**
Groundwater Evapotranspiration Uptake		
● Groundwater ET Uptake	-184	-113
	-184	**-113**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO GROUNDWATER ELEVATIONS (GWE)	**-672**	**-1,121**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO SEAWATER INTRUSION (SWI)	*0*	*0*

Notes:

(a) Corral de Tierra (CDT) Management Area is subdivided into Corral de Tierra / San Benancio WBZ and Toro Park / Serra Village WBZ.
(b) Positive values indicate a net inflow and negative values indicate a net outflow.
(c) SWIM v4 estimates of Salinas River flows into and out of the Monterey Subbasin are uncertain due to lack of streamflow gaging data within the Subbasin and will directly influence corresponding estimates of cross-boundary outflows to the 180/400-Foot Aquifer Subbasin.
(d) The Marina-Ord Area WBZ includes inflows to and outflows from the portion of Corral de Tierra that is north of Reservation Rd.

6.4.4.1 Historical Water Budget

6.4.4.1.1 Aerial Recharge

Estimated average annual recharge to the Toro Park / Serra Village WBZ during the historical period was 1,062 AFY. This recharge was estimated utilizing the SVIHM and incorporates land surface system processes. Outputs from the SVIHM are detailed by subbasin in the SVIHM documentation included in Appendix 6-A.

6.4.4.1.2 Well Pumping

Estimated average annual well pumping in the Toro Park / Serra Village WBZ during the historical period was 72 AFY. The well pumping values are negative in Table 6-4 and represent an outflow from the Toro Park / Serra Village WBZ.

6.4.4.1.3 Net Inter-Basin and Intra-Basin Flows

Figure 6-7 depicts the general direction of groundwater cross-boundary flows to and from the Toro Park / Serra Village WBZ. The estimated magnitude of each of these inter- and intra- basin cross boundary flows are itemized in Table 6-4 and described below.

Estimated net annual freshwater inter-basin outflows averaged -6,887 AFY across the Toro Park / Serra Village WBZ over the historical period, with all inter-basin outflows going into the 180/400-Foot Aquifer Subbasin.

Estimated net annual intra-basin outflows averaged -476 AFY across the Toro Park / Serra Village WBZ over the historical period. Intra-basin flow components include a net outflow of -831 AFY to the Marina-Ord WBZ and a net inflow of +355 AFY from the Corral de Tierra / San Benancio WBZ. As shown on Figure 6-7, groundwater gradients typically flow from the higher-elevation areas of the Corral de Tierra / San Benancio WBZ into the Toro Park / Serra Village WBZ through the El Toro Creek Canyon before continuing onward as an intra-basin or inter-basin outflow.

6.4.4.1.4 Groundwater-Surface Water Interactions and Evapotranspiration Uptake

Groundwater-surface water interactions simulated by the SWIM v4 resulted in a net estimated streamflow recharge (i.e., inflow) to the Toro Park / Serra Village WBZ of 5,862 AFY over the historical period. A large majority of streamflow recharge occurs along the Salinas River, which intersects the Subbasin in a small portion at the northern edge of the Toro Park / Serra Village WBZ. It is important to note that SWIM v4 estimates of Salinas River inflows are uncertain due to a lack of streamflow gaging data within the Subbasin and will directly influence corresponding estimates of cross-boundary outflows to the 180/400-Foot Aquifer Subbasin as nearly all streamflow recharge from the Salinas River in the Monterey Subbasin immediately flowing northward back into the 180/400-Foot Aquifer Subbasin as subsurface outflow.

Groundwater ET uptake rates within the Toro Park / Serra Village WBZ averaged approximately 184 AFY over the historical water budget period and predominantly occurred in cells immediately adjacent to the Salinas River.

6.4.4.1.5 Net Annual Change in Groundwater Storage due to Groundwater Elevations

During the historical period, groundwater recharge (6,887 AFY) far exceeded pumping in the Toro Park / Serra Village WBZ (72 AFY), yet the SWIM v4 results simulates a net groundwater storage decline of approximately -672 AFY due to groundwater level declines over the historical period.

Net inter-basin and intra-basin outflows from the Toro Park / Serra Village WBZ (-7,363 AFY) were very significant, with the majority of cross-boundary outflows occurring along the 180/400-Foot Aquifer Subbasin Boundary underlying the Salinas River. These outflows to the 180/400-Foot Subbasin (-6,931 AFY) are equal to the estimated groundwater recharge from precipitation and inflows from the Salinas River (-6,924 AFY), indicating that recharge from the Salinas River in the Toro Park / Serra Village WBZ mainly flows into the 180/400 Subbasin. These results demonstrate the relationship and interdependence between changes in groundwater storage within the Toro Park / Serra Village WBZ and cross-boundary outflows to the neighboring 180/400-Foot Aquifer Subbasin and further illustrate the ongoing need for coordinated sustainable groundwater management across these subbasins.

6.4.4.1.6 Net Annual Change in Groundwater Storage due to Seawater Intrusion

The Toro Park / Serra Village WBZ is entirely outside the mapped SWI extent within the Basin, and therefore no changes in groundwater storage due to seawater intrusion were observed within the historical water budget period.

6.4.4.2 Current Water Budget

Annual average inflow and outflow components for the current water budget period (WY 2018 – 2022) are summarized in Table 6-4. Although the current water budget includes both dry and wet years, average precipitation during this period (13.56 in/yr) was lower than the historical period (15.51 in/yr). Accordingly, aerial recharge (974 AFY) and streamflow recharge (4,247 AFY) were comparatively lower, resulting in a reduction to groundwater storage of -1,121 AFY within the Toro Park / Serra Village WBZ over the current period.

6.5 Projected Water Budget

Per 23-CCR §354.18(e)(2), projected water budgets are required as a way to estimate future conditions of water supply and demand within a basin, as well as the aquifer response to implementation of the Plan over the planning and implementation horizon. To develop the projected water budget, the same tools and methodologies that were used for the historical and current water budget were used, with updated inputs for climate variables (i.e., precipitation and ET), land use (water demand), and future Subbasin boundary conditions.

This section presents groundwater budget results from the calibrated SWIM v4 over the 50-year projected water budget period under baseline and climate-modified hydrologic conditions and for a potential range of future water level conditions within the neighboring 180/400-Subbasin. Data sources and methodologies used to develop the projected baseline water budget are detailed in Section 6.5.1. A description of the unique hydrologic and boundary condition assumptions used for each of the modified projected water budget scenarios is provided in

Section 6.5.2. Consistent with the historical and current water budgets, projected water budget results are presented in Section 6.5.3. for the entire Monterey Subbasin and for each of the three unique WBZ delineated for the Basin (see Figure 6-2).

Given that historical water budget results indicate that conditions in the Monterey Subbasin are highly sensitive to conditions in adjacent subbasins, projected water budget results are presented for baseline boundary conditions and two sets of alternative boundary conditions in the 180/400 Subbasin. SGMA requires that the 180/400 Subbasin be sustainably managed by 2040. As such, the alternative boundary condition scenarios are predicated on the assumption that the 180/400 Subbasin will be managed so that groundwater levels will, at a minimum, approach water level minimum thresholds (MTs) by 2040 and during the remaining 32-year portion of 50-year projected model period (i.e., 2040 through 2072).

The chief purpose of this projected water budget analysis is to assess the magnitude of the net water supply deficit that would need to be addressed through PMAs to prevent undesirable results (discussed further in Chapters 8 and 9) and achieve the Sustainability Goal. This section describes the development and results of the projected water budget for the entire subbasin and by water budget zones.

6.5.1 Projected Baseline Scenario and Data Sources

The Baseline Scenario predicts future groundwater levels and seawater intrusion within the northern Salinas Valley before implementation of PMAs and with no changes to the current land use, reservoir operation rules, and climate conditions. The assumptions and approaches for simulating boundary conditions in the Baseline Scenario with SWIM v4 are summarized in Table 6-5 below and detailed in Appendix 6-A.

As discussed in Section 6.3.3, the 50-year period is simulated using a repeated 25-year representative climate sequence that reflects the Subbasin's long-term average hydrologic conditions.

Within the Marina-Ord Area, projected water demand and land use are based on projected urban development within MCWD's future service area through 2040. MCWD projected urban pumping is based on information provided in Table 4.10 of MCWD's 2020 UWMP (Schaff & Wheeler, 2021), which projects potable water demand within the MCWD service area to increase from 3,367 AFY in 2020 to 8,984 AFY by 2040[23]. For the purposes of these projected water budgets, it has been assumed that potable water demands for the entire MCWD future service area would be supplied by pumping from existing MCWD wells in the Marina-Ord Area. This groundwater pumping has been divided roughly evenly between the 180/400-Foot Aquifer and Deep Aquifers based on the pumping distributions inferred from MCWD's historical operations[24].

[23] An additional 600 AFY of non-potable demand are anticipated to be met by recycled water. A total demand of 9,584 AFY is anticipated by 2040.

[24] Based on historical operations, 44% of MCWD's groundwater pumping is projected to be produced from 180/400-Foot Aquifer production wells and 56% from Deep Aquifer production wells.

Projected basin-wide land use was adjusted from historical land use to reflect projected development within MCWD's projected future service area. Land use information was obtained from MCWD's 2020 Water Master Plan, consistent with local land use plans and approved development.

Within the Corral de Tierra Area, agricultural pumping was estimated based on land use and climate by the Salinas Valley Operational Model (SVOM) v1, water system pumping was specified at the 2020-2023 average, and domestic pumping was held constant at 2022 rates.

Table 6-5 Summary of Projected Baseline Scenario Boundary Conditions Approach

Assumption or Model Boundary Condition	Approach
Initial Conditions	Extracted from the final historical SWIM stress period
Land Use	Assumed to be the same as in the final year of the SVIHM
Groundwater Pumping	Extracted from SVOM simulated pumping rates at individual agricultural wells; municipal pumping based on estimated population growth
Groundwater Recharge	Extracted from SVOM groundwater recharge rates, averaged by Water Balance Subregion
Riparian Evapotranspiration (ET)	Average by month historical model potential ET rates from WY 2022
Ocean Boundary	Based on published estimates of projected sea level rise
Pajaro Valley Boundary	Continuation of historical, simulated SVIHM WY 2022 values
Southeastern Boundary	Extracted from SVOM simulated groundwater heads at model boundary, averaged by reach
Surface Water Flow	Salinas Valley Watershed Model (SVWM) stream inflows matching 25-year historical sequence. Salinas River at Chualar inflows from SVOM corrected for SVIHM/SVOM bias; Salinas River Diversion Facility diversions from SVOM

The Baseline Scenario does not incorporate the potential benefits of any new PMAs within the Subbasin. However, it does assume that benefits from the following ongoing PMAs will continue into the future:

- *MCWD Demand Management Measures* within the Marina-Ord Area (Section , project M1); and
- *Stormwater Recharge Management* within the Marina-Ord Area (Section , project M2).

Further description of the anticipated benefits of these projects is included in Chapter 9.

6.5.2 Projected Water Budget Scenarios

Per 23-CCR §354.18(e)(2), projected water budgets are required as a way to estimate future conditions of water supply and demand within a basin, as well as the aquifer response to implementation of the Plan over the planning and implementation horizon. To develop the projected water budget, the same tools and methodologies that were used for the historical and

current water budget were used, with updated inputs for climate variables (i.e., precipitation and ET) and future Subbasin boundary conditions. Given that historical water budget results indicate that conditions in the Monterey Subbasin are highly sensitive to conditions in adjacent subbasins, projected water budget results are presented for three alternative sets of boundary conditions in the 180/400-Foot Aquifer Subbasin. These boundary conditions include:

- Baseline Boundary Conditions;
- Near-Minimum Threshold Coastal (Near-MTC) Boundary Conditions; and
- Near-Minimum Threshold (Near-MT) Boundary Conditions.

The Baseline Boundary Condition assumes that groundwater conditions in the northern Salinas Valley are consistent with the Baseline Scenario described in Section 6.5.1 above. This scenario predicts future groundwater levels and seawater intrusion in the northern Salinas Valley without PMAs and with no changes to current land use, reservoir operation rules, or climate conditions. Under these baseline conditions, groundwater modeling presented in the 180/400 GSP Amendment 2 predicts that groundwater levels would continue to decline and groundwater level MTs would not be achieved in the majority of wells within the 180/400 Subbasin. Therefore, the Baseline Boundary Conditions are inconsistent with SMCs established in the 180/400 GSP and subsequent amendments. As such, projected water budget results are also presented for two alternative sets of boundary conditions in the 180/400 Subbasin, which have been identified as "Near-MTC Boundary Conditions" and "Near-MT Boundary Conditions."

The Near-MTC Boundary Conditions simulate conditions in the Monterey Subbasin if groundwater levels in the 180- and 400-Foot Aquifers approach MTs in the coastal portion of the 180/400 Subbasin by 2040. The impacts of this boundary condition are specifically assessed relative to the Marina Ord Area WBZ.

The Near-MT Boundary Conditions simulate conditions in the Monterey Subbasin if water levels in the 180- and 400-Foot Aquifer approach MTs in the majority of the 180/400 Subbasin by 2040.

These alternative boundary conditions are predicated on the assumption that the 180/400 Subbasin will be managed so that groundwater levels will, at a minimum, approach MTs by 2040 and during the remaining portion of the 50-year projected model period (i.e., 2040 through 2072). The adjustments to groundwater extraction under the Near-MTC and Near-MT Boundary Condition scenarios are analytical assumptions used to evaluate the sensitivity of the Monterey Subbasin groundwater budget to conditions in adjacent subbasins. They do not prescribe the specific projects or management actions that will be implemented in the 180/400 Subbasin or other Subbasins. Rather, the scenarios establish a range of groundwater level conditions that may result from regional sustainable management implementation efforts.

Modeling conducted by SVBGSA for the 180/400 Subbasin indicates that meeting water-level MTs in the 180/400 Subbasin will not be sufficient to meet seawater-intrusion MTs in this subbasin or avoid undesirable results, and that addressing seawater intrusion would require additional PMAs, as discussed in Chapter 9. Therefore, the projected water budgets for the Monterey Subbasin simulated under Near-MTC and Near-MT boundary conditions are assumed

conservative for evaluating the Monterey Subbasin's sustainable yield, unless these SMCs are modified to facilitate implementation of selected projects or management actions.

6.5.2.1 Variable Climate Conditions

Projected water budget results are presented for two alternative sets of hydrology and climate conditions which have been identified as:

- Baseline (Historical Analog) Climate Scenario: This scenario uses the same hydrologic inputs as the Baseline Scenario described in Section 6.5.1. From a climate perspective, it is reflective of long-term average hydrologic conditions consistent with those observed in the basin over the historical period. However, this scenario does incorporate projected sea level rise.
- 2070 Climate Change Scenario: This scenario estimates the potential effects on the projected water budget of climate change towards the end of the planning and implementation horizon (i.e., 50 years out into the future). It is based on 2070 "central tendency" climate change factors published by DWR. For this scenario, precipitation and ET were both adjusted using the monthly 2070 "central tendency" change factors published by DWR.

6.5.2.2 Variable Subbasin Boundary Conditions

Because groundwater elevations at the Monterey-180/400 Subbasin boundary are simulated model results in SWIM rather than independently controlled inputs, the projected boundary condition scenarios cannot be represented directly by assigning groundwater elevations along the boundary. Instead, the scenarios are developed by altering groundwater extraction in the 180/400 Subbasin and adjacent subbasins relative to the Baseline Scenario. MTs within the 180/400 Subbasin are established based on water levels measured in November/December of every year. This period generally corresponds to the midpoint of seasonal fluctuations in basin water levels, which are primarily driven by agricultural pumping and precipitation. Therefore, it has been assumed that if water levels in an RMS well are at or above MTs more than 50% of the time, water levels are near the established MT. Table 6-6 identifies the percent of 180- and 400-Foot Aquifer RMS wells and Deep Aquifer RMS wells in the 180/400 Subbasin where model-simulated water levels are at or above MTs for each boundary scenario, based on this criterion. It should be noted that an undesirable result occurs in the 180/400 Subbasin if, over the course of any one year, less than 85% of RMS wells in any single aquifer are below their respective MTs. In addition, no one RMS well can be below its MT for two consecutive years.

Table 6-6 Estimated Percentage of RMS Wells where Water Levels are Above MTs after 2040 within the 180/400-Subbasin under Identified Boundary Conditions

Aquifer	Number of Wells	Baseline Boundary Condition		Near-MTC Boundary Condition	Near-MT Boundary Condition	
		Baseline Climate Condition	2070 Climate Condition	2070 Climate Condition	Baseline Climate Condition	2070 Climate Condition
180- and 400-Foot Aquifers	64	17%	3%	8%	100%	20%
Deep Aquifer	18	11%	6%	6%	78%	11%

The boundary condition scenarios described in Section 6.5.3, were evaluated using the following assumptions:

- Baseline Boundary Condition: This scenario includes no changes to the Baseline Scenario input parameters discussed in Section 6.5.1.
- Near-MTC Boundary Condition: This scenario is simulated by uniformly reducing groundwater extraction in the coastal portion of the 180/400 Subbasin. A 25% reduction in groundwater pumping is applied over the Coastal Area of the 180/400 Subbasin identified on Figure 6B-1 in Appendix 6-B during the projected period.

  This scenario increases water levels in the Coastal Area of the 180/400 Subbasin along the Monterey-180/400 Subbasin boundary, particularly along the boundary between the Marina Ord WBZ and the 180/400 Subbasin. As shown in Table 6-6, under this boundary condition, SWIM v4 results indicate that[25]:

  - Under baseline climate conditions, water levels in [results pending] % of 180-Foot and 400-Foot Aquifer RMS wells of the 180/400 Basin are at or above MTs between WY 2040 and 2072.
  - Under 2070 climate conditions, water levels in only 8% of 180-Foot and 400 Foot Aquifer RMS wells in the 180/400 Basin are at or above MTs between WY 2040 and 2072.

  Although SWIM v4 results indicate that a small percentage of 180-Foot and 400-Foot RMS wells will be at or above MTs under 2070 climate change scenarios (see Table 6-6), the water budget results show a marked impact on the Marina-Ord WBZ (Section 6.6.1). As

[25] MTs within the 180/400 Subbasin and Monterey Subbasin are established based on groundwater elevation measured in November/December of every year. This period generally corresponds to the midpoint of seasonal fluctuations in basin water levels, which are primarily driven by groundwater pumping in the larger Salinas Valley and precipitation. Therefore, it has been assumed that if groundwater elevation in an RMS well are at or above MTs more than 50% of the modeled monthly time-steps, water levels are at or above the established MT evaluated in November/December of every year.

such, discussions related to this scenario generally focus on water budget results within the Marina-Ord WBZ of the Monterey Subbasin. The adjustments in groundwater extraction applied under the Near-MTC Boundary Condition scenario are insufficient to bring water levels anywhere near MTs across the larger 180/400 Subbasin or in the Deep Aquifers.

- Near-MT Boundary Condition Scenario: This scenario is simulated by reducing groundwater extraction within the SWIM v4 domain by 36% in the 180/400 Subbasin and 25% in Eastside Subbasin during the projected period. The portions of these Subbasins that are within the SWIM v4 domain are shown on Figure 6-3. The applied reductions in groundwater extraction were informed by the March 2026 technical memorandum on *Modeling Impacts of Demand Management* (Demand Management Modeling TM; M&A, 2026c). The study evaluated demand management by subbasin and shows that such reductions significantly increase groundwater levels in the 180/400 Foot Aquifer. The Demand Management Modeling TM results indicate that under the Baseline Scenario with Baseline Climate Conditions,
    - A 36% reduction in the rate of extraction from agricultural wells in the 180/400 Subbasin will raise and maintain water levels at or above MTs in more than 85% of 180-Foot and 400-Foot Aquifer RMS wells in this subbasin, thereby avoiding undesirable results for this SMC under Baseline Climate Conditions. It will also meet MOs at some RMS.
    - A 25% reduction in the rate of extraction from agricultural wells in the Eastside Subbasin will raise and maintain water levels at or above MTs in more than 85% of the 180-Foot and 400-Foot Aquifer RMS in this Subbasin, thereby avoiding undesirable results for this SMC under Baseline Climate Conditions. It will also meet MOs at some RMS.

  The Near-MT Boundary Condition scenario does not attempt to replicate demand management scenarios presented in the Demand Management Modeling TM, as it
    - Does not reduce extraction in areas outside of the SWIM model domain, which only encompasses a portion of the 180/400 Subbasin and Eastside Subbasin;
    - Uniformly reduces extraction within these subbasin areas over the entire projected modeling period, not just in agricultural wells and after 2030;
    - Does not consider reductions in agricultural return flows that will occur as a result of reductions in agricultural irrigation, particularly in areas outside of the pressure zone area within the 180/400 Subbasin; and
    - Simulates simultaneous reductions in groundwater extraction in the 180/400 Subbasin and Eastside Subbasin, rather than simulating the effects of reducing extraction in each subbasin independently as was done in the Demand Management Modeling TM; and
    - Evaluates Baseline Climate Conditions as well as 2070 Climate Conditions.

As shown in Table 6-6, under this Near-MT Boundary Condition scenario, SWIM v4 results indicate that:

- With Baseline Climate conditions, [results pending] of 180-Foot and 400-Foot Aquifer RMS wells in the simulated portion of the 180/400 Subbasin are at or above MTs between WY 2040 and 2070.
- With 2070 Climate conditions, 20% of 180-Foot and 400-Foot Aquifer RMS wells in the simulated portion of the 180/400 Subbasin are at or above MTs between WY 2040 and 2070.
- Simulated reductions in groundwater extraction in these subbasins do not come close to achieving MTs in Deep Aquifer RMS wells located in the 180/400 Subbasin or in the Monterey Subbasin. These results are consistent with those presented in the Demand Management Modeling TM, which indicate that groundwater extraction would need to be reduced by more than 45% in the Deep Aquifers to achieve MTs under baseline climate conditions. Therefore, further evaluations will need to be conducted to address projected declines in groundwater levels in the Deep Aquifers within the Monterey Subbasin and other Subbasins within the Salinas Valley Basin (see Sections 9.4 and 9.5).

As noted previously, the adjustments to groundwater extraction under the Near-MT and Near-MTC Boundary Condition scenarios are analytical assumptions used to evaluate the sensitivity of the Monterey Subbasin groundwater budget to conditions in adjacent subbasins. They do not prescribe the specific projects or management actions that will be implemented in the 180/400 Subbasin or other Subbasins. Rather, the scenarios establish a range of groundwater level conditions that may result from regional sustainable management implementation efforts.

6.5.3 Projected Water Budget Results and Changes in Water Elevations Relative to SMCs

Consistent with historical and current water budget results, projected water budget results for each boundary condition scenario are assessed for the entire Monterey Subbasin and each WBZ. An overview of projected water budget results for each area is presented on the following tables:

- The entire Monterey Subbasin (Table 6-7);
- The Marina-Ord Area WBZ (Table 6-8);
- The Corral de Tierra/San Benancio WBZ (Table 6-10); and
- The Toro Park/Serra Village WBZ (Table 6-11).

These tables summarize the magnitude of water budget components associated with each projected water budget scenario and the change in storage due to water level declines and additional seawater intrusion. The water budget components include: aerial recharge, streamflow, well pumping, net inter-basin flow, net intra-basin flow[26], and groundwater

[26] Intra-basin flows are only included in WBZ water budget tables as they are not relevant to basin-wide results.

evapotranspiration uptake. Similar to historical and current water budget results, positive values identified in these tables indicate a net inflow to the Subbasin or WBZ and negative values indicate a net outflow from the Subbasin or WBZ.

The summary of projected water budget results focuses on the impacts of the variable boundary and climate conditions. For comparison purposes, these results are presented along with the basin-wide water budget for the historical period (WY 2004-2018). The magnitude of each of the budget components is generally described on a basin-wide basis.

Predicted net annual changes in storage and changes in groundwater levels are also discussed by management area WBZ, as each management area has its own RMS wells andSMC. As part of this analysis, projected water level elevations are compared to water level MTs to provide additional insights regarding the extent to which each scenario will limit undesirable results and bring the WBZ into sustainability. Table 6-9 Identifies the number of RMS wells within identified aquifer groups in the Marina Ord WBZ, where groundwater elevations are predicted to be at or above MTs under each scenario.

Similar to the 180/400 Subbasin, MTs within the Monterey Subbasin are established based on groundwater elevation measured in November/December of every year. This period generally corresponds to the midpoint of seasonal fluctuations in water levels within the Marina Ord WBZ, which are primarily driven by groundwater pumping in the larger Salinas Valley and precipitation. Therefore, it has been assumed that if groundwater elevation in an RMS well in this WBZ are at or above MTs more than 50% of the modeled monthly time-steps, water levels are at or above the established MT evaluated in November/December of every year.

As discussed in Chapter 8, an undesirable result occurs in the Monterey Subbasin if, in a given water year, water levels in less than 80% of RMS wells are above MTs (or more than 20% RMS wells are below MTs) within (a) both the Dune Sand and upper 180 Foot Aquifers, or (b) both the lower 180- and 400-Foot Aquifers, or (c) Deep Aquifers, or (d) the El Toro Primary Aquifer System. Table 6-9 has been developed to assess if water level MTs will generally be achieved in Marina Ord WBZ under the identified scenarios.

6.5.3.1 Projected Basin-Wide Water Budget

The projected basin-wide water budget results are summarized in Table 6-7.

6.5.3.1.1 Projected Aerial Recharge

Under all boundary condition scenarios, the estimated average annual recharge to the Subbasin during the projected 50-year period (projected period) increases from the historical period by approximately 5.6 percent under the Baseline Climate scenario and by approximately 11.4 percent under the 2070 Climate scenario.

6.5.3.1.2 Projected Well Pumping

Estimated average annual well pumping in the Subbasin during the projected period ranges from -9,340 AFY to -9,404 AFY. Projected well pumping exceeds that of the historical period and reflects increased water demand consistent with MCWD's 2020 UWMP (MCWD, 2021). It

includes pumping from MCWD-owned wells and pumping from other water systems and private wells in the Corral de Tierra Area.

6.5.3.1.3 Projected Net Inter-Basin Flows

Baseline Boundary Condition

Similar to historical conditions, under the projected Baseline Boundary Conditions, outflows to the 180/400 Aquifer are significant (over 15,000 AFY) and are close to total estimated basin recharge, which ranges between 17,680 and 18,592 AFY depending on climate conditions. Under Baseline Boundary Conditions, inflows from the Seaside Subbasin increase by approximately 1,000 AFY to 2,000 AFY compared to historical conditions.

Under Baseline Boundary/Baseline Climate conditions, ocean inflows increase to 4,515 AFY, which is 50% greater than net ocean inflows under historical conditions (2,946 AFY). This increase in net ocean inflows leads to increases in seawater intrusion within the Subbasin. Therefore, although losses in storage due to groundwater level declines are less than historical conditions, the loss in storage from additional seawater intrusion more than makes up for this benefit.

Under Baseline Boundary/2070 Climate conditions, increased recharge in coastal areas results in net ocean inflows similar to net historical ocean inflows (i.e., 2,590 AFY), and storage losses from projected groundwater-level declines are similar to those observed during the historical period. Under Baseline/2070 Climate conditions inflows from the Seaside Subbasin also increase relative to baseline climate conditions, likely a result of increased recharge in coastal areas.

Near-MT Boundary Conditions

Under Near-MT Boundary/2070 Climate conditions, groundwater outflows to the 180/400 Subbasin decrease by approximately 5,000 AFY relative to historical conditions. This decrease in outflows results in a net increase in storage due to a retreat in the SWI front and brings the Basin closer to being balanced, where inflows equal outflows.

6.5.3.1.4 Projected Groundwater-Surface Water Interactions

Baseline Boundary Conditions

Under the Baseline Boundary/Baseline Climate Condition scenario, groundwater-surface water interactions simulated by the SWIM v4 resulted in a net estimated streamflow recharge (i.e., inflow) to the subbasin of 5,880 AFY over the projected period, nearly identical to inflows during the historical period (5,899 AFY). For the Baseline Boundary/2070 Climate Condition, streamflow recharge increases to 6,171 AFY, likely a result of increased aerial recharge over the projected period.

However as discussed previously, A large majority of streamflow recharge occurs along the Salinas River, which intersects the Subbasin in a small portion of the Toro Park / Serra Village WBZ of the Corral de Tierra Management Area. It is important to note that SWIM v4 estimates of Salinas River inflows and outflows are highly uncertain due to lack of streamflow gaging data within the Monterey Subbasin and will directly influence corresponding estimates of cross-boundary outflows to the 180/400 Subbasin as nearly all streamflow recharge from the Salinas

River immediately flows northward across the Subbasin boundary. Streamflow recharge estimates will be further evaluated and updated as more information becomes available in future GSP updates.

Near-MT Boundary Conditions

Under Near-MT Boundary/2070 Climate conditions, streamflow recharge is projected to slightly decrease compared to historical and Baseline Boundary conditions.

6.5.3.1.5 Projected Evapotranspiration Uptake

Groundwater ET uptake occurs in minor amounts within the Monterey Subbasin and is generally limited to areas where shallow or perched groundwater conditions exist and where GDEs or riparian vegetative communities are subsequently able to access the groundwater table to meet a portion of their specified ET demands. Subbasin-wide groundwater ET uptake rates averaged less than 228 AFY under all scenarios.

6.5.3.1.6 Projected Net Annual Change in Groundwater Storage due to Groundwater Elevations

Baseline Boundary Conditions

Compared to historical conditions, under Baseline Boundary/Baseline Climate conditions, a decrease in net inter-basin flows resulted in smaller loss in basin-wide groundwater storage due to groundwater elevations (GWE). However, this smaller storage loss due to GWE is more than compensated for by the increase in storage loss caused by increased seawater intrusion, as discussed in the next section.

Under Baseline Boundary/2070 Climate conditions, although aerial recharge increased compared to that of the Baseline Boundary/Baseline Climate conditions, decreases in ocean inflow resulted in an overall larger loss in storage due to declines in GWE.

Near-MT Boundary Conditions

Under Near-MT Boundary/2070 Climate conditions, loss in groundwater storage due to GWE is less than that calculated for the historical period and the Baseline Boundary/2070 Climate scenario.

6.5.3.1.7 Projected Net Annual Change in Groundwater Storage due to Seawater Intrusion

Baseline Boundary Conditions

Significant losses of storage due to seawater intrusion (SWI) are projected under the Baseline Boundary Condition scenarios. The 2070 Climate scenario projects smaller groundwater storage losses due to SWI (−908 to −1,816 AFY) than the Baseline Climate scenario (−3,688 to −7,376 AFY), reflecting greater areal recharge and reduced ocean inflow under 2070 Climate conditions. The range in estimated storage loss for each scenario reflects the use of effective porosity (0.15) versus total porosity (0.3) in the aquifer volume calculation for SWI.

Under both Baseline Boundary Condition scenarios, the combined storage losses associated with groundwater elevation declines (GWE) and seawater intrusion (SWI) are projected to be substantially greater than those estimated under historical conditions.

Near-MT Boundary Conditions

Under Near-MT Boundary conditions/2070 Climate conditions, a net increase in storage associated with SWI is projected to occur. This suggests that under this scenario, further migration of the SWI front will be limited within the Monterey Subbasin. However, a more detailed review of modeling results shows that although the SWI is projected to retreat in the majority of the Subbasin, advancement of the SWI front is still projected to occur in some areas of the Subbasin, particularly near some of MCWD's production wells (see Appendix 6-B). Because seawater intrusion is limited to the Marina-Ord Area, where MCWD is the sole groundwater extractor, these impacts could likely be mitigated by shifting pumping away from MCWD production wells in areas where additional seawater intrusion is projected, thereby avoiding undesirable results.

Under the Near-MT Boundary/2070 Climate Scenario, a loss in storage of approximately 1,700 AFY is still projected to occur because of GWL declines. This storage loss is projected to occur in the Corral de Tierra Area. Further discussion of these results relative to each WBZ is provided below.

Table 6-7 Comparison of Projected Water Budget Results, Monterey Subbasin

50-Yr Net Annual Groundwater Flows (AFY) (a)	Historical	Baseline Boundary Condition		Near-MT Boundary Condition	
	WY 2004 - 2018	Baseline Climate Condition	2070 Climate Condition	Baseline Climate Condition	2070 Climate Condition
Recharge					
● Aerial Recharge	11,152	11,800	12,421	Pending	12,421
● Streamflow Recharge (b)	5,899	5,880	6,171	Pending	5,230
	17,051	**17,680**	**18,592**	**0**	**17,651**
Well Pumping					
● Well Pumping	-5,321	-9,346	-9,404	Pending	-9,341
	-5,321	**-9,346**	**-9,404**	**0**	**-9,341**
Net Inter-Basin Flow					
● Ocean (c)	2,946	4,515	2,590	Pending	500
● Seaside Subbasin	501	1,552	2,502	Pending	1,960
● 180/400 Foot Aquifer Subbasin (b,c)	-17,889	-15,477	-17,987	Pending	-12,535
● Outside Basin	-27	-19	243	Pending	241
	-14,469	**-9,429**	**-12,652**	**0**	**-9,834**
Groundwater Evapotranspiration Uptake					
● Groundwater ET Uptake	-225	-139	-155	Pending	-228
	-225	**-139**	**-155**	**0**	**-228**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO GROUNDWATER ELEVATIONS (GWE)	**-2,939**	**-1,202**	**-3,604**	**Pending**	**-1,736**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO SEAWATER INTRUSION (SWI) (d)	**0**	**-3,688 to -7,376**	**-908 to -1,816**	**Pending**	**509 to 1018**

Notes:

(a) Positive values indicate a net inflow and negative values indicate a net outflow.

(b) SWIM v4 estimates of Salinas River inflows are highly uncertain due to lack of streamflow gaging data within the subbasin, and will directly influence corresponding estimates of cross-boundary outflows to the 180/400-Foot Aquifer Subbasin.

(c) Cross boundary flows to/from ocean and 180/400-Foot Aquifer include both seawater and freshwater. Net seawater inflows to the Monterey Subbasin are reflected in the Change in Groundwater Storage due to Seawater Intrusion term (see Note d).

(d) Change in Groundwater Storage due to Seawater Intrusion is calculated as the annualized total aquifer volume located between the initial and final extent of the 500 mg/L chloride isocontour line over the water budget timeframe based on historical monitoring data (for historical/current water budgets) or estimated by SWIM v4 (for projected water budget). Ranges reflect the use of either effective porosity (0.15) or total porosity (0.3) in the aquifer volume calculation.

6.5.3.2 Projected Marina-Ord WBZ Water Budget Results and Projected Changes in Water Elevations Relative to SMCs

Table 6-8 summarizes projected annual inflows, outflows, and net change in storage within the Marina-Ord Area WBZ under variable climate and boundary conditions. For the Marina-Ord Area WBZ, results for Near-MTC Boundary/2070 Climate conditions are presented in addition to the other scenarios shown for the other WBZs and the whole Subbasin. Table 6-9 also presents the percentage of RMS wells where water levels will meet MTs after year 2040 within this WBZ under each scenario.

Baseline Boundary Conditions

Groundwater storage losses attributable to groundwater elevation declines (GWE) are projected to be lower under the Baseline and 2070 Climate scenarios (526 AFY and 1,143 AFY, respectively) than during the historical period (1,500 AFY). However, substantial storage losses due to seawater intrusion (SWI) are projected under both Baseline Boundary Condition scenarios.

Similar to results for the whole Subbasin, a higher loss in storage due to declines in GWE and a lower loss in storage due to SWI is observed under 2070 Climate conditions compared to Baseline Climate conditions, with 2070 Climate scenario showing a smaller overall loss in storage.

Table 6-9 also shows that under Baseline Boundary conditions water levels will above MTs in

- less than 35% of Dune Sand and upper 180-Foot RMS wells and
- no lower 180-Foot Aquifer, 400-Foot Aquifer or Deep Aquifer wells.

These conditions will cause undesirable results within the Subbasin.

Near-MTC and Near-MT Boundary Conditions

Comparison of the 2070 Climate Condition scenarios under variable boundary conditions indicates that losses in groundwater storage due to both GWE and SWI decrease significantly with both Near-MTC and Near-MT boundary conditions. A net increase in storage due to SWI is observed under Near-MTC Boundary/2070 Climate conditions and a total net increase in storage is observed under Near-MT Boundary/2070 Climate conditions. These results indicate that Near-MTC conditions would generally stop the progression of the SWI front and that the Marina-Ord Area WBZ inflows and outflows would be essentially balanced under Near-MT boundary conditions. As such, these projected water budget results suggest that this management area will not be in overdraft if water levels in the 180-Foot and 400-Foot aquifers approach water level MTs.

However, as discussed in Section 6.5.3.1, a detailed review of modeling results shows that although the SWI front is projected to retreat in the majority of the Subbasin, advancement of the SWI front is still projected to occur in some areas of the Subbasin under this scenario, particularly near some of MCWD's production wells (see Appendix 6-B). Because seawater intrusion is limited to the Marina-Ord Area, where MCWD is the sole groundwater extractor, the resulting impacts could likely be mitigated by shifting pumping away from MCWD production wells in areas of projected additional seawater intrusion, thereby avoiding undesirable results.

Under the Near-MT Boundary/2070 Climate change scenario, modeling results also indicate that water levels in fewer than 80% of lower 180-Foot/400-Foot Aquifer RMS wells will remain above MTs over the projected period. However, few RMS wells exist in these aquifers, and additional 400-Foot Aquifer RMS wells were installed in areas where data gaps exist. These wells were added to the monitoring network in 2026, and water levels from these wells may modify these statistics. In addition, because these aquifers are not projected to experience a net loss in storage due to SWI, these results do not necessarily indicate an undesirable outcome. The MTs for these aquifers were established primarily to prevent further seawater intrusion; therefore, adjustments to the MTs under 2070 climate change conditions may be appropriate if projected water level declines do not result in additional seawater intrusion.

Unfortunately, results presented in Table 6-9, show that water levels will remain below MTs in all Deep Aquifer RMS wells within the Marina Ord WBZ under the Near-MT Boundary Condition/ 2070 Climate scenario. This result is not unexpected because Deep Aquifer RMS wells in the 180/400 Subbasin do not come close to reaching MTs under the Near-MT Boundary/2070 Climate Change scenario (see Table 6-6). Given that approximately half of the projected well pumping in this WBZ occurs from the Deep Aquifers, it is clear that undesirable results cannot be avoided and water level MTs in this aquifer cannot be met without (a) the implementation of projects and/or management actions in adjacent Subbasins which will raise water levels in the Deep Aquifer to water level MTs, and (b) the potential implementation of local projects and/or management actions within the Monterey Subbasin (see Chapter 9).

Table 6-8 Comparison of Projected Water Budget Results, Marina-Ord Area WBZ

50-Yr Net Annual Groundwater Flows (AFY) (b)	Historical	Baseline Boundary Condition		Near-MTC Boundary Condition	Near-MT Boundary Condition	
	WY 2004 - 2018	Baseline Climate Condition	2070 Climate Condition	2070 Climate Condition	Baseline Climate Condition	2070 Climate Condition
Recharge						
• Aerial Recharge	8,882	9,408	9,838	9,838	Pending	9,838
• Streamflow Recharge	0	0	0	0	Pending	0
	8,882	**9,408**	**9,838**	**9,838**	**0**	**9,838**
Well Pumping						
• Well Pumping	-4,472	-8,604	-8,606	-8,561	Pending	-8,542
	-4,472	**-8,604**	**-8,606**	**-8,561**	**0**	**-8,542**
Net Inter-Basin Flow						
• Ocean (c)	2,946	4,515	2,590	1,530	Pending	500
• Seaside Subbasin	654	1,701	2,791	2,570	Pending	2,254
• 180/400 Foot Aquifer Subbasin (c)	-10,959	-8,880	-9,571	-7,720	Pending	-5,815
	-7,359	**-2,664**	**-4,190**	**-3,620**	**0**	**-3,061**
Net Intra-Basin Flow (d)						
• Corral de Tierra (Toro Park / Serra Village WBZ)	831	821	1,055	1,081	Pending	1,280
• Corral de Tierra (CDT / San Benancio WBZ)	653	529	774	765	Pending	750
	1,484	**1,350**	**1,829**	**1,846**	**0**	**2,030**
Groundwater Evapotranspiration Uptake						
• Groundwater ET Uptake	-38	-23	-17	-18	Pending	-21
	-38	**-23**	**-17**	**-18**	**0**	**-21**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO GROUNDWATER ELEVATIONS (GWE)	-1,500	-526	-1,143	-513	**Pending**	247
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO SEAWATER INTRUSION (SWI) (e)	**0**	-3,688 to -7,376	-908 to -1,816	12 to 24	**Pending**	509 to 1018

Notes:

(a) The Marina-Ord Water Budget Zone (WBZ) includes inflows to and outflows from the portion of Corral de Tierra that is north of Reservation Rd.

(b) Positive values indicate a net inflow and negative values indicate a net outflow.

(c) Cross boundary flows to/from ocean and 180/400-Foot Aquifer include both seawater and freshwater. Net seawater inflows to the Basin are reflected in the Change in Groundwater Storage due to Seawater Intrusion term (see Note e).

(d) Corral de Tierra (CDT) Management Area is subdivided into CDT / Sen Benancio and Toro Park / Serra Village WBZ.

(e) Change in Groundwater Storage due to Seawater Intrusion is calculated as the annualized total aquifer volume located between the initial and final extent of the 500 mg/L chloride isocontour line over the water budget timeframe based on historical monitoring data (for historical/current water budgets) or estimated by SWIM v4 (for projected water budget). Ranges reflect the use of either effective porosity (0.15) or total porosity (0.3) in the aquifer volume calculation.

Table 6-9 Estimated Percentage of RMS Wells with Water Levels above MTs after WY 2040 within the Monterey Subbasin

Management Area	Aquifer	Number of Wells	Baseline Boundary Condition		Near-MTC Boundary Condition	Near-MT Boundary Condition	
			Baseline Climate Condition	2070 Climate Condition	2070 Climate Condition	Baseline Climate Condition	2070 Climate Condition
Marina Ord	Dune Sand / Upper 180-Foot	16	25%	31%	81%	81%	88%
	Lower 180-Foot / 400-Foot	7	0%	0%	14%	100%	29%
	Deep Aquifer	9	0%	0%	0%	67%	0%
Corral de Tierra	El Toro Aquifer	11	0%	91%	91%	18%	100%

6.5.3.3 Projected Corral de Tierra / San Benancio WBZ Water Budget Results

Table 6-10 summarizes projected annual inflows and outflows from the Corral de Tierra Area / San Benancio WBZ under variable climate and boundary conditions.

Baseline Boundary Conditions

Under Baseline Boundary/Baseline Climate conditions, the net loss in groundwater storage (-399 AFY) is lower than that calculated for the historical period (-767 AFY) due to lower intra-basin outflows to the Marina-Ord WBZ and Toro Park / Serra Village WBZ. However, estimated groundwater storage losses for the Baseline Boundary/2070 Climate scenario (-1,318 AFY) are greater than for the historical period and the Baseline Boundary/Baseline Climate scenario. The increase in storage loss under 2070 Climate conditions is the result of projected increases in aerial recharge and inter-basin inflows from outside DWR Bulletin-118-defined basins, causing an increase in the groundwater gradient that drives more groundwater flow to the adjacent WBZs.

Near-MT Boundary Conditions

Under Near-MT Boundary/2070 Climate conditions, the net loss in groundwater storage (-1278 AFY) is lower than that calculated for the historical period (-767 AFY) and is similar to that calculated for the Baseline Boundary/2070 Climate scenario. These results indicate that the variable boundary conditions have limited impact on projected groundwater conditions within the Corral de Tierra / San Benancio WBZ.

These results indicate that this WBZ is in overdraft and undesirable results will likely occur within this WBZ during the projected time period if no projects or management actions are undertaken in this management area.

Table 6-10 Comparison of Projected Water Budget Results, Corral de Tierra / San Benancio WBZ

50-Yr Net Annual Groundwater Flows (AFY) (b)	Historical	Baseline Boundary Condition		Near-MT Boundary Condition	
	WY 2004 - 2018	Baseline Climate Condition	2070 Climate Condition	Baseline Climate Condition	2070 Climate Condition
Recharge					
• Aerial Recharge	1,208	1,203	1,300	Pending	1,300
• Streamflow Recharge	37	100	67	Pending	56
	1,245	**1,303**	**1,367**	**0**	**1,356**
Well Pumping					
• Well Pumping	-777	-710	-764	Pending	-764
	-777	**-710**	**-764**	**0**	**-764**
Net Inter-Basin Flow					
• Ocean	0	0	0	Pending	0
• Seaside Subbasin	-153	-149	-289	Pending	-294
• 180/400 Foot Aquifer Subbasin	0	0	0	Pending	0
• Outside Basin	-71	-57	144	Pending	143
	-224	**-206**	**-145**	**0**	**-151**
Net Intra-Basin Flow					
• Corral de Tierra (Toro Park / Serra Village WBZ	-355	-254	-999	Pending	-966
• Marina Ord WBZ (c)	-653	-529	-774	Pending	-750
	-1,008	**-783**	**-1,773**	**0**	**-1,716**
Groundwater Evapotranspiration Uptake					
• Groundwater ET Uptake	-4	-1	-4	Pending	-5
	-4	**-1**	**-4**	**0**	**-5**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO GROUNDWATER ELEVATIONS (GWE)	**-767**	**-399**	**-1,318**	**Pending**	**-1,278**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO SEAWATER INTRUSION (SWI)	**0**	**0**	**0**	**0**	**0**

Notes:

(a) Corral de Tierra (CDT) Management Area is subdivided into CDT / Sen Benancio and Toro Park / Serra Village and water budget zones (WBZ).

(b) Positive values indicate a net inflow and negative values indicate a net outflow.

(c) The Marina-Ord Area WBZ includes inflows to and outflows from the portion of Corral de Tierra that is north of Reservation Rd.

6.5.3.4 Projected Water Budget Results for Toro Park / Serra Village WBZ

Table 6-11 summarizes projected annual inflows and outflows from the Toro Park / Serra Village WBZ under variable climate and boundary conditions.

Baseline Boundary Conditions

Under Baseline Boundary/Baseline Climate conditions, the net loss in groundwater storage (-277 AFY) is lower than that calculated for the historical period (-672 AFY) due to lower intra-basin outflows to the Marina-Ord WBZ and Toro Park / Serra Village WBZ. However, estimated loss in groundwater storage for the Baseline Boundary/2070 Climate scenario (-1,143 AFY) is estimated to be significantly greater compared to that of the historical period and the Baseline Boundary/Baseline Climate scenario. This increase in storage loss under 2070 Climate conditions is the result of projected increases in aerial recharge and inter-basin inflows from the Corral de Tierra / San Benancio WBZ causing an increase in the groundwater gradient that drive more groundwater flow to the 180/400 Subbasin and the Marina-Ord WBZ.

Near-MT Boundary Conditions

Under Near-MT Boundary/2070 Climate conditions, the net loss in groundwater storage (-704 AFY) is similar to that calculated for the historical period (-672 AFY) and lower than that calculated for the Baseline Boundary/2070 Climate scenario (-1,143 AFY). These results indicate that storage losses in the Toro Park/Serra Village WBZ decrease as groundwater levels in the 180/400-Foot Aquifer Subbasin rise and approach their MTs.

However, this WBZ remains in overdraft under the Near MT-Boundary Conditions/2070 Climate Change scenario, and it is reasonable to assume that undesirable results will occur within this WBZ during the projected time period if no projects or management actions are undertaken in this management area.

Table 6-11 Comparison of Projected Water Budget Results, Toro Park / Serra Village WBZ

50-Yr Net Annual Groundwater Flows (AFY) (b)	Historical	Baseline Boundary Condition		Near-MT Boundary Condition	
	WY 2004 - 2018	Baseline Climate Condition	2070 Climate Condition	Baseline Climate Condition	2070 Climate Condition
Recharge					
● Aerial Recharge	1,062	1,190	1,283	Pending	1,283
● Streamflow Recharge (c)	5,862	5,779	6,104	Pending	5,173
	6,924	**6,969**	**7,387**	**0**	**6,456**
Well Pumping					
● Well Pumping	-72	-32	-34	Pending	-34
	-72	**-32**	**-34**	**0**	**-34**
Net Inter-Basin Flow					
● Ocean	0	0	0	Pending	0
● Seaside Subbasin	0	0	0	Pending	0
● 180/400 Foot Aquifer Subbasin (c)	-6,931	-6,597	-8,416	Pending	-6,720
● Outside Basin	44	38	99	Pending	98
	-6,887	**-6,559**	**-8,317**	**0**	**-6,622**
Net Intra-Basin Flow					
● Corral de Tierra (CDT / San Benancio WBZ)	355	254	999	Pending	966
● Marina Ord WBZ (d)	-831	-821	-1,055	Pending	-1,280
	-476	**-567**	**-56**	**0**	**-314**
Groundwater Evapotranspiration Uptake					
● Groundwater ET Uptake	-184	-115	-134	Pending	-203
	-184	**-115**	**-134**	**0**	**-203**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO GROUNDWATER ELEVATIONS (GWE)	**-672**	**-277**	**-1,143**	**Pending**	**-704**
NET ANNUAL CHANGE IN GROUNDWATER STORAGE DUE TO SEAWATER INTRUSION (SWI)	**0**	**0**	**0**	**0**	**0**

Notes:

(a) Corral de Tierra (CDT) Management Area is subdivided into CDT / Sen Benancio and Toro Park / Serra Village and water budget zones (WBZ).

(b) Positive values indicate a net inflow and negative values indicate a net outflow.

(c) SWIM v4 estimates of Salinas River inflows are highly uncertain due to lack of streamflow gaging data within the Basin, and will directly influence corresponding estimates of cross-boundary outflows to the 180/400-Foot Aquifer Subbasin.

(d) The Marina-Ord Area WBZ includes inflows to and outflows from the portion of Corral de Tierra that is north of Reservation Rd.

6.6 Historical, Current, and Projected Overdraft and Sustainable Yield

SGMA defines sustainable yield as "the maximum quantity of water, calculated over a base period representative of long-term conditions in the Subbasin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result" (CWC §10721(w)). DWR's Water Budget BMP (DWR, 2016b) further states that "Water budget accounting information should directly support the estimate of sustainable yield for the Subbasin and include an explanation of how the estimate of sustainable yield will allow the Subbasin to be operated to avoid locally defined undesirable results. The explanation should include a discussion of the relationship or linkage between the estimated sustainable yield for the Subbasin and local determination of the SMC (sustainability goal, undesirable results, minimum thresholds, and measurable objectives)."

A key part of the codified definition and the BMP statement is the avoidance of undesirable results, defined as "significant and unreasonable" effects for any of the six SGMA sustainability indicators. For example, declining levels during a drought do not constitute an Undesirable Result for chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reduction in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods (CWC §10721(x)(1)). Therefore, while the water budget should provide support for sustainable yield, determination of the sustainable yield for the Subbasin ultimately depends upon whether undesirable results are avoided within the timeframes required by SGMA.

The sustainable yield of the Monterey Subbasin is significantly affected by recharge, pumping, and conditions in adjacent subbasins. As such, the sustainable yield established based on historical overdraft has significant uncertainty and does not address all undesirable results. Groundwater conditions in adjacent subbasins are projected to change as these subbasins move toward sustainability. A first-order estimate of the sustainable yield is estimated by subtracting the total estimated change in storage resulting from groundwater declines and increased seawater intrusion. A description of the methods used to calculate changes in storage due to seawater intrusion is included in Section 6.2.2. Since sustainable management criteria were not established historically, the historical sustainable yield does not reflect sustainability as it is defined in this GSP. Projected water budget results have been used to estimate the projected sustainable yield under various boundary conditions. However, it should be recognized that these first-order estimates can be misleading, as the location and rates of extraction dramatically impact the sustainable yield, particularly in a coastal basin, which is subject to seawater intrusion.

Although these first-order sustainable yield estimates provide a basis for evaluating groundwater management needs, they should not be interpreted as fixed pumping limits that will prevent undesirable results. Simply reducing pumping to within the sustainable yield is not proof of sustainability and will not necessarily stop the expansion of seawater intrusion or allow water levels to reach MTs. Achievement of sustainability must ultimately be demonstrated through compliance with the SMCs established for the Subbasin.

The sustainable yield has been evaluated by Management Area (i.e., water budget zone) as conditions vary and independent SMCs have been established for each area.

6.6.1 Marina-Ord Area WBZ

An estimate of the sustainable yield of the groundwater system underlying the Marina-Ord Area WBZ can be made on the basis of the historical and current water budget data presented in Table 6-2 and the projected water budget results presented in Table 6-8.

These first-order estimates have been developed by summing (a) the average annual extraction under the identified scenario, with (b) the average change in storage under that scenario. This calculation leads to the following estimates of

- An estimated historical sustainable yield in the Marina-Ord WBZ of 2,972 AFY;
- An estimated current sustainable yield in the Marina-Ord WBZ of 1,468 AFY to 1,760 AFY.

The current time period covers only a few years and does not reflect long-term groundwater conditions. The historical and current sustainable yield estimates are for information only and do not guide groundwater management activities in this GSP.

Projected sustainable yield estimates for the Marina-Ord WBZ under the projected water budget scenarios are shown in Table 6-12.

Table 6-12 Estimated Projected Sustainable Yield, Marina-Ord WBZ

Projected Sustainable Yield, Marina-Ord Area WBZ (AFY) (a)	Baseline Boundary Conditions	Near-MTC Boundary Conditions	Near-MT Boundary Conditions
Baseline Climate Conditions	702 to 4,390	Not Evaluated	Pending
2070 Climate Change Conditions	5,647 to 6,555	8,060 to 8,072	9,298 to 9,807

Note:

a. The range in sustainable yield estimates for each scenario reflects the assumed effective porosity range (i.e., 0.15 to 3.0) used to calculate the change in storage due to increased seawater intrusion.

These sustainable yield estimates do not represent a fixed pumping limit that would necessarily prevent undesirable results, particularly within the Deep Aquifers [27]. However, these results, along with those in Table 6-8, provide insight into the projected sustainable yield of the Marina-Ord WBZ under Baseline, Near-MT, and Near-MTC Boundary Conditions and confirm that reaching sustainability within the Monterey Subbasin will require coordination with adjacent subbasins.

[27] As with the 180-Foot and 400-Foot Aquifers, avoiding undesirable results and meeting water-level MTs in the Deep Aquifers within the Marina-Ord Area WBZ depends on achieving sustainable conditions in the adjacent 180/400 Subbasin. Further analysis is needed to identify actions that will achieve such sustainable conditions within the Salinas Valley Basin.

6.6.1.1 Baseline Boundary Conditions

As shown in Table 6-8, under Baseline Boundary Conditions and projected extraction rates of approximately 8,600 AFY, groundwater storage declines and seawater intrusion increase over the projected period in the Marina-Ord Area WBZ under both Baseline and 2070 Climate change conditions. The results suggest a projected sustainable yield ranging between 702 AFY to 6,555 AFY for this WBZ (Table 6-12). The large variability in projected sustainable yield reflects uncertainty about additional storage loss resulting from the projected advancement of the seawater intrusion front under Baseline Boundary Conditions.

6.6.1.2 Near-MTC Boundary Conditions

Results presented on Table 6-8 indicate that under Near-MTC Boundary/2070 Climate change conditions, no additional loss in storage will occur as a result of seawater intrusion. These results suggest that projected rates of extraction of 8,600 AFY in this WBZ can generally be met without creating undesirable results for this critical sustainability indicator under these climate conditions. Based on projected storage losses due to groundwater-level declines, the projected sustainable yield under this scenario is 8,048 AFY (Table 6-12). However, similar to Near MT-Boundary conditions, results presented in Table 6-9 show that under this scenario water levels are below MTs in all Deep Aquifer RMS wells and additional projects and management actions will be required to avoid undesirable results in this aquifer. Further, only 14% of the lower 180-Foot and 400-Foot RMS wells reach MTs under this scenario, and expansion of the SWI front occurs in some areas of the Subbasin; therefore, unless these undesirable results can be mitigated by shifting extraction within the Subbasin, undesirable results will also occur in these aquifers. These results highlight the need for substantial attainment of water-level SMCs in the 180/400 Subbasin.

6.6.1.3 Near-MT Boundary Conditions

Results presented on Table 6-8 indicate that under Near-MT Boundary/Baseline Climate conditions, no additional loss in storage will occur as a result of groundwater level declines or seawater intrusion. The results suggest a projected sustainable yield of 9,298 to 9,807 AFY, which exceeds projected rates of extraction (Table 6-12). However, review of projected water levels at RMS wells within the Marina Ord WBZ relative to water level MTs (Table 6-9), shows that water levels are below MTs in all Deep Aquifer RMS wells under this scenario. This result is not unexpected because Deep Aquifer RMS wells in the 180/400 Subbasin do not come close to reaching MTs under the Near-MT Boundary/2070 Climate Change scenario (see Table 6-11). Given that approximately half of the projected well pumping in the Marina-Ord WBZ occurs from the Deep Aquifers, it is clear that undesirable results cannot be avoided and water level MTs in this aquifer cannot be met without (a) the implementation of projects and/or management actions in adjacent Subbasins which will raise water levels in the Deep Aquifer to water level MTs, and (b) the potential implementation of local projects and/or management actions within the Monterey Subbasin (see Chapter 9).

6.6.2 Corral de Tierra / San Benancio WBZ

An estimate of the sustainable yields of the groundwater system underlying the Corral de Tierra / San Benancio WBZ can be made based on the historical and current water budget data presented in Table 6-3 and the projected water budget results presented in Table 6-10.

These first-order estimates have been developed by summing (a) the average annual extraction under the identified scenario, with (b) the average change in storage under that scenario. This calculation leads to the following estimates for the Corral de Tierra / San Benancio WBZ:

- An estimated historical sustainable yield of 10 AFY;
- An estimated current sustainable yield of 0 AFY.

While this is only a rough first-order estimate, these sustainable yield estimates suggest that:

- under historical conditions only 10 AFY could have been extracted from these WBZ with no loss in storage; and
- that no amount of pumping reduction in the WBZ could have brought the area into balance during the current period.

These results indicate that outflows to adjacent subbasins and the Marina-Ord Area WBZ result in an overdraft independent of the WBZ pumping. These historical and current sustainable yield estimates are for information only and do not guide groundwater management activities in this GSP.

Projected sustainable yield estimates for the Corral de Tierra / San Benancio WBZ under four water budget scenarios are shown in Table 6-13.

Table 6-13 Estimated Projected Sustainable Yield, Corral de Tierra/San Benancio WBZ

Projected Sustainable Yield, Corral de Tierra/San Benancio WBZ (AFY) (a)	Baseline Boundary Conditions	Near-MT Boundary Conditions
Baseline Climate Conditions	311	Pending
2070 Climate Change Conditions	-554	-514

While the simplified method described above yields a negative sustainable yield, these results show that no amount of pumping reductions would bring the WBZ out of overdraft as the WBZ conditions are related to the adjacent areas. These 1st-order projected sustainable yield estimates do not represent a fixed pumping limit upon which undesirable results can be assessed. However, these results, along with those in Table 6-11 provide insight into the projected sustainable yield of the Corral de Tierra / San Benancio WBZ under Baseline and MT Boundary Conditions and that the WBZ is likely in, or near overdraft during the projected period.

6.6.2.1 Baseline Boundary Conditions

As shown in Table 6-11 under Baseline Boundary Conditions and projected extraction rates, which range from 710 to 764 AFY, groundwater storage decreases in this WBZ under both

Baseline and 2070 Climate change conditions. As shown in Table 6-13 the estimated sustainable yield under Baseline Climate conditions is 311 AFY and is negative (-554 AFY) under 2070 Climate change conditions. A negative sustainable yield indicates that estimated inter-basin and intra-basin outflows from this WBZ exceed inflows, and no pumping reduction in the WBZ could balance this area without further changing conditions in adjacent areas under this climate scenario.

6.6.2.2 Near-MT Boundary Conditions

The Near-MT Boundary/2070 Climate Change Scenario also results in a negative sustainable yield, indicating that no pumping reduction in the WBZ could balance this area without further changing conditions in adjacent areas.

6.6.3 Toro Park / Serra Village WBZ

An estimate of the sustainable yield of the groundwater system underlying the Toro Park / Serra Village WBZ can be made based on the historical and current water budget data presented in Table 6-4 and the projected water budget results presented in Table 6-11.

These first-order estimates have been developed by summing (a) the average annual extraction under the identified scenario, with (b) the average change in storage under that scenario. This calculation leads to the following estimates for the Toro Park / Serra Village WBZ:

- An estimated historical sustainable yield of -600 AFY;
- An estimated current sustainable yield of -1,096 AFY.

While these are only rough first-order estimates, the negative sustainable yields suggest that no amount of pumping reduction in the WBZ could have historically brought the area into balance. The outflows to adjacent subbasins and the Marina-Ord WBZ result in overdraft independent of the WBZ pumping. Historical and current sustainable yield estimates are for information only and do not guide groundwater management activities in this GSP.

Projected sustainable yield estimates for the Toro Park / Serra Village WBZ under the four water budget scenarios are shown in Table 6-14.

Table 6-14 Estimated Projected Sustainable Yield, Toro Park / Serra Village WBZ

Projected Sustainable Yield, Marina-Ord Area WBZ (AFY) (a)	Baseline Boundary Conditions	Near-MT Boundary Conditions
Baseline Climate Conditions	-245	Pending
2070 Climate Change Conditions	-1,109	-670

These results, along with those in Table 6-11 provide insight into the projected sustainable yield of the Corral de Tierra / San Benancio WBZ under Baseline and MT Boundary Conditions.

6.6.3.1 Baseline Boundary Conditions

As shown in Table 6-11. under Baseline Boundary Conditions and projected extraction rates, which range from 32 AFY to 34 AFY, groundwater storage decreases in this WBZ under both Baseline and 2070 Climate change conditions. As shown in Table 6-14 the estimated sustainable yield values under both Baseline and 2070 Climate conditions are negative. A negative sustainable yield indicates that estimated inter-basin and intra-basin outflows from this WBZ exceed inflows, and no pumping reduction in the WBZ could balance this area without changing conditions in adjacent subbasins and/or WBZs.

6.6.3.2 Near-MT Boundary Conditions

The Near-MT Boundary/2070 Climate Change Scenario also results in a negative sustainable yield, indicating that no pumping reduction in the WBZ could balance this area without further changing conditions in adjacent areas under these climate conditions.

6.7 Water Budget Uncertainty and Limitations

Models are mathematical representations of physical systems. They have limitations in their ability to represent physical systems exactly and in the data inputs they use. There is also inherent uncertainty in groundwater flow modeling because mathematical (or numerical) models can only approximate physical systems and are limited by computational capacity. However, DWR (2018) recognizes that although models are not exact representations of physical systems because mathematical depictions are imperfect, they are powerful tools that can provide useful insights. As mentioned in Section 6.1 and described in detail in Appendix 6-A, SWIM v4 was developed using established scientific practices and principles for groundwater flow simulation, and calibrated using the best available data within the Subbasin and other coastal subbasins within the greater Salinas Valley. Inputs to the models are carefully selected using the best available data, the model's calculations represent established science for groundwater flow, and the model calibration error is within acceptable bounds. Therefore, the models are the best available tools for estimating water budgets and simulating projected groundwater conditions. As demonstrated by the calibration error statistics summarized in Section 6.1 and presented in detail in Appendix 6-A, the SWIM v4 reasonably represents historical groundwater conditions within the Subbasin.

As is the case with any numerical groundwater flow model, the SWIM is subject to uncertainties and data gaps in hydrogeologic conceptualization (e.g., depth and extent of principal aquifer units), model parameterization (e.g., aquifer transmitting and storage properties) and calibration data (i.e., historical water level monitoring data), and simulated stresses (e.g., recharge, pumping, and boundary conditions). Here, "uncertainty" refers to the incomplete understanding of the physical setting, characteristics, and current conditions that significantly affect the calculation of the water budgets presented above. "Data gaps" refer to limitations in the spatial coverage of measured data or periods of time when no data are available. Each of these main

categories of uncertainty and/or data gaps contribute to the overall uncertainty in the water budget outputs from SWIM.

The following list groups water budget components in increasing order of uncertainty.

(a) Measured: metered municipal, agricultural, and some small water system pumping

(b) Estimated: domestic pumping, including depth, rate, and location

(c) Simulated primarily based on climate data: precipitation, evapotranspiration, irrigation pumping

(d) Simulated based on calibrated model: all other water budget components

Simulated components based on calibrated model have the most uncertainty because those simulated results encompass uncertainty of other water budget components used in the model in addition to model calibration error.

As discussed in Chapter 10, MCWDGSA and SVBGSA will continue to address data gaps and collect information in the Monterey Subbasin and adjacent subbasins. As additional data become available, they will be used to refine numerical models during GSP implementation.

7 MONITORING NETWORKS

This chapter describes the monitoring networks within the Monterey Subbasin that will be used to assess SMCs explained further in Chapter 8. This description of monitoring networks has been prepared in accordance with the GSP Regulations §354.32 to include monitoring objectives, monitoring protocols, and data reporting requirements. Since completion of the 2022 GSP, the MCWDGSA and the SVBGSA have constructed new monitoring wells to fill data gaps and made other minor adjustments to the monitoring networks.

In addition to the monitoring networks within the Monterey Subbasin, the GSAs will include data from wells in the adjacent subbasins as part of the monitoring network and will continue their collaboration with agencies in adjacent subbasins. Further information on the wells in the adjacent subbasins can be found in the 180/400 GSP and the Basin Management Action Plan for the Seaside Subbasin.

7.1 Introduction

7.1.1 Monitoring Network Objectives

SGMA requires monitoring networks to collect data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the Subbasin, and to evaluate changing conditions that occur as the Plan is implemented. The monitoring networks are intended to:

- Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds;
- Demonstrate progress toward achieving measurable objectives;
- Monitor impacts to the beneficial uses or users of groundwater; and
- Quantify annual changes in water budget components.

7.1.2 Approach to Monitoring Networks

Monitoring networks are developed for each of the six sustainability indicators that are relevant to the Subbasin:

- Chronic lowering of groundwater levels
- Reduction in groundwater storage
- Seawater intrusion
- Degraded water quality
- Land subsidence
- Depletion of interconnected surface water

Representative Monitoring Sites (RMS) are a subset of the monitoring network and are focused on monitoring changes in groundwater conditions relative to Undesirable Results described further in Chapter 8. These are also limited to sites with data that are publicly available and not confidential.

MCWDGSA and SVBGSA established the density of monitoring sites and the frequency of measurements to demonstrate short-term, seasonal, and long-term trends. If the monitoring site density is determined to be inadequate, MCWDGSA and SVBGSA will continue to expand monitoring networks as needed during GSP implementation. Continued development of more extensive and complete monitoring networks have improved MCWDGSA and SVBGSA's ability to demonstrate sustainability and refine the existing conceptual and numerical hydrogeologic models. MCWDGSA and SVBGSA will review the monitoring network in each five-year assessment. This review will include an evaluation of uncertainty and assess remaining data gaps that could affect the ability of the GSP to achieve the sustainability goal for the Subbasin.

7.1.3 Management Areas

When Management Areas are established, GSP Regulations require that the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the Basin Setting and SMCs specific to that area.

As introduced in Section 1.4, this GSP establishes two Management Areas within the Monterey Subbasin including the Marina-Ord Area and the Corral de Tierra Area. These Management Areas facilitate coordinated GSP implementation by each GSA in their respective area . As such, an adequate number of representative monitoring sites for each sustainability indicator has been identified for each Management Area. In Chapter 8, a basin-wide approach is taken for establishing Undesirable Results. However, where the drivers of Undesirable Results are different between Management Areas, SMCs are developed separately for each Management Area. Therefore, Management Area-specific monitoring networks are identified in this chapter.

7.2 Representative Monitoring Sites

RMS are defined in the GSP Emergency Regulations as a subset of monitoring sites that are representative of conditions in the Subbasin and will be used to establish SMCs. The sections below discuss the existing monitoring sites in the Subbasin as well as the RMS networks for each sustainability indicator. The monitoring networks for chronic lowering of groundwater levels and seawater intrusion will be used as a proxy to monitor the reduction in groundwater storage, as described in Chapter 8.

7.3 Groundwater Elevation Monitoring Network

The sustainability indicator for chronic lowering of groundwater levels is evaluated by monitoring groundwater elevations in designated monitoring wells. The GSP Emergency Regulations require a network of monitoring wells sufficient to demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features.

Management Area-specific groundwater elevation monitoring networks are identified for monitoring of groundwater levels within the Subbasin. The groundwater elevation monitoring network currently comprises over 440 wells monitored by MCWD, U.S. Army, MCWRA, or MPWMD in the Marina-Ord Area; and 15 wells monitored by MCWD or by MCWRA on behalf of SVBGSA in the Corral de Tierra Area. Of these wells that are actively monitored by a local agency, 39 are selected as groundwater elevation RMS wells in the Marina-Ord Area and 15 are selected as groundwater elevation RMS wells in the Corral de Tierra Area. Figure 7-1 through Figure 7-6 show the locations of the groundwater elevation monitoring network and wells selected for the RMS network within the Marina-Ord Area and the Corral de Tierra Area.

The groundwater elevation monitoring network and RMS network for each management area are broken out by principal aquifer. However, as discussed in Chapters 4 and 5, the 180-Foot Aquifer is separated into an "upper" and a "lower" portion by a thin clay layer in the coastal areas of the Marina-Ord Area. In these areas, groundwater elevation and seawater intrusion conditions in the upper 180-Foot Aquifer are distinct from those in the lower 180-Foot Aquifer, while conditions in the lower 180-Foot Aquifer are consistent with those observed in the 400-Foot Aquifer. Therefore, the monitoring network and RMS network are selected to additionally distinguish the upper 180-Foot Aquifer and the lower 180-Foot Aquifer. Known seawater intrusion conditions in the lower 180-Foot and 400-Foot Aquifers are included on Figure 7-7 to demonstrate the selected groundwater elevation and seawater intrusion RMS network.

The RMS wells within each Management Area have been selected to facilitate monitoring of significant and unreasonable groundwater conditions identified in Chapter 8. The groundwater elevation RMS network in the Marina-Ord Area has been coordinated with the seawater intrusion RMS network (Section 7.5). Groundwater elevation data will be utilized in conjunction with salinity data from these wells to monitor the potential expansion of the seawater intrusion front. Criteria for selecting wells as part of the RMS network include:

- RMS wells should facilitate monitoring of groundwater elevations within each principal aquifer;
- RMS wells should cover areas of the Subbasin where beneficial uses of groundwater are occurring (e.g., groundwater extraction, groundwater dependent ecosystems, etc.);
- RMS wells should facilitate monitoring along the existing seawater intrusion front to verify that water levels in these areas are not declining and increasing the risk of seawater intrusion.
- RMS wells that could be included in both the groundwater elevation and seawater intrusion RMS networks are preferred;
- RMS wells should be located on public parcels or on properties where access agreements have been negotiated;
- RMS wells must have known depths and well completion data;

- RMS wells should have relatively long periods of historical data (i.e., greater than 10 years and/or 50 water level measurements) and exhibit high-quality groundwater elevation data; if no other nearby wells exist, wells that do not meet this requirement may be used;
- RMS well hydrographs should be visually representative of the hydrographs from surrounding wells; and
- RMS wells should not be influenced by nearby infiltration, groundwater pumping, or groundwater remediation activities at Fort Ord.

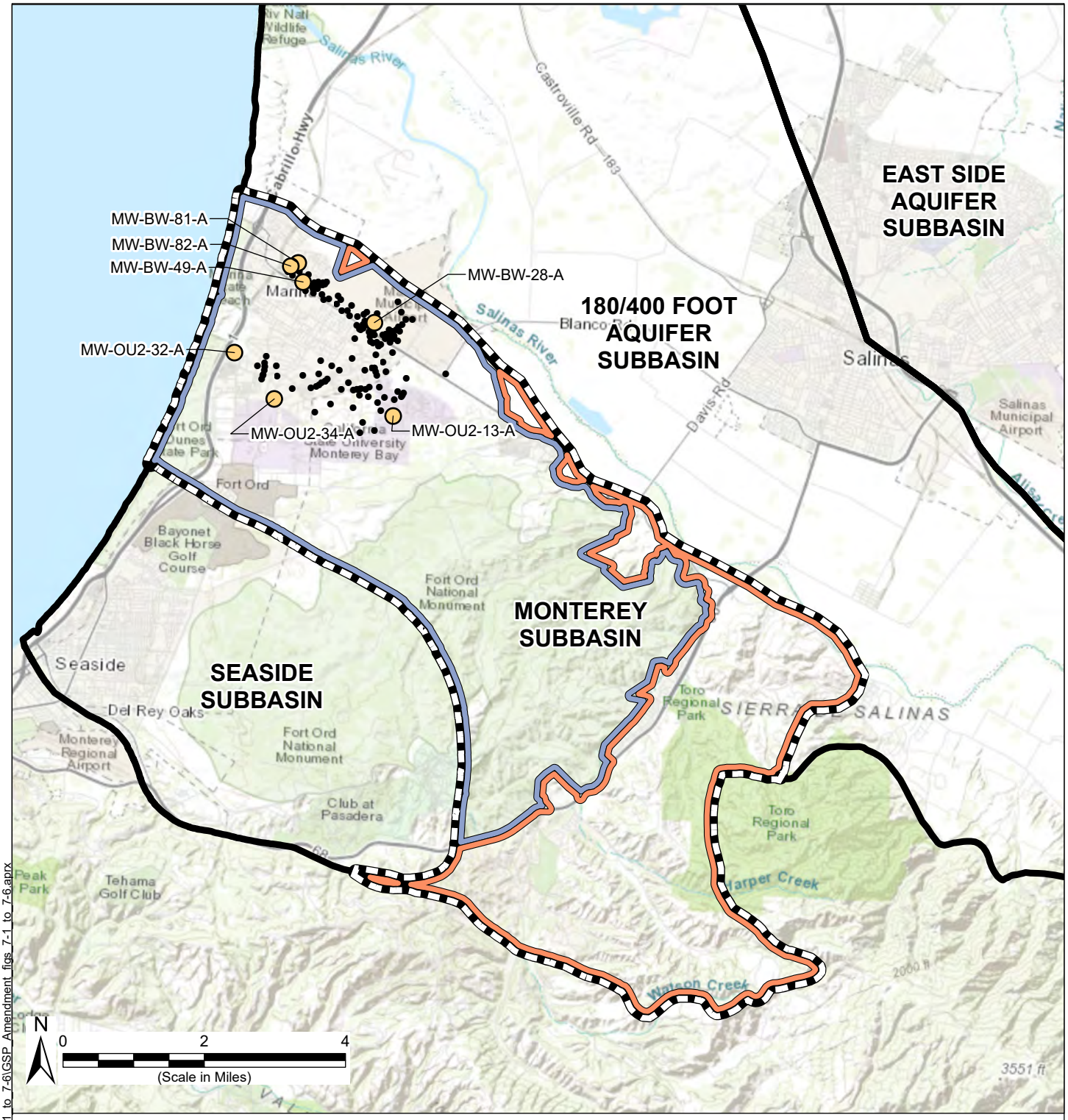
Data from RMS wells will be considered public and will be used for groundwater elevation maps and analyses unless the owner of the RMS well opts out through correspondence with MCWDGSA or SVBGSA.[28]

Visual inspection of the geographic distribution of the monitoring network indicates there are no wells in the southeastern portion of the Marina-Ord Area (i.e., the Fort Ord hills). However, no monitoring of groundwater levels is needed in this area because:

- It is undeveloped and overseen by the BLM and has no current or likely future groundwater use or extraction.
- It is far from the ocean and therefore not subject to seawater intrusion.
- It is part of the federal land area not subject to SGMA.

The RMS wells included in the groundwater level monitoring network are listed by Management Area in Table 7-1. The assessment of data gaps is discussed in Section 7.3.2. Appendix 8-A presents well construction information and historical hydrographs for each RMS well. As discussed in this chapter above, MCWDGSA will include wells in the adjacent subbasins as part of the groundwater level monitoring network and consider their data in groundwater management. However, those wells are not included as RMS wells in the Monterey Subbasin.

[28] If an owner opts out of public data reporting, another well will be identified for RMS monitoring.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Representative Monitoring Sites for Groundwater Elevations
- Active Groundwater Elevation Monitoring Wells

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 12 June 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Notes

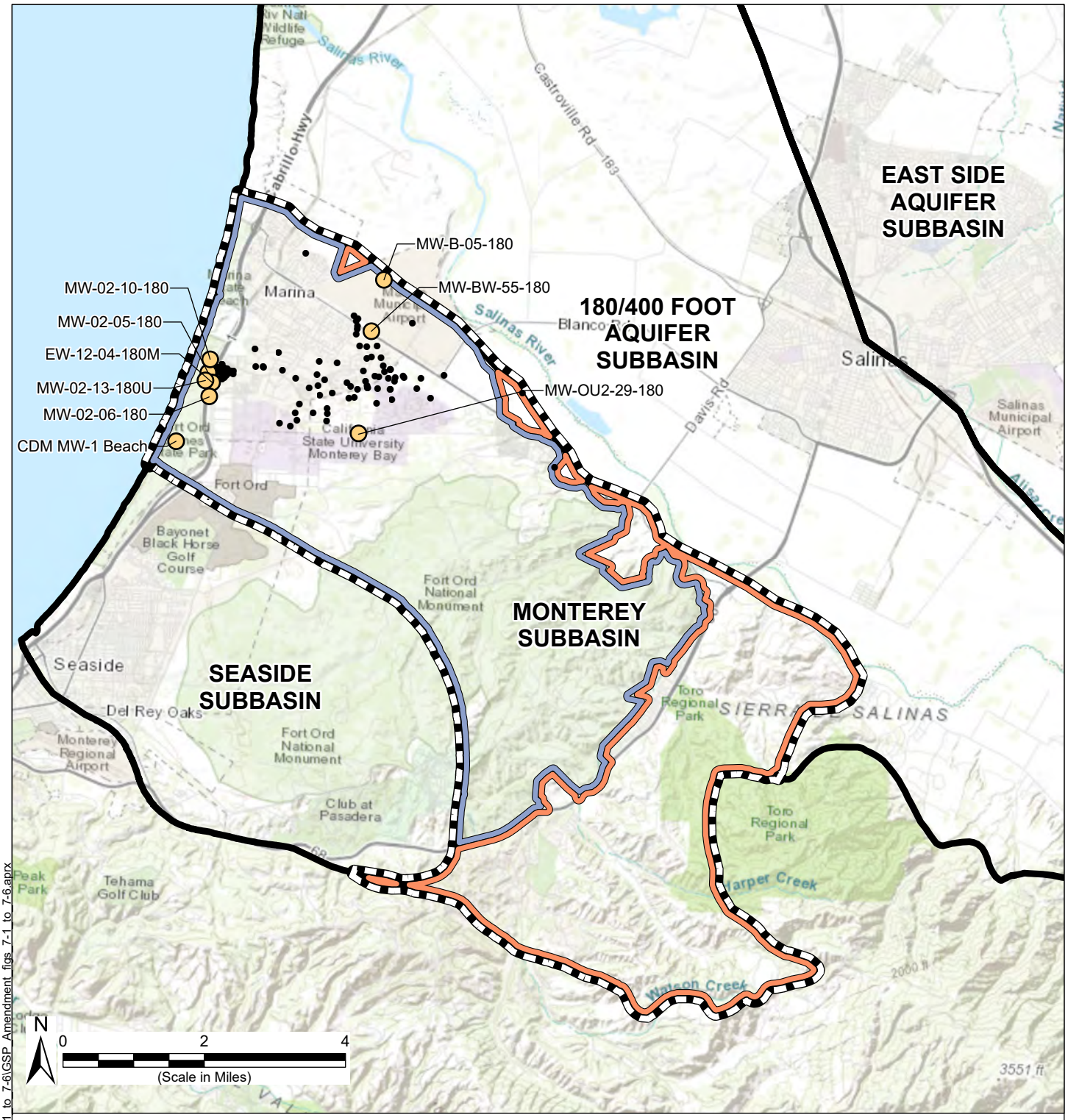
1. All locations are approximate.

Marina-Ord Area: Monitoring Network for Groundwater Elevations Dune Sand Aquifer

Monterey Subbasin
Groundwater Sustainability Plan
June 2026

Figure 7-1

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Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Representative Monitoring Sites for Groundwater Elevations
- Active Groundwater Elevation Monitoring Wells

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 12 June 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Notes

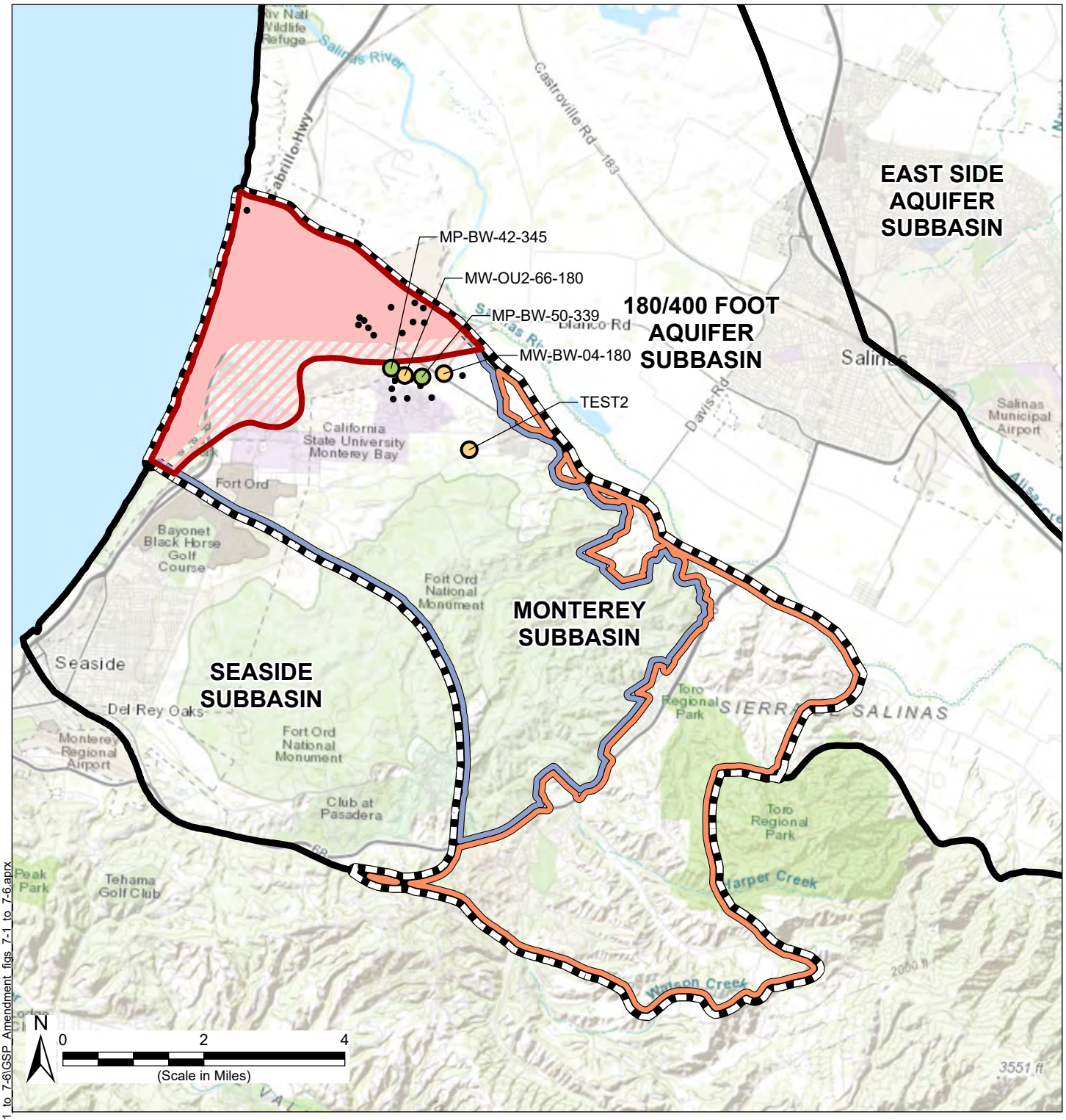
1. All locations are approximate.

Marina-Ord Area: Monitoring Network for Groundwater Elevations Upper 180-Foot Aquifer

Monterey Subbasin
Groundwater Sustainability Plan
June 2026

Figure 7-2

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Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Active Groundwater Elevation Monitoring Wells

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Estimated Seawater Intrusion in Monterey Subbasin

- Area of Known Seawater Intrusion
- Area of Potential Seawater Intrusion

Representative Monitoring Sites for Groundwater Elevations

- Lower 180-Foot Aquifer
- Lower 180-Foot, 400-Foot Aquifer

Notes

1. All locations are approximate.

Sources

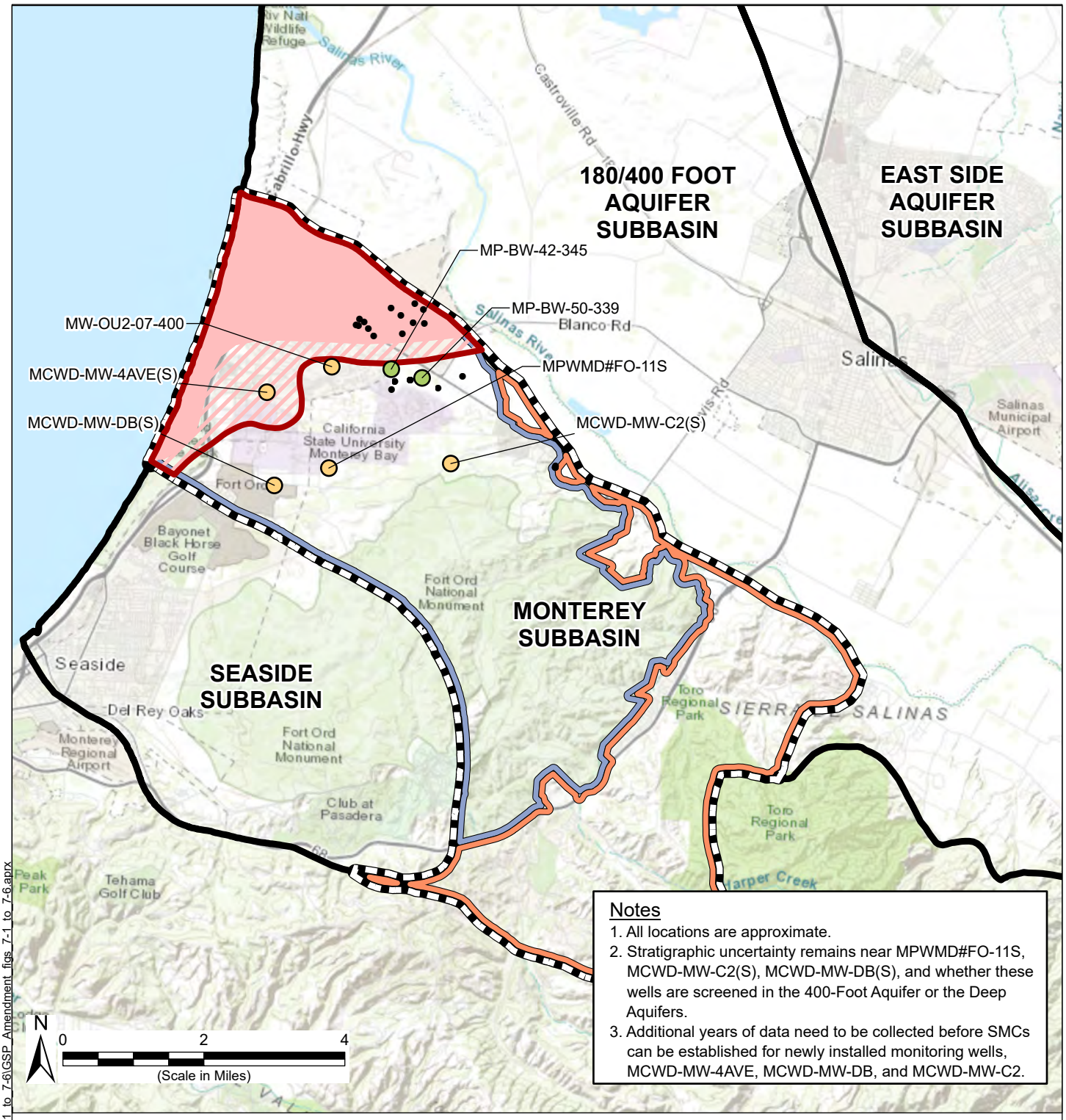
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 19 October 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Marina-Ord Area: Monitoring Network for Groundwater Elevations Lower 180-Foot Aquifer

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 7-3

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Notes

1. All locations are approximate.
2. Stratigraphic uncertainty remains near MPWMD#FO-11S, MCWD-MW-C2(S), MCWD-MW-DB(S), and whether these wells are screened in the 400-Foot Aquifer or the Deep Aquifers.
3. Additional years of data need to be collected before SMCs can be established for newly installed monitoring wells, MCWD-MW-4AVE, MCWD-MW-DB, and MCWD-MW-C2.

Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Active Groundwater Elevation Monitoring Wells

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Estimated Seawater Intrusion in Monterey Subbasin

- Area of Known Seawater Intrusion
- Area of Potential Seawater Intrusion

Representative Monitoring Sites for Groundwater Elevations

- 400-Foot Aquifer
- Lower 180-Foot, 400-Foot Aquifer

Abbreviations

SMC = Sustainability Management Criteria

Sources

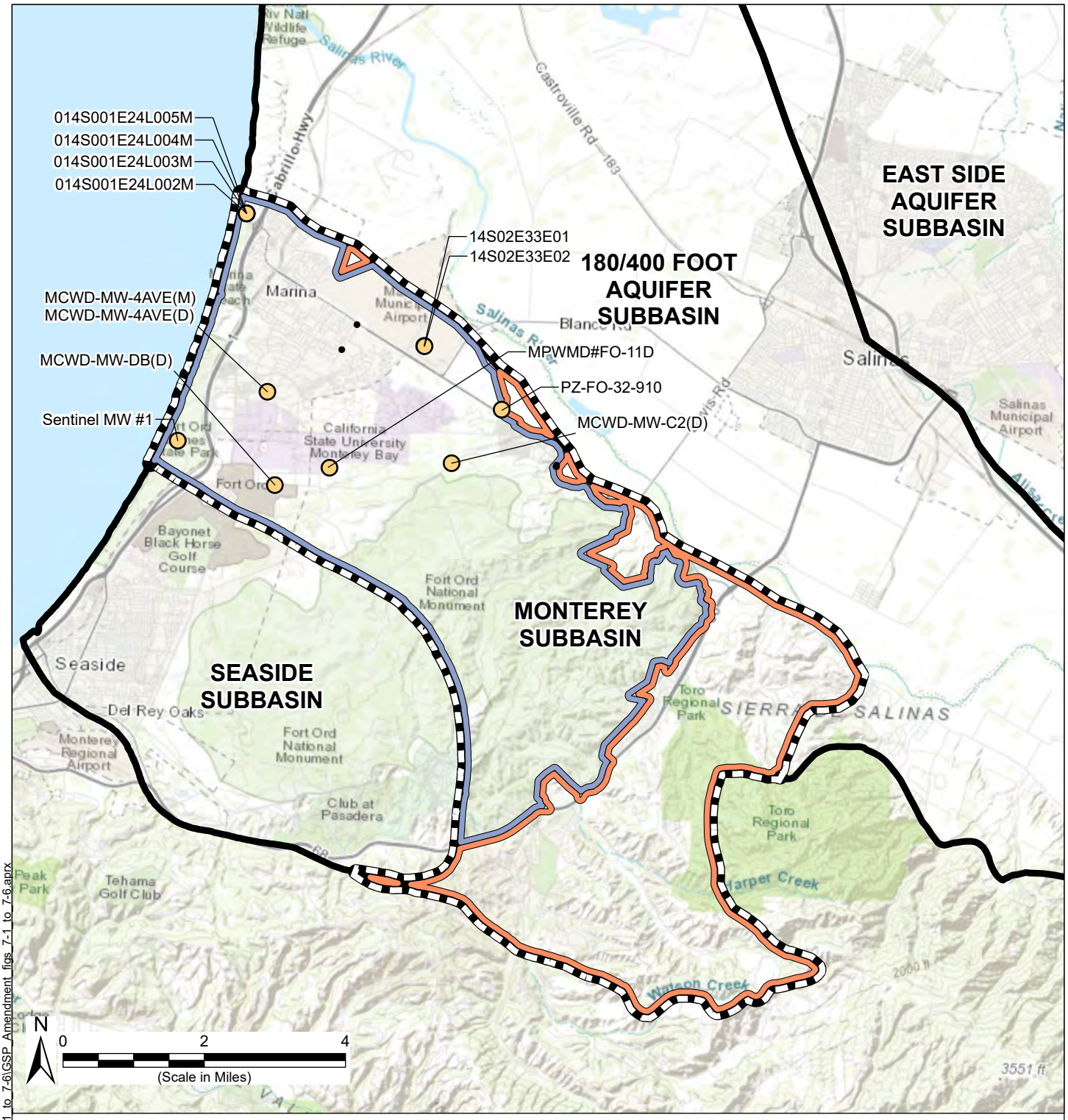
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 19 October 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Marina-Ord Area: Monitoring Network for Groundwater Elevations 400-Foot Aquifer

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 7-4

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Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Representative Monitoring Sites for Groundwater Elevations
- Active Groundwater Elevation Monitoring Wells

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Abbreviations

SMC = Sustainability Management Criteria

Notes

1. All locations are approximate.
2. Additional years of data need to be collected before SMCs can be established for newly installed monitoring wells, MCWD-MW-4AVE, MCWD-MW-DB, and MCWD-MW-C2.

Sources

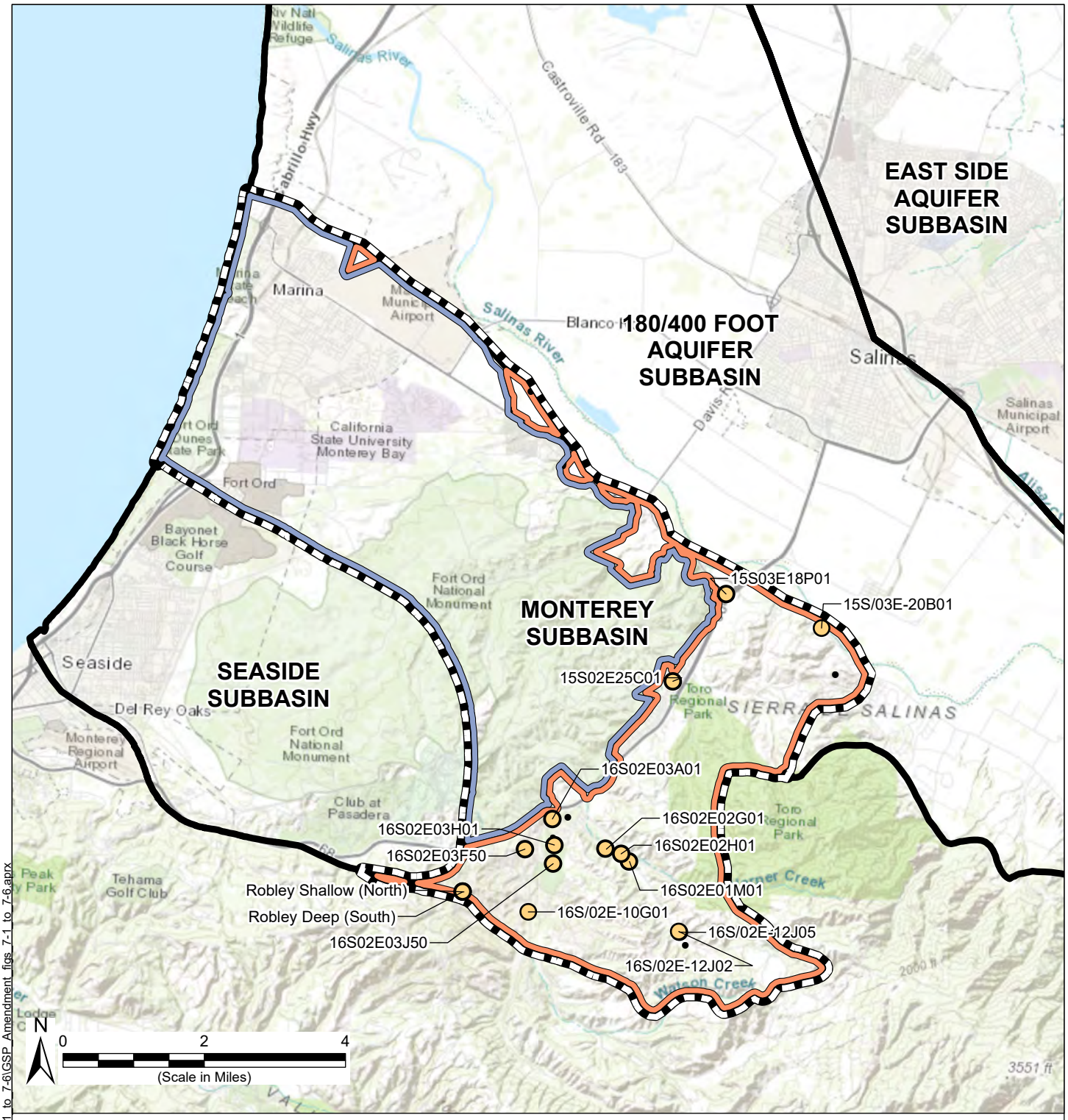
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 6 July 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Marina-Ord Area: Monitoring Network for Groundwater Elevations Deep Aquifers

Monterey Subbasin
Groundwater Sustainability Plan
July 2026

Figure 7-5

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Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Representative Monitoring Sites for Groundwater Elevations
- Active Groundwater Elevation Monitoring Wells

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Abbreviations

SMC = Sustainability Management Criteria

Notes

1. All locations are approximate.
2. Additional years of data need to be collected before SMCs can be established for newly installed monitoring wells, 15S/03E-20B01, 16S/02E-10G01, 16S/02E-12J02 and 16S/02E-12J05.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained July 6, 2026
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Corral de Tierra Area: Monitoring Network for Groundwater Elevations
El Toro Primary Aquifer

Monterey Subbasin
Groundwater Sustainability Plan
July 2026

Figure 7-6

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Table 7-1 Monterey Subbasin Groundwater Elevation Representative Monitoring Sites

Site Name	Aquifer	SGMA Site Code	Well Use	Total Well Depth (ft)	Latitude (NAD 83)	Longitude (NAD 83)
Marina-Ord Area						
MW-BW-28-A	Dune Sand Aquifer	366775N1217743W001	Monitoring	104	36.6775	-121.7744
MW-BW-49-A	Dune Sand Aquifer	366854N1217928W001	Monitoring	62	36.6854	-121.7928
MW-BW-81-A	Dune Sand Aquifer	366893N1217942W001	Monitoring	82	36.6893	-121.7942
MW-BW-82-A	Dune Sand Aquifer	366886N1217960W001	Monitoring	74	36.6886	-121.7961
MW-OU2-13-A	Dune Sand Aquifer	366584N1217688W001	Monitoring	146	36.6584	-121.7689
MW-OU2-32-A	Dune Sand Aquifer	366705N1218098W001	Monitoring	140	36.6705	-121.8098
MW-OU2-34-A	Dune Sand Aquifer	366612N1217993W001	Monitoring	166	36.6613	-121.7993
CDM MW-1 Beach	Upper 180-Foot Aquifer (a)	366521N1218236W001	Monitoring	140	36.6521	-121.8236
EW-12-04-180M	Upper 180-Foot Aquifer (a)	366643N1218149W001	Monitoring	145	36.6644	-121.8149
MW-02-05-180	Upper 180-Foot Aquifer (a)	366664N1218159W001	Monitoring	69	36.6664	-121.8159
MW-02-06-180	Upper 180-Foot Aquifer (a)	366615N1218155W001	Monitoring	110	36.6615	-121.8155
MW-02-10-180	Upper 180-Foot Aquifer (a)	366691N1218155W001	Monitoring	64	36.6691	-121.8155
MW-02-13-180U	Upper 180-Foot Aquifer (a)	366647N1218166W001	Monitoring	78	36.6648	-121.8166
MW-B-05-180	Upper 180-Foot Aquifer (a)	366864N1217718W001	Monitoring	210	36.6865	-121.7719
MW-BW-55-180	Upper 180-Foot Aquifer (a)	366758N1217746W001	Monitoring	202	36.6758	-121.7747
MW-OU2-29-180	Upper 180-Foot Aquifer (a)	366547N1217772W001	Monitoring	286	36.6548	-121.7772
MW-BW-04-180	Lower 180-Foot Aquifer (a)	366673N1217560W001	Monitoring	364	36.6674	-121.7560
MW-OU2-66-180	Lower 180-Foot Aquifer (a)	366667N1217660W001	Monitoring	339	36.6667	-121.7661
TEST2	Lower 180-Foot Aquifer (a)	366518N1217490W001	Monitoring	425	36.6519	-121.7490
MP-BW-42-345	Lower 180-Foot, 400-Foot Aquifer (a)	366681N1217695W002	Monitoring	467	36.6682	-121.7695
MP-BW-50-339	Lower 180-Foot, 400-Foot Aquifer (a)	366665N1217616W002	Monitoring	397	36.6666	-121.7616
MPWMD#FO-11S	400-Foot Aquifer (c)	366474N1217847W002	Monitoring	740	36.6474	-121.7847
MW-OU2-07-400	400-Foot Aquifer	366683N1217847W001	Monitoring	580	36.6683	-121.7847

Site Name	Aquifer	SGMA Site Code	Well Use	Total Well Depth (ft)	Latitude (NAD 83)	Longitude (NAD 83)
MCWD-MW-4AVE(S)	400-Foot Aquifer	(b)	Monitoring	493	36.6626	-121.8012
MCWD-MW-C2(S)	400-Foot Aquifer (c)	(b)	Monitoring	828	36.6491	-121.7536
MCWD-MW-DB(S)	400-Foot Aquifer (c)	(b)	Monitoring	705	36.6435	-121.7986
014S001E24L002M	Deep Aquifers	366992N1218076W001	Monitoring	1880	36.6993	-121.8077
014S001E24L003M	Deep Aquifers	366992N1218076W002	Monitoring	1430	36.6993	-121.8077
014S001E24L004M	Deep Aquifers	366992N1218076W003	Monitoring	1080	36.6993	-121.8077
014S001E24L005M	Deep Aquifers	366992N1218076W004	Monitoring	970	36.6993	-121.8077
14S02E33E01	Deep Aquifers	366730N1217615W001	Monitoring	1095	36.6730	-121.7615
14S02E33E02	Deep Aquifers	366729N1217614W001	Monitoring	1760	36.6730	-121.7614
PZ-FO-32-910	Deep Aquifers	366604N1217412W001	Monitoring	910	36.6604	-121.7413
MPWMD#FO-11D	Deep Aquifers	366474N1217847W001	Monitoring	1130	36.6474	-121.7847
Sentinel MW#1	Deep Aquifers	366521N1218236W002	Monitoring	1500	36.6521	-121.8236
MCWD-MW-4AVE(M)	Deep Aquifers	(b)	Monitoring	928	36.6626	-121.8012
MCWD-MW-4AVE(D)	Deep Aquifers	(b)	Monitoring	1414	36.6626	-121.8013
MCWD-MW-C2(D)	Deep Aquifers	(b)	Monitoring	1227	36.6491	-121.7536
MCWD-MW-DB(D)	Deep Aquifers	(b)	Monitoring	1043	36.6436	-121.7986
Corral de Tierra Area						
16S/02E-01M01	El Toro Primary Aquifer System	365680N1217073W001	Residential	294	36.5680	-121.7072
16S/02E-02G01	El Toro Primary Aquifer System	365705N1217134W001	Residential	440	36.5704	-121.7132
Robley Deep (South)	El Toro Primary Aquifer System	365608N1217494W001	Monitoring	820	36.5608	-121.7494
Robley Shallow (North)	El Toro Primary Aquifer System	365608N1217494W002	Monitoring	430	36.5608	-121.7494
15S/02E-25C01	El Toro Primary Aquifer System	366053N1216974W001	Residential	680	36.6053	-121.6974
15S/03E-18P01	El Toro Primary Aquifer System	366235N1216845W001	Monitoring	810	36.6235	-121.6845
16S/02E-02H01	El Toro Primary Aquifer System	365696N1217094W001	Residential	204	36.5696	-121.7094
16S/02E-03A01	El Toro Primary Aquifer System	365763N1217271W001	Irrigation	134	36.5763	-121.7271
16S/02E-03F50	El Toro Primary Aquifer System	365700N1217339W001	Residential	510	36.5700	-121.7339
16S/02E-03H01	El Toro Primary Aquifer System	365710N1217264W001	Irrigation	948	36.5710	-121.7264
16S/02E-03J50	El Toro Primary Aquifer System	365672N1217266W001	Irrigation	810	36.5672	-121.7266
15S/03E-20B01	El Toro Primary Aquifer System	(b)	Monitoring	545	36.6171	-121.6600
16S/02E-10G01	El Toro Primary Aquifer System	(b)	Monitoring	395	36.5571	-121.7326
16S/02E-12J02	El Toro Primary Aquifer System	(b)	Monitoring	330	36.5538	-121.6940
16S/02E-12J05	El Toro Primary Aquifer System	(b)	Monitoring	745	36.5539	-121.6941

Notes:

(a) The RMS network is selected to additionally distinguish the upper 180-Foot Aquifer and the lower 180-Foot Aquifer, since conditions in the upper 180-Foot are distinct from those in the lower 180-Foot Aquifer, as described in Chapter 5.

(b) Additional years of data are needed before SMCs can be established for these newly installed or rehabilitated monitoring wells. Therefore, these wells are included in the RMS network presented in Chapter 7 but are not included in the established SMCs presented in Chapter 8. SGMA Site Codes are not yet available for these wells because RMS wells must have established SMCs before they can be entered into the SGMA Portal and assigned a site code.

(c) There is uncertainty regarding the hydrostratigraphic designation of MPWMD#FO-11S, MCWD-MW-C2(S), and MCWD-MW-DB(S) and whether they are screened in the 400-Foot Aquifer or the upper Deep Aquifers.

7.3.1 Groundwater Elevation Monitoring Protocols

Groundwater elevation measurements will be collected pursuant to the protocols identified in the following documents. These monitoring plans are included in Appendices 7-A through 7-E.

- The MCWDGSA Monitoring Plan is included as Appendix 7-A and describes MCWDGSA's monitoring programs and protocols. Groundwater elevation measurements by hand are collected monthly for RMS wells and quarterly for non-RMS wells. Automated pressure transducers are installed in RMS wells where it is feasible to collect at least four measurements per day.
- Chapter 4 of the MCWRA CASGEM monitoring plan includes a description of existing MCWRA CASGEM groundwater elevation monitoring procedures (MCWRA, 2015). Groundwater elevation measurements are collected at least two times per year to represent seasonal low and seasonal high groundwater conditions. The monitoring protocols described in Appendix 7-B cover multiple monitoring methods for collecting data by hand and by automated pressure transducers.
- MCWRA's Monitoring Plan for the Deep Aquifers in the Salinas Valley Groundwater Basin includes groundwater elevation monitoring protocols to be implemented by water management authorities in the Salinas Valley (MCWRA, 2025). The plan is included as Appendix 7-C. Additionally, the water management authorities, including MCWRA, SVBGSA, Seaside Watermaster, and MPWMD, entered a Memorandum of Understanding following developing of the monitoring plan for Deep Aquifers data collection and sharing.
- MPWMD CASGEM monitoring plan (Appendix 7-D) describes groundwater elevation monitoring procedures implemented by MPWMD (MPWMD, 2012). Groundwater elevation measurements are collected twice a year, once at the end of September and once at the end of March. Groundwater elevation measurements are taken by electric measuring tape to the nearest hundredth of a foot.
- Appendix A of the Quality Assurance Project Plan (QAPP; Appendix 7-E) for the former Fort Ord includes a description of groundwater monitoring procedures at the former Fort Ord (USACE, 2019b). Groundwater elevation measurements are collected at least semi-

annually, subject to future monitoring program revisions, and in accordance with applicable Standard Operating Procedures covered in the QAPP.

These protocols are consistent with data and reporting standards described in GSP Emergency Regulations §352.4.

7.3.2 Groundwater Elevation Monitoring Network Data Gaps

Based on the GSP Emergency Regulations and BMPs published by DWR on monitoring networks (DWR, 2016c), a visual analysis of the existing monitoring network was performed. This analysis was conducted using professional judgment to evaluate whether there are data gaps in the groundwater elevation monitoring network based upon potential significant and unreasonable conditions within the Subbasin.

While there is no definitive requirement on monitoring well density, the BMP cites several studies (Heath, 1976; Sophocleous, 1983; Hopkins, 1984) that recommend 0.2 to 10 wells per 100 square miles. The BMP notes that professional judgment should be used to design the monitoring network to account for high-pumping areas, proposed projects, and other subbasin-specific factors.

The Monterey Subbasin encompasses a total of 48.2 square miles. The Marina-Ord Area covers approximately 30.2 square miles and the Corral de Tierra Area covers approximately 18.0 square miles. If BMP guidance recommendations are applied to each of the areas, the monitoring network should include between 1 and 3 wells in the Marina-Ord Area and between 1 and 2 wells in the Corral de Tierra Area. The current RMS network includes 39 wells in the Marina-Ord Area (2 to 9 wells per principal aquifer) and 15 wells in the Corral de Tierra Area. In addition, the monitoring network includes over 440 wells in the Marina-Ord Area and 15 wells in the Corral de Tierra Area that are regularly monitored by local agencies. Data from wells in the monitoring network will be used by the GSAs to assess groundwater conditions and inform SGMA implementation. The number of groundwater elevation monitoring wells in Monterey Subbasin therefore exceeds the number recommended in BMP guidance.

As discussed above, although no wells exist in the southeastern portion of Marina-Ord Area (i.e., the Fort Ord hills), no monitoring of groundwater levels is needed in this area because it is part of a federal land area and has no current or planned future groundwater extraction. The 2022 GSP identified data gaps near the ocean in areas subject to seawater intrusion and new monitoring wells have been completed in 2026 by MCWDGSA. Locations of these new wells are shown on Figure 7-4 and Figure 7-5. MCWDGSA plans to collect 1 to 3 years of data from these new wells before establishing SMCs at these locations and adding them to the groundwater elevation RMS network.

For the Corral de Tierra Area, visual inspection of the geographic distribution of the monitoring network indicates that it is sufficient to monitor groundwater levels and characterize the Area with completion of new monitoring wells in 2025.

7.4 Groundwater Storage Monitoring Network

Data and minimum thresholds used to define undesirable results for chronic lowering of groundwater levels and seawater intrusion will also be used to assess reduction of groundwater storage (see Chapter 8). As such, the reduction of groundwater storage monitoring network will consist of the same RMS wells as described in Sections 7.3 and 7.5. Minimum thresholds for chronic lowering of groundwater levels and seawater intrusion are sufficiently protective to ensure prevention of significant and unreasonable occurrences of reduction in groundwater storage.

7.5 Seawater Intrusion Monitoring Network

Pursuant to §354.34 of the GSP Emergency Regulations, seawater intrusion should be monitored "using chloride concentrations, or other measurements convertible to chloride concentrations, so that the current and projected rate and extent of seawater intrusion for each applicable principal aquifer may be calculated". The sustainability indicator for seawater intrusion is evaluated using the location of the 500 milligrams per liter (mg/L) chloride isoconcentration contour that is based on chloride concentrations, equivalent total dissolved solids (TDS) concentrations, and/or specific conductivity measurements (Figure 5-25).

The seawater intrusion monitoring network comprises 45 RMS wells monitored by MCWD, U.S. Army, MCWRA, MPWMD, and the Seaside Groundwater Basin Watermaster in the Marina-Ord Area (see Figure 7-7 through Figure 7-11). All monitoring wells that are currently monitored for seawater intrusion in the Subbasin are included as part of the RMS network.

The seawater intrusion RMS network in the Marina-Ord Area has been coordinated with the groundwater elevation RMS network (Section 7.3). Groundwater elevation data will be utilized in conjunction with chloride data from these wells to monitor potential expansion of the seawater intrusion front. The RMS wells within each management area have been selected to facilitate monitoring of significant and unreasonable groundwater conditions identified in Chapter 8. Criteria for selecting wells as part of the seawater intrusion RMS network include:

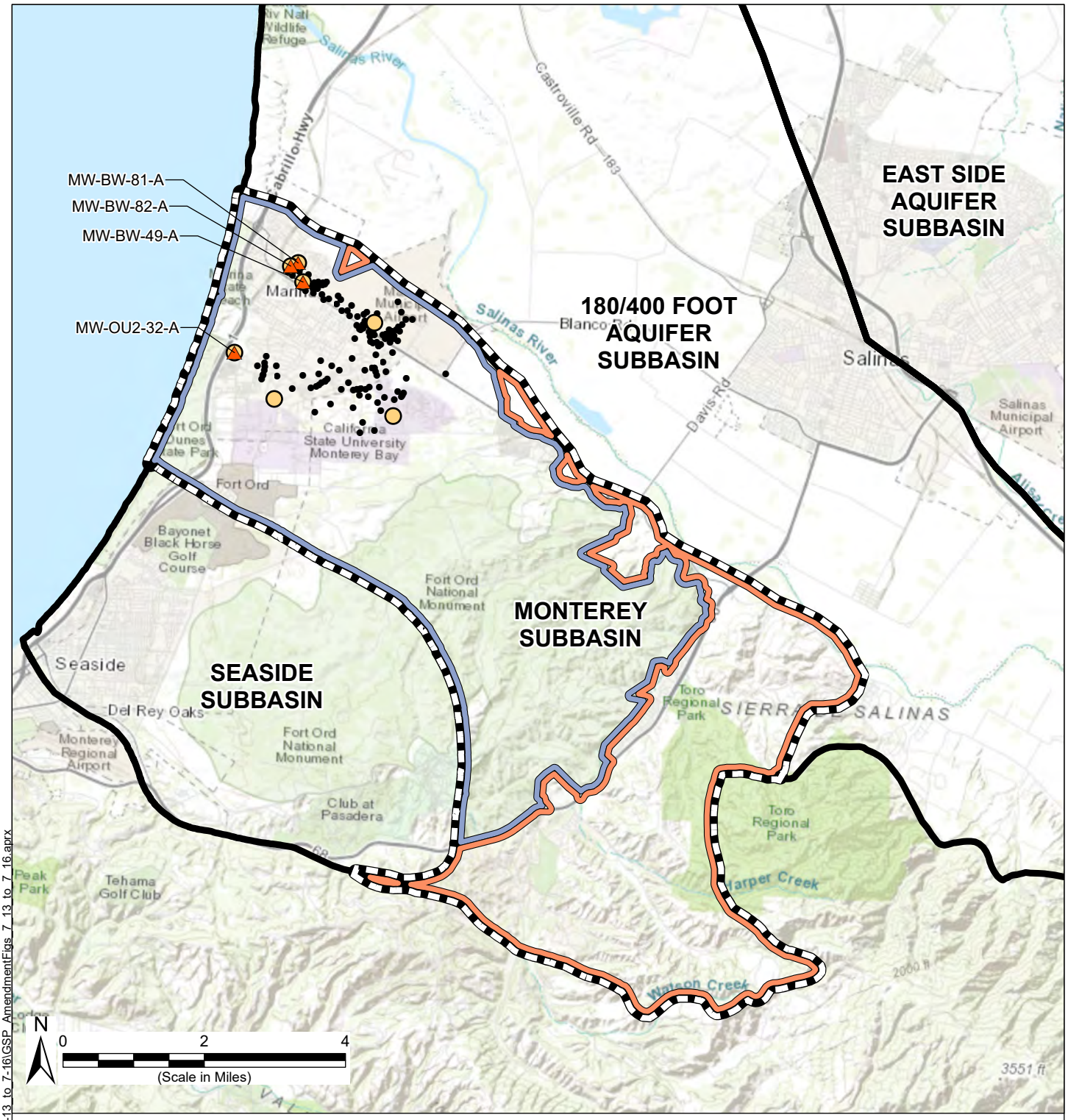
- RMS wells should facilitate monitoring seawater intrusion within all principal aquifers;
- RMS wells should be located near the coast in aquifer zones where seawater intrusion has not been identified (i.e., the Dune Sand Aquifer, the upper 180-Foot Aquifer, and the Deep Aquifers);
- RMS wells should be located near the coast and at the extent of the 500 mg/L chloride isoconcentration contour in aquifers where seawater intrusion has already occurred (i.e., the lower 180-Foot/400-Foot Aquifer);
- RMS wells that could be included in both the groundwater elevation and seawater intrusion RMS networks are preferred;
- RMS wells should be located on public parcels or on properties where access agreements have been negotiated;

- RMS wells must have known depths and well completion data;
- RMS wells should not be influenced by nearby infiltration or groundwater remediation activities;
- RMS wells with available historical chloride and groundwater elevation data are preferred, but wells without this information may be used where alternate wells are not available; and
- Available chloride and/or water level data for seawater intrusion RMS wells should be representative of similar data from nearby surrounding wells.

Data from seawater intrusion RMS wells will be considered public and will be used for seawater intrusion maps and analyses unless the owner of the well opts out through correspondence with MCWDGSA or SVBGSA.[29]

The RMS wells currently in the seawater intrusion monitoring network are listed in Table 7-2. The need for any additional wells is discussed in Section 7.5.2.

[29] If an owner opts out of public data reporting, another well will be identified for SWI monitoring.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Representative Monitoring Sites for Seawater Intrusion
- Representative Monitoring Sites for Groundwater Elevations
- Active Groundwater Elevation Monitoring Wells

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 11 June 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Notes

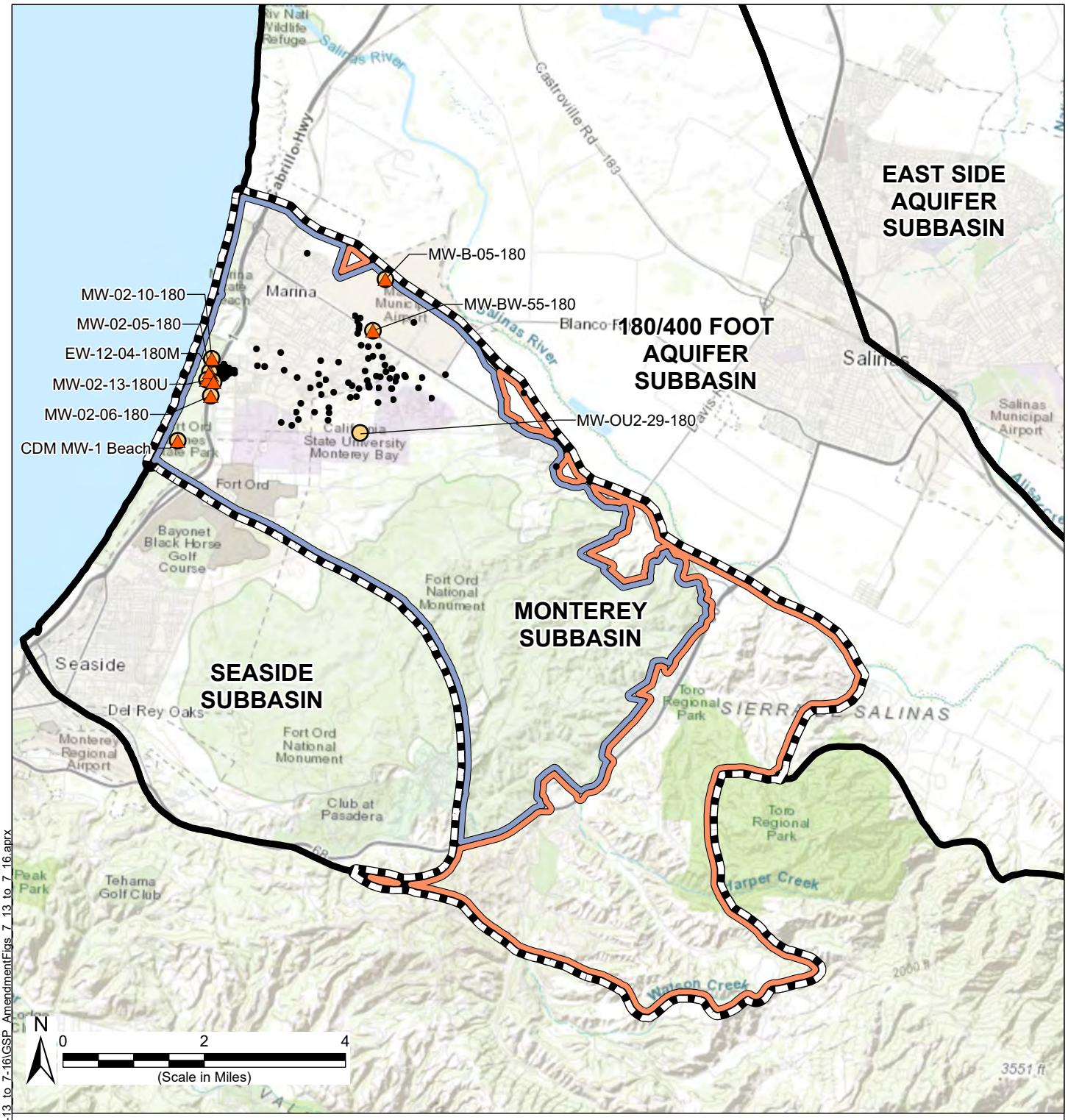
1. All locations are approximate.

Marina-Ord Area: Monitoring Network for Groundwater Elevations and Seawater Intrusion Dune Sand Aquifer

Monterey Subbasin
Groundwater Sustainability Plan
June 2026

Figure 7-7

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Amendment_Figs_7-13_to_7-16\GSP_AmendmentFigs_7_13_to_7_16.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Representative Monitoring Sites for Seawater Intrusion
- Representative Monitoring Sites for Groundwater Elevations
- Active Groundwater Elevation Monitoring Wells

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Notes

1. All locations are approximate.

Sources

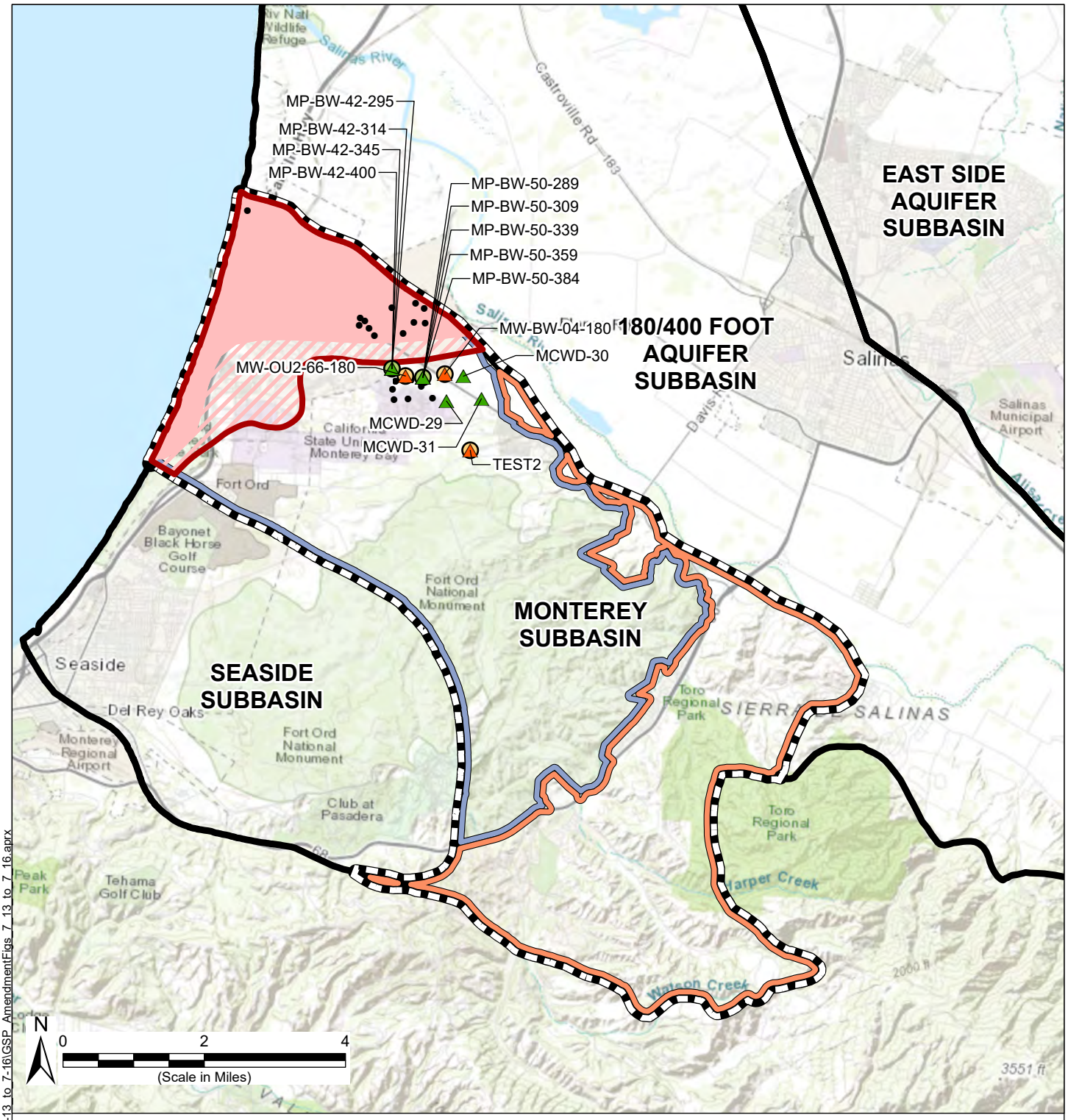
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 11 June 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Marina-Ord Area: Monitoring Network for Groundwater Elevations and Seawater Intrusion Upper 180-Foot Aquifer

Monterey Subbasin
Groundwater Sustainability Plan
June 2026

Figure 7-8

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Amendment_Figs_7-13_to_7-16\GSP_AmendmentFigs_7_13_to_7_16.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Active Groundwater Elevation Monitoring Wells

Estimated 2015 Seawater Intrusion

- Area of Known Seawater Intrusion
- Area of Potential Seawater Intrusion

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Representative Monitoring Sites for Seawater Intrusion

- Lower 180-Foot Aquifer
- Lower 180-Foot, 400-Foot Aquifer

Representative Monitoring Sites for Groundwater Elevations

- Lower 180-Foot Aquifer
- Lower 180-Foot, 400-Foot Aquifer

Notes

1. All locations are approximate.

Sources

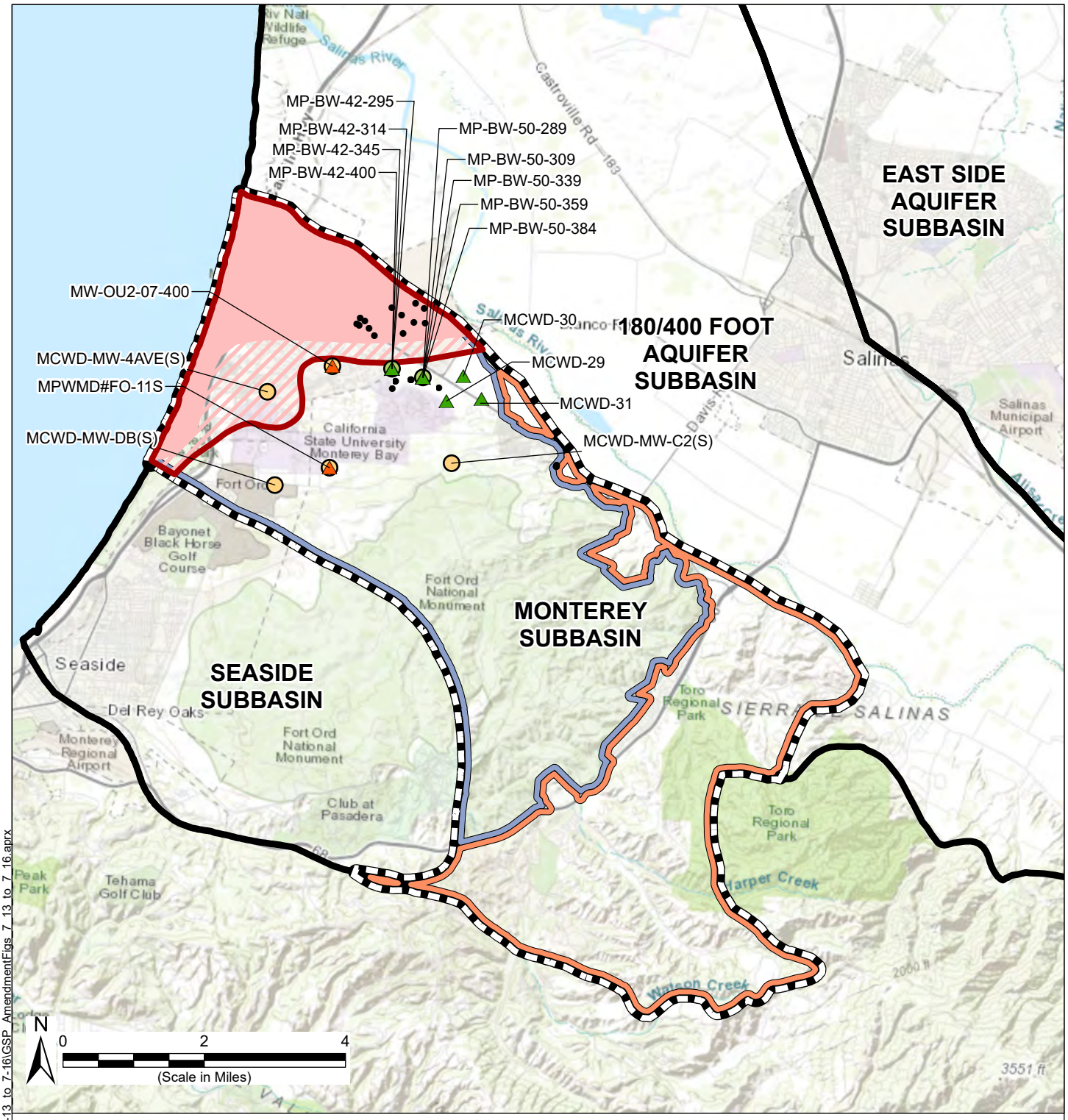
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 19 October 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Marina-Ord Area: Monitoring Network for Groundwater Elevations and Seawater Intrusion Lower 180-Foot Aquifer

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 7-9

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Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Active Groundwater Elevation Monitoring Wells

Estimated 2015 Seawater Intrusion

- Area of Known Seawater Intrusion
- Area of Potential Seawater Intrusion

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Representative Monitoring Sites for Seawater Intrusion

- 400-Foot Aquifer
- Lower 180-Foot, 400-Foot Aquifer

Representative Monitoring Sites for Groundwater Elevations

- 400-Foot Aquifer
- Lower 180-Foot, 400-Foot Aquifer

Notes

1. All locations are approximate.
2. Stratigraphic uncertainty remains near MPWMD#FO-11S, MCWD-MW-C2(S), MCWD-MW-DB(S), and whether these wells are screened in the 400-Foot Aquifer or the Deep Aquifers.

Sources

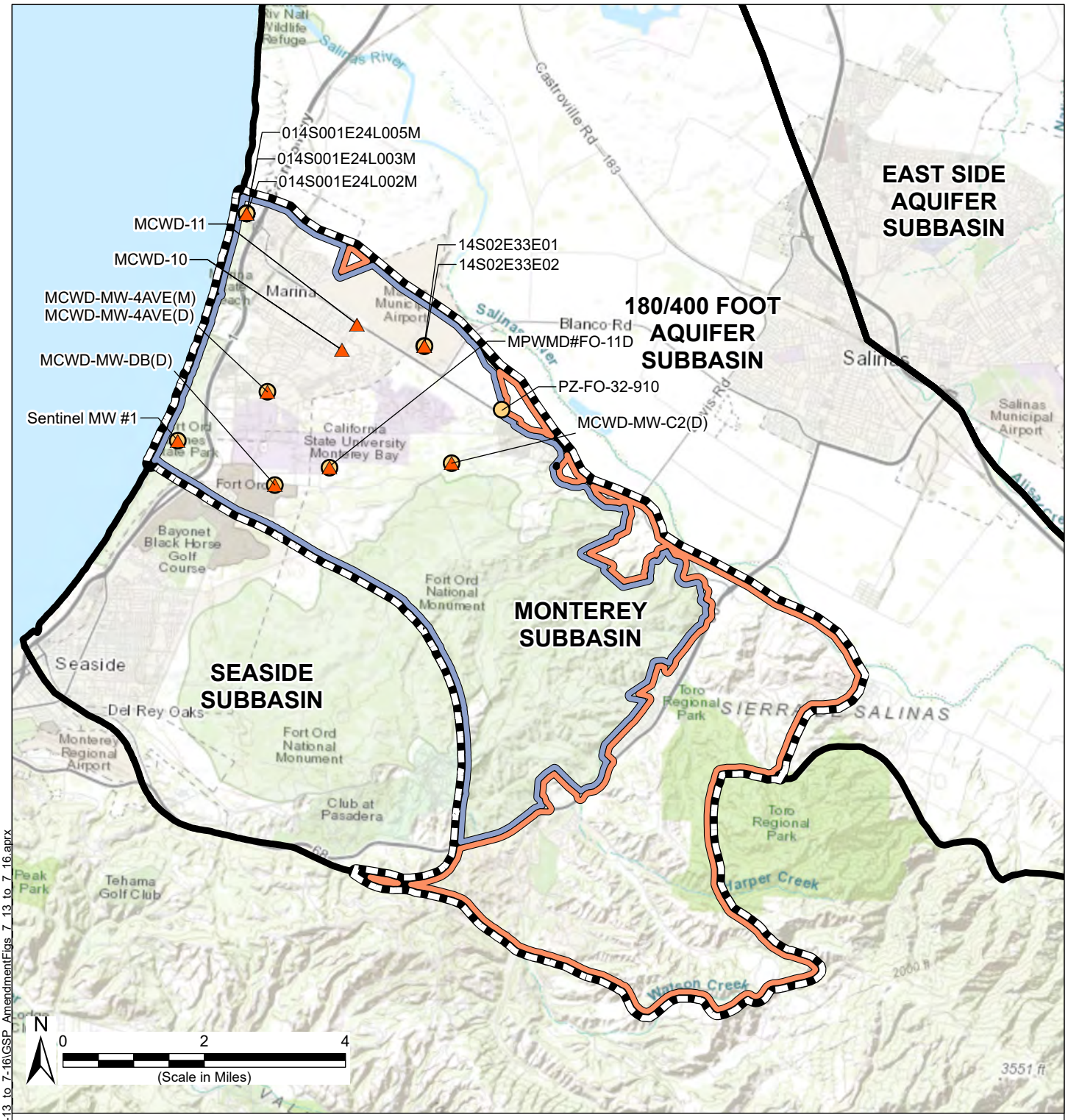
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 19 October 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Marina-Ord Area: Monitoring Network for Groundwater Elevations and Seawater Intrusion 400-Foot Aquifer

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 7-10

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Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Representative Monitoring Sites for Seawater Intrusion
- Representative Monitoring Sites for Groundwater Elevations
- Active Groundwater Elevation Monitoring Wells

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 7 July 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Marina-Ord Area: Monitoring Network for Groundwater Elevations and Seawater Intrusion Deep Aquifers

Monterey Subbasin
Groundwater Sustainability Plan
July 2026

Figure 7-11

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Table 7-2 Monterey Subbasin Seawater Intrusion Representative Monitoring Sites

Site Name	Aquifer	SGMA Site Code	Well Use	Total Well Depth (ft)	Latitude (NAD 83)	Longitude (NAD 83)
Marina-Ord Area						
MW-BW-49-A	Dune Sand Aquifer	366854N1217928W001	Monitoring	62	36.6854	-121.7928
MW-BW-81-A	Dune Sand Aquifer	366893N1217942W001	Monitoring	82	36.6893	-121.7942
MW-BW-82-A	Dune Sand Aquifer	366886N1217960W001	Monitoring	74	36.6886	-121.7961
MW-OU2-32-A	Dune Sand Aquifer	366705N1218098W001	Monitoring	140	36.6705	-121.8098
CDM MW-1 Beach	Upper 180-Foot Aquifer (a)	366521N1218236W001	Monitoring	140	36.6521	-121.8236
EW-12-04-180M	Upper 180-Foot Aquifer (a)	366643N1218149W001	Monitoring	145	36.6644	-121.8149
MW-02-05-180	Upper 180-Foot Aquifer (a)	366664N1218159W001	Monitoring	69	36.6664	-121.8159
MW-02-06-180	Upper 180-Foot Aquifer (a)	366615N1218155W001	Monitoring	110	36.6615	-121.8155
MW-02-10-180	Upper 180-Foot Aquifer (a)	366691N1218155W001	Monitoring	64	36.6691	-121.8155
MW-02-13-180U	Upper 180-Foot Aquifer (a)	366647N1218166W001	Monitoring	78	36.6648	-121.8166
MW-B-05-180	Upper 180-Foot Aquifer (a)	366864N1217718W001	Monitoring	210	36.6865	-121.7719
MW-BW-55-180	Upper 180-Foot Aquifer (a)	366758N1217746W001	Monitoring	202	36.6758	-121.7747
MW-BW-04-180	Lower 180-Foot Aquifer (a)	366673N1217560W001	Monitoring	364	36.6674	-121.7560
MW-OU2-66-180	Lower 180-Foot Aquifer (a)	366667N1217660W001	Monitoring	339	36.6667	-121.7661
TEST2	Lower 180-Foot Aquifer (a)	366518N1217490W001	Monitoring	425	36.6519	-121.7490
MCWD-29	Lower 180-Foot, 400-Foot Aquifer (a)	--	Public Supply	557	36.6618	-121.7553
MCWD-30	Lower 180-Foot, 400-Foot Aquifer (a)	--	Public Supply	552	36.6670	-121.7513
MCWD-31	Lower 180-Foot, 400-Foot Aquifer (a)	--	Public Supply	490	36.6625	-121.7465
MP-BW-42-295	Lower 180-Foot, 400-Foot Aquifer (a)	366681N1217695W005	Monitoring	467	36.6682	-121.7695

Site Name	Aquifer	SGMA Site Code	Well Use	Total Well Depth (ft)	Latitude (NAD 83)	Longitude (NAD 83)
MP-BW-42-314	Lower 180-Foot, 400-Foot Aquifer (a)	366681N1217695W003	Monitoring	467	36.6682	-121.7695
MP-BW-42-345	Lower 180-Foot, 400-Foot Aquifer (a)	366681N1217695W002	Monitoring	467	36.6682	-121.7695
MP-BW-42-400	Lower 180-Foot, 400-Foot Aquifer (a)	366681N1217695W004	Monitoring	467	36.6682	-121.7695
MP-BW-50-289	Lower 180-Foot, 400-Foot Aquifer (a)	366665N1217616W006	Monitoring	397	36.6666	-121.7616
MP-BW-50-309	Lower 180-Foot, 400-Foot Aquifer (a)	366665N1217616W003	Monitoring	397	36.6666	-121.7616
MP-BW-50-339	Lower 180-Foot, 400-Foot Aquifer (a)	366665N1217616W002	Monitoring	397	36.6666	-121.7616
MP-BW-50-359	Lower 180-Foot, 400-Foot Aquifer (a)	366665N1217616W004	Monitoring	397	36.6666	-121.7616
MP-BW-50-384	Lower 180-Foot, 400-Foot Aquifer (a)	366665N1217616W005	Monitoring	397	36.6666	-121.7616
MPWMD#FO-11S	400-Foot Aquifer (c)	366474N1217847W002	Monitoring	740	36.6474	-121.7847
MW-OU2-07-400	400-Foot Aquifer	366683N1217847W001	Monitoring	580	36.6683	-121.7847
MCWD-MW-DB(S)	400-Foot Aquifer (c)	(b)	Monitoring	705	36.6435	-121.7986
MCWD-MW-4AVE(S)	400-Foot Aquifer	(b)	Monitoring	493	36.6626	-121.8012
MCWD-MW-C2(S)	400-Foot Aquifer (c)	(b)	Monitoring	828	36.6491	-121.7536
MCWD-MW-DB(D)	Deep Aquifers	(b)	Monitoring	1043	36.6436	-121.7986
MCWD-MW-4AVE(M)	Deep Aquifers	(b)	Monitoring	928	36.6626	-121.8012
MCWD-MW-4AVE(D)	Deep Aquifers	(b)	Monitoring	1414	36.6626	-121.8013
MCWD-MW-C2(D)	Deep Aquifers	(b)	Monitoring	1227	36.6491	-121.7536
014S001E24L002M	Deep Aquifers	366992N1218076W001	Monitoring	1880	36.6993	-121.8077
014S001E24L003M	Deep Aquifers	366992N1218076W002	Monitoring	1430	36.6993	-121.8077
014S001E24L005M	Deep Aquifers	366992N1218076W001	Monitoring	970	36.6993	-121.8077
14S02E33E01	Deep Aquifers	366730N1217615W001	Monitoring	1095	36.6730	-121.7615
14S02E33E02	Deep Aquifers	366729N1217614W001	Monitoring	1760	36.6730	-121.7614

Site Name	Aquifer	SGMA Site Code	Well Use	Total Well Depth (ft)	Latitude (NAD 83)	Longitude (NAD 83)
MCWD-10	Deep Aquifers	--	Public Supply	1550	36.6717	-121.7824
MCWD-11	Deep Aquifers	--	Public Supply	1660	36.6770	-121.7788
Sentinel MW#1	Deep Aquifers	366521N1218236W002	Monitoring	1500	36.6521	-121.8236

Notes:

(a) The RMS network is selected to distinguish the upper 180-Foot Aquifer and the lower 180-Foot Aquifer, since conditions in the upper 180-Foot are distinct from those in the lower 180-Foot Aquifer, as described in Chapter 5.

(b) SGMA Site Codes are not yet available for newly installed or rehabilitated wells because RMS wells must have established SMCs before they can be entered into the SGMA Portal and assigned a site code.

(c) There is uncertainty regarding the hydrostratigraphic designation of MPWMD#FO-11S, MCWD-MW-C2(S), and MCWD-MW-DB(S) and whether they are screened in the 400-Foot Aquifer or the upper Deep Aquifers.

7.5.1 Seawater Intrusion Monitoring Protocols

Groundwater quality data or specific conductivity measurements will be collected pursuant to the following protocols as applicable to the monitoring agency of each well. These monitoring plans are included in appendices hereto.

- The MCWDGSA Monitoring Plan describes MCWDGSA's monitoring programs and protocols and is included as Appendix 7-A. Monitoring for RMS wells includes specific conductivity measurements, chloride and total dissolved solids (TDS) sampling, and induction logging in Deep Aquifer RMS on an annual basis. In addition to routine sampling, more frequent measurements as well as analysis of a broader suite of inorganic analytes and isotopes are employed at a suite of seawater intrusion "watch-list" wells that are experiencing active seawater intrusion or are located within a defined distance of the seawater intrusion front.
- MCWRA's Monitoring Plan for the Deep Aquifers in the Salinas Valley Groundwater Basin includes water quality monitoring protocols to be implemented by water management authorities in the Salinas Valley (MCWRA, 2025). The plan is included as Appendix 7-C. Additionally, the water management authorities, including MCWRA, SVBGSA, Seaside Watermaster, and MPWMD, entered a Memorandum of Understanding following developing of the monitoring plan for Deep Aquifers data collection and sharing.
- The Monterey County Quality Assurance Project Plan (QAPP; Appendix 7-F) describes existing MCWRA groundwater quality data monitoring protocols.
- The Seaside Basin Watermaster Monitoring and Management Program (Seaside Basin Watermaster, 2006; Appendix 7-G) describes MPWMD groundwater monitoring protocols conducted on behalf of the Seaside Watermaster. Sentinel MW#1 is monitored by the

Seaside Watermaster via induction logging and more frequent transducer and datalogger based groundwater elevation monitoring.

- Appendix A of the Quality Assurance Project Plan (QAPP; Appendix 7-E) for the former Fort Ord includes a description of groundwater monitoring procedures at the former Fort Ord (USACE, 2019b). Groundwater quality or specific conductivity measurements will be collected annually and in accordance with applicable Standard Operating Procedures covered in the QAPP.

These protocols are consistent with data and reporting standards described in GSP Emergency Regulations §352.4.

7.5.2 Seawater Intrusion Monitoring Network Data Gaps

There is no definitive requirement regarding seawater intrusion monitoring well density. The current network includes 2 to 9 seawater intrusion monitoring wells in the aquifers with no evidence of seawater intrusion and a total of 20 seawater intrusion monitoring wells in the lower 180-Foot, 400-Foot Aquifer where seawater intrusion has occurred. The 2022 GSP identified data gaps in the 400-Foot and Deep Aquifers near the central coastline. New monitoring wells have been completed in 2026 by MCWDGSA and are added to the seawater intrusion RMS network as shown on Figure 7-10 and Figure 7-11. The current geographic distribution of the seawater intrusion monitoring network is sufficient to monitor seawater intrusion within the Subbasin.

7.6 Water Quality Monitoring Network

The sustainability indicator for degraded water quality is evaluated at wells monitored for established water quality regulatory programs. The GSP Emergency Regulations require sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators to address known water quality issues.

The municipal public water system supply wells included in the monitoring network were identified by reviewing data from the SWRCB DDW. The SWRCB collects data for municipal systems; community water systems; non-transient, non-community water systems; and non-community water systems that provide drinking water to at least 15 service connections or serve an average of at least 25 people for at least 60 days a year. Only active DDW wells are included in the groundwater quality monitoring network. These wells are shown on Figure 7-12 and listed in Appendix 7-H.

The CCRWQCB ILP regulates discharge from irrigated agricultural lands through Ag Order 4.0. This order established two main monitoring requirements: 1) the creation of a monitoring plan to assess groundwater quality trends, and 2) monitoring of all on-farm domestic wells for the presence of 1,2,3-trichloropropane (1,2,3-TCP) and nitrate. SVBGSA is developing the Groundwater Quality Trend Monitoring (GQTM) Workplan to address the trend monitoring requirement of the Ag Order 4.0. The GQTM Workplan will evaluate nitrate and major cations and anions trends in select wells. All ILP wells currently sampled by Preservation Inc. are provisionally included in the Subbasin's monitoring network until the GQTM Workplan is

approved by the CCRWQCB. Once it's approved, the SVBGSA's monitoring network will comprise the wells in the GQTM Workplan and additional on-farm domestic wells sampled for 1,2,3-TCP and nitrate. However, the GQTM Workplan does not include any wells in the Monterey Subbasin. Therefore, only the ILP on-farm domestic wells sampled for 1,2,3-TCP and nitrate are adopted for the groundwater quality network. Additionally, the ILP monitors the agricultural lands in the Monterey Subbasin through wells within the 180/400 Subbasin.

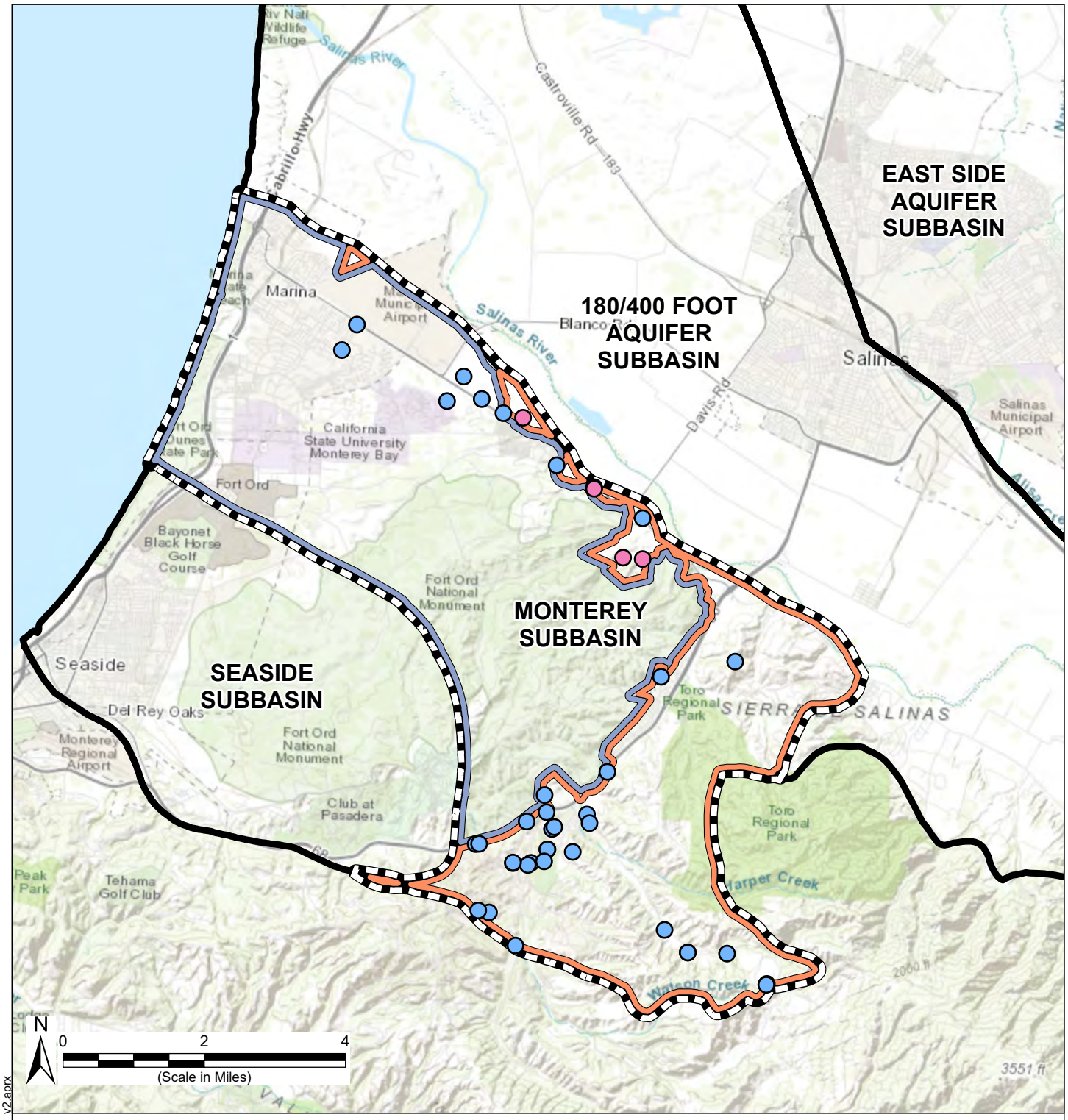
7.6.1 Groundwater Quality Monitoring Protocols

Water quality data from public water systems are collected, analyzed, and reported in accordance with protocols that are reviewed and approved by the SWRCB, DDW, in accordance with the state and federal Safe Drinking Water Acts. Monitoring protocols may vary by agency.

The ILP data are collected annually under CCRWQCB Ag Order 4.0. Ag Order 4.0 will take effect in the Subbasin beginning in 2027. Copies of the Order 4.0 monitoring and reporting programs are included in Appendix 7-I and are incorporated into this GSP. These protocols are consistent with data and reporting standards described in GSP Emergency Regulations §352.4.

7.6.2 Groundwater Quality Monitoring Data Gaps

There is adequate spatial coverage to assess impacts to beneficial uses and users for the DDW and ILP monitoring programs. Neither MCWDGSA nor SVBGSA plan on expanding the monitoring network at this time because the monitoring network relies on existing supply wells and neither MCWDGSA nor SVBGSA plan to independently sample wells for any COC.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- DDW Well
- ILRP Domestic Well

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 11 June 2026.

Abbreviations

DDW = Division of Drinking Water
GAMA = Groundwater Ambient Monitoring and Assessment
ILRP = Irrigated Lands Regulatory Program

Locations of Wells in the Groundwater Quality Monitoring Network

Monterey Subbasin
Groundwater Sustainability Plan
June 2026

Figure 7-12

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7.7 Land Subsidence Monitoring Network

As described in Section 5.5, DWR collects land subsidence data using InSAR satellite data, and makes these data available to GSAs. This subsidence dataset represents the best available data for the Monterey Subbasin and is therefore used as the subsidence monitoring network.

7.7.1 Land Subsidence Monitoring Protocols

The land subsidence monitoring protocols are the ones used by DWR for InSAR measurements and interpretation. If the annual monitoring indicates subsidence is occurring at a rate greater than the minimum thresholds, then additional investigation and monitoring may be warranted. In particular, the GSAs will implement a study to assess if the observed subsidence can be correlated to declining groundwater elevations, and whether a reasonable causality can be established. These protocols are consistent with data and reporting standards described in GSP Emergency Regulations §352.4.

7.7.2 Land Subsidence Data Gaps

There are no data gaps associated with the subsidence monitoring network.

7.8 Interconnected Surface Water Monitoring Network

As detailed in Chapter 8, shallow groundwater elevations near locations of interconnected surface water will be used as a proxy metric for this indicator. As such, the interconnected surface water monitoring network will be comprised of RMS sites adjacent to potential interconnected surface waters where minimum thresholds and measurable objectives based on shallow groundwater levels are developed for depletion of interconnected surface water.

As described in Section 5.6 of this GSP, potential interconnected surface water locations identified within the Subbasin are (1) the ponds and lakes located within the City of Marina (Figure 5-36), (2) near the confluence of the El Toro Creek and the Salinas River (Figure 5-37), and (3) slightly upstream along the Salinas River near the Monterey-180/400 Subbasin boundary.

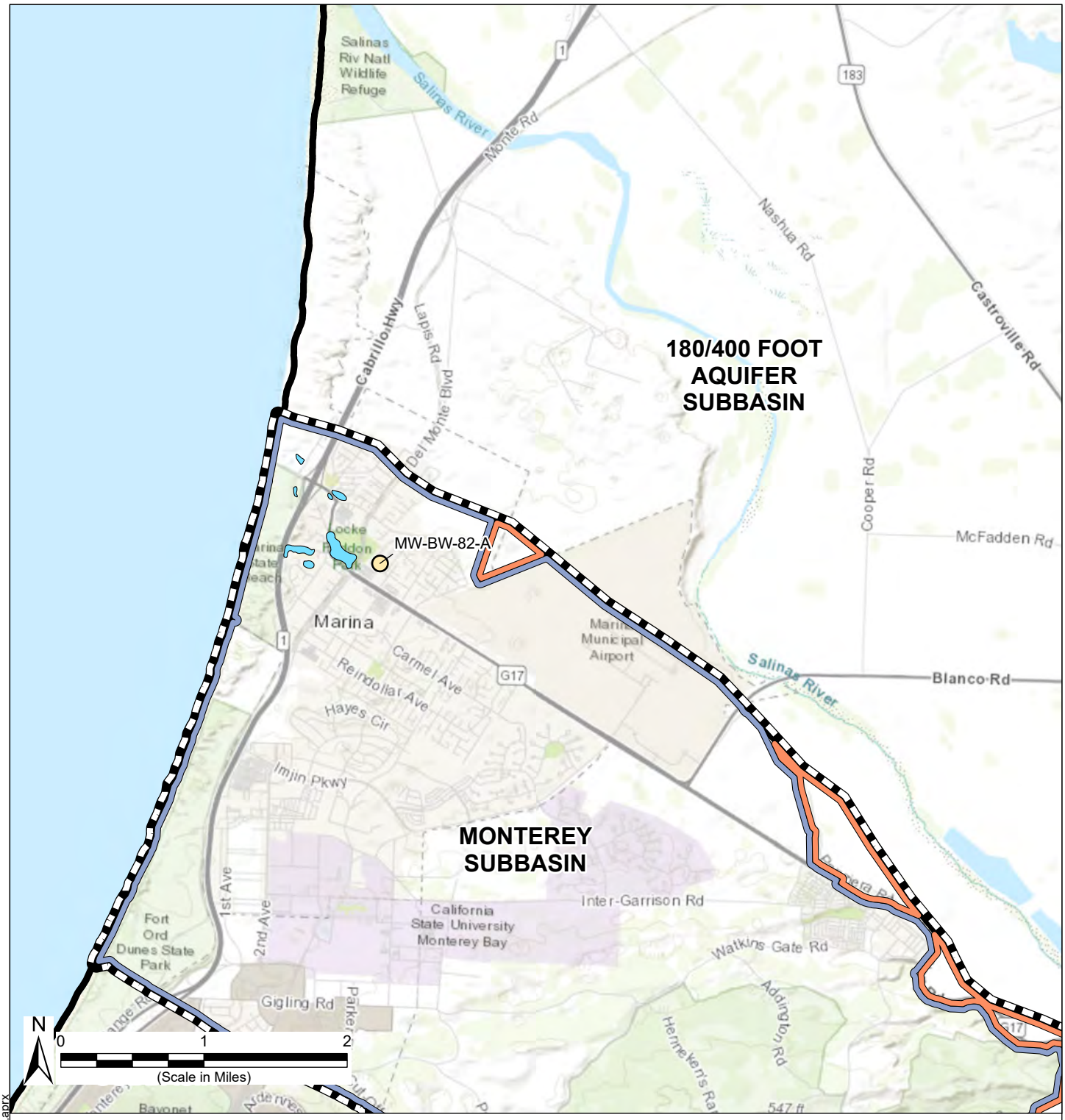
The primary tool for assessing depletions of interconnected surface water is shallow monitoring wells adjacent to the Subbasin's interconnected surface water locations. Groundwater elevations measured in shallow wells adjacent to interconnected surface water bodies will serve as the primary approach for monitoring depletion of surface water.

One RMS well is included in the interconnected surface water monitoring network in the Marina-Ord Area, as shown in Table 7-3 and on Figure 7-13. As discussed in Chapter 8, given the stable groundwater patterns in the Dune Sand Aquifer, there is no significant and unreasonable depletion of interconnected surface water under current conditions. In the event that future groundwater activities in the Subbasin or the adjacent 180/400 Subbasin may influence the condition of the Marina vernal ponds and/or the Dune Sand Aquifer, the GSAs will work with project proponents to install additional shallow groundwater monitoring wells.

There is currently one RMS well in the interconnected surface water monitoring network in the Corral de Tierra Area near the confluence of El Toro Creek and the Salinas River. As shown on Figure 7-14, an analysis of shallow groundwater levels is used to identify areas of potential interconnection between surface water and groundwater.

Table 7-3 Monterey Subbasin Interconnected Surface Water Representative Monitoring Sites

State Well Number	Aquifer	Well Use	Total Well Depth (ft)	Latitude (NAD 83)	Longitude (NAD 83)
Marina-Ord Area					
MW-BW-82-A	Dune Sand Aquifer	Monitoring	74	36.6886	-121.7961
Corral de Tierra Area					
M-ISW-1	Shallow Sediments	Monitoring	70	36.6235	-121.6846



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Marina Vernal Ponds
- ISW Representative Monitoring Site

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Notes

1. All locations are approximate.

Abbreviations

ISW = Interconnected Surface Water

Sources

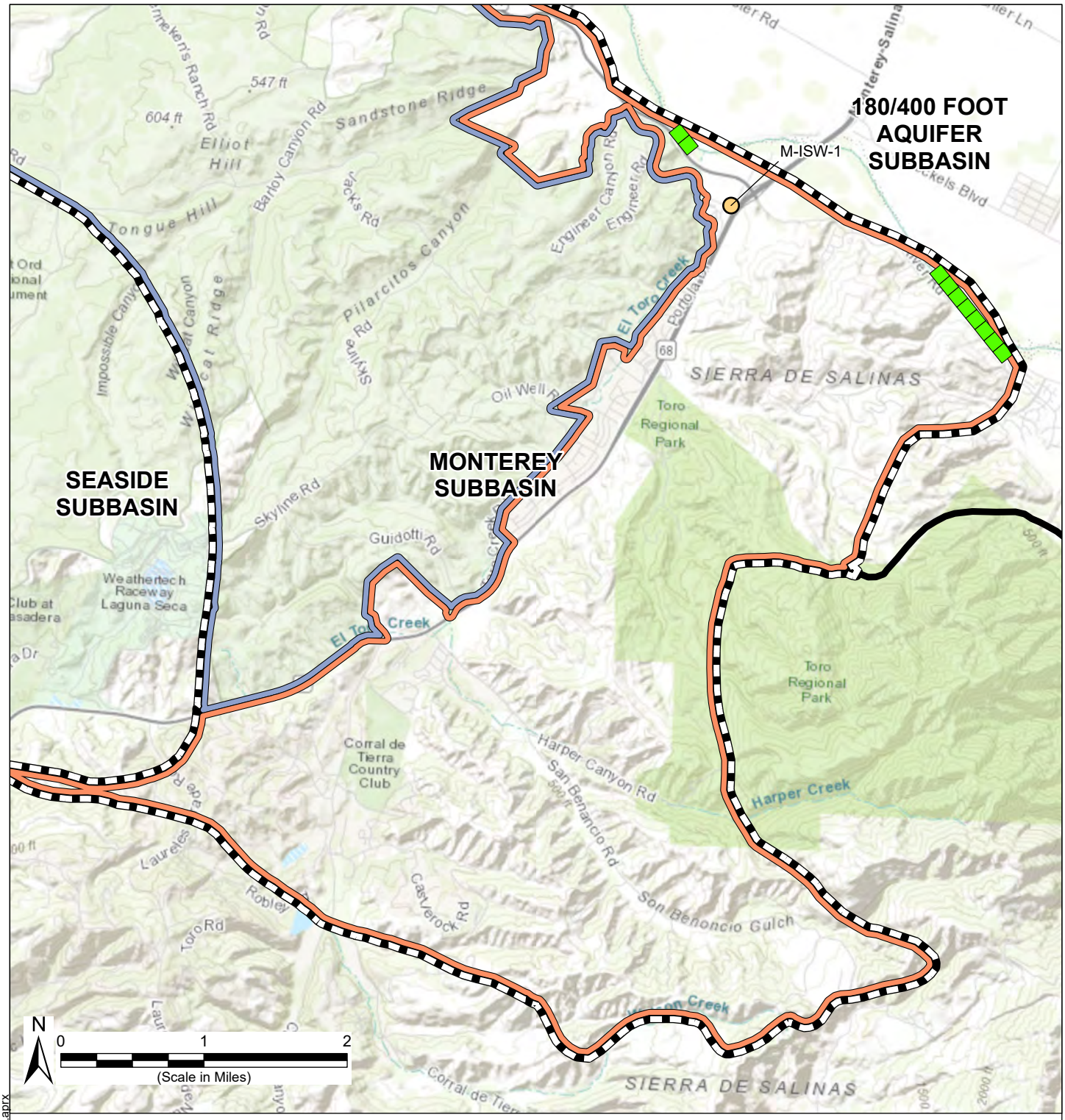
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 7 July 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.
3. Depth to water data are calculated by subtracting the 2017 Fall Dune Sand Aquifer contour from land surface.

Interconnected Surface Water Representative Monitoring Sites Dune Sand Aquifer

Monterey Subbasin
Groundwater Sustainability Plan
July 2026

Figure 7-13

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Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- ISW Representative Monitoring Site
- Model Grid Stream Cells Connected to Groundwater for More Than 10% of the Model Period

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Notes

1. All locations are approximate.

Abbreviations

ISW = Interconnected Surface Water

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 7 July 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Interconnected Surface Water Representative Monitoring Sites El Toro Primary Aquifer

Monterey Subbasin
Groundwater Sustainability Plan
July 2026

Figure 7-14

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7.9 Other Monitoring Networks

7.9.1 Groundwater Extraction Monitoring Network

MCWRA's GEMS has been replaced with the GMP. The GMP is used to monitor extraction in the Salinas Valley. Monthly extractions for agricultural and urban water use are reported annually to MCWRA under Monterey County Ordinance 5426. Urban water use includes larger public water systems and industrial water use. While historically most pumping in the Salinas Valley was only reported for Zones 2, 2A, and 2B, which did not provide sufficient coverage of the Corral de Tierra Area, the GMP provides full coverage. 7.9.1.2Extraction is self-reported by well owners or operators on a water year basis (October 1 to September 30).

SVBGSA will work with MCWRA to obtain the GMP data through a coordinated reporting program such that well owners can provide a single annual reporting to fulfill the requirements of both the GSP and the existing County Ordinance 5426.

SVBGSA prepared an estimate of rural domestic pumping until sufficient data from the GMP is available. Rural domestic pumping is estimated to use the number of drinking water connections based on data compiled for water systems and 2024 Monterey County parcel data. After estimating the number of connections, the connections were multiplied by a constant value 0.35 AF/yr per connection across all subbasins to estimate water use. This constant was verified using reported urban pumping to assess the accuracy of the connections and water use estimates.

7.9.1.1 Groundwater Extraction Monitoring Protocols

Groundwater extraction monitoring uses existing monitoring programs performed by MCWD and other agencies, including MCWRA's GMP. These monitoring protocols are consistent with data and reporting standards described in GSP Emergency Regulations §352.4.

7.9.1.2 Groundwater Extraction Monitoring Data Gaps

An accurate assessment of the amount of pumping requires an accurate count of the number of municipal, agricultural, and domestic wells in the GSP area. This information exists within the Marina-Ord Area, however, it is more limited in the Corral de Tierra Area. As discussed in Chapter 9, MCWRA conducted a well registration desktop analysis to develop a database of existing and active groundwater wells and has established a well registration program. This database draws from the existing MCWRA database and the Monterey County Health Department database of state small and local small water systems. As part of the analysis and well registration program, MCWRA is verifying well completion information and location and whether the well is active, abandoned, or destroyed, as is discussed further in Chapter 9.

The accuracy and reliability of groundwater pumping reported through the GMP is constantly being updated. SVBGSA will continue to work with MCWRA to assure data reliability.

7.9.2 Salinas River Watershed Diversions

Salinas River watershed monthly diversion data are collected annually in the SWRCB's eWRIMS on a water year basis. eWRIMS is used to track information of water rights in the state, publicly accessible at: https://ciwqs.waterboards.ca.gov/ciwqs/ewrims/reportingDiversionDownloadPublicSetup.do. These data also include diversions from tributaries of the Salinas River.

7.9.2.1 Salinas River Watershed Diversions Monitoring Protocols

Salinas River watershed diversion monitoring protocols are those that the SWRCB has established for the collection of water right information. These protocols are consistent with data and reporting standards described in GSP Emergency Regulations §352.4.

7.9.2.2 Salinas River Watershed Diversions Monitoring Data Gaps

There are no data gaps in the Salinas River watershed diversion monitoring network in the Monterey Subbasin.

7.9.3 Groundwater Dependent Ecosystem Monitoring and Assessment

Central Coast Wetlands Group will monitor and assess GDEs within the Corral de Tierra Area to detect if their conditions are declining. When such declines in condition are detected, the GDE must be flagged for further investigation into the root cause of the decline to determine if it is related to groundwater management activities. For the purposes of GDE monitoring in the Salinas Valley, ecosystem condition is primarily defined through vegetation health and vigor since this metric can be most readily tied to groundwater conditions. If groundwater levels are lowered below a depth that vegetation roots can access, a decline in vegetation vigor due to the loss of the water source would be an expected result and defined as an adverse impact.

The GDE monitoring methodology uses a two-pronged approach including an annual desktop-based component and a 5-year interval field-based component. A change in GDE vegetation vigor could be related to many factors, so a subsequent hydrogeological analysis is required to investigate groundwater level trends around potential GDEs to understand if GDE health is related to groundwater management.

The City of Marina is responsible for management of the vernal ponds within the City, which are designated as ESHA under the City's Local Coastal Program.

7.10 Data Management System and Data Reporting

Data collected from the SGMA Monitoring Network will be uploaded to Data Management Systems maintained by MCWDGSA and SVBGSA and reported to the DWR in accordance with the Monitoring Protocols developed for the Subbasin, as described in the appendices hereto. Additional data collected as part of the Subbasin's other monitoring programs may be used in conjunction with data collected from the SGMA Monitoring Network to meet compliance with

requirements regarding annual reporting (GSP Emergency Regulations §356.2) or as otherwise deemed necessary by the GSAs.

8 SUSTAINABLE MANAGEMENT CRITERIA

This chapter defines the conditions that constitute sustainable groundwater management and establishes minimum thresholds, measurable objectives, and undesirable results for each sustainability indicator. This chapter includes adequate data to explain how SMCs were developed and how they influence all beneficial uses and users.

The chapter is structured to address all the GSP Emergency Regulations regarding SMCs. To retain an organized approach, the SMCs are grouped by sustainability indicators. The discussion of each sustainability indicator follows a consistent format that contains all information required by §354.22 et seq. of the GSP Emergency Regulations, and as further clarified in the SMCs BMP (DWR, 2017; CCR, 2016).

8.1 Definitions

The SGMA legislation and GSP Emergency Regulations contain terms relevant to SMCs. The definitions included in the GSP Emergency Regulations are repeated below with additional explanatory text.

- **Sustainability indicator** refers to any of the effects caused by groundwater conditions occurring throughout the Subbasin that, when significant and unreasonable, cause undesirable results, as described in CWC §10721(x).

  The six sustainability indicators relevant to this subbasin include chronic lowering of groundwater levels; reduction of groundwater storage; degraded water quality; land subsidence; seawater intrusion; and depletion of interconnected surface waters.

- **Undesirable Results** occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the Subbasin.

  The GSP Emergency Regulations require that the description of undesirable results include (1) the cause of groundwater conditions that would lead to or has led to undesirable results; (2) a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the Subbasin (i.e., the undesirable result criteria); and (3) potential effects that may occur or are occurring from undesirable results. An example undesirable result criterion could be defined as: more than 10% of the measured groundwater elevations being lower than the minimum thresholds.

- **Significant and Unreasonable Conditions**

  Significant and unreasonable is not defined in the Regulations. However, the definition of undesirable results states, “Undesirable results occur when significant and unreasonable effects … are caused by groundwater conditions…”. The SGMA BMP states that “the GSAs must consider and document the conditions at which each of the six sustainability indicators become significant and unreasonable, including reasons for justifying each particular threshold selected.” Therefore, this GSP adopts the phrase significant and

unreasonable conditions to be the qualitative description of conditions used to justify selected minimum thresholds and undesirable results criteria.

- **Measurable objectives** refer to specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the Subbasin.

  Measurable objectives are quantitative goals that the GSP is designed to achieve for each sustainability indicator.

- **Minimum threshold** refers to a numeric value for each sustainability indicator used to define undesirable results.

  Minimum thresholds are quantitative indicators of an unreasonable condition.

- **Interim milestone** refers to a target value representing measurable groundwater conditions, in increments of five years, set by an Agency as part of a Plan.

  Interim milestones are targets such as groundwater elevations that will be achieved every five years to demonstrate progress towards sustainability.

8.2 Sustainability Goal

The sustainability goal of the Monterey Subbasin is to manage groundwater resources for long-term community, financial, and environmental benefits to the Subbasin's residents and businesses. The goal of this GSP is to ensure long-term viable water supplies to local communities at a reasonable cost. In addition, because the Subbasin is hydrologically connected with other Salinas Valley Basin Subbasins, this GSP aims to develop a coordinated approach to groundwater management within this Subbasin and neighboring Subbasins. The Subbasin will achieve long-term sustainability through inter- and intra-basin coordination as well as implementation of projects and management actions.

Several projects and management actions are included in this GSP and detailed in Chapter 9. These projects and management actions will diversify the Subbasin's water supply portfolio, increase supply reliability, and protect the Subbasin's groundwater resources against seawater intrusion. Chapter 10 describes the planned implementation of projects and management actions as of GSP Amendment 1. The Subbasin's historical efforts to invest in water conservation will continue under SGMA.

8.3 Achieving Long-Term Sustainability

The GSP addresses long-term groundwater sustainability. Correspondingly, the Subbasin GSAs have developed SMCs to avoid undesirable results under future hydrogeologic conditions with long-term, deliberate management of groundwater. The Subbasin GSAs' best understanding of future conditions is based on historical precipitation, evapotranspiration, streamflow, and reasonably anticipated climate change and sea-level rise, which have been estimated based on the best available climate science (DWR, 2018). These parameters underpin the estimated future water budget over the planning horizon (see Section 6.5). Groundwater conditions that are the

result of extreme climatic conditions, which are worse than those anticipated based on the best available climate science, do not constitute an undesirable result. As such, SMCs may be modified in the future to reflect observed future climate conditions.

The GSAs track hydrologic conditions as an ongoing GSP implementation activity. These observed hydrologic conditions are compared with projected hydrologic conditions for the Subbasin as presented in this GSP. This information is used to interpret the Subbasin's performance against SMCs.

Because the GSP addresses long-term groundwater sustainability, exceedance of some SMCs during an individual year does not constitute an undesirable result by itself. Pursuant to SGMA Regulations (CWC §10721(w)(1)), "Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods." Therefore, groundwater levels may temporarily fall below minimum thresholds during prolonged droughts, which could be more extreme than those anticipated based on historical data and expected climate change conditions. Such temporary exceedances do not constitute an undesirable result.

The SMCs presented in this chapter have been developed based on historically observed hydrologic conditions and, in most cases, reasonably anticipated climate change. These SMCs may be updated in future amendments to reflect changes in anticipated climate conditions and climate change based upon groundwater modeling results or changes in anticipated monitoring trends.

8.4 Management Areas

As introduced in Section 1.4, this GSP establishes two Management Areas within the Subbasin including the Marina-Ord Area and the Corral de Tierra Area. These Management Areas have been developed to facilitate GSP implementation considering the differences in jurisdiction, water use sector, and principal aquifer characteristics described in Chapters 3 through 5.

Per GSP Emergency Regulations §354.20(a), "[m]anagement areas may define different minimum thresholds and be operated to different measurable objectives than the basin at large, provided that undesirable results are defined consistently throughout the basin"; and §354.20 (b) "A basin that includes one or more Management Areas shall describe the following in the Plan… (2) The minimum thresholds and measurable objectives established for each management area and an explanation of the rationale for selecting those values, if different from the basin at large."

This chapter takes a basin-wide approach to establishing undesirable results and identifies the drivers of undesirable results within each management area. The drivers for undesirable results often differ between the Management Areas, warranting different minimum thresholds and measurable objectives. For example, the primary concern of groundwater management in the Marina-Ord Area is seawater intrusion. Due to the land use characteristics and groundwater conditions in this area, effects that are typically associated with chronic lowering of groundwater

levels, such as dewatering of wells, are not likely to occur. However, groundwater elevation SMCs in the Marina-Ord Area need to be established at levels that can control seawater intrusion. The Corral de Tierra Area is generally located further inland, where seawater intrusion is not likely to occur. However, the area supports groundwater use by numerous municipal water systems, small water users, and domestic users where chronic lowering of groundwater levels may cause dewatering of wells, increased pumping costs, or reductions in storage that are significant and unreasonable. Therefore, groundwater elevation SMCs in the Corral de Tierra Area need to be established at levels that protect the ability to pump from domestic and small water system wells.

Minimum thresholds and measurable objectives defined in this chapter are developed through close coordination between the two GSAs to ensure the criteria established for one management area do not contribute to undesirable results in the other. In addition, SMCs identified in this chapter consider SMCs and conditions identified in adjacent subbasins, which are in direct hydraulic communication with the Monterey Subbasin as described in Chapters 4 and 5. Due to the interconnectivity between the Monterey Subbasin and adjacent subbasins, the Monterey Subbasin groundwater elevation minimum thresholds are intended to be consistent with adjacent subbasins and are based on the assumption that SMCs and sustainability goals will be met in the adjacent subbasins. Therefore, continued coordination of SMCs and sustainability goals is critical, as each subbasin's ability to achieve sustainability is affected by the adjacent subbasins' ability to manage their groundwater sustainably. Through implementation, continued monitoring, data collection, additional analysis, and modeling will be used to validate the impact of the SMCs on the Monterey Subbasin and adjacent subbasins to inform the GSAs of compliance and needed adjustments.

Chapter 7 identifies the management area-specific monitoring networks that facilitate monitoring of SMCs defined in this chapter.

8.5 General Process for Establishing Sustainable Management Criteria

MCWDGSA and SVBGSA established a Technical Committee and a Steering Committee for the Monterey Subbasin to facilitate coordination between the two GSAs in development of this GSP. These Committees are established in accordance with the GSAs' Framework Agreement. The Technical Committee consists of GSA staff and consultants and meets on a monthly basis or more frequently as needed. The Technical Committee is the platform for coordinating technical analysis, data sharing, and communication in development of the GSP. The Steering Committee consists of one Board Member and the General Manager of each GSA and ihas generally convened every quarter since DWR's approval of the original GSP. The purpose of the Steering Committee is to resolve any issues raised by the Technical Committee and reach consensus between the GSAs.

The SMCs presented in this chapter were developed using publicly available information, hydrogeologic analysis, feedback gathered during public meetings, and coordination between MCWDGSA and SVBGSA via the Monterey Subbasin Technical and Steering Committees during development of the original GSP and subsequent amendments.

The general process to develop and update the SMCs included:

- Establishing a procedure for SMC development in the Technical Committee;
- Gathering input and developing preferences for establishing SMCs for each GSA's respective management area, including consultation with stakeholders and discussions within GSA staff;
- Reconciling management area-level input in the Technical Committee;
- Presenting proposed SMCs to GSA governing bodies and stakeholder groups;
- Modifying SMCs based on input from the public, GSA staff, and board members.

8.6 Sustainable Management Criteria Summary

Table 8-1 provides a summary of the SMCs for each of the six sustainability indicators. The measurable objectives are the goals that reflect the Subbasin's desired groundwater conditions for each sustainability indicator and provide operational flexibility above the minimum thresholds. The minimum thresholds are quantitative indicators of the Subbasin's locally defined significant and unreasonable conditions. An undesirable result is a combination of minimum threshold exceedances that show a significant and unreasonable condition across the Subbasin as a whole.

This GSP is designed to not only avoid undesirable results, but to achieve the sustainability goals within 20 years, along with interim milestones every 5 years to demonstrate progress. Acknowledging that the Subbasin shares aquifers with adjacent subbasins and achieving sustainability is a regional effort, Chapter 9 includes management actions and projects that are designed to maintain conditions above minimum thresholds or reach the measurable objectives within 20 years and maintain those conditions for 30 years for all 6 sustainability indicators. The rationale and background for developing these SMCs are described in detail in the following sections. The SMCs presented in Table 8-1 are part of the GSA's 50-year management plan: SGMA allows for 20 years to reach sustainability and requires the Subbasin have no undesirable results for the subsequent 30 years.

Table 8-1 Sustainable Management Criteria Summary

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result	Interim Milestones
Chronic lowering of groundwater levels	Measured through the groundwater elevation representative monitoring well network within each management area	**Marina-Ord Area:** Minimum groundwater elevations historically observed between 1995 and 2015 in the Dune Sand, 180-Foot, 400-Foot, and Deep Aquifers.	**Marina-Ord Area:** Groundwater elevations observed in 2004 in the Dune Sand, 180-Foot, 400-Foot, and Deep Aquifers.	Over the course of any one year, exceedance of more than 20% of groundwater level minimum thresholds in **either** (a) both the Dune Sand and upper 180-Foot Aquifers, or (b) both the lower 180-Foot and 400-Foot Aquifers, or (c) the Deep Aquifers, or (d) the El Toro Primary Aquifer System.	**Whole Subbasin:** Interim milestones are described in Table 8-3 for each RMS well that is defined in Chapter 7.
		Corral de Tierra Area: Groundwater elevations observed in 2015 in the El Toro Primary Aquifer System.	**Corral de Tierra Area:** Groundwater elevations observed in 2008 in the El Toro Primary Aquifer System.		

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result	Interim Milestones
Reduction in groundwater storage	Measured through the groundwater elevation and seawater intrusion representative monitoring well networks.	**Whole Subbasin:** Minimum thresholds for chronic lowering of groundwater levels and seawater intrusion will be used as a proxy for reduction of groundwater storage minimum threshold.	**Whole Subbasin:** Measurable objectives for chronic lowering of groundwater levels and seawater intrusion will be used as a proxy for reduction of groundwater storage measurable objective.	Over the course of any one year, (1) exceedance of more than 20% of groundwater level minimum thresholds in **either** (a) both the Dune Sand and upper 180-Foot Aquifers, or (b) both the lower 180-Foot and 400-Foot Aquifers, or (c) the Deep Aquifers, or (d) the El Toro Primary Aquifer System; OR (2) exceedance of seawater intrusion minimum thresholds.	**Whole Subbasin:** Groundwater elevation and seawater intrusion interim milestones described respectively in Table 8-3 and Section 8.9.4.2 will serve as a proxy for reduction of groundwater storage interim milestones.

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result	Interim Milestones
Seawater intrusion	Measured through seawater intrusion representative monitoring well network.	**Whole Subbasin:** The approximate location in 2015 of the 500 mg/L chloride concentration isocontour in the lower 180-Foot and 400-Foot Aquifers; Approximately 3,500 feet from the coast in the Dune Sand Aquifer, upper 180-Foot Aquifer and Deep Aquifers. This distance is generally consistent with the location of Highway 1 in the Monterey Subbasin and seaward of groundwater extraction wells in the Subbasin. No seawater intrusion in the El Toro Primary Aquifer System.	**Whole Subbasin:** Measurable objective is identical to the minimum threshold.	Any exceedance of the minimum threshold is considered as an undesirable result.	**Whole Subbasin:** Identical to minimum thresholds and measurable objectives. No chloride concentration above 500 mg/L attributable to seawater intrusion in RMS wells.

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result	Interim Milestones
Degraded groundwater quality	Groundwater quality data downloaded annually from state sources and requested annually from CCRWQCB for ILP wells.	**Whole Subbasin:** No additional exceedances of either the regulatory drinking water standards or Basin Plan water quality objectives for groundwater quality COC. See Table 8-5 for the list of constituents.	**Whole Subbasin:** Measurable objective is identical to the minimum threshold.	Future or new minimum threshold exceedances that are caused by a direct result of extraction or GSA groundwater management action(s) are considered as an undesirable result, unless minimum threshold exceedances have been managed to provide a water supply (i.e., treated, blended, or replaced) or beneficial users are not potentially harmed. GSA groundwater management actions include projects or management actions and regulation of groundwater extraction.	**Whole Subbasin:** Identical to minimum thresholds and measurable objectives, which represent conditions during the GSP Baseline Period.
Subsidence	Measured using DWR-provided InSAR data.	**Whole Subbasin:** Zero net long-term subsidence, with no more than 0.1 foot per year of measured vertical displacement between June of one year and June of the subsequent year to account for InSAR measurement errors.	**Whole Subbasin:** Measurable objective is identical to the minimum threshold.	Any exceedance of minimum thresholds during any one year due to lowered groundwater elevations is considered as an undesirable result.	**Whole Subbasin:** Identical to minimum thresholds and measurable objectives, which represent current conditions.

Sustainability Indicator	Measurement	Minimum Threshold	Measurable Objective	Undesirable Result	Interim Milestones
Depletion of interconnected surface water (ISW)	Measured through shallow groundwater elevations as a proxy near potential locations of ISW in the ISW representative monitoring well network.	**Whole Subbasin:** Minimum shallow groundwater elevations historically observed between 1995 and 2015 near locations of interconnected surface water.	**Whole Subbasin:** Identical to minimum threshold shallow groundwater elevations.	Any minimum threshold exceeded in a shallow groundwater well near any location of ISW for more than two consecutive years.	**Whole Subbasin:** Identical to minimum thresholds and measurable objectives, which represent conditions during the GSP Baseline Period.

8.7 Chronic Lowering of Groundwater Levels SMCs

Chronic lowering of groundwater levels is arguably the most fundamental Sustainability Indicator, as it influences several other key sustainability indicators, including seawater intrusion, reduction of groundwater storage, land subsidence, and interconnected surface water. Groundwater levels are also some of the most readily available and measurable metrics of groundwater conditions, which allows for a systematic, data-driven approach to the development of Sustainable Management Criteria.

8.7.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable groundwater elevations in the Marina-Ord and Corral de Tierra Areas are identified as follows.

Marina-Ord Area

Significant and unreasonable groundwater elevations in the Marina-Ord Area include:

- Groundwater elevations below those historically observed prior to 2015[30]:
    - Near the coast in the Dune Sand, 180-Foot, and 400-Foot Aquifers (where seawater intrusion was not observed),
    - Near the seawater intrusion front in the lower 180-Foot and 400-Foot Aquifers, and
    - Throughout the Deep Aquifers, because such groundwater elevations could cause lateral or vertical expansion of the existing seawater intrusion extent and/or eventual migration of saline water into Deep Aquifer wells.

As discussed in Section 3.1.6, groundwater use within the Marina-Ord Area is almost exclusively limited to generation of municipal supplies by MCWD. Groundwater elevations are significantly higher than municipal production well screen elevations in all aquifers in the Marina-Ord Area, and there is limited concern regarding the potential dewatering of groundwater production wells. Therefore, groundwater levels that could cause undesirable results associated with other locally relevant sustainability indicators, such as the lateral or vertical expansion of the existing seawater intrusion extent and/or eventual migration of saline water into Deep Aquifer wells, have been used to define groundwater level minimum thresholds in the Marina-Ord Area.

Corral de Tierra Area

Significant and unreasonable groundwater elevations in the Corral de Tierra Area include:

- Groundwater elevations at or below those observed in 2015. Lower groundwater elevations could lead to inadequate water production in a significant number of domestic

[30] Based upon the historical period (Water Year 2003 through 2017)

and small water system wells, not only in the Corral de Tierra Area but also in the Laguna Seca subarea of the adjacent Seaside Subbasin.

- Groundwater elevations that cause undesirable results associated with other locally relevant sustainability indicators, including interconnected surface water and groundwater quality, as described in the sections below.

These significant and unreasonable conditions were determined during development of the original GSP.

8.7.2 Undesirable Results

Undesirable results have been defined within each management area. However, pursuant to the GSP Emergency Regulations, which state that Undesirable Results are to be defined consistently throughout the Subbasin (23 CCR §354.20), the definitions of undesirable results have been coordinated between Management Areas by subbasin GSAs and are described below.

8.7.2.1 Criteria for Determining Undesirable Results

The chronic lowering of groundwater levels undesirable result is a quantitative combination of groundwater level minimum threshold exceedances. For the Subbasin, the undesirable result for chronic lowering of groundwater levels occurs when

> *Over the course of any one year, exceedance of more than 20% of the groundwater level minimum thresholds in either:*
>
> *a. both the Dune Sand Aquifer and Upper 180-Foot Aquifer, or*
> *b. both the Lower 180 Foot and 400 Foot aquifer, or*
> *c. the Deep Aquifers, or*
> *d. the El Toro Primary Aquifer System.*

Since the GSP addresses long-term groundwater sustainability, exceedances of groundwater levels minimum thresholds during a drought do not constitute an undesirable result. Pursuant to SGMA Regulations (California Water Code §10721(w)(1)), "Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods." Therefore, groundwater levels may temporarily exceed minimum thresholds during droughts, and do not constitute an undesirable result, as long as groundwater levels rebound.

Setting undesirable results based on an allowable percentage of minimum threshold exceedances provides flexibility in defining sustainability. Increasing the percentage of allowed minimum threshold exceedances allows for greater localized fluctuations in water levels but may lead to significant and unreasonable conditions for some beneficial users. Reducing the percentage of allowed minimum threshold exceedances ensures strict adherence to minimum thresholds but reduces operational flexibility due to unanticipated hydrogeologic conditions. The

undesirable result is set at 20% within each principal aquifer or group of principal aquifers. For grouped aquifers, an undesirable result occurs only when more than 20% of RMSs exceed minimum thresholds within both aquifers comprising the group. The percentages balance the interests of beneficial users with the practical aspects of groundwater management under uncertainty and apply to both Management Areas.

This undesirable result definition refers to and relies on minimum thresholds established for each principal aquifer, or group of principal aquifers. As discussed further below and in Chapter 7, minimum thresholds for groundwater levels are set at 35 Representative Monitoring Sites in the Marina-Ord Area and 13 Representative Monitoring Sites in the Corral de Tierra Area. Within the Marina-Ord Area and the Reservation Road portion of the Corral de Tierra Area where the hydrogeological setting is similar, it is considered an undesirable result for chronic lowering of groundwater levels if minimum thresholds are exceeded in more than 20% of the Representative Monitoring Sites within either (a) the Dune Sand and upper 180-Foot Aquifer, or (b) the lower 180-Foot and 400-Foot Aquifers, or (c) the Deep Aquifers. Undesirable results for chronic lowering of water levels within the Marina-Ord Area and the Reservation Road portion of the Corral de Tierra Area are set based on minimum thresholds within these groups of aquifers, because of how they are hydraulically connected near the coast where the greatest potential for additional seawater intrusion exists and the RMS networks are primarily focused. For example, groundwater levels within the Dune Sand Aquifer and upper 180-Foot are very similar in coastal wells due to the pinching out of the Fort Ord/Salinas Valley Aquitard (FO/SVA)[31]. Similarly, groundwater elevations in the lower 180-Foot Aquifer are similar to those measured in the 400-Foot Aquifer across much of the Marina-Ord Area.

Based on the RMS wells that have SMCs as of GSP Amendment 1, the 20% limit on minimum threshold exceedances in the undesirable result allows for:

(a) A total of 3 exceedances out of the 16 existing RMS wells within the Dune Sand Aquifer and upper 180-Foot Aquifer,

(b) A total of 1 exceedance out of the 7 existing RMS wells within the lower 180-Foot Aquifer and 400-Foot Aquifer,

(c) A total of 1 exceedance out of the 9 existing RMS wells within the Deep Aquifer, and

(d) A total of 2 exceedances out of the 11 existing RMS wells within the El Toro Primary Aquifer System.

The maximum allowable number of wells under the exceedance criteria is the greatest whole number below 20% of the applicable RMS total. This number of exceedances is considered reasonable given the hydrogeologic uncertainty of the Subbasin. If the monitoring system grows, additional exceedances will be allowed. One additional exceedance will be allowed for approximately every five new monitoring wells.

[31] See discussion in Chapter 5

8.7.2.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result include the following:

- **Unsustainable groundwater management in adjacent subbasins**. Due to the hydrologic connectivity between the Subbasin and other Salinas Valley Basin Subbasins, increased groundwater extraction or reduced recharge in either the Subbasin or the greater Salinas Valley Basin may lead to undesirable results.
- **Localized pumping clusters**. Even if regional pumping is maintained within the sustainable yield, clusters of high-capacity of heavily utilized wells may cause excessive localized drawdowns that lead to undesirable results.
- **Expansion of municipal or agricultural pumping**. Additional extractions for municipal or agricultural purposes, without an offsetting increase in recharge, cross-boundary flows and/or projects will reduce groundwater elevations.
- **Reservoir operations.** Operation of Nacimiento and San Antonio Reservoirs affect the timing and quantity of surface water flows. This affects groundwater levels in the subbasin both directly from recharge of surface water in the Subbasin and indirectly from subsurface flows after recharge in adjacent subbasins. In addition, surface water rediversion at the Salinas River Diversion Facility (SRDF), along with recycled water availability, affect CSIP groundwater demand.
- **Departure from the GSP's climatic assumptions, including extensive, unanticipated drought**. Minimum thresholds were established based on historical groundwater elevations and reasonable estimates of future climatic conditions and groundwater elevations. Departure from the GSP's climatic assumptions or extensive, unanticipated droughts may lead to excessively low groundwater elevations and undesirable results.

At the time of original GSP adoption, an undesirable result for chronic lowering of groundwater levels existed based on fall 2020 or 2019 monitoring data:

(1) groundwater elevations within the Marina-Ord Area exceeded minimum thresholds in

   a. 7 out of 9 existing RMS wells (78%) in the Deep Aquifers; and

(2) Groundwater elevations within the Corral de Tierra Area exceeded minimum thresholds in 5 out of 11 existing RMS wells (45%).

8.7.2.3 Effects on Beneficial Users and Land Uses

As discussed in Section 3.1.6, groundwater use within the Marina-Ord Area is almost exclusively limited to generation of municipal supplies by MCWD. There is one recognized disadvantaged community within the subbasin as shown on Figure 2-1. This community relies on water services provided by MCWD.

As discussed above, undesirable results caused by chronic lowering of groundwater levels in the Marina-Ord Area are primarily associated with the expansion of seawater intrusion and other locally relevant sustainability indicators. These sustainability indicators have been considered when defining groundwater level minimum thresholds in the Marina-Ord Area.

In the Corral de Tierra Area, domestic wells are generally the most vulnerable due to their shallower depths. Low groundwater levels may result in higher pumping costs, the need to lower well pumps, mechanical problems, microbial contamination, or the need to drill deeper replacement wells. Undesirable results caused by chronic lowering of groundwater levels in the Corral de Tierra Area indicate a risk that shallower wells may go dry, as well as risk of interference with other locally relevant sustainability indicators. Allowing 20% exceedances in the Corral de Tierra Area are only reasonable if the exceedances are spread out across the management area. If the exceedances are clustered in a small area, it may indicate that significant and unreasonable effects are being borne by a localized group of landowners and water users and should be evaluated.

GDEs have the potential to be impacted if the depth to groundwater falls below their rooting depths.

8.7.3 Minimum Thresholds

Minimum thresholds for chronic lowering of groundwater levels ("groundwater elevation minimum thresholds") in the **Marina-Ord Area** are defined as follows:

> *Minimum groundwater elevations historically observed between 1995 and 2015 in the Dune Sand, 180-Foot, 400-Foot, and Deep Aquifers.*

Groundwater elevation minimum thresholds in the **Corral de Tierra Area** are defined as follows:

> *Groundwater elevation observed in 2015 in the El Toro Primary Aquifer System.*

Groundwater elevation measurements collected during the fourth quarter (i.e., October, November, December) are used to establish minimum thresholds and measurable objectives in the Subbasin and will be used in the future for comparison to these thresholds. This methodology is (1) consistent with the methodology used in the adjacent 180/400 Subbasin; and (2) considers the existing monitoring schedule for the majority of RMS wells.

Minimum thresholds for each well within the groundwater elevation representative monitoring network are provided in Table 8-2. Figure 8-1 through Figure 8-7 show minimum thresholds and measurable objectives for each RMS. These tables and maps do not show SMCs for the 11 new monitoring wells installed between 2024 and 2026, after the original GSP. SMCs will be established for each well and will be documented through annual reports once these wells have additional three to five years of groundwater elevation measurements.

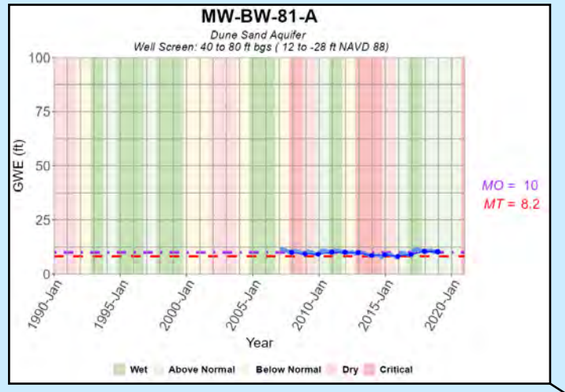
Table 8-2 Chronic Lowering of Groundwater Elevations Minimum Thresholds and Measurable Objectives

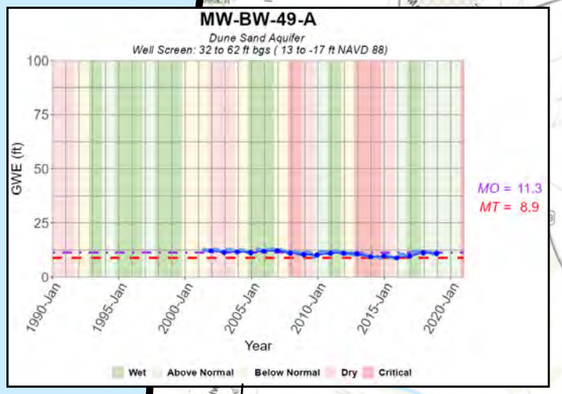
Monitoring Site	Aquifer	Minimum Threshold (ft NAVD88)	Measurable Objective (ft NAVD88)
Marina-Ord Area			
MW-BW-28-A	Dune Sand Aquifer	63.7	70.3
MW-BW-49-A	Dune Sand Aquifer	8.9	11.3
MW-BW-81-A	Dune Sand Aquifer	8.2	10.0
MW-BW-82-A	Dune Sand Aquifer	7.9	9.5
MW-OU2-13-A	Dune Sand Aquifer	89.6	94.4
MW-OU2-32-A	Dune Sand Aquifer	7.2	8.1
MW-OU2-34-A	Dune Sand Aquifer	4.7	6.6
CDM MW-1 Beach	Upper 180-Foot Aquifer	3.3	3.3
EW-12-04-180M	Upper 180-Foot Aquifer	6.0	6.5
MW-02-05-180	Upper 180-Foot Aquifer	6.5	8.4
MW-02-06-180	Upper 180-Foot Aquifer	6.1	7.3
MW-02-10-180	Upper 180-Foot Aquifer	6.5	7.3
MW-02-13-180U	Upper 180-Foot Aquifer	6.8	7.3
MW-B-05-180	Upper 180-Foot Aquifer	-8.0	-3.4
MW-BW-55-180	Upper 180-Foot Aquifer	-6.4	-5.7
MW-OU2-29-180	Upper 180-Foot Aquifer	-9.0	-7.2
MW-BW-04-180	Lower 180-Foot Aquifer	-11.0	-11.0
MW-OU2-66-180	Lower 180-Foot Aquifer	-10.0	-9.2
TEST2	Lower 180-Foot Aquifer	-11.9	-10.6
MP-BW-42-345	Lower 180-Foot, 400-Foot Aquifer	-10.4	-7.9
MP-BW-50-339	Lower 180-Foot, 400-Foot Aquifer	-8.5	-7.1
MPWMD#FO-11S	400-Foot Aquifer	-25.9	-6.4
MW-OU2-07-400	400-Foot Aquifer	-6.6	-4.2
MCWD-MW-4AVE(S) (a)	400-Foot Aquifer	--	--
MCWD-MW-C2(S) (a)	400-Foot Aquifer	--	--
MCWD-MW-DB(S) (a)	400-Foot Aquifer	--	--
014S001E24L002M	Deep Aquifers	-25.2	-16.4
014S001E24L003M	Deep Aquifers	-2.4	7.9
014S001E24L004M	Deep Aquifers	-30.2	-16.6
014S001E24L005M	Deep Aquifers	-22.1	-1.5
14S02E33E01	Deep Aquifers	-45.3	-23.3
14S02E33E02	Deep Aquifers	-19.0	-11.4

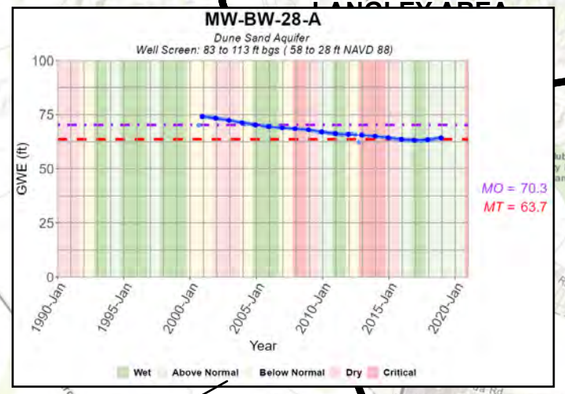
Monitoring Site	Aquifer	Minimum Threshold (ft NAVD88)	Measurable Objective (ft NAVD88)
PZ-FO-32-910	Deep Aquifers	-44.1	-19.7
MPWMD#FO-11D	Deep Aquifers	-4.8	3.3
Sentinel MW#1	Deep Aquifers	-25.4	-18.8
MCWD-MW-4AVE(M) (a)	Upper Deep Aquifer	--	--
MCWD-MW-4AVE(D) (a)	Lower Deep Aquifer	--	--
MCWD-MW-C2(D) (a)	Upper Deep Aquifer	--	--
MCWD-MW-DB(D) (a)	Upper Deep Aquifer	--	--
Corral de Tierra Area			
16S/02E-01M01	El Toro Primary Aquifer System	310.6	320.3
16S/02E-02G01	El Toro Primary Aquifer System	297.1	301.8
Robley Deep (South)	El Toro Primary Aquifer System	169.8	183.5
Robley Shallow (North)	El Toro Primary Aquifer System	245.2	255.2
15S/02E-25C01	El Toro Primary Aquifer System	23.0	33.0
15S/03E-18P01	El Toro Primary Aquifer System	0.1	18.1
16S/02E-02H01	El Toro Primary Aquifer System	291.7	298.7
16S/02E-03A01	El Toro Primary Aquifer System	218.0	223.0
16S/02E-03F50	El Toro Primary Aquifer System	231.3	236.3
16S/02E-03H01	El Toro Primary Aquifer System	207.0	217.0
16S/02E-03J50	El Toro Primary Aquifer System	199.5	216.3
15S/03E-20B01 (a)	El Toro Primary Aquifer System	--	--
16S/02E-10G01 (a)	El Toro Primary Aquifer System	--	--
16S/02E-12J02 (a)	El Toro Primary Aquifer System	--	--
16S/02E-12J05 (a)	El Toro Primary Aquifer System	--	--

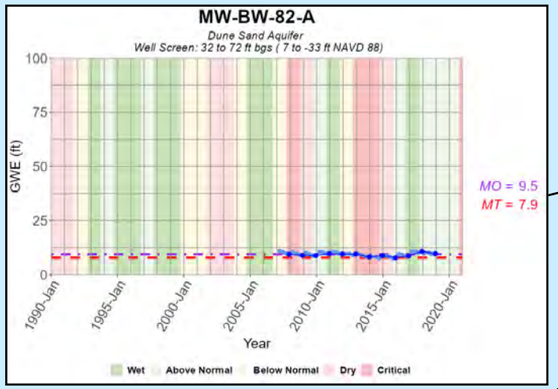
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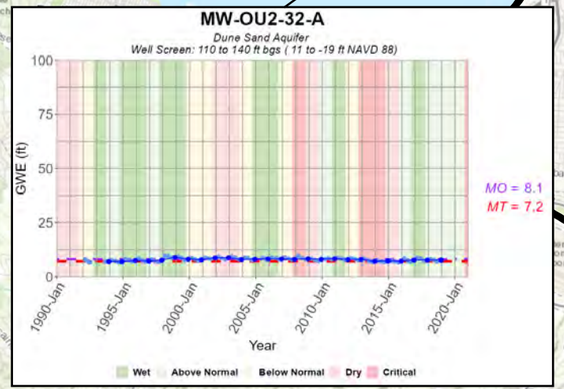
(a) Additional years of data are needed before SMCs can be established for these newly installed monitoring wells.

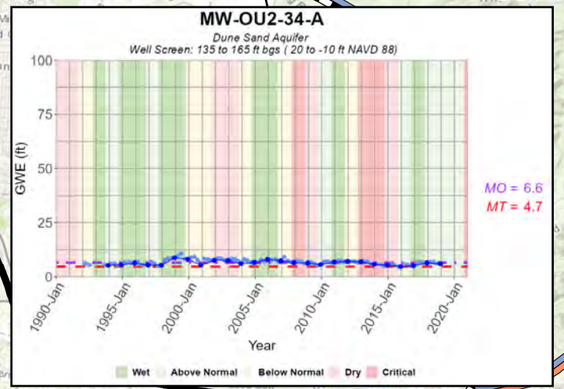


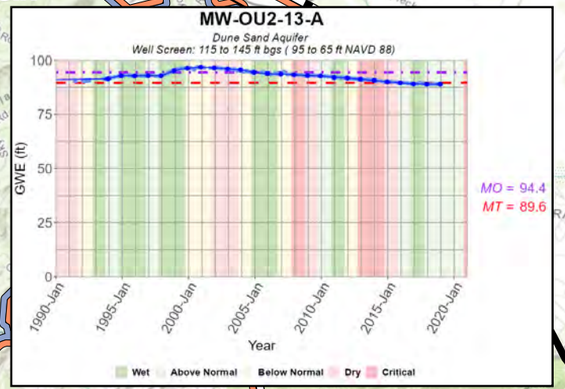












MW-BW-81-A
MW-BW-49-A
MW-BW-82-A
MW-BW-28-A
MW-OU2-32-A
MW-OU2-34-A
MW-OU2-13-A

180/400 FOOT AQUIFER SUBBASIN

MONTEREY SUBBASIN

Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Representative Monitoring Sites for Groundwater Elevations

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Representative Monitoring Sites

- Selected Fourth Quarter GWE Measurements
- Other GWE Measurements
- Measurable Objectives
- Minimum Thresholds

Abbreviations

DWR	= California Department of Water Resources
ft	= foot
GWE	= groundwater elevation
MO	= Measurable Objectives
MT	= Minimum Thresholds
NAVD 88	= North American Vertical Datum of 1988

Notes

1. Selected fourth quarter measurements are measurements closest to December 1st of the year.
2. Groundwater elevations are in ft NAVD 88.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 11 August 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

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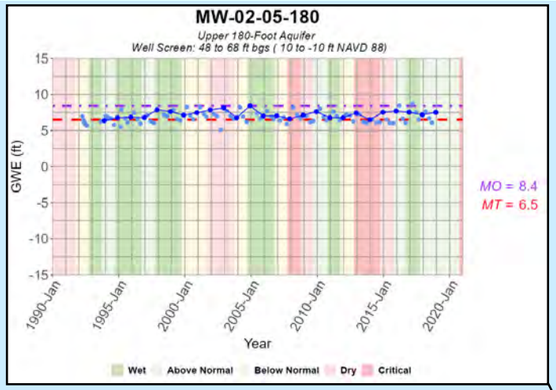
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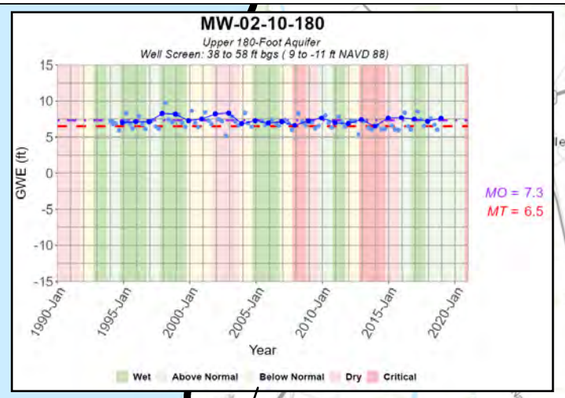
Marina-Ord Area: Groundwater Elevation Minimum Thresholds and Measurable Objectives Dune Sand Aquifer

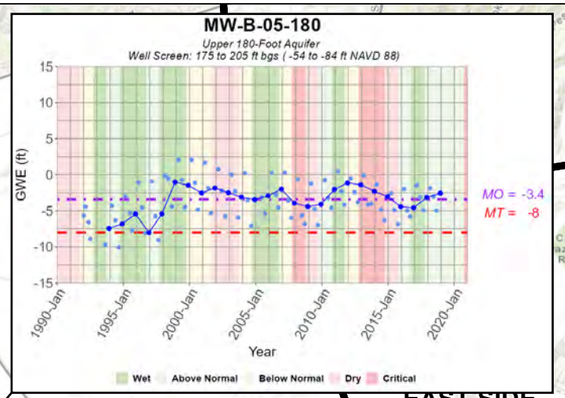
Monterey Subbasin
Groundwater Sustainability Plan
August 2026

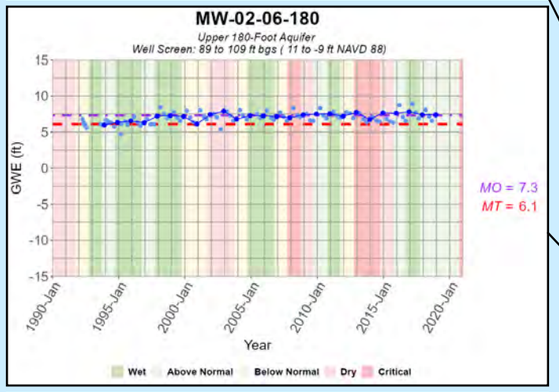
Figure 8-1

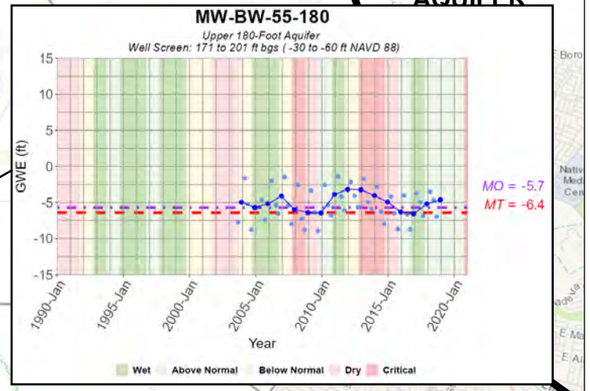
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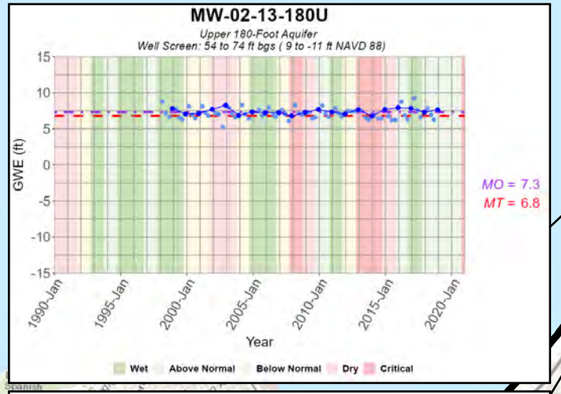


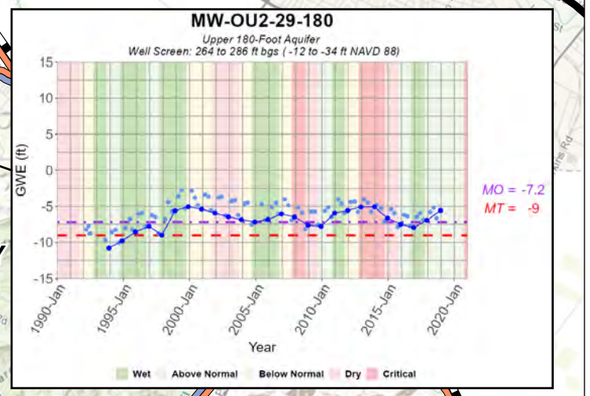


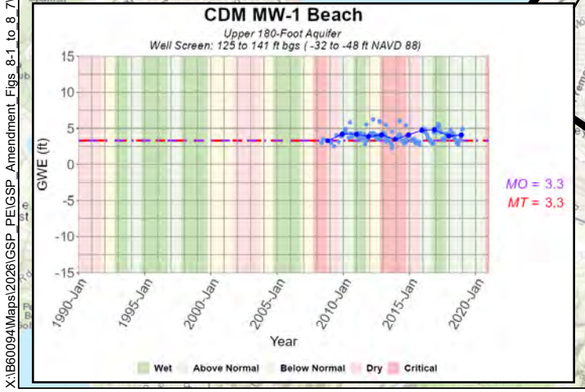


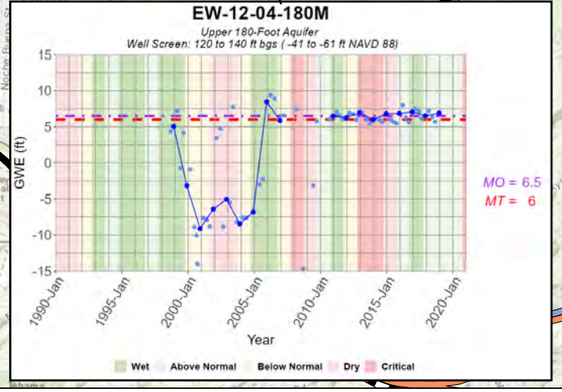












Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Representative Monitoring Sites for Groundwater Elevations

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Representative Monitoring Sites

- Selected Fourth Quarter GWE Measurements
- Other GWE Measurements
- Measurable Objectives
- Minimum Thresholds

Abbreviations

DWR	= California Department of Water Resources
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GWE	= groundwater elevation
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Notes

1. Selected fourth quarter measurements are measurements closest to December 1st of the year.
2. Groundwater elevations are in ft NAVD 88.
3. EW-12-04-180M is a former extraction that stopped pumping in 2009.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 11 August 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

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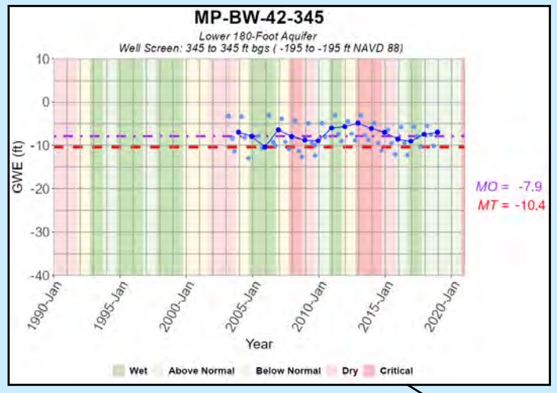
(Scale in Miles)

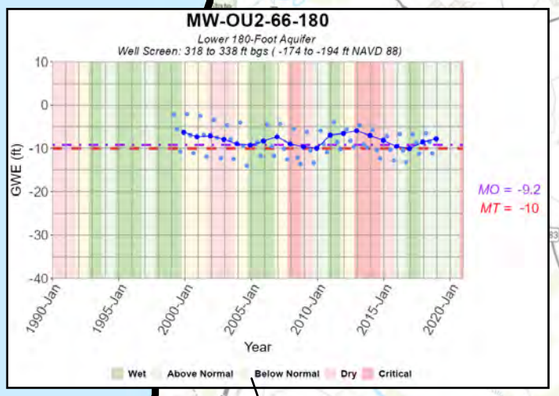
Marina-Ord Area: Groundwater Elevation Minimum Thresholds and Measurable Objectives Upper 180-Foot Aquifer

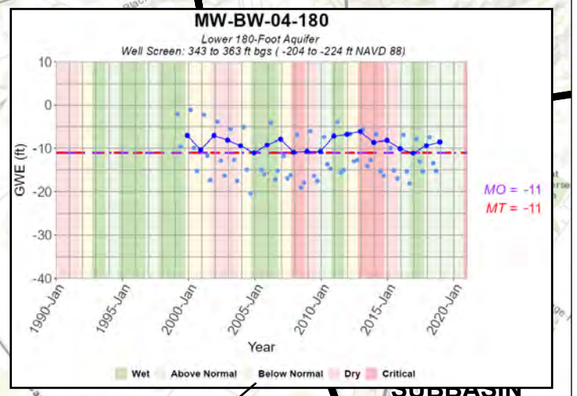
Monterey Subbasin
Groundwater Sustainability Plan
August 2026

Figure 8-2

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180/400 FOOT AQUIFER SUBBASIN

MONTEREY SUBBASIN

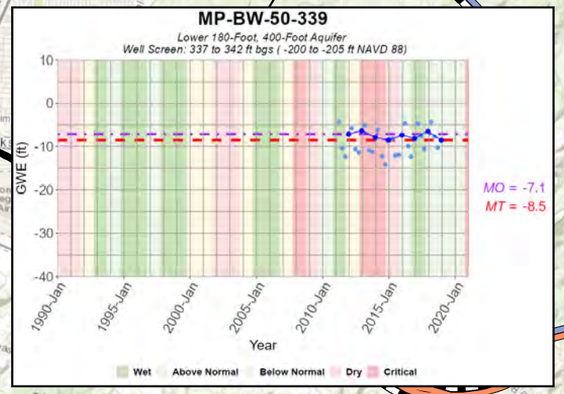
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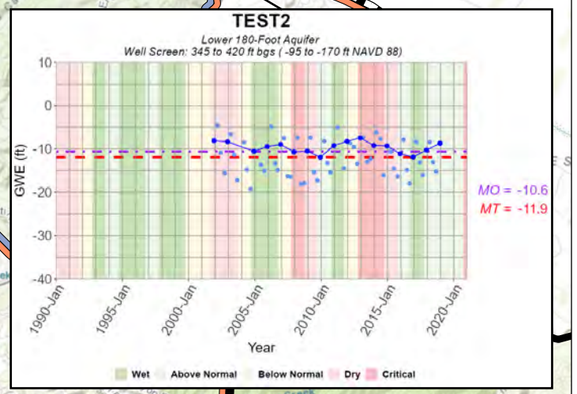
MP-BW-42-345

MW-OU2-66-180

MP-BW-50-339

TEST2





Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Representative Monitoring Sites for Groundwater Elevations

- Lower 180-Foot Aquifer
- Lower 180-Foot, 400-Foot Aquifer

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Representative Monitoring Sites

- Selected Fourth Quarter GWE Measurements
- Other GWE Measurements
- Measurable Objectives
- Minimum Thresholds

Abbreviations

DWR	= California Department of Water Resources
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MO	= Measurable Objectives
MT	= Minimum Thresholds
NAVD 88	= North American Vertical Datum of 1988

Notes

1. Selected fourth quarter measurements are measurements closest to December 1st of the year.
2. Groundwater elevations are in ft NAVD 88.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 11 August 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

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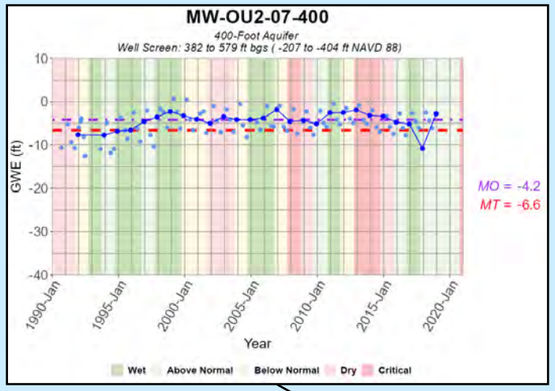
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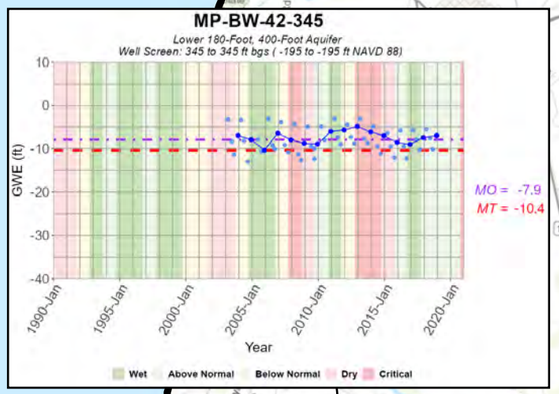
Marina-Ord Area: Groundwater Elevation Minimum Thresholds and Measurable Objectives Lower 180-Foot Aquifer

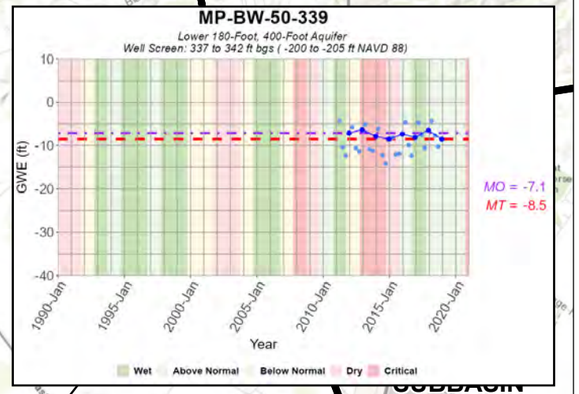
Monterey Subbasin
Groundwater Sustainability Plan
August 2026

Figure 8-3

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Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Representative Monitoring Sites for Groundwater Elevations

- 400-Foot Aquifer
- Lower 180-Foot, 400-Foot Aquifer

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Representative Monitoring Sites

- Selected Fourth Quarter GWE Measurements
- Other GWE Measurements
- Measurable Objectives
- Minimum Thresholds

Abbreviations

DWR	= California Department of Water Resources
ft	= foot
GWE	= groundwater elevation
MO	= Measurable Objectives
MT	= Minimum Thresholds
NAVD 88	= North American Vertical Datum of 1988

Notes

1. Selected fourth quarter measurements are measurements closest to December 1st of the year.
2. Groundwater elevations are in ft NAVD 88.
3. Additional years of data need to be collected before SMCs can be established for newly installed monitoring wells, MCWD-MW-4AVE, MCWD-MW-DB, and MCWD-MW-C2.
4. Stratigraphic uncertainty remains near MPWMD#FO-11S, and whether the well is screened in the 400-Foot Aquifer or the Deep Aquifers.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 11 August 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

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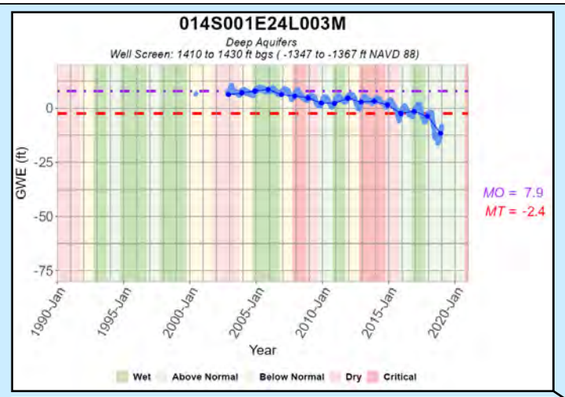
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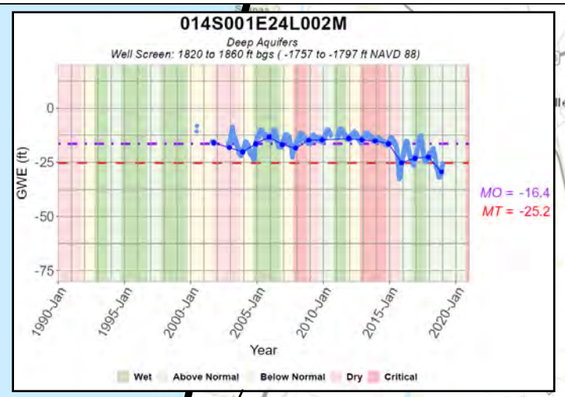
Marina-Ord Area: Groundwater Elevation Minimum Thresholds and Measurable Objectives 400-Foot Aquifer

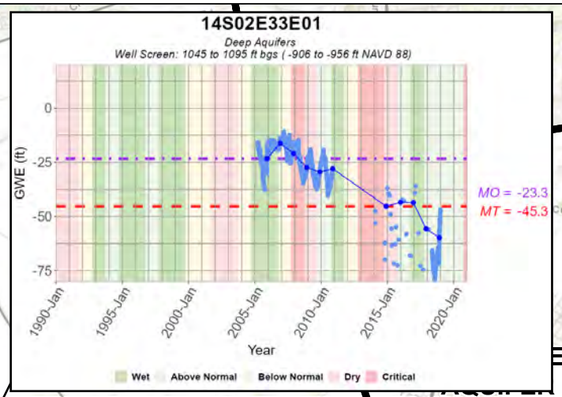
Monterey Subbasin
Groundwater Sustainability Plan
August 2026

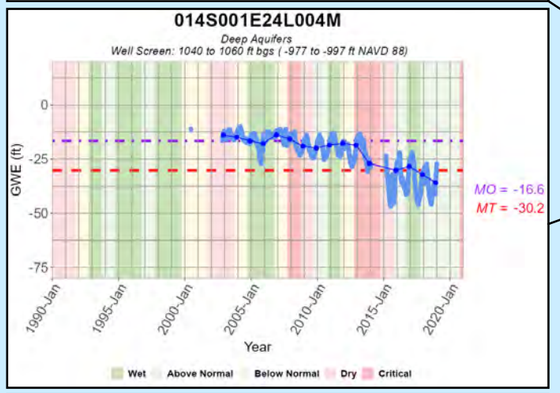
Figure 8-4

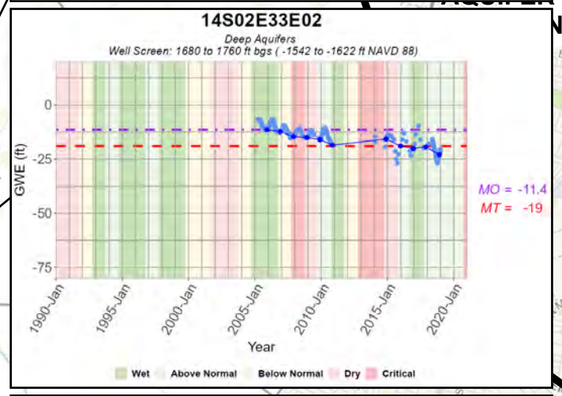
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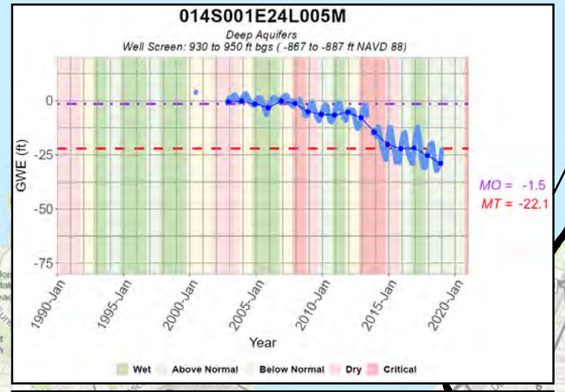


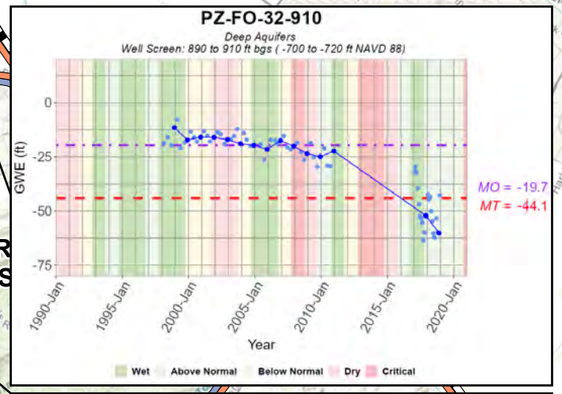


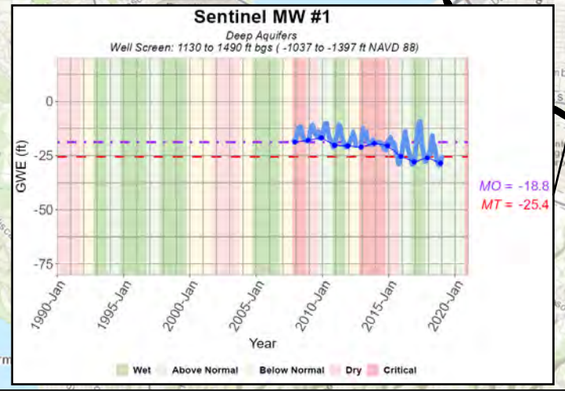


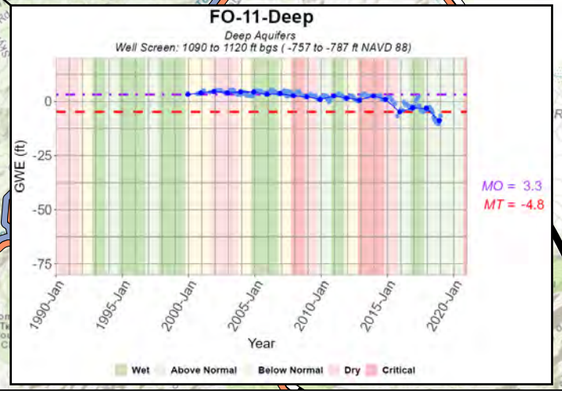


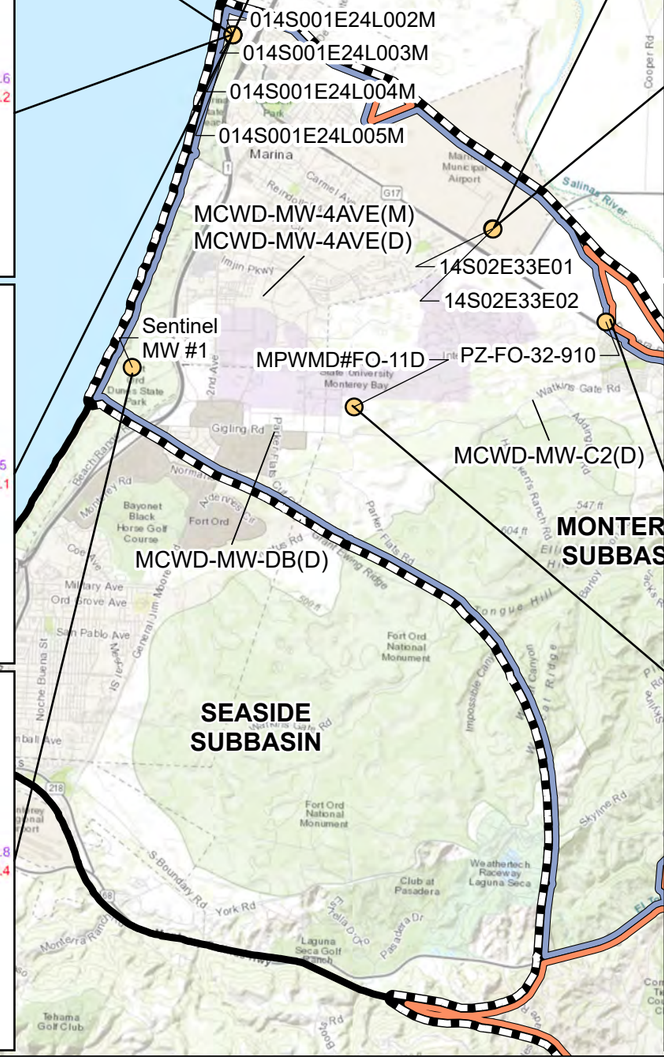












Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Representative Monitoring Sites for Groundwater Elevations

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Representative Monitoring Sites

- Selected Fourth Quarter GWE Measurements
- Other GWE Measurements
- Measurable Objectives
- Minimum Thresholds

Abbreviations

DWR	= California Department of Water Resources
ft	= foot
GWE	= groundwater elevation
MO	= Measurable Objectives
MT	= Minimum Thresholds
NAVD 88	= North American Vertical Datum of 1988

Notes

1. Selected fourth quarter measurements are measurements closest to December 1st of the year.
2. Groundwater elevations are in ft NAVD 88.
3. Additional years of data need to be collected before SMCs can be established for newly installed monitoring wells, MCWD-MW-4AVE, MCWD-MW-DB, and MCWD-MW-C2.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 18 September 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

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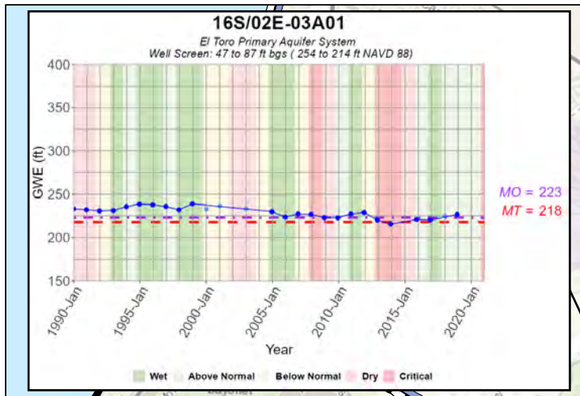
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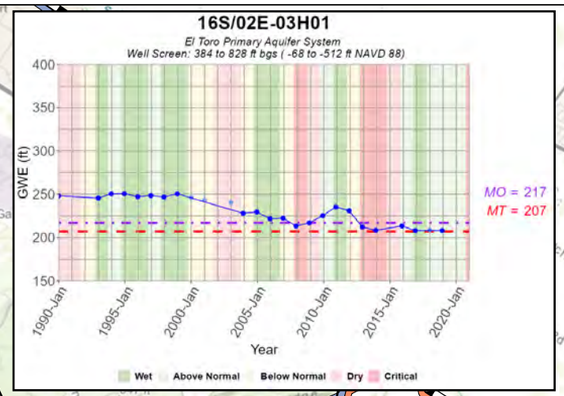
Marina-Ord Area: Groundwater Elevation Minimum Thresholds and Measurable Objectives Deep Aquifers

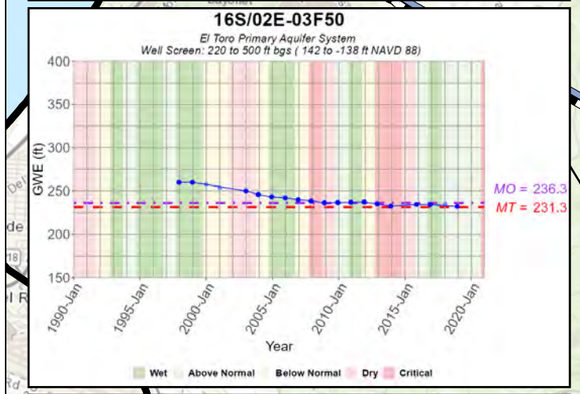
Monterey Subbasin
Groundwater Sustainability Plan
September 2026

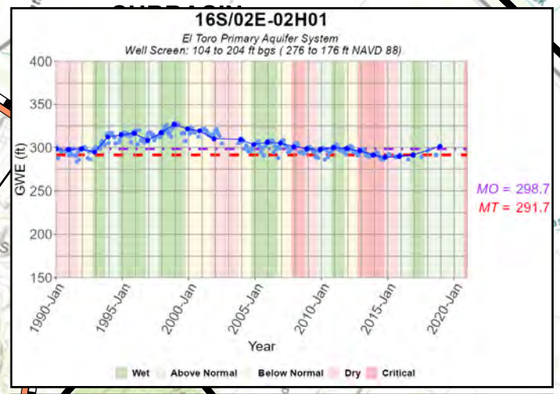
Figure 8-5

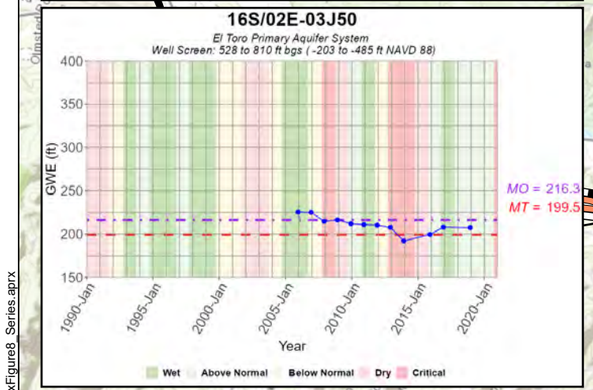
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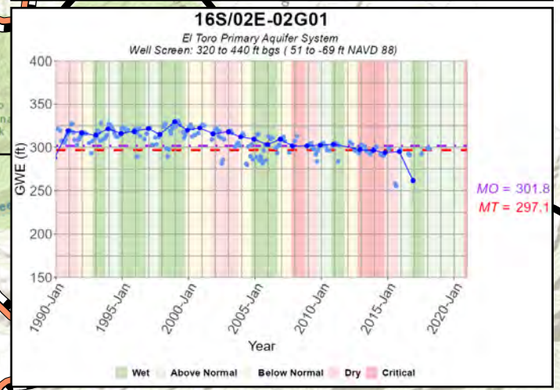


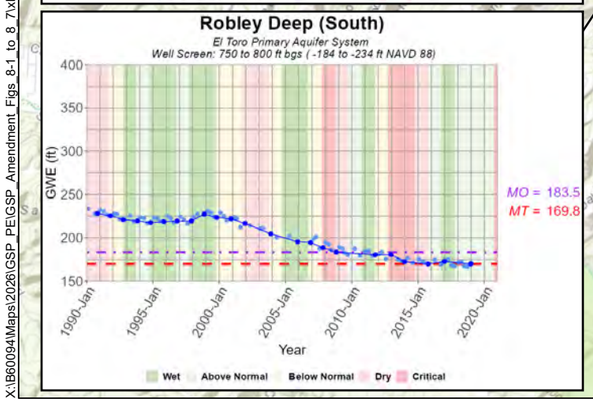


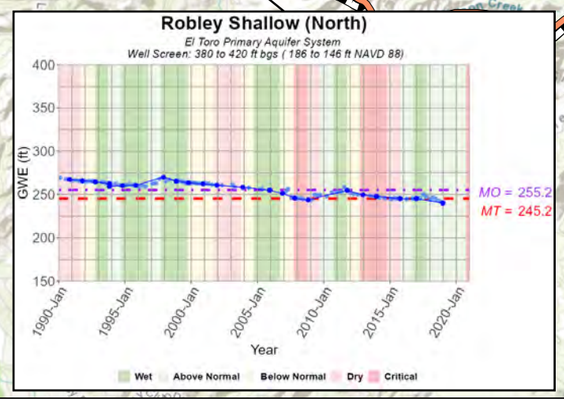


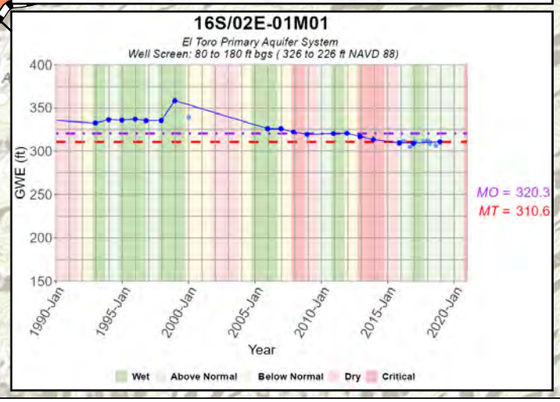












Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Representative Monitoring Sites for Groundwater Elevations

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Representative Monitoring Sites

- Selected Fourth Quarter GWE Measurements
- Other GWE Measurements
- Measurable Objectives
- Minimum Thresholds

Abbreviations

DWR	= California Department of Water Resources
ft	= foot
GWE	= groundwater elevation
MO	= Measurable Objectives
MT	= Minimum Thresholds
NAVD 88	= North American Vertical Datum of 1988

Notes

1. Selected fourth quarter measurements are measurements closest to December 1st of the year.
2. Groundwater elevations are in ft NAVD 88.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 18 September 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

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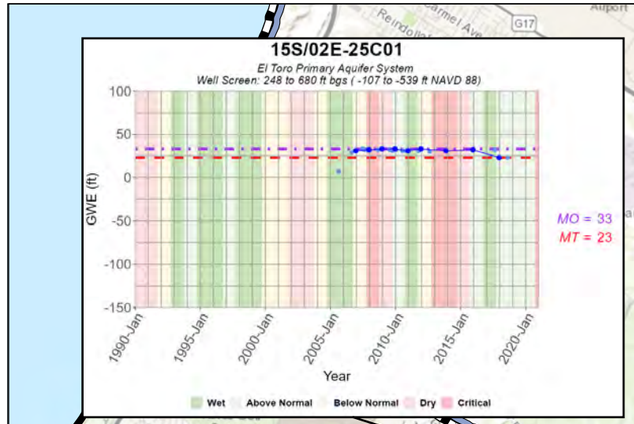
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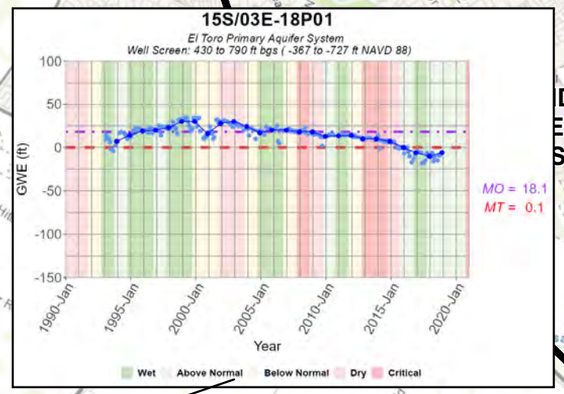
Marina-Ord Area: Groundwater Elevation Minimum Thresholds and Measurable Objectives El Toro Primary Aquifer (South)

Monterey Subbasin
Groundwater Sustainability Plan
September 2026

Figure 8-6

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Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Representative Monitoring Sites for Groundwater Elevations

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Representative Monitoring Sites

- Selected Fourth Quarter GWE Measurements
- Other GWE Measurements
- Measurable Objectives
- Minimum Thresholds

Abbreviations

DWR	= California Department of Water Resources
ft	= foot
GWE	= groundwater elevation
MO	= Measurable Objectives
MT	= Minimum Thresholds
NAVD 88	= North American Vertical Datum of 1988

Notes

1. Selected fourth quarter measurements are measurements closest to December 1st of the year.
2. Groundwater elevations are in ft NAVD 88.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 18 September 2026.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

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(Scale in Miles)

Marina-Ord Area: Groundwater Elevation Minimum Thresholds and Measurable Objectives El Toro Primary Aquifer (North)

Monterey Subbasin
Groundwater Sustainability Plan
September 2026

Figure 8-7

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8.7.3.1 Information and Methodology Used to Establish Minimum Thresholds and Measurable Objectives

Marina-Ord Area

A similar process is used to develop minimum thresholds and measurable objectives for each Management Area.

Consistent with the GSP Emergency Regulations §354.28(c), the definition of groundwater elevation minimum thresholds is based on considerations of historical groundwater elevation trends, water year types, projected water use in Management Areas, and relationships with other sustainability indicators.

The information and criteria relied on to establish minimum thresholds and measurable objectives in the Marina-Ord Area include:

- Historical water level data from the selected RMS wells, each of which has a long-term historical water level record;
- Proximity to the seawater intrusion extent for consideration of seawater intrusion impacts;
- Minimum thresholds or levels of management established in the adjacent subbasins; and
- Well construction information.

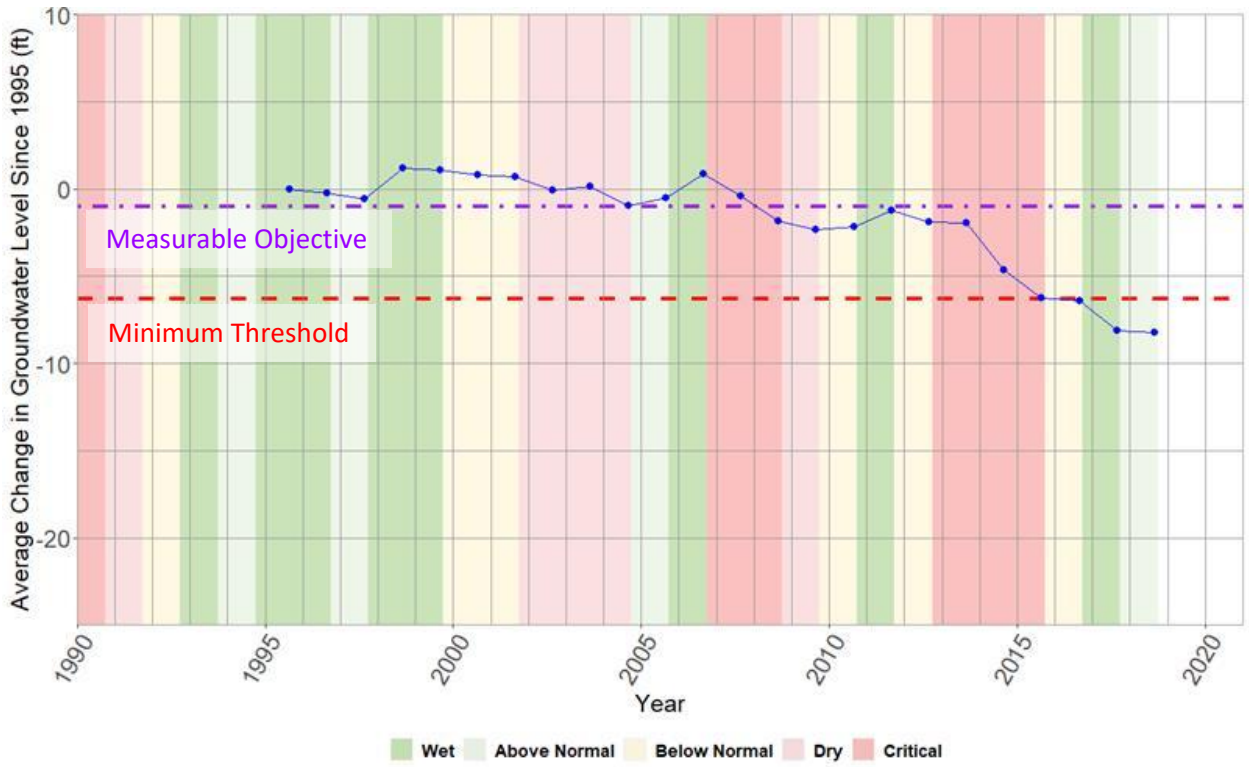
As discussed in the preceding sections, the potential effects of undesirable results caused by chronic lowering of groundwater levels in the Marina-Ord Area are primarily associated with the expansion of seawater intrusion. The observed lateral extent of seawater intrusion within the Subbasin appears to have been generally stable within the 180- and 400-Foot Aquifers between 1995 and 2015. As such, minimum thresholds have been set based upon minimum groundwater elevations observed between 1995 and 2015 in the 180-Foot and 400-Foot aquifers. Seawater intrusion is additionally monitored and managed pursuant to seawater intrusion SMCs (Section 8.9 below) to verify that seawater intrusion does not expand within the Subbasin due to sea-level rise and/or changes in the groundwater gradient.

Seawater intrusion was not observed in the Deep Aquifer through the GSP Historical and Baseline Periods. However, groundwater elevations were declining and have been significantly below sea level. As discussed in Section 5.1.3.1, the declining groundwater elevations in the Deep Aquifers may be causing groundwater elevations to fall within the 400-Foot and Deep Aquifers in the southwestern portion of the Marina-Ord Area (i.e., near MPWMD#FO-11S). However, as stated in Section 5.1.3.1, the actual cause could not be confirmed due to the stratigraphic uncertainty in this area, which is currently being investigated through the completion of new monitoring wells. Although there is some uncertainty whether the Deep Aquifers is subject to seawater intrusion from the ocean, continued decline of groundwater elevations in the Deep Aquifers could increase the risk of seawater intrusion and may eventually cause vertical migration of saline water from overlying aquifers into the Deep Aquifers. As such, minimum thresholds for the Deep

Aquifers are set to historically observed minimum groundwater elevations between 1995 and 2015, which are equivalent to the groundwater elevations observed in 2015 for most Deep Aquifer wells.

In order to evaluate the reasonableness of the proposed minimum thresholds and measurable objectives, the GSAs plotted these values on monitoring well hydrographs. They visually inspected each hydrograph to check if the minimum thresholds and measurable objectives are appropriate. If an RMS well did not have measurements from 1995 through 2015, the SMCs were established considering groundwater elevation trends in the principal aquifers and the closest year for which groundwater elevation data were available.

Figure 8-8 shows the cumulative average change in groundwater levels for all RMS wells in the Marina-Ord Area since 1995. Given that groundwater elevations have been steady in the shallower aquifers since 1995, average downward groundwater elevation trends in the Marina-Ord Area are primarily driven by downward elevation trends in the Deep Aquifers' wells as well as MPWMD#FO-11S located in the southwestern portion of the Marina-Ord Area that are potentially connected to the Deep Aquifers.



Note: Water year type designation based on PRISM climate data for the Monterey Subbasin, obtained from https://prism.oregonstate.edu/.

Figure 8-8 Cumulative Average Groundwater Elevation Change Since 1995 with Measurable Objective and Minimum Threshold for the Marina-Ord Area

As discussed in Chapter 5, conditions in the Deep Aquifers are closely connected to those in the adjacent 180/400 Subbasin where new production wells have been installed immediately north of the Marina-Ord Area. Rates of groundwater extraction from the Deep Aquifers by MCWD have generally been consistent since extraction from this aquifer was initiated in the late 1980s. After an initial drop in groundwater elevations within the Deep Aquifers at the initiation of groundwater extraction by MCWD, groundwater elevations in this aquifer stabilized within the Monterey Subbasin through approximately 2004. However, increases in the total rate of groundwater extraction from the Deep Aquifers since 2004 have caused groundwater elevations in the Deep Aquifers to decline.

Due to the interconnectivity between the Marina-Ord Area and the 180/400 principal aquifers, each subbasin's ability to achieve sustainability is also affected by the adjacent subbasins' ability to meet their respective established minimum thresholds, measurable objectives, and groundwater sustainability goals. Therefore, the Subbasins have taken a coordinated approach to SMCs development.

Corral de Tierra Area

The information and criteria relied on to establish the minimum thresholds and measurable objectives in the Corral de Tierra Area include:

- Feedback from discussions with the Subbasin Committee on challenges and goals
- Historical groundwater elevation data and hydrographs from wells monitored by the MCWRA and Seaside Basin Watermaster
- Maps of current and historical groundwater elevation data
- Analysis of the impact of groundwater elevations on domestic wells

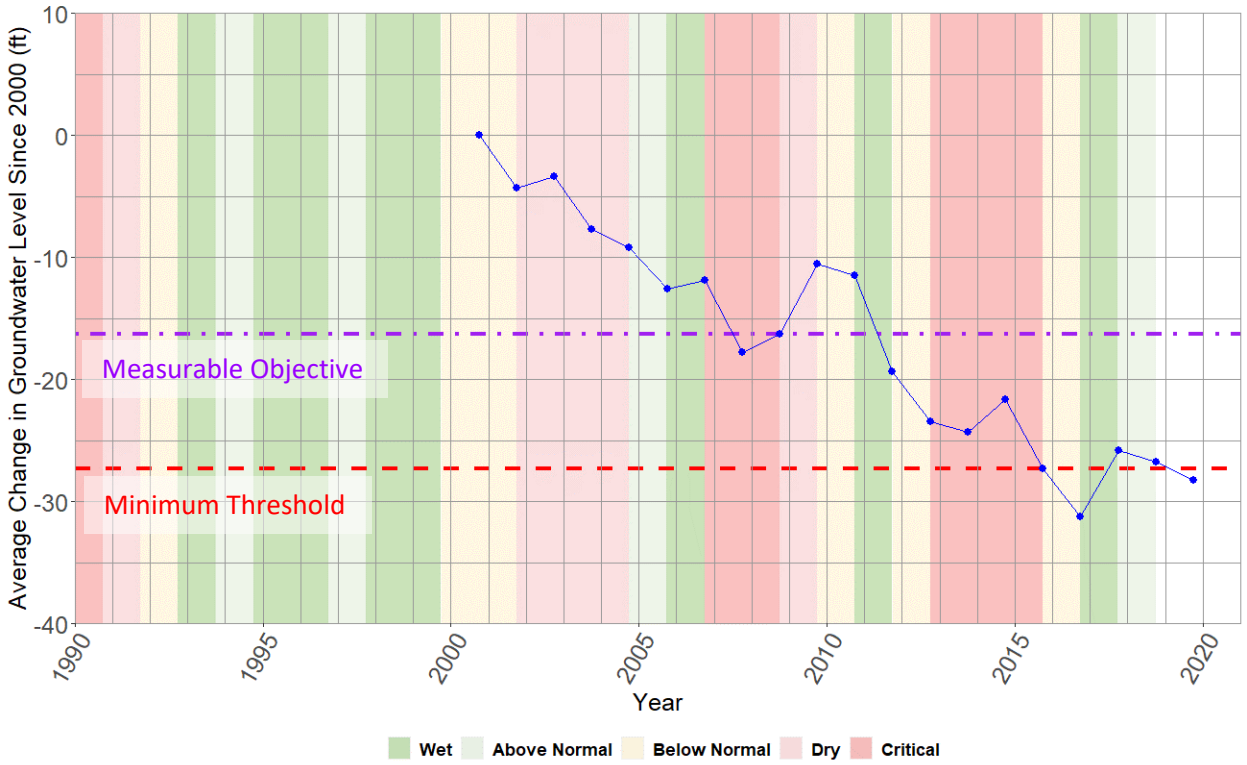
The general steps for developing minimum thresholds and measurable objectives during development of the original GSP were:

1. SVBGSA presented options to the Subbasin Planning Committee and recommended an approach and criteria to set the groundwater elevation minimum thresholds and measurable objectives, which was approved by the GSA Boards through GSP adoption.
2. SVBGSA developed an average groundwater elevation change hydrograph to select representative years that could define minimum thresholds and measurable objectives for the Corral de Tierra Area. Groundwater elevations like those experienced during the representative climatic cycle between 2000 and 2015 were used to identify minimum thresholds and measurable objectives to ensure that they were achievable under reasonably expected climatic conditions.

The average groundwater elevation change hydrograph with minimum threshold and measurable objectives lines for the Corral de Tierra Area are shown on Figure 8-9. Groundwater elevations observed in 2015 are used to represent the threshold below which conditions may become significant and unreasonable in the Corral de Tierra Area. When looking at the

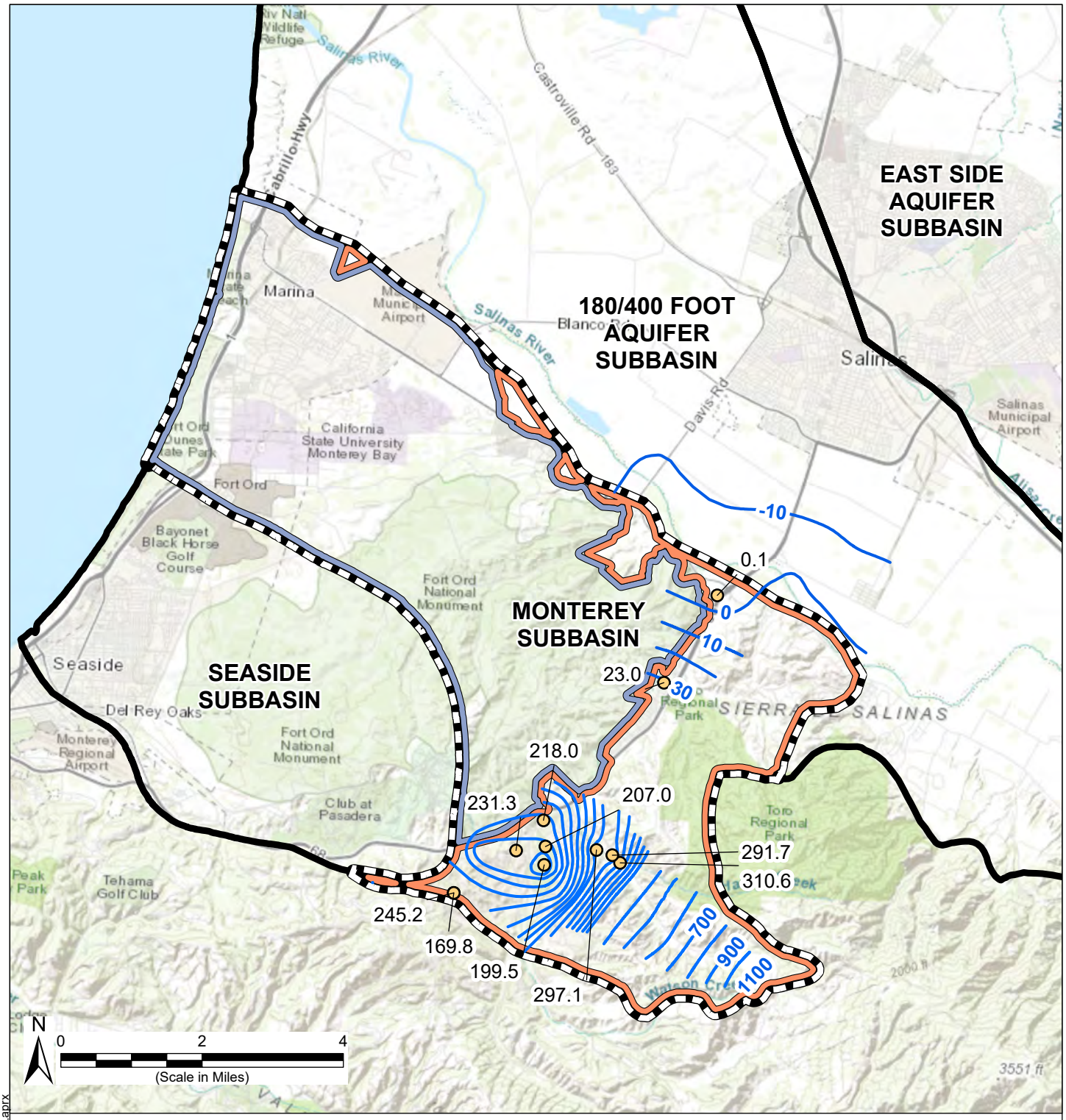
cumulative groundwater elevation changes within the representative climatic cycle (Figure 8-9), the historical lowest elevations occurred in 2016, not in 2015. To maintain groundwater elevations above this extreme low, the minimum thresholds were therefore set to 2015 groundwater elevations. The measurable objective is set to 2008 groundwater elevations, which was been identified as an achievable goal for the Subbasin under reasonably expected climatic conditions.

SVBGSA identified the appropriate minimum thresholds and measurable objectives on the respective monitoring well hydrographs. Each hydrograph was visually inspected to check if the minimum threshold and measurable objective were reasonable. If the SMCs seemed unreasonable for an RMS, they were adjusted based on historical water levels and groundwater elevation trends seen in surrounding wells. Moreover, the SMCs were adjusted to have a difference of at least 5 feet between the 2 levels. The minimum threshold contour map, along with the monitoring network wells, are shown on Figure 8-10 for the Corral de Tierra Area.



Note: Water year type designation based on PRISM climate data for the Monterey Subbasin, obtained from https://prism.oregonstate.edu/.

Figure 8-9 Cumulative Average Groundwater Elevation Change Since 2000 with Measurable Objective and Minimum Threshold for the Corral de Tierra Area



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Representative Monitoring Sites for Groundwater Elevations
- Groundwater Elevation Minimum Threshold Contours in the El Toro Primary Aquifer (ft NAVD 88)

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Abbreviations

ft = feet
NAVD 88 = North American Vertical Datum of 1988

Notes

1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88.
3. Labeled values are Minimum Threshold at Representative Monitoring Sites.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 18 September 2026.

Corral de Tierra Area: Groundwater Elevation Minimum Threshold Contour Map

Monterey Subbasin
Groundwater Sustainability Plan
September 2026

Figure 8-10

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8.7.3.2 Minimum Thresholds Impact on Domestic Wells

There is no known domestic use in the Marina-Ord Area. Land uses in this area are either urban, where well construction restrictions are imposed by the City of Marina and Monterey County, or open space. Additionally, groundwater elevation minimum thresholds in the shallower Dune Sand and 180-Foot Aquifers have been defined within their historical range of groundwater elevations, which has been steady for more than two decades. Therefore, minimum thresholds for groundwater elevation in the Marina-Ord Area are unlikely to impact domestic wells which are typically completed at shallower depths.

In the Corral de Tierra Area, groundwater elevation minimum thresholds are compared to the range of domestic well depths using DWR's Online System for Well Completion Reports (OSWCR) database. This check was done to ensure that the minimum thresholds maintain operability in a reasonable percentage of domestic wells. The proposed minimum thresholds for groundwater levels do not necessarily protect all domestic wells because it is impractical to manage a groundwater basin in a manner that fully protects the shallowest wells. The average computed depth of domestic wells in the Subbasin is 391.8 feet using data from the OSWCR database.

While this approach is reasonable, there are some errors that add inaccuracy to the analysis. These include:

- The OSWCR database may include wells that have been abandoned or destroyed and therefore may not represent active domestic users potentially affected by lowered groundwater elevations.
- Domestic wells drilled prior to 1995 may no longer be in use, particularly if residents switched to small water systems.
- Some domestic wells may draw water from shallow, perched groundwater that is not managed in this GSP.
- Some wells in the OSWCR database are not accurately located, and therefore the estimated depth to water may not be accurate.
- The depth to water is derived from a smoothly interpolated groundwater elevation contour map. Errors in the map may result in errors in groundwater elevation at the selected domestic wells.

Given the limitations listed above, the analysis included 19 wells that had accurate locations and were drilled after 1994 out of the total 169 domestic wells in the OSWCR database for this area. In the Corral de Tierra Area, 100% of the domestic wells should have at least 25 feet of water in them to remain operable if groundwater elevations are at minimum thresholds. Therefore, the minimum thresholds appear to be reasonably protective for domestic users.

An additional analysis was completed using MCWRA well database, which includes 11 active domestic wells. Of these, only 9 wells had construction information and were used to compare to the minimum thresholds. All but 1 domestic well will have at least 25 feet of water in them as

long as groundwater elevations remain above minimum thresholds; and will also have at least 25 feet of water in them when measurable objectives are achieved. If more wells with construction information are registered, the assessment may be redone.

For both sets of domestic wells used for the analysis, the depth to water is derived from a smoothly interpolated groundwater elevation contour map and a digital elevation model of land surface elevation. Such regional interpolation maps are the best estimate of the groundwater elevations between measured points in the subbasin; however, site-specific groundwater elevations may not match it precisely. Uncertainty in the regional map may result in discrepancies in groundwater elevations at the selected domestic wells.

8.7.3.3 Relationship to Other Sustainability Indicators

Groundwater elevation minimum thresholds can influence other sustainability indicators. The Subbasin GSAs reviewed the relationship between groundwater level minimum thresholds and the other sustainability indicators and verified that these minimum thresholds will limit undesirable results for other sustainability indicators. As discussed above, the groundwater level minimum thresholds have primarily been established to limit seawater intrusion and maintain adequate groundwater storage within the Subbasin. These groundwater level minimum thresholds are also consistent with minimum thresholds established for:

- depletion of interconnected surface waters in wells proximate to such areas, and
- subsidence, as they are set above historical groundwater levels.

Through the RCA analysis that evaluated the relationship between groundwater quality and both groundwater levels and extraction, a statistically significant correlation was identified between increasing arsenic concentrations and increasing groundwater levels in the Corral de Tierra Area (M&A, 2026d). This aligns with existing studies that document higher arsenic concentrations in the shallower Paso Robles Formation than the underlying Santa Margarita Sandstone. However, this relationship does not negate the need to keep groundwater levels above minimum thresholds to protect beneficial uses and users, nor does the groundwater level minimum threshold cause a water quality undesirable result.

8.7.3.4 Effects of Minimum Threshold between Management Areas

The minimum thresholds for each management area have been developed in a coordinated matter through discussions within the Subbasin Technical Committee. Because the minimum thresholds in each management area are defined at levels generally representative of 2015 conditions in all areas where water levels are declining, they will not cause undesirable results in the other management area.

8.7.3.5 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Monterey Subbasin has two neighboring subbasins within the Salinas Valley Groundwater Basin:

- The 180/400Subbasin to the north; and
- The Seaside Subbasin to the south.

The GSAs coordinating the Monterey Subbasin GSP are the same GSAs with management over the adjacent 180/400 Subbasin GSP. The GSAs have coordinated on the development of minimum thresholds and measurable objectives with the 180/400 Subbasin GSP, which was submitted to DWR in 2020. SVBGSA prepared Amendment 1 in 2022, which was submitted to DWR with the first 5-year periodic evaluation in January 2025. 180/400 GSP Amendment 2 has been prepared concurrently with this Monterey GSP Amendment 1. Due to the interconnectivity between the Marina-Ord Area and the 180/400 Subbasin principal aquifers, the groundwater elevation minimum thresholds for the Marina-Ord Area are established to be consistent with the 180/400 Subbasin GSP and are based on the assumption that SMCs will be met in the adjacent subbasin. Additionally, the other 4 SVBGSA GSPs within the Salinas Valley for the Langley, Eastside, Forebay and Upper Valley Subbasins have been developed with consistent methods and SMCs.

The Seaside Subbasin is an adjudicated basin and not subject to SGMA. The GSAs have and will continue to coordinate closely with the Seaside Watermaster to ensure that the Monterey Subbasin minimum thresholds do not prevent the Seaside Subbasin from meeting its adjudication requirements, including the occurrence of "Material Injury" (as defined in the Seaside Basin adjudication decision) in the Laguna Seca subarea due to lowered groundwater levels.

8.7.3.6 Effects on Beneficial Users and Land Uses

The groundwater elevation minimum thresholds may have several effects on beneficial users and land uses in the Subbasin and adjacent subbasins.

Urban land uses and users. The groundwater elevation minimum thresholds may reduce the amount of groundwater pumping in the Subbasin or adjacent subbasins, or result in obtaining alternative sources of water within the Monterey Subbasin or through regional efforts. This may result in higher water costs for water users. Keeping groundwater elevations above historical lows will help prevent greater electricity demand associated with pumping at lower elevations.

Domestic land uses and users. The groundwater elevation minimum thresholds are intended to protect most domestic wells along with small local system wells. Therefore, the minimum thresholds will likely have an overall beneficial effect on existing domestic land uses by protecting the ability to pump from domestic wells or be supplied by small systems. However, domestic wells may become dry if they are shallow, groundwater elevations in their vicinity are very low, or pump capacity is low, which may require deeper wells, higher capacity pumps, or joining a water system, if capacity is available. Maintaining groundwater levels above historical lows also helps prevent problems associated with elevations below well screens, such as mechanical damage to wells such as cavitation, reduced pump efficiency, and microbial growth.

Agricultural land uses and users. The groundwater elevation minimum thresholds prevent continued lowering of groundwater elevations in the Subbasin. This may have the effect of

limiting the amount of groundwater pumping in the Subbasin and the amount and type of crops that can be grown in the Subbasin. The groundwater elevation minimum thresholds could therefore limit the expansion of the Subbasin's agricultural economy. This could have various effects on beneficial users and land uses:

- Agricultural land currently under irrigation may become more valuable as bringing new lands into irrigation becomes more difficult and expensive.
- Agricultural land not currently under irrigation may become less valuable or converted to another land use because it may be too difficult and expensive to irrigate.

Keeping groundwater elevations above historical lows will help prevent greater electricity demand associated with pumping at lower elevations.

Ecological land uses and users. Groundwater elevation minimum thresholds may limit the amount of groundwater pumping in the Subbasin and may limit both urban and agricultural growth. This outcome may benefit ecological land uses and users by curtailing the conversion of native vegetation to agricultural or domestic uses, and by reducing pressure on existing ecological land caused by declining groundwater elevations. Maintaining groundwater levels above historical lows helps protect GDEs whose rooting depths may be exceeded at deeper levels.

8.7.3.7 Relevant Federal, State, or Local Standards

No federal, state, or local standards exist for chronic lowering of groundwater elevations.

8.7.3.8 Method for Quantitative Measurement of Minimum Thresholds

Groundwater elevation minimum thresholds will be directly measured from the RMS network in accordance with the monitoring plans outlined in Chapter 7. Furthermore, groundwater elevation monitoring will meet the requirements of the technical and reporting standards included in the GSP Emergency Regulations. As noted in Chapter 7, the current groundwater elevation RMS network in the Subbasin across aquifers includes 35 wells.

8.7.4 Measurable Objectives

The measurable objectives for chronic lowering of groundwater levels ("groundwater elevation measurable objectives") represent target groundwater elevations that are higher than the minimum thresholds. These measurable objectives provide operational flexibility to ensure that the Subbasin can be managed sustainably over a reasonable range of hydrologic and climatic variability. Groundwater elevation measurable objectives are summarized in Table 8-2. The measurable objectives are also shown on the maps for each RMS in Appendix 8-A and Figures 8-1 through 8-7 above.

8.7.4.1 Methodology for Setting Measurable Objectives

In the Marina-Ord Area, groundwater elevation measurable objectives are defined as follows:

Groundwater elevations observed in 2004 in the Dune Sand, 180-Foot, 400-Foot, and Deep Aquifers, prior to the decline of groundwater levels in the southwestern portion of the Marina-Ord Area.

In the Marina-Ord Area, these measurable objectives are primarily set to further limit the potential for seawater intrusion within the Subbasin. At the time the 2022 GSP was prepared, data collected by the Seaside Watermaster indicated recent increases in chloride concentrations in MPWMD#FO-10S, located in the Monterey Subbasin, and MPWMD#FO-09S, a coastal Paso Robles Aquifer well located in the Seaside Subbasin [32]. These increases suggested that groundwater elevations in the southwestern portion of the Marina-Ord Area may induce seawater intrusion in the 400-Foot and/or Deep Aquifers of the Monterey Subbasin and the Paso Robles Aquifer of the Seaside Subbasin.

Although subsequent investigations indicated that the chloride trends in MPWMD#FO-09S and MPWMD#FO-10S may not have been reliable indicators of aquifer-specific seawater intrusion conditions, the underlying concern regarding potential seawater intrusion in the southern portion of the Monterey Subbasin remains. Since 2024, MPWMD#FO-11S has shown increasing salinity, with continued increases observed through 2026. As discussed earlier in Chapters 4 and 5, uncertainty remain regarding hydrostratigraphy and the cause of groundwater elevation declines within this area. However, available data continue to support the need for groundwater elevation with measurable objectives that maintain protective groundwater gradients and reduce the potential for seawater intrusion. For this GSP, the representative year of 2004 is retained for measurable objectives, which is prior to recent groundwater declines in the Marina-Ord Area as shown on Figure 8-8.

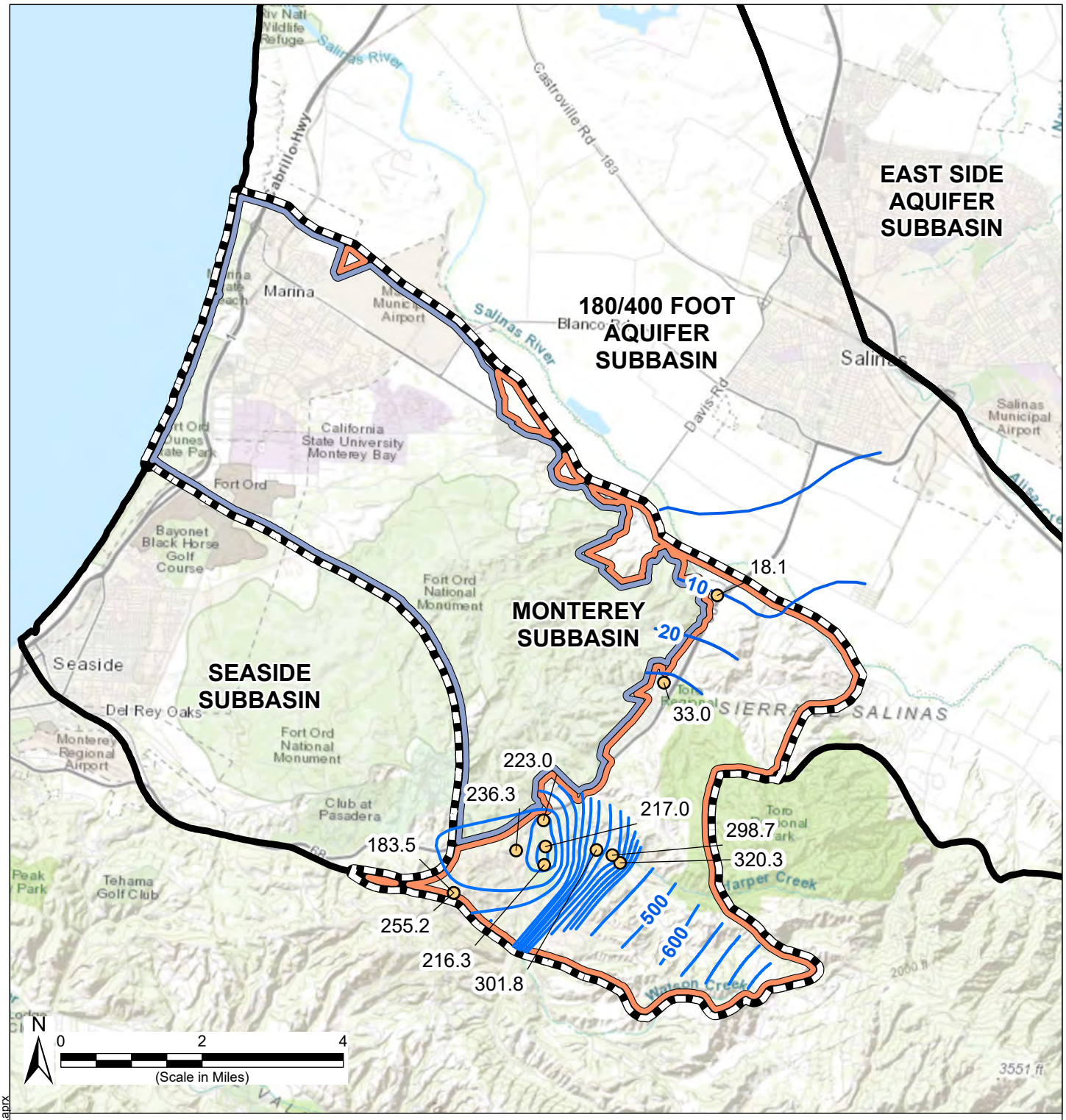
These measurable objectives are generally consistent with those set for the 180- and 400-Foot aquifers in the neighboring 180/400 Subbasin. Measurable objectives in the 180/400 Subbasin are set at 2003 levels.

In the Corral de Tierra Area, groundwater elevations from 2008 were selected as the measurable objectives to ensure that the objectives are achievable. Therefore, groundwater elevation measurable objectives in the Corral de Tierra Area are defined as follows:

Groundwater elevations observed in 2008 in the El Toro Primary Aquifer System.

The measurable objective contour maps along with the monitoring network wells are shown on Figure 8-11 for the Corral de Tierra Area.

[32] Chloride concentrations measured in September 2020 from MPWMD#FO-10S and MPWMD#FO-09S were 89.9 mg/L and 90.4 mg/L, respectively. An investigation performed by MPWMD in 2021 concluded that MPWMD#FO-09S had leakage in the upper portion of the casing, which contributed to the observed chloride increases; this investigation ultimately led to replacement of the well. MCWD also investigated MPWMD#FO-10S and determined that the well cluster was poorly constructed and that screens within the cluster were cross-connected. The MPWMD#FO-10 cluster was also subsequently replaced in 2026.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Representative Monitoring Sites for Groundwater Elevations
- Groundwater Elevation Measurable Objective Contours in the El Toro Primary Aquifer (ft NAVD 88)

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Abbreviations

ft = feet
NAVD 88 = North American Vertical Datum of 1988

Notes

1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88.
3. Labeled values are Measurable Objective at Representative Monitoring Sites.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 20 October 2026.

Corral de Tierra Area: Groundwater Elevation Measurable Objective Contour Map

Monterey Subbasin
Groundwater Sustainability Plan
October 2026

Figure 8-11

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Amendment_fig8-11.aprx

8.7.4.2 Interim Milestones

Chapter 9 identifies projects and management actions to address the Subbasin's overdraft conditions and meet measurable objectives established herein. These projects and management actions are early in their planning phases and will require coordination with adjacent subbasins and collaborating partners. As such, time will be required to implement these projects and management actions, and begin monitoring for the expected benefits. Groundwater interim milestones are established to reflect the timeline for project implementation, and realization of project benefits over time.

Within the Monterey Subbasin, for wells in the 400-Foot Aquifer, Deep, and El Toro Primary Aquifer System Aquifers where groundwater levels have been declining, groundwater elevation interim milestones are defined based on a trajectory informed by current (fourth quarter of 2020) groundwater levels, historical groundwater elevation trends[33], and measurable objectives. This trajectory allows for and assumes a continuation of historical groundwater elevation trends during the first 5-year period of GSP implementation, a deviation from that trend over the second 5-year period, and a recovery towards the measurable objectives in the third and fourth (last) 5-year period. An example of the trajectory is shown on Figure 8-12 with a Marina-Ord well. As discussed below in Section 8.8.3.1, there are large volumes of freshwater in the Subbasin that provide additional time and flexibility to reach identified SMCs while projects and management actions are implemented. The temporary use of stored groundwater in the 400-Foot Aquifer, Deep, and El Toro Primary Aquifer Systems Aquifers are reflected in these groundwater elevation interim milestones.

Groundwater elevation interim milestones for wells in the Dune Sand, 180-Foot, and 400-Foot Aquifers, with stable groundwater elevations, are set at their respective measurable objectives. Groundwater elevation interim milestones for wells that have already exceeded their measurable objective also use the measurable objective in place of the interim milestones.

Interim milestones for groundwater elevations are shown in Table 8-3. Hydrographs showing minimum thresholds, measurable objectives, and interim milestones for each RMS are included in Appendix 8-B.

[33] Calculated based on fourth quarter measurements over the historical period (i.e., 2004 to 2018).

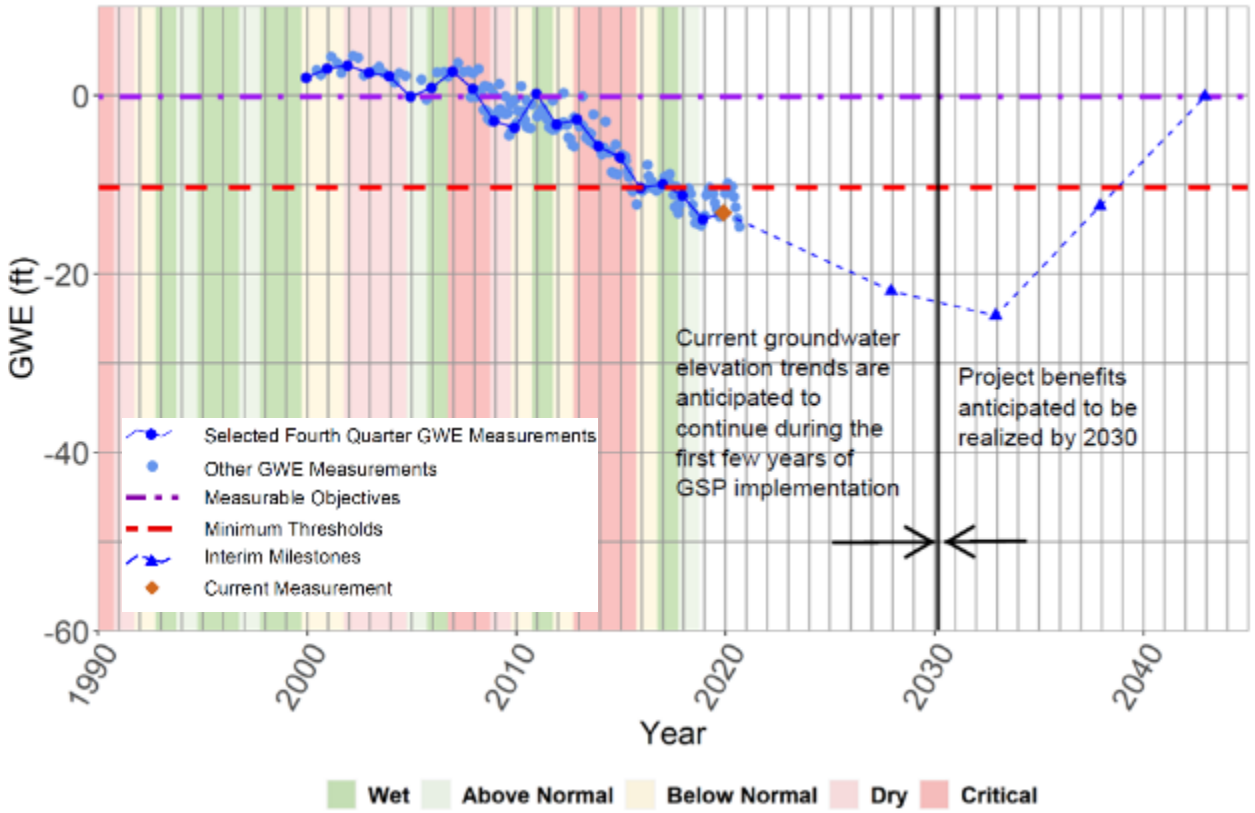


Figure 8-12 Example Trajectory for Groundwater Elevation Interim Milestones

Table 8-3 Groundwater Elevation Interim Milestones

Monitoring Site	Aquifer	Baseline Groundwater Elevation ft NAVD88 (assume at 2020)	Interim Milestone at Year 2027 (ft NAVD88)	Interim Milestone at Year 2032 (ft NAVD88)	Interim Milestone at Year 2037 (ft NAVD88)	Measurable Objective (ft NAVD88) (goal to reach at 2042)
Marina-Ord Area						
MW-BW-28-A	Dune Sand Aquifer	64.4 (a)	70.3	70.3	70.3	70.3
MW-BW-49-A	Dune Sand Aquifer	11.9 (a)	11.3	11.3	11.3	11.3
MW-BW-81-A	Dune Sand Aquifer	11 (a)	10.0	10.0	10.0	10.0
MW-BW-82-A	Dune Sand Aquifer	10.5 (a)	9.5	9.5	9.5	9.5
MW-OU2-13-A	Dune Sand Aquifer	89.3 (a)	94.4	94.4	94.4	94.4
MW-OU2-32-A	Dune Sand Aquifer	8.1 (a)	8.1	8.1	8.1	8.1
MW-OU2-34-A	Dune Sand Aquifer	7.1 (a)	6.6	6.6	6.6	6.6
CDM MW-1 Beach	Upper 180-Foot Aquifer	4.8 (a)	3.3	3.3	3.3	3.3
EW-12-04-180M	Upper 180-Foot Aquifer	6.5	6.5	6.5	6.5	6.5
MW-02-05-180	Upper 180-Foot Aquifer	7.5 (a)	8.4	8.4	8.4	8.4
MW-02-06-180	Upper 180-Foot Aquifer	7.2	7.3	7.3	7.3	7.3
MW-02-10-180	Upper 180-Foot Aquifer	7.6 (a)	7.3	7.3	7.3	7.3
MW-02-13-180U	Upper 180-Foot Aquifer	7.7 (a)	7.3	7.3	7.3	7.3
MW-B-05-180	Upper 180-Foot Aquifer	-2.3 (a)	-3.4	-3.4	-3.4	-3.4
MW-BW-55-180	Upper 180-Foot Aquifer	-4.2 (a)	-5.7	-5.7	-5.7	-5.7
MW-OU2-29-180	Upper 180-Foot Aquifer	-6.3 (a)	-7.2	-7.2	-7.2	-7.2
MW-BW-04-180	Lower 180-Foot Aquifer	-8.2 (a)	-11.0	-11.0	-11.0	-11.0
MW-OU2-66-180	Lower 180-Foot Aquifer	-7.3 (a)	-9.2	-9.2	-9.2	-9.2
TEST2	Lower 180-Foot Aquifer	-8.5 (a)	-10.6	-10.6	-10.6	-10.6
MP-BW-42-345	Lower 180-Foot, 400-Foot Aquifer	-6.6	-7.9	-7.9	-7.9	-7.9
MP-BW-50-339	Lower 180-Foot, 400-Foot Aquifer	-7.8	-7.1	-7.1	-7.1	-7.1
MPWMD#FO-11S	400-Foot Aquifer	-29.8 (a)	-44.4	-49.0	-27.7	-6.4
MW-OU2-07-400	400-Foot Aquifer	-3.1 (a)	-4.2	-4.2	-4.2	-4.2

Monitoring Site	Aquifer	Baseline Groundwater Elevation ft NAVD88 (assume at 2020)	Interim Milestone at Year 2027 (ft NAVD88)	Interim Milestone at Year 2032 (ft NAVD88)	Interim Milestone at Year 2037 (ft NAVD88)	Measurable Objective (ft NAVD88) (goal to reach at 2042)
MCWD-MW-4AVES(S) (b)	400-Foot Aquifer	--	--	--	--	--
MCWD-MW-C2S) (b)	400-Foot Aquifer	--	--	--	--	--
MCWD-MW-DB(S) (b)	400-Foot Aquifer	--	--	--	--	--
014S001E24L002M	Deep Aquifers	-25.9	-30.5	-32.2	-24.3	-16.4
014S001E24L003M	Deep Aquifers	-7.9	-14.5	-16.8	-4.5	7.9
014S001E24L004M	Deep Aquifers	-27.8	-37.1	-40.4	-28.5	-16.6
014S001E24L005M	Deep Aquifers	-21.1	-35.2	-40.3	-20.9	-1.5
14S02E33E01	Deep Aquifers	-55.2	-63.9	-69.6	-46.5	-23.3
14S02E33E02	Deep Aquifers	-22.3	-20.1	-20.8	-16.1	-11.4
PZ-FO-32-910	Deep Aquifers	-44.3	-65.6	-73.2	-46.4	-19.7
MPWMD#FO-11D	Deep Aquifers	-9.7 (a)	-15.7	-17.6	-7.2	3.3
Sentinel MW#1	Deep Aquifers	-29.9 (a)	-37.8	-40.3	-29.5	-18.8
MCWD-MW-4AVE(M) (b)	Deep Aquifers	--	--	--	--	--
MCWD-MW-4AVE(D) (b)	Deep Aquifers	--	--	--	--	--
MCWD-MW-4AVE(M) (b)	Deep Aquifers	--	--	--	--	--
MCWD-MW-4AVE(M) (b)	Deep Aquifers	--	--	--	--	--
Corral de Tierra Area						
16S/02E-01M01	El Toro Primary Aquifer System	311.7	313.4	315.1	316.4	320.3
16S/02E-02G01	El Toro Primary Aquifer System	297.6	300.2	300.6	300.9	301.8
Robley Deep (South)	El Toro Primary Aquifer System	165.13	160.5	160.5	170	183.5
Robley Shallow (North)	El Toro Primary Aquifer System	238.64	230.7	230.7	240.8	255.2
15S/02E-25C01	El Toro Primary Aquifer System	21.3	21.0	21.0	26.0	33.0
15S/03E-18P01	El Toro Primary Aquifer System	-3.9	-16.1	-6.1	3.9	18.1
16S/02E-02H01	El Toro Primary Aquifer System	299.5	301.3	300.7	300.2	298.7
16S/02E-03A01	El Toro Primary Aquifer System	205.8	215.7	217.5	218.9	223.0

Monitoring Site	Aquifer	Baseline Groundwater Elevation ft NAVD88 (assume at 2020)	Interim Milestone at Year 2027 (ft NAVD88)	Interim Milestone at Year 2032 (ft NAVD88)	Interim Milestone at Year 2037 (ft NAVD88)	Measurable Objective (ft NAVD88) (goal to reach at 2042)
16S/02E-03F50	El Toro Primary Aquifer System	227.8	230.9	232.3	233.3	236.3
16S/02E-03H01	El Toro Primary Aquifer System	210.4	212.0	213.23	214.2	217.0
16S/02E-03J50	El Toro Primary Aquifer System	217.8	215.4	215.6	215.8	216.3
15S/03E-20B01 (b)	El Toro Primary Aquifer System	--	--	--	--	--
16S/02E-10G01 (b)	El Toro Primary Aquifer System	--	--	--	--	--
16S/02E-12J02 (b)	El Toro Primary Aquifer System	--	--	--	--	--
16S/02E-12J05 (b)	El Toro Primary Aquifer System	--	--	--	--	--

(a) These current groundwater levels were taken in the fourth quarter of 2019 due to the lack of measurements in fourth quarter of 2020.

(b) Additional years of data are needed before SMCs can be established for these newly installed monitoring wells.

8.8 Reduction in Groundwater Storage SMC

8.8.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable conditions in groundwater storage in the Subbasin are those that:

- Lead to chronic, long-term reduction in groundwater storage, or
- Interfere with other sustainability indicators

These significant and unreasonable conditions were determined based on input collected during MCWD stakeholder meetings, SVBGSA Subbasin Committee meetings, and Subbasin Technical Committee meetings during development of the original GSP.

8.8.2 Undesirable Results

8.8.2.1 Criteria for Defining Reduction in Groundwater Storage Undesirable Results

The criteria used to define undesirable results for reduction of groundwater storage are based on minimum thresholds established for chronic lowering of groundwater levels and seawater intrusion.

The undesirable result for reduction of groundwater storage is defined to be consistent with groundwater elevation and seawater intrusion undesirable results, as identified below:

Over the course of any one year, exceedance of more than 20% of the groundwater level minimum thresholds in either:

a. both the Dune Sand Aquifer and Upper 180-Foot Aquifer, or
b. both the Lower 180 Foot and 400 Foot aquifer, or
c. the Deep Aquifers, or
d. the El Toro Primary Aquifer System.

OR

a. Exceedance of seawater intrusion minimum thresholds.

Since the GSP addresses long-term groundwater sustainability, exceedances of groundwater level minimum thresholds during a drought do not constitute an undesirable result. Pursuant to SGMA Regulations (CWC §10721(w)(1)), "Overdraft during a period of drought is not sufficient to establish a chronic lowering of groundwater levels if extractions and groundwater recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods." Therefore, groundwater levels may temporarily exceed minimum thresholds during droughts, and do not constitute an undesirable result, as long as groundwater levels rebound.

Within the Subbasin, groundwater elevations are typically well above production well screen elevations and therefore there is limited concern regarding available groundwater storage to withstand future droughts. The critical limiting factor associated with groundwater availability in the Subbasin is further seawater intrusion and chronic decline in groundwater levels that can lead to seawater intrusion. As such, it is not necessary to define unique SMCs for reduction of groundwater storage.

There is adequate fresh groundwater in storage for beneficial uses and users within the Subbasin to withstand droughts when:

(a) groundwater elevations are equivalent to minimum thresholds established for chronic lowering of groundwater levels, and

(b) the extent of seawater intrusion, defined by the 500 mg/L chloride concentration isocontour, is equivalent to established seawater intrusion minimum thresholds.

Therefore, SMCs established for (a) chronic lowering of groundwater levels and (b) seawater intrusion are reasonable proxies for protection of groundwater storage.

8.8.2.2 Potential Causes of Undesirable Results

Reduction of groundwater storage is directly correlated to chronic lowering of groundwater levels and seawater intrusion. Therefore, the potential causes of undesirable results due to reduction of groundwater storage are the same as the potential causes listed for undesirable results due to chronic lowering of groundwater levels and seawater intrusion in Sections 8.7.2.2 and 8.9.2.2, respectively. As such, an undesirable result for reduction of groundwater storage will

not occur as long as undesirable results are avoided with regard to the chronic lowering of groundwater levels and seawater intrusion indicators.

8.8.2.3 Effects on Beneficial Users and Land Use

The undesirable result is designed to avoid dropping below the level of groundwater in storage during 2015 for long-term use. Therefore, the primary potential effect of this undesirable result is generally beneficial for the groundwater uses and users in the Subbasin.

8.8.3 Minimum Thresholds

The undesirable results definition for reduction of groundwater storage refers to a decrease in storage caused by (1) water levels declining below groundwater elevation minimum thresholds or (2) high salinity groundwater migrating beyond seawater intrusion minimum thresholds. It is logical to tie these sustainability indicators together, because the amount of groundwater in storage is directly related to groundwater elevations and the extent of seawater intrusion. The minimum thresholds for chronic lowering of groundwater level and seawater intrusion, therefore, will be used as proxies for reduction of groundwater storage.

8.8.3.1 Information and Methodology Used to Establish Minimum Thresholds

Pursuant to the GSP Emergency Regulations and as further described in the DWR Sustainable Management Criteria BMP (DWR, 2017), minimum thresholds for reduction of groundwater storage may be set by using groundwater levels as a proxy if it is demonstrated that a correlation exists between the two metrics. One approach to using groundwater levels as a proxy, described in the DWR Sustainable Management Criteria BMP, is to demonstrate that minimum thresholds for chronic lowering of groundwater levels are sufficiently protective to ensure prevention of significant and unreasonable occurrences of the Sustainability Indicator in question.

This GSP has adopted and extended this approach to use minimum thresholds defined for both the chronic lowering of groundwater level indicator and the seawater intrusion indicator as a proxy. As discussed above, the amount of groundwater in storage is directly related to groundwater elevations and the extent of seawater intrusion. As demonstrated in the calculation below, groundwater elevation and seawater intrusion minimum thresholds are sufficiently protective of the groundwater storage indicator. As shown in Table 8-4, the estimated fresh groundwater storage volume is calculated based on:

- The area of each principal aquifer outside its seawater intrusion minimum threshold;
- The saturated thickness of each principal aquifer[34];

[34] Saturated thickness is estimated by either (1) the difference between groundwater elevations in Fall 2015 and the bottom of the aquifer, or (2) the thickness of the aquifer, whichever is smaller. This method conservatively assumes that the confined storage within each aquifer is negligible compared to the drainable porosity.

- An estimated specific yield ranging between 0.1 and 0.2, based on typical values for sandy aquifers.

Table 8-4 Estimated Fresh Groundwater Storage in the Marina-Ord Area

Principal Aquifer	Estimated Fresh Groundwater Storage (AF)	
	Lower Range (Specific Yield at 0.1)	Upper Range (Specific Yield at 0.2)
Marina-Ord Area		
Dune Sand Aquifer	30,000	60,000
Upper 180-Foot Aquifer	50,000	100,000
Lower 180-Foot Aquifer	44,000	88,000
400-Foot Aquifer	134,000	268,000
Deep Aquifers	1,544,000	3,088,000

This calculation represents a theoretical estimate of the total volume of fresh groundwater that exists within the principal aquifers within the Subbasin. It should be noted, however, that not all fresh groundwater in storage can be practically accessed or used. Chronic declines in groundwater levels and the potential for increased seawater intrusion are the critical limiting factors associated with usable groundwater storage in the Subbasin. As such, minimum thresholds established for seawater intrusion and groundwater elevations are appropriate proxies for this sustainability indicator. However, the existence of such groundwater storage within the Subbasin provides additional time and flexibility to reach identified SMCs for chronic lowering of groundwater levels. Groundwater can temporarily be removed from storage until local and/or regional projects and/or management actions can be implemented. The temporary use of stored groundwater is reflected in interim milestones established for chronic lowering of groundwater levels within the Deep Aquifers, where no seawater intrusion has yet been identified during the GSP Historical and Baseline Periods, based on available data.

8.8.3.2 Relationship to Other Sustainability Indicators

As discussed above, the groundwater storage minimum thresholds are set at a level consistent with groundwater elevation and seawater intrusion minimum thresholds, which are also consistent with other sustainability indicators, as described in Sections 8.7.3.3 and 8.9.3.2.

8.8.3.3 Effects of Minimum Threshold between Management Areas

The minimum thresholds for each management area have been developed in a coordinated manner through discussions within the Subbasin Technical Committee. Because the minimum thresholds in each management area are defined similarly based on groundwater elevation and seawater intrusion minimum thresholds, they will not cause undesirable results in the other management area.

8.8.3.4 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Monterey Subbasin has two neighboring subbasins within the Salinas Valley Groundwater Basin:

- The 180/400-Foot Aquifer Subbasin to the north;
- The Seaside Subbasin to the south

The GSAs coordinating the Monterey Subbasin GSP are the same GSAs managing the adjacent 180/400-Foot Aquifer Subbasin. The GSAs have been coordinating the development of the minimum thresholds and measurable objectives within the 180/400 Subbasin GSP, which was submitted to DWR in 2020, with Amendment 1 prepared in 2022 and considered by DWR in January 2025. 180/400 GSP Amendment 2 has been prepared concurrently with this Monterey GSP Amendment 1. Minimum thresholds for groundwater storage are established consistently with the 180/400-Foot Aquifer Subbasin GSP. Additionally, SVBGSA's 4 additional GSPs within the Langley, Eastside, Forebay and Upper Valley Subbasins in the Salinas Valley have been developed with consistent methods and SMCs.

The Seaside Subbasin is an adjudicated basin and not subject to the SGMA's minimum threshold requirements. Because the minimum thresholds are set to avoid dropping below recent levels of storage, it is likely that the minimum thresholds will not prevent the Seaside Subbasin from meeting its adjudication requirements. The Subbasin GSAs have and will continue to coordinate closely with the Seaside Watermaster to ensure that the Monterey Subbasin minimum thresholds do not prevent the Seaside Subbasin from meeting its adjudication requirements.

8.8.3.5 Effect on Beneficial Uses and Users

Because the groundwater storage minimum thresholds are defined based on groundwater elevation and seawater intrusion minimum thresholds, the effects of groundwater storage minimum threshold on beneficial uses and users are similar to those described in Sections 8.7.3.6 and 8.9.3.4.

8.8.3.6 Relation to State, Federal, or Local Standards

No federal, state, or local standards exist for reductions in groundwater storage.

8.8.3.7 Method for Quantitative Measurement of Minimum Threshold

Because the groundwater elevation and seawater intrusion minimum thresholds will be used as a proxy for reduction of groundwater storage, the measurement of change in groundwater storage will be measured directly from the groundwater elevation and seawater intrusion monitoring networks described in Chapter 7.

8.8.4 Measurable Objectives

Because the close relationship between the reduction of groundwater storage and the chronic lowering of groundwater level and seawater intrusion sustainability indicators, the groundwater

elevation and seawater intrusion measurable objectives serve as proxies for reduction of groundwater storage.

8.8.4.1 Method for Setting Measurable Objectives

This methodology is designed to represent groundwater in storage when groundwater elevations and the seawater intrusion extent are maintained at their respective measurable objectives. As stated above, the measurable objectives for chronic lowering of groundwater levels and seawater intrusion provide an adequate margin of operational flexibility.

8.8.4.2 Interim Milestones

The groundwater elevation and seawater intrusion interim milestones described respectively in Table 8-3 and Section 8.9.4.2 will serve as a proxy for reduction of groundwater storage.

8.9 Seawater Intrusion SMC

8.9.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable seawater intrusion in the Subbasin is defined as follows:

- Expansion of the 2015 seawater intruded area in the Subbasin, identified based upon the 500 mg/L chloride concentration isocontour.

The seawater intrusion SMCs apply to the whole Subbasin, as shown in Figure 8-13 and Figure 8-14.

These significant and unreasonable conditions were determined based on input collected during MCWD stakeholder meetings, SVBGSA Subbasin Committee meetings, and discussions with GSA staff during Subbasin Technical Committee meetings during development of the original GSP.

8.9.2 Undesirable Results

8.9.2.1 Criteria for Defining Seawater Intrusion Undesirable Results

The seawater intrusion undesirable result is a quantitative combination of chloride concentrations minimum threshold exceedances. As discussed below, there is one minimum threshold for each of the four principal aquifers within the Marina-Ord Area and Reservation Road portion of the Corral de Tierra Area where the hydrogeologic setting is the same as the Marina-Ord Area. Because even localized expansion of the seawater intrusion front is not acceptable, the undesirable result of seawater intrusion is:

Any exceedance of the minimum threshold is considered as an undesirable result.

This undesirable result may be modified as the projects and actions to address seawater intrusion are refined during implementation of this GSP.

8.9.2.2 Potential Causes of Undesirable Results

Conditions that may lead to an undesirable result for seawater intrusion include the following:

- **Decreases in groundwater levels near the coast in Monterey Subbasin and/or adjacent coastal subbasins (the adjudicated Seaside Subbasin and 180/400-Foot Aquifer Subbasin).** Decreases in groundwater levels near the coast could lead to further migration of seawater inland into the Monterey Subbasin.
- **Vertical migration from an overlying intruded aquifer.** Downward vertical gradient between aquifers (e.g., between the 400-Foot and Deep Aquifers) could lead to vertical migration of intruded seawater.
- **Sea level rise**. Increase in sea level increases the driving force for seawater intrusion and can lead to further migration of seawater inland.

8.9.2.3 Effects on Beneficial Users and Land Use

The primary detrimental effect on beneficial users and land uses from allowing seawater intrusion to continue or occur in the future is that the pumped groundwater may become saltier and thus impact groundwater supply wells (i.e., MCWD production wells or agricultural wells) and associated land uses. This may force production wells to move to further inland or to deeper aquifers, which will cause increased groundwater production costs, and reduce water supply reliability.

Allowing seawater intrusion to continue or occur in the future may also impact agriculture and limit the type of crops that can be grown. Chloride moves readily within soil and water and is taken up by the roots of plants. It is then transported to the stems and leaves. Sensitive berry rootstocks can tolerate only up to 120 mg/L of chloride, while grapes can tolerate up to 700 mg/L or more (University of California Agriculture and Natural Resources, 2002). Agricultural land may become less valuable because it may be too difficult and expensive to irrigate. Reduced yields may have a ripple effect on the local economy and may negatively affect land values.

Limiting seawater intrusion will benefit groundwater users because it will protect groundwater production wells within the Marina-Ord Area and Reservation Road portion of the Corral de Tierra Area and maintain adequate storage in the Subbasin. However, limitations on groundwater extraction and/or development of alternative water supplies may be required to achieve minimum thresholds, which will cause increased water production costs or a reduction in water supplies.

8.9.3 Minimum Thresholds

Pursuant to GSP Emergency Regulations §354.28, the seawater intrusion minimum threshold is defined by a chloride concentration isocontour for each principal aquifer.

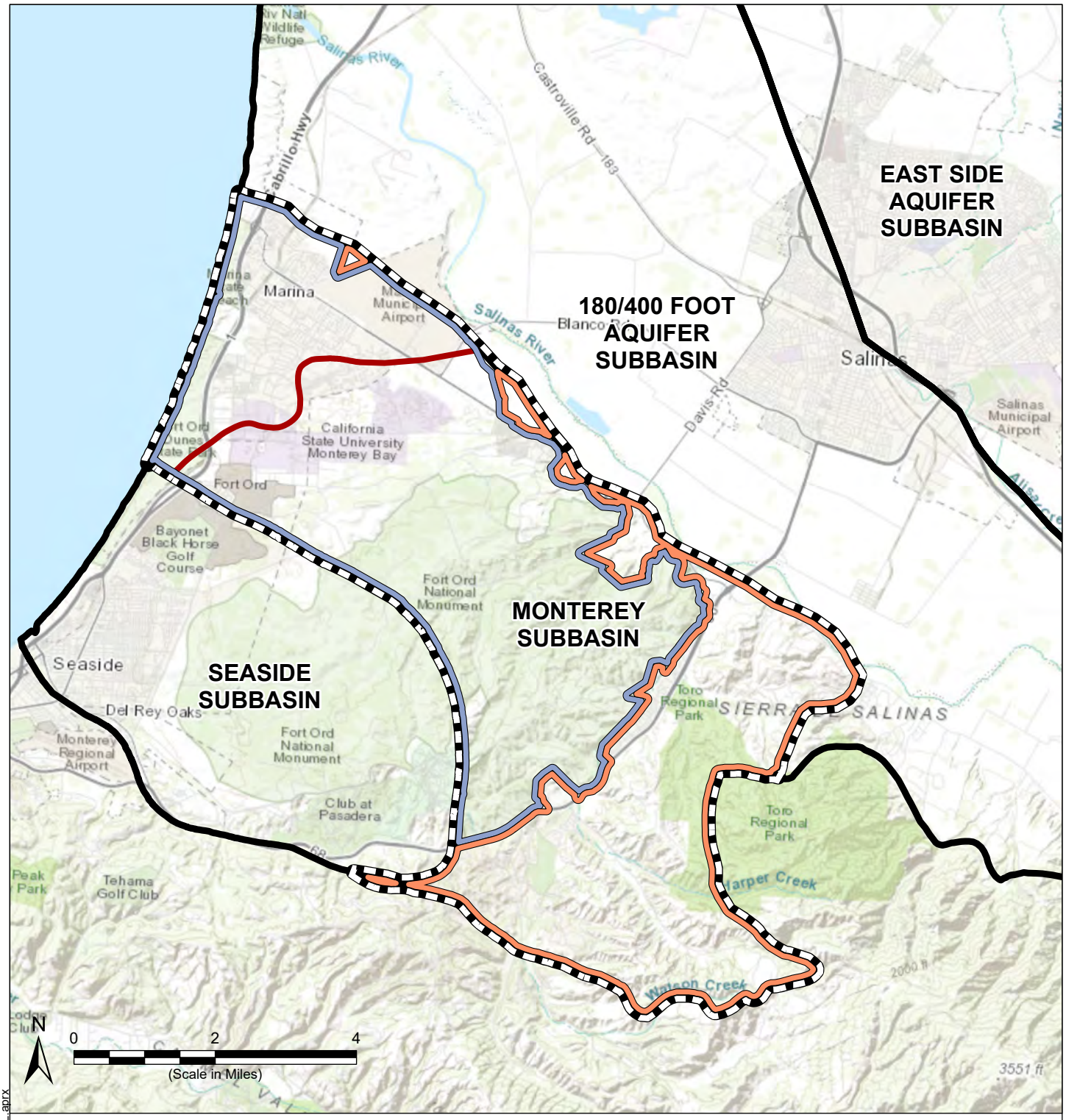
Because further expansion of the seawater intruded area is significant and unreasonable, the seawater intrusion minimum threshold is defined as:

The approximate location in 2015 of the 500 mg/L chloride concentration isocontour in the lower 180-Foot and 400-Foot Aquifers;

Approximately 3,500 feet from the coast in the Dune Sand Aquifer, upper 180-Foot Aquifer and Deep Aquifers. This distance is generally consistent with the location of Highway 1 in the Monterey Subbasin and seaward of groundwater extraction in the Subbasin.

The approximate line of Highway 1 is determined as the seawater intrusion minimum threshold in the Dune Sand Aquifer, upper 180-Foot Aquifer and Deep Aquifers, as there is very limited seawater intrusion observed in these aquifers currently. The intent of this is minimum threshold is to limit seawater from intruding into these aquifers. Such seawater intrusion could occur from the ocean and/or through vertical migrations from underlying or overlying aquifers which are currently seawater intruded.

Figure 8-13 presents the minimum threshold for seawater intrusion in the lower 180-Foot and 400-Foot Aquifers. Figure 8-14 presents the minimum threshold for seawater intrusion in the Dune Sand, upper 180-Foot, and Deep Aquifers.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Minimum Thresholds Boundary

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Notes

1. All locations are approximate.
2. The minimum thresholds for seawater intrusion in the Lower 180-Foot and 400-Foot Aquifers are set at the current seawater intrusion boundaries.

Sources

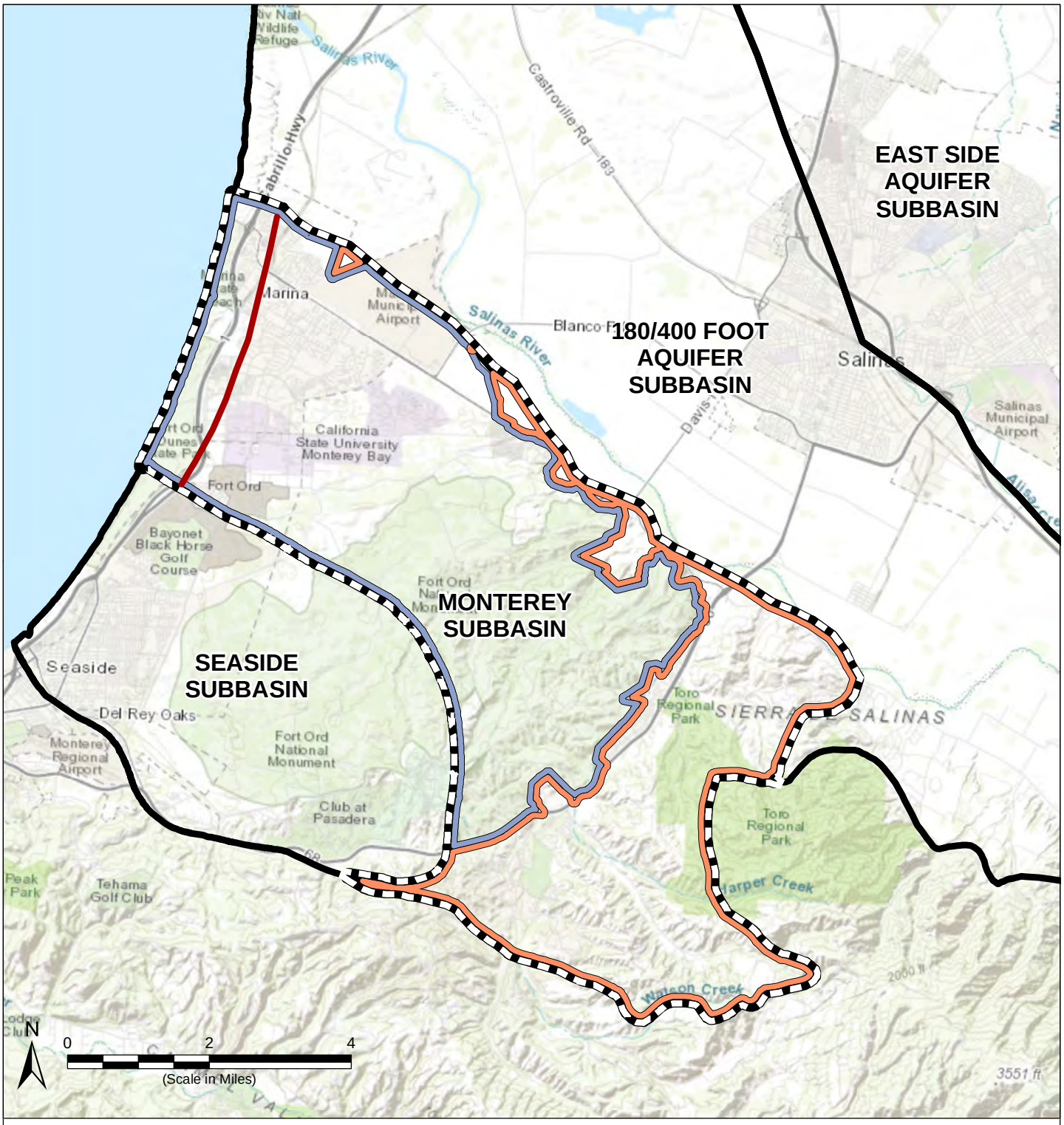
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 28 September 2026

Minimum Thresholds for Seawater Intrusion in the Lower 180-Foot and 400-Foot Aquifers

Monterey Subbasin
Groundwater Sustainability Plan
September 2026

Figure 8-13

Path: X:\B60094\Maps\2026\GSP_PE\GSP_Figure5_30_TDS_CL.aprx



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management

- Marina-Ord
- Corral de Tierra
- Minimum Thresholds

Notes

1. All locations are approximate.
2. The minimum thresholds for seawater intrusion in the Dune Sand, Upper 180-Foot and Deep Aquifers are set at Highway 1.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 15 September 2021

Minimum Thresholds for Seawater Intrusion in the Dune Sand, Upper 180-Foot and Deep Aquifers

Monterey Subbasin
Groundwater Sustainability Plan
November 2021

Figure 8-14

Path: X:\B60094\Maps\2021\09\Fig8-14_SWI_Deep.mxd

8.9.3.1 Information and Methodology Used to Establish Minimum Thresholds and Measurable Objectives

Consistent with GSP Emergency Regulations §354.28 (c), the definition of minimum thresholds for seawater intrusion is based on maps and cross-sections of the chloride concentration isocontour and how minimum thresholds will be affected by current and projected sea levels.

The seawater intrusion minimum thresholds are developed based on seawater intrusion maps and cross-sections of the GSP Baseline Period included in Chapter 5 of this GSP. The maps identify the extent of seawater intrusion as the estimated location of the 500 mg/L chloride concentration isocontour line in 2015. The maps are developed through analysis of TDS and chloride measurements collected from monitoring wells near the coast, geophysical data, and the hydrogeological setting. For this GSP Amendment 1, the estimated 2015 extent of seawater intrusion was refined using additional monitoring data collected during GSP implementation, including data from monitoring wells installed in 2026. The updated interpretation indicates that seawater intrusion had extended farther inland than the 2015 extent previously mapped.

The groundwater models that have been used to assess the effectiveness of projects and management actions on seawater intrusion specifically incorporate assumptions for future sea level rise. Therefore, the actions to avoid undesirable results incorporate assumptions associated with future sea level rise in their design and development.

8.9.3.2 Relationship to Other Sustainability Indicators

As discussed above, minimum thresholds for seawater intrusion have been considered in the development of SMCs for related sustainability indicators including:

- groundwater level elevations SMCs, and
- depletion of groundwater storage SMCs.

Seawater intrusion is the primary driver used to set SMCs for these other sustainability indicators, which are also consistent with minimum thresholds established for:

- depletion of interconnected surface waters in wells proximate to such areas, and
- subsidence, as they are set above historical groundwater levels.

No conflict exists between seawater intrusion and degraded groundwater quality SMCs, beyond that caused by seawater intrusion itself, which increases chloride, sodium and TDS concentrations in groundwater wells (e.g., chloride, TDS).

8.9.3.3 Effect of Minimum Threshold on Neighboring Basins and Subbasin

The Monterey Subbasin has two neighboring subbasins within the Salinas Valley Groundwater Basin:

- The 180/400-Foot Aquifer Subbasin to the north;
- The Seaside Subbasin to the south

The GSAs coordinating the Monterey Subbasin GSP are the same GSAs managing the adjacent 180/400-Foot Aquifer Subbasin. The GSAs have been coordinating the development of the minimum thresholds and measurable objectives within the 180/400 Subbasin GSP, which was submitted to DWR in 2020, with Amendment 1 prepared in 2022 and considered by DWR in January 2025. 180/400 GSP Amendment 2 has been prepared concurrently with this Monterey GSP Amendment 1. Minimum thresholds for seawater intrusion are established consistent with the 180/400-Foot Aquifer Subbasin GSP. Additionally, SVBGSA's 4 additional GSPs within the Langley, Eastside, Forebay and Upper Valley Subbasins in the Salinas Valley have been developed with consistent methods and SMCs.

The Seaside Subbasin is an adjudicated basin and not subject to SGMA. Because the minimum thresholds in the Monterey Subbasin are established to prevent expansion of the seawater intruded area in the Subbasin, it is likely that the minimum thresholds will not prevent the Seaside Subbasin from meeting its adjudication requirements. The Subbasin GSAs have and will continue to coordinate closely with the Seaside Watermaster to ensure that the Monterey Subbasin minimum thresholds do not prevent the Seaside Subbasin from meeting its adjudication requirements.

8.9.3.4 Effects on Beneficial Users and Land Uses

Urban land uses and users. The seawater intrusion minimum thresholds will prevent high salinity levels from impacting the water supply of urban land uses and users, along with agricultural uses and users. However, the seawater intrusion minimum threshold may (a) reduce the amount of allowable groundwater pumping within the Subbasin, or (b) require implementation of local or regional projects and/or management actions to augment existing water supplies within the Subbasin. This may result in higher water costs for water users.

Agricultural land uses and users. The seawater intrusion minimum thresholds generally provide positive benefits to the Subbasin's agricultural water users. Preventing additional seawater intrusion protects the supply of usable groundwater will exist for beneficial agricultural use.

On-farm domestic land uses and users. There are no known on-farm domestic groundwater users in the Marina-Ord Area, where SMCs are developed for seawater intrusion.

Ecological land uses and users. Although the seawater intrusion minimum threshold does not directly benefit ecological uses, it can be inferred that the seawater intrusion minimum thresholds generally provide positive benefits to the Subbasin's ecological water uses. Preventing seawater intrusion into the Subbasin will help prevent unwanted high salinity levels from impacting ecological groundwater uses.

8.9.3.5 Relevant Federal, State, or Local Standards

No federal, state, or local standards exist for seawater intrusion.

8.9.3.6 Method for Quantitative Measurement of Minimum Threshold

Chloride concentrations are measured in groundwater samples collected from the seawater intrusion monitoring network identified in Chapter 7. These samples are used to develop the approximate location of the 500 mg/L chloride isocontour. The methodology and protocols for collecting samples and developing the 500 mg/L concentration isocontour during GSP implementation are detailed in Appendix 7-C through Appendix 7-E.

8.9.4 Measurable Objectives

In the Monterey Subbasin, the measurable objectives for the seawater intrusion are the same as the minimum thresholds:

> *The approximate location in 2015 of the 500 mg/L chloride concentration isocontour in the lower 180-Foot and 400-Foot Aquifers;*
>
> *Approximately 3,500 feet from the coast in the Dune Sand Aquifer, upper 180-Foot Aquifer and Deep Aquifers. This distance is generally consistent with the location of Highway 1 in the Monterey Subbasin and seaward of groundwater extraction wells in the Subbasin.*

8.9.4.1 Method for Setting Measurable Objectives

As described above, measurable objectives are set to be identical to the minimum thresholds for the respective principal aquifers and therefore follow the same method as detailed in Section 8.9.3.1.

8.9.4.2 Interim Milestones

The interim milestones for seawater intrusion are the same as the measurable objective.

8.10 Degraded Water Quality SMC

8.10.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable changes in groundwater quality resulting from extraction or direct GSA action in the Subbasin are increases in a chemical constituent that either:

- Increase in number of potable supply wells in which COC concentrations exceed Title 22 California Code of Regulations (Title 22) drinking water standards (i.e., maximum contaminant levels (MCLs) or SMCLs, or
- Increase in the number of agricultural supply wells in which COC concentrations exceed levels that may lead to reduced crop production based on the water quality objectives from the Water Quality Basin Plan for the Central Coastal Basin (CCRWQCB, 2019).

Such conditions are not considered significant and unreasonable where the COC is effectively managed to maintain beneficial uses for drinking water supply (i.e. treated, blended, or replaced) or where beneficial users are not reasonably expected to be impacted.

Significant and unreasonable conditions were determined with input collected during MCWD stakeholder meetings, SVBGSA Subbasin Committee meetings, and through the Subbasin Technical Committee meetings, and for GSP Amendment 1, the CCRWQCB.

8.10.2 Undesirable Results

8.10.2.1 Criteria for Defining Undesirable Results

Water quality degradation that results in a minimum threshold exceedance becomes an undesirable result when it is a direct result of extraction or GSA action. Some groundwater quality changes are expected to occur independent of extraction or SGMA activities; because these changes are not related to SGMA activities, nor GSA management, they do not constitute an undesirable result. Additionally, SGMA states that GSAs are not responsible for addressing water quality degradation that was present before January 1, 2015 (CWC §10727.2(b)(4)). Therefore, the degradation of groundwater quality reaches an undesirable result when:

> *Future or new minimum thresholds exceedances are caused by a direct result of extraction or GSA groundwater management action, including projects or management actions and regulation of groundwater extraction, unless minimum threshold exceedances are effectively managed to maintain beneficial uses for drinking water supply (i.e., treated, blended, or replaced) or beneficial users are not potentially harmed.*

The groundwater level SMC is designed and intended to help protect groundwater quality. Setting the groundwater level minimum thresholds at or above historical lows assures that no new depth dependent constituents of water quality concern are mobilized. The GSAs may pursue projects or management actions to ensure that groundwater levels do not fall below groundwater level minimum thresholds.

This undesirable result recognizes there is an existing regulatory framework in the form of the California Porter Cologne Act and the federal Clean Water Act that addresses water quality management; and considers existing federal, state, and local groundwater quality standards, which were used in the development of minimum thresholds in the GSP. The GSAs are not responsible for enforcing drinking water requirements or for remediating violations of those requirements that were caused by others (Moran and Belin, 2019). The existing regulatory regime does not require nor obligate the SVBGSA or MCWDGSA to take any affirmative actions to manage or control existing groundwater quality. However, SVBGSA and MCWDGSA are committed to monitoring and disclosing changes in groundwater quality and ensuring its groundwater management actions do not cause drinking water or irrigation water to be unusable.

SVBGSA and MCWDGSA will work closely with the CCRWQCB and other entities that have regulatory authority over water quality. SVBGSA will lead the Water Quality Coordination Group, which includes meeting annually with these partner agencies to review the status of water quality data and discuss any action needed to address water quality degradation in the Corral De Tierra Area.

If minimum thresholds are exceeded, the GSAs will review groundwater quality and groundwater gradients in and around the project areas to assess if the exceedance resulted from extraction or GSAs actions to address sustainability indicators, or was independent of the GSAs' activities. Both the implementation of actions and assessment of exceedances will occur throughout the GSP timeframe of 50 years as required by SGMA. The evaluation of whether a minimum threshold exceedance constitutes an undesirable result includes:

Step 1: Desktop Assessment
Conduct initial screening of whether the exceedance is likely caused by extraction or GSA groundwater management action, is not managed, and is not associated with seawater intrusion.

Step 2: Coordination and Verification
For MT exceedances within the Corral de Tierra Management Area, consult with the Water Quality Coordination Group.

Step 3: Evaluate Potential Impacts on Beneficial Uses and Users
If the exceedance is likely attributable to extraction or GSA actions, assess whether there are beneficial users that could potentially be harmed.

Step 4: Assess Data Needs
Evaluate whether additional sampling is needed to confirm conditions or better understand causes, considering existing monitoring programs (e.g., Preservation, Inc., MCWRA, SWRCB reporting).

Step 5: Identify Potential Actions to Address Water Quality Degradation
If degradation is linked to extraction or GSA actions, consider appropriate responses, such as:

- Additional data collection and/or analysis
- Modifications to projects or management actions
- Extraction management
- Well mitigation measures

Figure 1 outlines these steps and some of the specific considerations within them. Steps 1-3 will be conducted as part of the GSP annual report process. Steps 4 and 5 require more time and will be conducted afterwards. GSP 5-year periodic evaluations will summarize results of all steps, as well as if any management was added after annual reports to address undesirable results.

For SGMA compliance, undesirable results for groundwater quality are not caused by (1) lack of action, unless due to pumping; (2) GSA required reductions in pumping; (3) exceedances in groundwater quality minimum thresholds that occur, if there are fewer exceedances than if there had been a lack of management; (4) exceedances in groundwater quality minimum thresholds that would have occurred independent of pumping or projects or management actions implemented by the GSAs; (5) past harm.

In the Corral de Tierra Area specifically, arsenic is a naturally occurring constituent. Elevated arsenic levels in drinking water are a concern for local stakeholders, especially if they relate to declining groundwater elevations. Analysis of the relationship between arsenic concentration trends and groundwater extraction identified no statistically significant relationship. A positive correlation was found between arsenic concentration trends and groundwater elevation trends (i.e. higher concentrations found at higher groundwater levels), likely due to higher natural concentrations in the shallower geologic formations that comprise the El Toro Primary Aquifer System (M&A, 2026d). Since this relationship is driven by site-specific hydrogeologic conditions and increases in groundwater levels are needed for other sustainability indicators, higher arsenic concentrations related to higher groundwater levels do not constitute an undesirable result.

8.10.2.2 Potential Causes of Undesirable Results

As shown in Chapter 5, known groundwater quality issues within the Marina-Ord Area are caused by legacy Fort Ord contamination. To date, no COCs are detected above drinking water standards in any Marina-Ord Area groundwater supply wells (i.e., MCWD production wells). The U.S. Army is responsible for remediation of groundwater contamination associated with historical releases at the former Army base. This remediation is being conducted under the oversight of the US Armed Forces, US EPA, and the CCRWQCB.

High arsenic concentrations are known to occur within the El Toro Primary Aquifer System within the Corral de Tierra Area; these concentrations are naturally occurring. There is also no clear correlation that has been established between extraction and groundwater quality at this time.

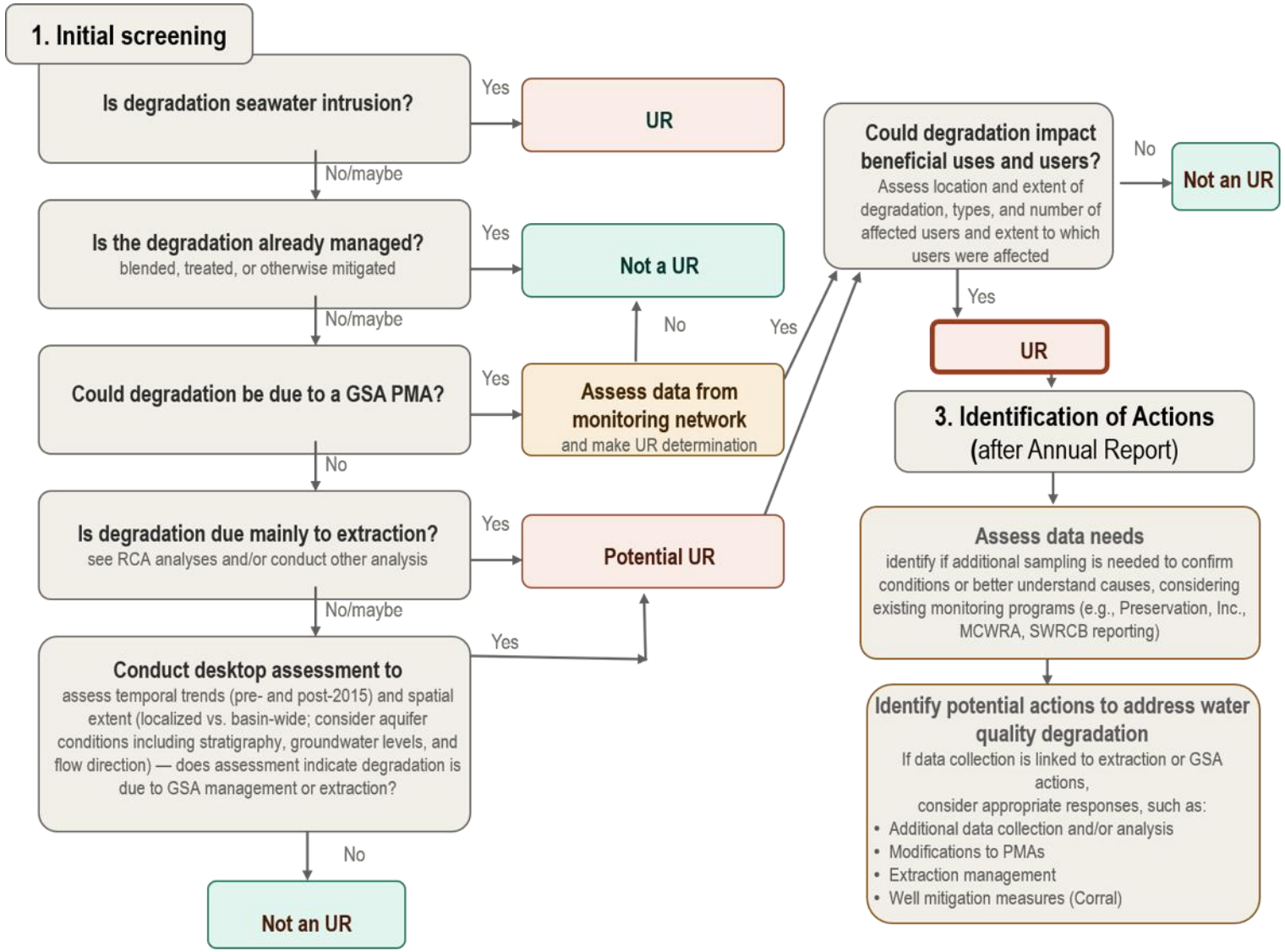


Figure 8-15 Flow Chart of Process to Determine if Minimum Threshold Exceedances Constitute an Undesirable Result

The potential for harming water quality will be considered in the process of selecting projects and management actions. If needed, additional project-specific groundwater quality monitoring networks may be established to ensure projects do not harm water quality. Conditions that may lead to an undesirable result in the Marina-Ord-Area or the Corral de Tierra Area include the following:

- **Required Changes to Subbasin Pumping**. If the location and rates of groundwater pumping change as a result of projects implemented under the GSP, these changes could alter hydraulic gradients and associated flow directions, and cause movement of COC towards a supply well at concentrations that exceed relevant standards. However, as noted above, quality changes from GSA-required reductions in pumping do not constitute an undesirable result.
- **Groundwater Recharge**. Active recharge of imported water or captured runoff could modify groundwater gradients and move COC towards a supply well in concentrations that exceed relevant limits.
- **Recharge of Poor-Quality Water**. Recharging the Subbasin with water that exceeds an MCL, SMCL, or level that reduces crop production could lead to an undesirable result.

County Ordinance No. 04011 (see Section 3.4) restricts well construction in areas that may interfere with contamination plumes at the former Fort Ord. Therefore, the potential for GSP projects to impact legacy contamination at Fort Ord within the Marina-Ord Area is low. However, large regional projects that could substantially change groundwater gradients within the vicinity of Fort Ord will need to evaluate such impacts and coordinate with the U.S. Army.

8.10.2.3 Effects on Beneficial Users and Land Use

Avoiding groundwater quality degradation at potable and agricultural wells due to pumping and actions directly resulting from GSP implementation will positively affect beneficial users as it will limit the need for potential groundwater treatment. However, this SMC will limit implementation of selected projects and in the vicinity of Fort Ord until legacy contaminants have been remediated. Remediation of legacy Ford Ord contamination is required pursuant to the Records of Decision, entered into by the Army and overseeing regulatory agencies.

8.10.3 Minimum Thresholds

The minimum threshold for degraded water quality ("water quality minimum threshold") for the Monterey Subbasin is defined as:

> *No additional exceedances of Title 22 drinking water standards or Basin Plan water quality objectives beyond those observed in 2019 for groundwater quality constituents of concern.*

Minimum thresholds for all wells in the water quality RMS network are based on Title 22 drinking water standards (i.e., MCLs and SMCLs) and the water quality objectives listed in the Basin Plan (CCRWQCB, 2019) (Agricultural Water Quality Objectives). These drinking water and agricultural

water quality criteria are jointly defined herein as "concentration level of concern". As part of this GSP Amendment 1's update to the water quality SMC and evaluation process in response to the DWR's recommended corrective actions, the concentration level of concern methodology has been revised. The original GSP evaluated ILP well results against thresholds for irrigated agricultural use from the CCRWQCB's 2019 Basin Plan and DDW well results against Title 22 MCLs or SMCLs. For this amendment, the concentration of concern is determined as follows:

- Within the Marina-Ord area, Title 22 MCLs or SMCLs are applied as only groundwater production wells are MCWD's municipal supply wells;
- Within the Corral de Tierra Area, if a constituent is monitored for both Title 22 and the Basin Plan, then the more stringent threshold of the two is applied, regardless of well type. The Basin Plan has more stringent limits for only chloride, sodium, and boron.

The minimum threshold values for the COC identified for each management area are provided in Table 8-5 and are based on data up to WY 2019. While SGMA states that undesirable results that occur after January 1, 2015, should be addressed for groundwater quality, 2019 was selected because it was the last year of data available when the original GSP was drafted and there was no substantial difference from 2015 water quality data. Full discussion of these conditions is included in Chapter 5 and comparison between 2015 and 2019 quality is included in the 2027 periodic evaluation. Because the minimum thresholds reflect no additional exceedances, the minimum thresholds are set to the percentage of exceedances in 2019. Surpassing the percentage of existing exceedances for any of the listed constituents will lead to an undesirable result. Not all wells in the monitoring network are sampled for every COC. 0The constituents listed in Table 8-5 comprise the constituent watchlist for the Monterey Subbasin. This table expands upon the water quality assessment presented in Table 5-3. A subset of these constituents defines the COC for which SMC are established, as discussed in Chapter 8. Several constituents were not sampled prior to WY 2019; however, these constituents exceed the Title 22 regulatory standard or Basin Plan water quality objective during the WY 2021 to WY 2025 period and therefore need to be included in the constituent watchlist.

The fourth through sixth columns of Table 8-5 show the criteria used to select COC that are described in Section 8.10.3.1. The constituents that meet the COC criteria for the purposes of this GSP are highlighted in orange in Table 8-5. In the Marina-Ord Area, CT and TCE do not meet the criteria to be a COC, however, they are selected as COC due to the ongoing plumes described in Section 5.4.2. Similarly, neither chloride nor TDS meet the criteria, but they are considered COC because of the ongoing seawater intrusion in the Marina-Ord Area.

Table 8-5 Groundwater Quality Constituent Watchlist and Minimum Thresholds

Constituent	Concentration Level of Concern	Standard Units	Data from WY 2021 to WY 2025 for COC Criteria			Data up to WY 2019		
			Number of Years with Level of Concern Exceedances (COC>3)	Average Percentage of Wells with Exceedances (COC >10%)	Average Number of Wells with Exceedances (COC > 5)	Number of Wells Sampled	Number of Wells Exceeding Level of Concern in the Last Sample	Minimum Threshold/ Measurable Objective – Percent of Wells Exceeding Level of Concern
Marina-Ord Area								
DDW Wells (Data from August 1986 to September 2019)								
Carbon tetrachloride (CT)	0.5	µg/L	0	0%	0	7	0	0%
Chloride	500	mg/L	0	0%	0	7	0	0%
Total Dissolved Solids	1000	mg/L	0	0%	0	7	0	0%
Trichloroethene (TCE)	5	µg/L	0	0%	0	7	0	0%
Corral de Tierra Area								
DDW Wells (Data from August 1986 to September 2019)								
Arsenic	10	µg/L	5	67%	10	22	9	41%
Chloride	106	mg/L	5	94%	5	22	19	86%
Chromium	50	µg/L	1	3%	1	21	1	5%
Iron	300	µg/L	5	41%	4	22	8	36%
Manganese	50	µg/L	5	48%	4	22	9	41%
Radium 226 + Radium 228	5	pCi/L	1	10%	1	14	1	7%
Sodium	69	mg/L	3	94%	4	0	0	-
Specific Conductance	1600	µmhos/cm	2	5%	1	22	1	5%
Total Dissolved Solids	1000	mg/L	0	0%	0	22	1	5%
Zinc	5	mg/L	0	0%	0	22	1	5%
ILP On-Farm Domestic Wells (Data from March 2043 to September 2019)								
Specific Conductance	1600	µmhos/cm	2	10%	1	4	0	0%

Constituent	Concentration Level of Concern	Standard Units	Data from WY 2021 to WY 2025 for COC Criteria			Data up to WY 2019		
			Number of Years with Level of Concern Exceedances (COC>3)	Average Percentage of Wells with Exceedances (COC >10%)	Average Number of Wells with Exceedances (COC > 5)	Number of Wells Sampled	Number of Wells Exceeding Level of Concern in the Last Sample	Minimum Threshold/ Measurable Objective – Percent of Wells Exceeding Level of Concern
ILP Irrigation Supply Wells (Data from June 2017 to September 2019)								
Nitrate + Nitrite (sum as nitrogen)	10	mg/L	3	100%	1	0	0	-
Specific Conductance	1600	µmhos/cm	3	100%	1	0	0	-
Total Dissolved Solids	1000	mg/L	3	100%	1	0	0	-

Only constituents that meet the criteria outlined below in Section 8.10.3.10 are designated as COC; however, all monitored constituents included in the watchlist are reviewed as part of annual reports. As part of 5-year periodic evaluations, the list of COCs are reassessed and SMCs are added for additional constituents if they meet the COC criteria. This enables identification of persistent constituents, rather than year-to-year fluctuations. If any new COC are identified during the periodic evaluation, the minimum threshold is either: (1) set to 0% if it was sampled for and there were no exceedances of the level of concern for the COC in WY 2019, or (2) set after initial years of monitoring if it was not historically sampled. Since WY 2019, there has been no additional COC in the Subbasin.

8.10.3.1 Information and Methodology Used to Establish Water Quality Minimum Thresholds and Measurable Objectives

The powers granted to GSAs to effect sustainable groundwater management under SGMA generally revolve around managing the quantity, location, and timing of groundwater pumping. SGMA does not empower GSAs to develop or enforce water quality standards; that authority rests with the SWRCB Division of Drinking Water and Monterey County, because of the limited purview of GSAs with respect to water quality, and the rightful emphasis on those constituents that may be related to groundwater quantity management activities.

Therefore, this GSP is designed to avoid taking any action that may inadvertently move groundwater constituents already in the Subbasin in such a way that the constituents have a significant and unreasonable impact that would not otherwise occur. COCs must meet the following criteria:

1. They must have an established level of concern such as an MCL or SMCL for drinking water, or a level known to affect crop production.
2. They must have been detected in groundwater within the Subbasin at levels above the level of concern in at least 3 years from WY 2021 to WY 2025.
3. They must have been found in the Subbasin at levels above the level of concern in 10% or more of the wells sampled on average between WY 2021 and WY 2025.
4. They must occur at levels above the level of concern in at least 5 wells in the monitoring network averaged from WY 2021 to WY 2025.

Based on the review of groundwater quality data discussed in Chapter 5, the COCs for the Monterey Subbasin are listed in Table 8-5. The COCs in the Marina-Ord Area include:

- Trichloroethylene
- Carbon Tetrachloride
- TDS
- Chloride

TCE and CT are being remediated by the Army at the former Fort Ord. Although currently not detected above their respective MCLs within Marina-Ord Area water supply wells, these compounds are identified as constituents of concern because they are detected above their respective MCLs in groundwater monitoring wells in the vicinity of water supply wells. TDS and chloride are also detected in groundwater above their respective SMCLs in the Marina-Ord Area primarily as a result of seawater intrusion.

Other constituents and associated beneficial uses within the Marina-Ord Area are managed through existing management and regulatory programs under the U.S. Army, CCRWQCB, and SWRCB. New projects and management actions that could impact groundwater quality will require associated monitoring and permitting by the SWRCB and CCRWQCB.

In the Corral de Tierra Area, arsenic is only the COC. The other constituents found in the Corral de Tierra Area discussed in Chapter 5 that do not meet the COC criteria will be monitored under the constituent watchlist but are not used to define the SMC.

8.10.3.2 Relationship to Other Sustainability Indicators

Preventing degradation of groundwater quality may affect other sustainability indicators or may limit activities needed to avoid exceeding minimum thresholds for other sustainability indicators. For example, groundwater quality minimum thresholds could influence the types and locations of projects needed to attain groundwater elevation minimum thresholds and seawater intrusion minimum thresholds by

- limiting the types of water that can be used for recharge to raise groundwater elevations, and
- limiting the locations where such recharge can occur due to legacy Fort Ord contamination.

Although higher concentrations of naturally occurring arsenic are found in the Paso Robles Formation compared to the underlying Santa Margarita Sandstone, the potential for higher arsenic concentrations do not limit the need for raising groundwater levels in the Corral de Tierra Area.

8.10.3.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The anticipated effect of the degraded groundwater quality minimum thresholds on each of the neighboring subbasins is addressed below.

The Monterey Subbasin has two neighboring subbasins within the Salinas Valley Groundwater Basin:

- The 180/400 Subbasin to the north;
- The Seaside Subbasin to the south

The GSAs coordinating the Monterey Subbasin GSP are the same GSAs managing the adjacent 180/400-Foot Aquifer Subbasin. The GSAs have been coordinating the development of the

minimum thresholds and measurable objectives within the 180/400 Subbasin GSP, which was submitted to DWR in 2020, with Amendment 1 prepared in 2022 and considered by DWR in January 2025. 180/400 GSP Amendment 2 has been prepared concurrently with this Monterey GSP Amendment 1. Minimum thresholds for water quality are established consistently with the 180/400-Foot Aquifer Subbasin GSP. Additionally, SVBGSA's 4 additional GSPs within the Langley, Eastside, Forebay and Upper Valley Subbasins in the Salinas Valley have been developed with consistent methods and SMCs.

The Seaside Subbasin is an adjudicated basin and not subject to SGMA. Because the minimum threshold in the Monterey Subbasin is no additional exceedance of regulatory standards, it is likely that the minimum thresholds will not prevent the Seaside Subbasin from meeting its adjudication requirements. The Subbasin GSAs have and will continue to coordinate closely with the Seaside Watermaster to ensure that the Monterey Subbasin minimum thresholds do not prevent the Seaside Subbasin from meeting its adjudication requirements.

8.10.3.4 Effect on Beneficial Uses and Users

Urban land uses and users. The groundwater quality minimum thresholds generally provide positive benefits to the Subbasin's urban water users. The minimum thresholds help ensure extraction or GSA actions do not degrade groundwater quality such that it would cause more drinking water wells to violate drinking water standards. This helps provide adequate groundwater quality for public water system supplies.

Agricultural land uses and users. The groundwater quality minimum thresholds generally provide positive benefits to the Subbasin's agricultural water users. The minimum thresholds help ensure extraction or GSA actions do not degrade groundwater quality such that it would reduce crop production. This helps protect groundwater supplies for agricultural production.

Domestic land uses and users. The groundwater quality minimum thresholds generally provide positive benefits to the Subbasin's domestic water users by helping ensure extraction and GSA actions do not degrade groundwater quality such that it would cause more drinking water wells to violate drinking water standards. This helps provide adequate groundwater quality for domestic supplies.

Ecological land uses and users. Although the groundwater quality minimum thresholds do not directly benefit ecological uses, it can be inferred that the degradation of groundwater quality minimum thresholds provide generally positive benefits to the Subbasin's ecological water uses. GDEs could potentially become impacted if contaminated groundwater is taken up by GDEs. Some effects may be indirect, such as elevated nitrates stimulating additional aquatic growth, resulting in depressed dissolved oxygen levels. Species-specific tolerance levels for each COC is unknown, so minimum thresholds help protect ecological uses by preventing further degradation due to extraction or GSA action.

8.10.3.5 Relation to State, Federal, or Local Standards

The groundwater quality minimum thresholds are set at the Subbasin's water supply wells and specifically incorporate state and federal water quality standards for drinking water.

8.10.3.6 Method for Quantitative Measurement of Minimum Thresholds

Degradation of groundwater quality minimum thresholds will be directly measured from active wells. Groundwater quality will be evaluated through existing monitoring programs. Groundwater quality will be evaluated based on SWRCB GAMA groundwater information system data submitted through DDW and data received from CCRWQCB ILP, as discussed in Chapter 7.

Exceedances of MCLs and SMCLs and Water Quality Objectives for crop production will be reviewed annually. This review will be centered around the COCs identified above. Every 5 years, in line with Periodic Evaluations, water quality data will be reassessed to determine whether any additional constituents meet the COCs criteria listed above. If so, these additional constituents will be added to the list of COCs for the Subbasin.

8.10.4 Measurable Objectives

The measurable objectives for degradation of groundwater quality represent target groundwater quality distributions in the Subbasin. SGMA does not mandate the improvement of groundwater quality. Therefore, measurable objectives have been set to be identical to the minimum thresholds, as defined in Table 8-5.

8.10.4.1 Method for Setting Measurable Objectives

As described above, measurable objectives are set to be identical to the minimum thresholds and therefore follow the same method as detailed in Section 8.10.3.1.

8.10.4.2 Interim Milestones

Interim milestones show how the GSAs anticipate the Subbasin will gradually move from current conditions to meeting the measurable objectives over the next 20 years of implementation. Interim milestones are set for each five-year interval following GSP adoption.

There is no anticipated degradation of groundwater quality during GSP implementation that results from the implementation of projects and actions as described in Chapter 9. Therefore, the expected interim milestones are identical to minimum thresholds and measurable objectives, which represent current conditions.

8.11 Subsidence SMC

8.11.1 Locally Defined Significant and Unreasonable Conditions

Locally defined significant and unreasonable subsidence in the Subbasin is defined as follows:

- Any inelastic land subsidence that is caused by lowering of groundwater elevations occurring in the Subbasin is significant and unreasonable.

Subsidence can be elastic or inelastic. Elastic subsidence is the small, reversible lowering and raising of the ground surface. Inelastic subsidence is generally irreversible. This set of SMCs only concerns inelastic subsidence.

8.11.2 Undesirable Results

8.11.2.1 Criteria for Defining Undesirable Results

By regulation, the ground surface subsidence undesirable result is a quantitative combination of subsidence minimum threshold exceedances. For the Monterey Subbasin, no long-term subsidence is acceptable. Therefore, the ground surface subsidence undesirable result is:

> *Any exceedance of minimum thresholds during any one year due to lowered groundwater elevations is considered as an undesirable result.*

As discussed below, the subsidence minimum thresholds allow for measurement error in the InSAR data of 0.1 foot per year. Should potential subsidence be observed, the Subbasin GSAs will first assess whether the subsidence may be due to elastic subsidence. If the subsidence is not elastic, the GSAs will undertake a program to assess whether the subsidence is caused by lowered groundwater elevations. The first step in the assessment will be to check if groundwater elevations have dropped below historical lows. If groundwater elevations remain above historical lows, the GSAs shall assume that any observed subsidence was not caused by lowered groundwater levels. If groundwater levels have dropped below historical lows, the GSAs will attempt to correlate the observed subsidence with measured groundwater elevations.

8.11.2.2 Potential Causes of Undesirable Results

As shown in Chapter 5, no land subsidence has been observed within the Subbasin through the GSP Historical and Baseline Periods. It is unlikely that land subsidence will occur within the Subbasin because of its proximity to the ocean. However, the GSAs have established SMCs for this sustainability indicator and will continue to monitor InSAR data.

8.11.2.3 Effects on Beneficial Users and Land Use

The undesirable result for subsidence does not allow any subsidence to occur in the Subbasin. Therefore, there is no negative effect on any beneficial uses and users.

8.11.3 Minimum Thresholds

The minimum threshold for subsidence is defined as:

> *Zero net long-term subsidence, with no more than 0.1 foot per year of measured vertical displacement between June of one year and June of the subsequent year to account for InSAR measurement errors.*

8.11.3.1 Information Used and Methodology for Establishing Subsidence Minimum Thresholds

The minimum threshold was established using InSAR data available from DWR. The minimum threshold is no long-term irreversible subsidence in the Subbasin. The InSAR data provided by DWR, however, is subject to measurement error. DWR stated that, on a statewide level, for the total vertical displacement measurements between June 2015 and June 2019, the errors are as follows (Brezing, personal communication):

1. The error between InSAR data and continuous Global Positioning System (GPS) data is 16 mm (0.052 feet) with a 95% confidence level.
2. The measurement accuracy when converting from the raw InSAR data to the maps provided by DWR is 0.048 feet with a 95% confidence level.

By adding errors 1 and 2, the combined error is 0.1 foot. While this methodology is not a robust statistical analysis, it does provide an estimate of the potential error in the InSAR maps provided by DWR.

Additionally, the InSAR data provided by DWR reflects both elastic and inelastic subsidence. While it is difficult to compensate for elastic subsidence, visual inspection of monthly changes in ground elevations suggests that elastic subsidence is largely seasonal. To minimize the influence of elastic subsidence on the assessment of long-term, permanent subsidence, changes in ground level will only be measured annually from June of one year to June of the following year.

8.11.3.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The subsidence minimum threshold has little or no impact on other minimum thresholds as there has been no observed subsidence observed to date. Therefore, the SMCs for subsidence should not trigger greater extraction or the implementation of any projects and/or management actions in the Subbasin which could affect other sustainability indicators.

8.11.3.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Monterey Subbasin has two neighboring subbasins within the Salinas Valley Groundwater Basin:

- The 180/400-Foot Aquifer Subbasin to the north;
- The Seaside Subbasin to the south

The GSAs coordinating the Monterey Subbasin GSP are the same GSAs managing the adjacent 180/400-Foot Aquifer Subbasin. The GSAs have been coordinating the development of the minimum thresholds and measurable objectives within the 180/400 Subbasin GSP, which was submitted to DWR in 2020, with Amendment 1 prepared in 2022 and considered by DWR in January 2025. 180/400 GSP Amendment 2 has been prepared concurrently with this Monterey GSP Amendment 1. Minimum thresholds for land subsidence are established consistently with

the 180/400-Foot Aquifer Subbasin GSP. Additionally, SVBGSA's 4 additional GSPs within the Langley, Eastside, Forebay and Upper Valley Subbasins in the Salinas Valley have been developed with consistent methods and SMCs.

The Seaside Subbasin is adjudicated not subject to SGMA. Because the minimum threshold in the Monterey Subbasin is zero subsidence, it is likely that the minimum thresholds will not prevent the Seaside Subbasin from meeting its adjudication requirements. The Subbasin GSAs have and will continue to coordinate closely with the Seaside Watermaster to ensure that the Monterey Subbasin minimum thresholds do not prevent the Seaside Subbasin from meeting its adjudication requirements.

8.11.3.4 Effects on Beneficial Uses and Users

The subsidence minimum threshold is set to prevent any inelastic land subsidence. Available data indicate that as of GSP Amendment 1, there has been no inelastic subsidence occurring in the Subbasin. The subsidence minimum threshold helps prevent damage to critical infrastructure, such as roads, drinking water systems, and supply wells.

8.11.3.5 Relation to State, Federal, or Local Standards

There are no federal, state, or local regulations related to subsidence.

8.11.3.6 Method for Quantitative Measurement of Minimum Threshold

Minimum thresholds will be assessed using DWR-supplied InSAR data.

8.11.4 Measurable Objectives

The measurable objective for ground surface subsidence represents target subsidence rates in the Subbasin. Because the minimum threshold of zero net long-term subsidence is the best achievable outcome, the measurable objective is identical to the minimum threshold.

8.11.4.1 Method for Setting Measurable Objectives

The measurable objective will be assessed using DWR-supplied InSAR data.

8.11.4.2 Interim Milestones

The subsidence measurable objective is set at zero net long-term subsidence, which is consistent with GSP Historical and Baseline Period conditions. Therefore, the interim milestones are identical to GSP Baseline Period conditions of zero long-term subsidence, and annual measurements of no more than 0.1 foot of subsidence per year.

8.12 Depletion of Interconnected Surface Water SMC

Areas with interconnected surface water occur where shallow groundwater may be connected to the surface water system. This set of SMCs only applies to locations of potential interconnected surface water, as shown on Figure 5-35 and Figure 5-36.

8.12.1 Locally Defined Significant and Unreasonable Conditions

The Monterey Subbasin generally does not have large areas where interconnected surface water occurs. As shown in Chapter 5, locations of interconnected surface water identified in the Subbasin include the Marina vernal ponds and two stretches of the Salinas River. The Salinas River supports surface water rights holders and has ecological flow requirements associated with reservoir operation. Additionally, potential GDEs are present near the locations of interconnected surface water. Therefore, the management of interconnected surface water within the Monterey Subbasin may affect groundwater impacts to GDEs.

Locally defined significant and unreasonable depletion of interconnected surface water in the Subbasin is defined as:

- Depletions that would result in an unreasonable impact on other beneficial uses and users of surface water, such as groundwater dependent ecosystems.

These significant and unreasonable conditions were determined based on input collected during MCWD stakeholder meetings, SVBGSA Subbasin Committee meetings, and discussions with GSA staff during Subbasin Technical Committee meetings during development of the original GSP.

8.12.2 Undesirable Results

8.12.2.1 Criteria for Defining Undesirable Results

By regulation, the depletion of interconnected surface water undesirable result is a quantitative combination of minimum threshold exceedances. Shallow groundwater elevations near the locations of potentially interconnected surface water will be used as a proxy for minimum thresholds and measurable objectives. Since there is likely to be a limited number of shallow groundwater wells by each location of interconnected surface water, more than one minimum threshold exceedance by a location of interconnected surface water would cause an undesirable result.

Therefore, for the Monterey Subbasin, the undesirable result for depletion of interconnected surface water is:

> *Any minimum threshold exceeded in a shallow groundwater well near any location of interconnected surface water for more than two consecutive years.*

The undesirable result is established based on historically observed hydrologic conditions , which indicate no significant or unreasonable depletion of interconnected surface water has occurred.

Within this subbasin, there are only a few instances of potential ISW: the Marina vernal ponds and the two locations of the Salinas River. Currently, there is no extraction near the Marina Ponds, and thus no cause for concern for extraction-induced depletion.

Future climate change and extreme droughts may cause shallow groundwater elevation declines and further depletions of interconnected surface water irrespective of groundwater pumping. The exceedance of minimum thresholds near locations of interconnected surface water due to naturally occurring, extreme drought conditions may not be considered an undesirable result. Additionally, the GSAs will continue to evaluate the effects of future climate change on groundwater conditions and may reevaluate SMCs when more information is available.

8.12.2.2 Potential Causes of Undesirable Results

Depletion of interconnected surface water is generally correlated to chronic lowering of groundwater levels in an interconnected groundwater aquifer system.

Conditions that may lead to an undesirable result for the depletion of interconnected surface waters in the Marina-Ord Area include the following:

- **Potential projects that would create groundwater declines in shallow groundwater.** There is currently no groundwater extraction in the Dune Sand Aquifer or the underlying 180-Foot Aquifer near locations of interconnected surface water within the Marina-Ord Area However, future projects near interconnected surface water bodies within the Monterey Subbasin or adjacent subbasins could reduce shallow groundwater elevations.

Conditions that may lead to an undesirable result for the depletion of interconnected surface waters in the Corral de Tierra Area, including the Salinas River, include the following:

- **Localized pumping increases**. Even if the Subbasin is adequately managed at the Subbasin scale, increases in localized pumping of shallow groundwater near ISW bodies could reduce shallow groundwater elevations.
- **Expansion of riparian water right water uses**. Riparian water rights holders pump from wells adjacent to streams. Pumping by riparian water rights holder users is not regulated under this GSP. Additional riparian pumping near interconnected reaches of rivers and streams may result in local reductions in shallow groundwater elevations.
- **Departure from the GSP's climatic assumptions, including extensive, unanticipated drought**. Minimum thresholds were established based on anticipated future climatic conditions. Departure from the GSP's climatic assumptions or extensive, unanticipated droughts may lead to excessively low groundwater elevations that could reduce shallow groundwater elevations.
- **Changes in Nacimiento and San Antonio Reservoir Releases.** Since the Salinas River is dependent on reservoir releases for sustained summer flows, reductions of reservoir releases could cause shallow groundwater elevations to decline.

8.12.2.3 Effects on Beneficial Users and Land Use

Potential effects of undesirable results of depletion of interconnected surface water in the Marina-Ord Area may include reduced surface water to support GDEs.

Potential effects of undesirable results of depletion of interconnected surface water in the Corral de Tierra may include reduced surface water flows to support downstream or in-stream uses, and to support riparian habitat or associated GDEs.

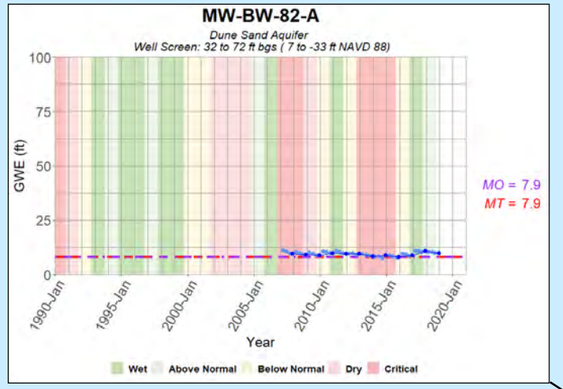
The depletion of interconnected surface water undesirable result is to have no net change in surface water depletion during average hydrologic conditions and over the long-term, as determined by shallow groundwater elevations. Therefore, during average long-term hydrologic conditions, the undesirable result will not have a negative effect on the beneficial users and uses of groundwater. However, pumping of shallow groundwater during dry years could temporarily increase rates of surface water depletions. Therefore, there could be short-term impacts on all beneficial users and uses of the surface water during dry years.

8.12.3 Minimum Thresholds

The minimum threshold for depletion of interconnected surface water is set to:

> *Minimum shallow groundwater elevations historically observed between 1995 and 2015 near locations of interconnected surface water.*

Figure 8-15 shows locations of interconnected surface water and shallow groundwater level minimum thresholds established in the Marina-Ord Area. As mentioned in Chapter 7, SVBGSA installed an ISW monitoring well in the Corral de Tierra Area near the confluence of El Toro Creek with the Salinas River. SMCs for the new well will be determined after groundwater elevations are measured for three to five years.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Representative Monitoring Sites for Interconnected Surface Water

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Representative Monitoring Sites

- Selected Fourth Quarter GWE Measurements
- Other GWE Measurements
- MO
- MT

Abbreviations

DWR	= California Department of Water Resources
ft	= foot
GWE	= groundwater elevation
MO	= Measurable Objectives
MT	= Minimum Thresholds
NAVD 88	= North American Vertical Datum of 1988

Notes

1. Selected fourth quarter measurements are measurements closest to December 1st of the year.
2. Groundwater elevations are in ft NAVD 88.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 15 September 2021.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

N

0 1.5 3

(Scale in Miles)

Marina-Ord Area: Interconnected Surface Water Minimum Thresholds and Measurable Objectives

Monterey Subbasin
Groundwater Sustainability Plan
November 2021
Figure 8-16

Path: X:\IB60094\Maps\2021\09\Fig8-16_ISW_MO_MT.mxd

8.12.3.1 Information Used and Methodology for Establishing Depletion of Interconnected Surface Water Minimum Thresholds

Establishing Groundwater Elevations as Proxies

The GSP Emergency Regulations §354.28(d) states that: "an Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence."

The evaluation of ISW in the Salinas Valley Groundwater Basin is based on an approach recommended by the Environmental Defense Fund (EDF, 2018) that uses groundwater elevations as surrogates for streamflow depletion rates caused by groundwater use. Basic hydraulic principles state that groundwater flow is proportional to the difference between groundwater elevations at different locations along a flow path. Using this basic principle, groundwater flow to a stream, or conversely seepage from a stream to the underlying aquifer, is proportional to the difference between water elevation in the stream and groundwater elevations at locations away from the stream. Assuming the elevation in the stream is relatively stable, changes in interconnectivity between the stream and the underlying aquifer are determined by changes in groundwater levels in the aquifer. Thus, the change in hydraulic gradient between stream elevation and surrounding groundwater elevations is representative of change in interconnection between surface water and groundwater. Monitoring the hydraulic gradient in the aquifer adjacent to the stream monitors the interconnectivity between stream and aquifer. Therefore, the gradient can be monitored by measuring and evaluating groundwater elevations at selected shallow monitoring wells near streams. No existing estimations of the quantity and timing of depletions of ISW exist, nor data available to make estimations, so the hydraulic principles provide the best available information.

Review of Beneficial Uses and Users of Surface Water

The various beneficial uses and users of surface waters were addressed when setting interconnected surface water depletion minimum thresholds. The classes of beneficial uses and users that were reviewed include riparian rights holders, appropriative rights holders, ecological surface water users, and recreational surface water users. This evaluation is not a formal analysis of public trust doctrine, but provides a reasonable review of all uses and users in an attempt to balance all interests. This evaluation does not assess what constitutes a reasonable beneficial use under Article X, Section 2 of the California Constitution.

The minimum thresholds for depletion of interconnected surface waters are developed using the definition of significant and unreasonable conditions described above, public information about critical habitat, public information about water rights described below, and the Subbasin water budget analysis.

Riparian water rights holders. There are no active riparian water rights holders within the Subbasin, including riparian water rights holders for the sections of the Salinas River where it

enters the Subbasin. The diversion data were obtained from queries of the SWRCB eWRIMS water rights management system.

The SVBGSA is not aware of any current riparian water rights litigation or water rights enforcement acts along the Salinas River in the Subbasin. Therefore, SVBGSA assumes that the current level of depletion has not injured any riparian water rights holders in the Subbasin.

Appropriative water rights holders. There are no appropriative water rights holders within the Subbasin.

Ecological surface water users. Within the Marina-Ord Area, groundwater elevations within the shallow-most aquifer, the Dune Sand Aquifer, have been stable for over two decades. In 2020, the City of Marina determined that the groundwater dependent ecosystems associated with the Marina vernal ponds are in "good condition". Given the stable groundwater patterns in the Dune Sand Aquifer and the good condition of the groundwater dependent ecosystems, there is no significant and unreasonable depletion of interconnected surface water under current conditions.

A review of MCWRA's Nacimiento Dam Operation Policy and MCWRA's water rights indicates MCWRA operates the Dam in a manner that meets downstream Salinas River demands and considers ecological surface water users. Since the reservoir operations consider ecological surface water users and reflect reasonable existing surface water depletion rates, this GSP infers that stream depletion from existing groundwater pumping is not unreasonable. If further river management guidelines are developed to protect ecological surface water users, the SMC in this GSP will be revisited.

Recreational surface water users. No recreational activities such as boating regularly occur on surface water bodies in the Subbasin.

As shown by the analysis above, the current rate of surface water depletion is not having an unreasonable impact on the various surface water uses and other users in the Subbasin. Therefore, the minimum thresholds are set based on historical minimum groundwater elevations observed between 1995 and 2005.

8.12.3.2 Relationship between Individual Minimum Thresholds and Relationship to Other Sustainability Indicators

The minimum threshold for depletion of ISW is set near the locations of ISW above historical and current groundwater elevations. The minimum thresholds reference the same historical years with consideration of fluctuations in aquifers that have steady groundwater elevations over the past two decades. Therefore, no conflict exists between minimum thresholds measured at various locations within the Subbasin.

As discussed above, SMCs for depletion of ISW minimum threshold are consistent with those established for chronic lowering of groundwater levels, change in groundwater storage, and seawater intrusion SMCs. There is no known relationship between these SMCs and groundwater quality or subsidence.

8.12.3.3 Effect of Minimum Thresholds on Neighboring Basins and Subbasins

The Monterey Subbasin has two neighboring subbasins within the Salinas Valley Groundwater Basin:

- The 180/400 Subbasin to the north;
- The Seaside Subbasin to the south

The GSAs coordinating the Monterey Subbasin GSP are the same GSAs managing the adjacent 180/400 Subbasin. The GSAs have been coordinating the development of the minimum thresholds and measurable objectives within the 180/400 Subbasin GSP, which was submitted to DWR in 2020, with Amendment 1 prepared in 2022 and considered by DWR in January 2025. 180/400 GSP Amendment 2 has been prepared concurrently with this Monterey GSP Amendment 1. Minimum thresholds for ISW are established consistently with the 180/400-Foot Aquifer Subbasin GSP. Additionally, SVBGSA's 4 additional GSPs within the Langley, Eastside, Forebay and Upper Valley Subbasins in the Salinas Valley have been developed with consistent methods and SMCs.

The Seaside Subbasin is an adjudicated basin and not subject to SGMA. Because there are no interconnected surface water bodies that cross the Monterey and the Seaside Subbasin, it is likely that the minimum thresholds will not prevent the Seaside Subbasin from meeting its adjudication requirements. The Subbasin GSAs have and will continue to coordinate closely with the Seaside Watermaster to ensure that the Monterey Subbasin minimum thresholds do not prevent the Seaside Subbasin from meeting its adjudication requirements.

8.12.3.4 Effect on Beneficial Uses and Users

Table 3-9 of the Salinas River Long-Term Management Plan (MCWRA, 2019) includes a list of 18 different designated beneficial uses on certain reaches of the river. In general, the major beneficial uses on the Salinas River are:

- Surface water diversions for agricultural, urban/industrial and domestic supply
- Groundwater pumping from recharged surface water
- Freshwater habitat
- Rare, threatened or endangered species, such as the Steelhead Trout
- CSIP diversions

The depletion of surface water minimum thresholds may have varied effects on beneficial users and land uses in the Subbasin.

Urban land uses and users. The depletion of ISW minimum threshold prevents lowering of shallow groundwater elevations adjacent to groundwater dependent ecosystems and certain parts of streams. This may limit the amount of urban pumping near these areas, which could limit urban growth in these areas and implementation of projects that extract groundwater from these shallow aquifers. Also, if pumping is limited, municipalities may have to obtain alternative

sources of water to achieve urban growth goals. If this occurs, this may result in higher water costs for municipal water users.

Domestic land uses and users. The depletion of ISW minimum threshold may benefit existing domestic land users and uses by maintaining shallow groundwater elevations near streams and groundwater dependent ecosystems protecting the operability of relatively shallow domestic wells. However, these minimum thresholds may limit the number of new domestic wells that can be installed near such areas to limit the additional drawdown from the new wells.

Agricultural land uses and users. The depletion of ISW minimum thresholds prevent lowering of shallow groundwater elevations adjacent to certain parts of streams and groundwater dependent ecosystems. This has the effect of limiting the amount of groundwater pumping in these areas. Limiting the amount of groundwater pumping may limit the quantity and type of crops that can be grown in these adjacent to streams and rivers.

Ecological land uses and users. The depletion of ISW minimum thresholds likely benefits ecological uses and users by preventing further degradation of ecological impacts from groundwater pumping. Additionally, by setting future groundwater levels at or above recent lows, there should be less impact to GDEs than experience at the start of SGMA. Therefore, GDEs are protected from future significant and unreasonable impacts due to low groundwater levels, regardless of the GDE location.

8.12.3.5 Relation to State, Federal, or Local Standards

The minimum thresholds are developed in accordance with National Marine Fisheries Service (NMFS) streamflow requirements. There are no NMFS streamflow requirements and known water rights litigation and enforcement complaints for the non-Salinas River surface water bodies within the Monterey Subbasin.

8.12.3.6 Method for Quantitative Measurement of Minimum Threshold

Groundwater elevations measured in shallow wells adjacent to potentially interconnected surface water bodies will serve as the primary approach for monitoring depletion of surface water. The Monterey Subbasin Model will serve as the secondary approach for monitoring depletion of surface water when it becomes available. At a minimum, the model will be updated every 5 years and the amount of surface water depletion that occurred in the previous 5 years will be estimated.

As discussed in Chapter 7, one shallow groundwater well is included in the monitoring network within the Marina-Ord Area. In the event that future groundwater activities in the Subbasin or the adjacent 180/400 Subbasin may influence the condition of these vernal ponds, the GSAs will work with project proponents to install additional shallow groundwater monitoring well. New projects or management actions that could impact groundwater conditions near the coastal areas of the City of Marina will require associated permitting by the City of Marina, the County of Monterey, and the CCC per land use restrictions discussed in Chapter 3.

SVBGSA installed one new shallow well along the Salinas River to add to the interconnected surface water monitoring network. SMC will be added after the initial three to five years of data collection.

8.12.4 Measurable Objectives

The measurable objective for depletion of interconnected surface water is the same as the minimum threshold.

8.12.4.1 Method for Setting Measurable Objectives

Depletion of interconnected surface water measurable objectives are set at conditions identified with the historical minimum shallow groundwater elevations between 1995 and 2015. Therefore, there is no need to set a measurable objective different than the minimum threshold.

Discussions with GSA staff and stakeholders suggested that stakeholders acknowledge El Toro Creek is the main stream that drains into the neighboring 180/400 Subbasin. The Corral de Tierra Area does not have areas where interconnected surface water potentially occurs. Therefore, there is no need to set a measurable objective different than the minimum threshold.

Releases of stored water from Nacimiento and San Antonio Reservoirs during the conservation release period are meant in part to intentionally recharge the groundwater basin. Therefore, there is no need to set a measurable objective different than the minimum threshold.

8.12.4.2 Interim Milestones

Depletion of interconnected surface water minimum thresholds and measurable objectives are set at conditions identified with the historical minimum shallow groundwater elevations between 1995 and 2015; there is no anticipated increase or decrease in surface water depletion during GSP implementation. The expected interim milestones are identical to the minimum threshold and measurable objectives shown on Figure 8-15. Figure 8-15 shows the identified historical minimum shallow groundwater elevations observed between 1995 and 2015.

9 PROJECTS AND MANAGEMENT ACTIONS

This chapter describes the projects and management actions that will allow the Subbasin to attain sustainability in accordance with §354.42 and §354.44 of the GSP Regulations.

The term "projects" generally refers to activities that require infrastructure or physical changes to the environment to support groundwater sustainability. The term "groundwater management actions" generally refers to activities that support groundwater sustainability without infrastructure.

MCWDGSA and SVBGSA have coordinated implementation of the GSP since its adoption. MCWDGSA is leading the planning and implementation of projects within the Marina-Ord Area, and SVBGSA is leading the planning and implementation of projects in the Corral de Tierra Area and the 5 additional Subbasins in SVBGSA's jurisdiction. Several projects identified in this chapter require multi-basin coordination and are facilitated by MCWDGSA, SVBGSA or MCWRA, and include other relevant agencies and parties.

9.1 Goals and Objectives of Projects and Management Actions

Per the GSP Emergency Regulations, GSPs must include projects and management actions to address any existing or potential future undesirable results for the identified relevant sustainability indicators. Therefore, the goal of the projects and management actions discussed herein is to address significant and unreasonable results related to the relevant sustainability indicators in each management area. As discussed in Chapter 8, existing and potential future undesirable results in the Subbasin are identified for the (1) chronic lowering of groundwater levels sustainability indicator in the Marina-Ord and Corral de Tierra Management Areas, and (2) seawater intrusion sustainability indicator in the Marina-Ord Area. In addition, the reduction of groundwater storage indicator is directly correlated with groundwater elevations and seawater intrusion.

9.1.1 Multi-Subbasin Projects and Management Actions

The PMAs described herein include local PMAs within the Marina-Ord Area and Corral de Tierra Area, and multi-subbasin PMAs that may affect groundwater conditions in the Monterey Subbasin.

Earlier chapters of this GSP highlighted the hydraulic connection between the Monterey Subbasin and both the adjacent critically overdrafted 180/400-Foot Aquifer Subbasin and Seaside Subbasin. Reaching sustainability and achieving measurable objectives within the Monterey Subbasin will be affected by groundwater conditions and management within these adjacent subbasins and the greater Salinas Valley Basin. Therefore, PMAs and implementation actions will need to be coordinated between subbasins to achieve sustainability.

The 180/400 GSP Amendment 2 describes a regional Integrated Implementation Strategy (IIS) led by SVBGSA, which is intended to coordinate PMAs across the Salinas Valley in recognition that aquifers and groundwater management challenges extend across subbasin boundaries to varying degrees. The IIS identifies a preferred portfolio to guide further development and refinement of

regional PMAs, while retaining ongoing and contingency PMAs that may be implemented or refined as conditions, feasibility, funding, stakeholder input, and technical information evolve.

This GSP incorporates by reference the PMAs identified in Chapter 9 and the implementation framework described in Chapter 10 of the 180/400-Foot Aquifer Subbasin GSP Amendment 2, as those documents may be updated through adopted periodic evaluations or future amendments. These PMAs are incorporated as multi-subbasin PMAs because they may directly or indirectly affect groundwater conditions in the Monterey Subbasin. SVBGSA is taking an integrated approach to GSP implementation activities across the Salinas Valley. These PMA will necessarily be developed in coordination with MCWDGSA, as well as with MCWRA and other agencies that own and operate facilities or hold water rights related to some PMA included in this chapter. A regional PMA may support Monterey Subbasin sustainability where it reduces regional groundwater extraction; improves groundwater elevations, storage, or gradients in hydraulically connected aquifers; reduces seawater-intrusion migration or risk; or improves operation of existing infrastructure.

Regional coordination projects and multi-subbasin projects are included when they have the potential to directly benefit this Subbasin. Therefore, the Subbasin Groundwater Sustainability Agencies (GSAs) have developed a California SGMA implementation approach that includes regional coordination actions, participating in regional, multi-basin projects, in addition to implementing local projects and management actions.

This GSP is developed as part of an integrated effort to achieve groundwater sustainability in all six subbasins of the Salinas Valley. Therefore, the projects and actions included in this GSP are part of a larger set of integrated projects and actions for the entire Valley.

9.1.2 Process for Developing Projects and Management Actions

9.1.2.1 Original GSP

Projects and management actions presented in the original GSP were developed through reviews of publicly available information, gathering feedback during public meetings, conducting hydrogeologic analysis, consulting with MCWD and SVBGSA staff, coordinating through the MCWDGSA/SVBGSA Subbasin Technical Committee and the SVBGSA Monterey Subbasin Planning Committee, and meeting with each GSA's governing body members.

Developing projects and management actions for the GSP involved building on, revising, and adding to the projects and management actions developed for the entire Valley as part of the 180/400 GSP and other 2022 Salinas Valley Basin GSPs. The initial list of projects in the 180/400 GSP and Amendment 1 was developed with stakeholder input, including a brainstorming workshop for stakeholders to propose and discuss their ideas. The list of PMAs developed in this workshop were then narrowed down based on feasibility, likelihood of stakeholder acceptance, and ability to address groundwater conditions.

Building off the previously identified projects, the GSAs undertook an iterative process at the Subbasin level to develop the projects and management actions in this GSP.

Within the Marina-Ord Area, project planning was built on foundational supply planning efforts conducted by MCWD prior to GSP development. A list of local projects for the Marina-Ord Area was developed by consulting with MCWDGSA staff and reviewing prior MCWDGSA feasibility assessments of water supply augmentation and recharge projects. Inclusion of multi-subbasin projects in this GSP was developed through the Subbasin Technical Committee. MCWDGSA and SVBGSA staff assessed multi-subbasin projects included in the 180/400 GSP and other 2022 Salinas Valley Basin GSPs that could potentially provide supply augmentation to the Monterey Subbasin and tailored those projects for the original GSP. After the initial list of local and multi-basin projects were developed, the identified projects and management actions were presented during stakeholder workshops, MCWD Board Meetings, and were discussed with stakeholders.

Within the Corral de Tierra Area, an overview of the purpose and types of projects and management actions was presented by SVBGSA to the Subbasin Planning Committee, and initial ideas were solicited. Committee members completed a survey for feedback and further solicitation of ideas. After these ideas were gathered, a list of potential projects and management actions specific to the management area was presented to the Subbasin Committee and discussed.

Special workshops and meetings were held with the purpose of considering pumping reductions. Potential projects and management actions were also discussed in terms of meeting the SMCs outlined in Chapter 8.

9.1.2.2 GSP Amendment 1

GSP Amendment 1 updates the PMA framework using information developed during the first phase of GSP implementation, including updated monitoring data, groundwater-condition assessments, technical studies, project feasibility studies and development activities, regional groundwater-model development, and coordination with partner agencies and stakeholders.

Within the Marina-Ord Area, additional PMAs identified subsequent to the original GSP were added. PMA descriptions are refined based on project implementation during the first phase of GSP implementation.

Within the Corral de Tierra Area, SVBGSA has developed demand management and planning as a management action that updates the pumping controls and allocations management action included in the original GSP. Two new management actions are added specifically to rural residential areas: Rural Residential Demand Management Water Use Efficiencies as a priority PMA and a Rural Residential Well Mitigation Program that could be implemented when and if needed to address undesirable results impacting domestic beneficial users.

This Amendment also updates the incorporation of multi-subbasin PMAs. The original GSP separately described several multi-subbasin projects that were expected to provide supply augmentation or other direct benefits to the Monterey Subbasin. Since adoption of the original GSP, the 180/400-Foot Aquifer Subbasin GSP has been further updated through GSP Amendment 1 and GSP Amendment 2. Those updates refined PMA descriptions, incorporated feasibility study

findings, added PMAs identified during implementation, and organized PMAs as priority, ongoing, and contingency actions within a broader Salinas Valley implementation framework.

Accordingly, GSP Amendment 1 does not independently describe or rely upon specific 180/400-Foot Aquifer Subbasin PMAs. Instead, multi-subbasin PMAs are addressed through the coordinated-management approach in Section 9.1.1 and are incorporated by reference to the applicable portions of the 180/400-Foot Aquifer Subbasin GSP, including Chapter 9, Projects and Management Actions, and Chapter 10, GSP Implementation, as subsequently adopted or updated. This approach recognizes that a regional PMA may be relevant to Monterey Subbasin sustainability even if it does not deliver a discrete water supply to Monterey Subbasin users.

9.1.3 Conditions and Assumptions

The PMAs in this chapter provide a portfolio of local and multi-subbasin actions that may be used to achieve sustainability; however, not all PMAs need to be implemented. PMA implementation will be guided by monitoring results, progress toward sustainability, and adaptive management decisions made during GSP implementation. Chapter 10 describes the approach for refining and implementing PMAs.

This GSP is developed as part of an integrated effort by the SVBGSA to achieve groundwater sustainability in all 6 subbasins of the Salinas Valley under its authority, in coordination with other GSAs and water management agencies including the MCWDGSA. Therefore, the PMAs included in this GSP may be part of a larger set of PMAs in the Salinas Valley. PMAs implemented in other subbasins may have benefits for the Monterey Subbasin, and PMAs implemented within this Subbasin may have benefits for other subbasins.

Some PMAs are based on existing infrastructure, including surface and recycled water facilities. They assume continued operation of that infrastructure at current capacity; however, there are known maintenance and repair projects that are needed and that may impact operations during construction or unforeseen circumstances. If current infrastructure is modified or expanded, or if other projects are implemented that affect groundwater conditions, the Subbasin GSAs will consider the effect of any such changes in meeting sustainability goals and will act in furtherance of reaching such goals.

Discussions and decisions regarding specific PMAs will continue throughout GSP implementation and will be part of the adaptive management of the Subbasin. PMAs identified in the original GSP provided a starting point for more detailed feasibility analyses and discussions with GSA stakeholders during the first phase of GSP implementation. As GSP and PMA implementation activities continue to progress, additional details for each PMA will need to be agreed upon in future phases.

To be able to relatively compare projects, this chapter estimates the cost per AF of water based on feasibility studies or the best available information developed at the time of the original GSP, if not further studied. The cost per AF is an amortized cost of the project divided by the annual yield. This is not the cost of water for irrigation or the domestic cost of drinking water for households on water systems. Cost analyses and future benefit analyses will continue to be

refined during the next phases of PMA development and GSP implementation. Final costs will depend on further design, environmental review and permitting. The potential costs for local groundwater users will depend on the type of PMA and beneficiaries of the PMA, as well as availability of external or other sources of funding.

The specific design of PMAs will provide landowners and public entities flexibility in how they manage water and how the Subbasin achieves groundwater sustainability. The GSAs will work collaboratively to prioritize PMAs necessary to achieve sustainability and will adjust through adaptive management if conditions change.

9.2 Overview of Projects and Management Actions

The projects and management actions for this GSP are summarized in Table 9-1 and include these major categories based on the leading agency and focused area:

- **Marina-Ord Area Local Projects and Management Actions** – Projects and management actions to be led by MCWD (or Marina-Ord Area agencies) that will primarily benefit the Marina-Ord Area.
- **Corral de Tierra Area Local Projects and Management Actions** – Projects and management actions to be led by SVBGSA that will primarily benefit the Corral de Tierra Area.

Additionally, multi-subbasin PMAs identified in 180/400 GSP Amendment 2 Chapter 9 are incorporated herein by reference. 180/400 GSP Amendment 2 identifies priority PMA to address seawater intrusion and groundwater-level declines in the Deep Aquifers, conditions that are also of concern in the Monterey Subbasin. These PMA are discussed in Chapter 10 of this GSP, as part of SVBGSA's Integrated Implementation Strategy. Additionally, management actions that specifically apply in the Corral Area are in this GSP, even if also included by reference in 180/400 GSP Amendment 2. As discussed in Section 9.4, implementation of PMAs in the 180/400 Subbasin and other Salinas Valley subbasins may directly or indirectly benefit the Monterey Subbasin and reduce the need for additional Subbasin-specific projects and management actions. The Subbasin GSAs' regional coordination efforts and their support of PMAs in adjacent subbasins is discussed in Section 10.5.

Table 9-1 Summary of Projects and Management Actions

PMA #	Name	Project Type / Water Supply	Description	Project Benefits / Quantification of Benefits	Cost
Multi-Subbasin Projects and Management Actions					
--	Multi-Subbasin PMAs Implemented under the 180/400 GSP Amendment 2	Multiple	Regional PMAs identified in 180/400 GSP Amendment 2 Chapter 9 included by reference.	May directly or indirectly improve groundwater elevations, storage, seawater intrusion conditions, and boundary flows affecting the Monterey Subbasin.	See 180/400 GSP Amendment 2
Marina-Ord Area Local Projects and Management Actions					
M1	MCWD Demand Management Measures	Management Action	Provides in-lieu recharge through reducing groundwater demands.	Equivalent to a 2,500 AFY in-lieu recharge benefit at the current population.	$350,000 to $450,000 annually
M2	Stormwater Recharge Management	Direct recharge	Existing policies will facilitate and result in additional stormwater catchment and infiltration over time as redevelopment occurs	Under the existing urban development footprint approximately 550 AFY of stormwater is generated and infiltrated west of Highway 1. Groundwater modeling indicates that stormwater recharge catchment and recharge will increase to 1,100 AFY on average as further projected development occurs which will increase net subbasin infiltration rates by 200 AFY to 500 AFY.	No additional cost to implement
M3	Recycled Water Reuse Through Landscape Irrigation and Indirect Potable Reuse	Direct and in-lieu recharge	Direct non-potable irrigation use and/or injection of advanced treated water from Monterey One Water (M1W) and extraction using existing MCWD wells or new production wells.	Would provide advance treated recycled water to MCWD at 1 MGD (1,120 AFY) with the potential to be expanded based on projected wastewater flows.	Investments have already been made to deliver 1,427 AFY for landscape irrigation. Unit cost: **$2,400/AF** Approximately 873 AFY recharge through IPR as evaluated in the 2022 Feasibility Study: Capital cost: **$26 million** Unit cost: **$1,035/AF**

PMA #	Name	Project Type / Water Supply	Description	Project Benefits / Quantification of Benefits	Cost
M4	Monitoring Well(s)	Data Gaps Filling	Installation of 400-Foot Aquifer and Deep Aquifer monitoring wells near the Seaside Subbasin boundary.	Would fill critical data gaps on hydrostratigraphy, seawater intrusion, and groundwater recharge mechanisms for the 400-Foot Aquifer and Deep Aquifers. It would also provide critical information for the design of recycled water reuse through IPR as described in M3.	A total of 7 wells has been completed in the Marina-Ord Area since adoption of the original GSP. Construction costs were approximately $1,900,000.
M5	Reservation Road Pilot Desalination Plant	Direct Delivery	Rehabilitation of MCWD's existing pilot desalination plant to provide potable water supply.	Would provide 300 AFY of water supply to MCWD upon completion.	Capital cost of **$13,900,000** based on the capital improvement budget approved for this project by MCWD.
M6	Aquifer Storage and Recovery at Armstrong Ranch	Direct Recharge	Construction of infiltration ponds at the MCWD Armstrong Ranch property to recharge surface water or alternatively sourced water into the Dune Sand Aquifer and recover stored water through an extraction well field at the site.	Would directly recharge groundwater aquifers with a maximum infiltration capacity of 2,500 AFY with approximately 1,900 AFY available for recovery.	Estimated project costs are under development.
M7	Expansion of Desalinated Water Supply	Direct Delivery	Expand MCWD's desalinated water supply at the Reservation Road Facility or at a new facility.	Would provide approximately 2,000 AFY in addition to project M5 for a total of 2,300 AFY of desalinated water supply.	Estimated project costs are under development.
Corral de Tierra Area Local Projects and Management Actions					
C1	Demand Management and Planning	Management Action	Proactively determines how extraction should be controlled and	Decreased extraction if needed and raised groundwater levels; range of potential benefits	Depends on measure(s) selected

PMA #	Name	Project Type / Water Supply	Description	Project Benefits / Quantification of Benefits	Cost
			planned for and employs demand management measures as needed		
C2	Rural Residential Demand Management Water Use Efficiencies	Management Action	Voluntary water use efficiency services and incentives for rural residential users. Potential measures include home water-use assessments, leak detection and repair, direct installation or rebates for efficient fixtures and appliances, outdoor irrigation audits and equipment, turf or high water-use landscape replacement, and technical assistance	Reduced local pumping, lower household water and energy costs, greater drought resilience, and reduced vulnerability of domestic wells to declining groundwater levels	Program development cost **$25,000-$50,000** Typical $/AF range for ongoing implementation depends on measure used, **from $100/AF to $3,500/AF**
C3	Rural Residential Well Mitigation	Management Action	Assist rural residential drinking water users through monitoring network improvements, groundwater level tracking, well registration, dry well reporting and notification systems, demand management planning, groundwater recharge projects, and coordination with agencies and	Mitigate impacts from declining groundwater levels in rural residential areas; unable to quantify until program is developed	Not yet determined

PMA #	Name	Project Type / Water Supply	Description	Project Benefits / Quantification of Benefits	Cost
			organizations involved in drinking water assistance		
C4	Small Scale Aquifer Recharge Projects	Direct recharge	Assess Corral area recharge suitability, where feasible, restore natural drainages, construct check dams to slow surface water to increase recharge, construct diversion facility(ies) to divert water for recharge when streamflow is high, or construct decentralized, medium scale bioswales and recharge basins on non-agricultural land	Suitable locations for small scale recharge projects to be assessed. Benefits from small scale projects range from 150 AFY – 180 AFY	Check dams: Capital Cost: **$5,143,000** Unit Cost: **$2,830/AF** Surface water diversions: Capital Cost: **$5,950,000** Unit Cost: **$3,050/AF** $150,000 - $200,000 to encourage projects through outreach, site assessments, and assistance with planning
C5	Wastewater Recycling for Reuse	In-lieu recharge	Upgrade existing wastewater treatment plant and pipelines to expand beneficial reuse through irrigation and recharge	232 AFY	Capital Cost: **$28,635,000** Unit Cost: **$11,750/AF**, with potential additional cost savings
C6	Decentralized Residential In-Lieu Recharge Projects	In-lieu recharge	Small-scale projects initiated by homeowners and business owners, including rooftop rainwater harvesting, rain gardens, and graywater systems	If 75 households install 5000-gallon rain barrels, up to 5.3 AFY rainwater harvested, and 0.97 AFY from graywater systems installed by 75 houses	Cost to GSA (not for homeowner implementation or incentives): $50,000 for 5 workshops on rainwater harvesting and $50,000 for 5 workshops on graywater reuse

PMA #	Name	Project Type / Water Supply	Description	Project Benefits / Quantification of Benefits	Cost
C7	Increase Groundwater Production in the Upper Corral de Tierra Valley for Distribution to Lower Corral de Tierra Valley (Artesian Well)	Direct delivery	Construct extraction well in the Upper Corral de Tierra Valley and pipe water down to Lower Corral de Tierra for direct use by water system in lieu of current extraction.	160 AFY	Capital Cost: **$13,275,000** Unit Cost: **$6,550/AF**

9.3 General Provisions

This section summarizes general provisions that are applicable to all proposed projects. These general provisions include certain permitting and regulatory processes and public noticing requirements. This section also identifies the methodology used in the GSP to evaluate project benefits and estimate costs. Further project specific details are included within each project description in Section 9.5 and Section 9.6.

9.3.1 Permitting and Regulatory Processes

Permitting and regulatory requirements vary for the different projects and management actions depending on whether they are infrastructure projects, recharge projects, or demand reduction management actions.

Projects of a magnitude capable of having a demonstrable impact on groundwater within the Monterey Subbasin will require a CEQA environmental review process. Projects will require either an Environmental Impact Report (EIR), Negative Declaration, or a Mitigated Negative Declaration. Additionally, any project that coordinates with federal facilities or agencies may require National Environmental Policy Act (NEPA) documentation.

Projects that utilize alternative sources of water to augment groundwater supply may require new permits or changes to existing surface water rights permits (e.g., Permit 11043) administered by the State Water Resources Control Board or by the Central Coast Regional Board regarding stormwater capture or recharge, recycled water use, and waste discharge.

Projects that are related to operations on the Salinas River will require conforming with California Division of Safety of Dams regulations, flow restrictions, and the County's HCP.

There will be a number of local, county and state permits, right of ways, and easements required depending on pipeline alignments, stream crossings, and project type.

Projects with wells will require a Monterey County Department of Health well construction permit.

Specific currently-identified permitting and regulatory requirements for projects and management actions are described in each project description in Section 9.5 and Section 9.6. Upon implementation, the regulatory and permitting requirements of the project or management action will be re-examined.

9.3.2 Public Noticing

Public notice requirements vary for the different projects and management actions listed above. Some projects that involve infrastructure improvements may not require specific public noticing (other than requirements related to CEQA and construction). Certain other management actions that involve, for example, imposition of fees by Subbasin GSAs, may require public noticing pursuant to Proposition 218 or Proposition 26. In general, projects and management actions being considered for implementation will be discussed during regular Board Meetings which are

open to the public. Additional stakeholder outreach efforts will be conducted prior to and during project implementation, as required by law.

9.3.3 Evaluation of Benefits

The primary expected benefits of projects and management actions identified herein relate to water quantity, e.g., AFY. The way in which a project or management action benefits are evaluated/quantified depends on its type. The following are the major types of projects and management actions that are included herein to supplement the Monterey Subbasin's groundwater supplies:

- Direct recharge through recharge basins or injection/dry wells
- In-lieu recharge through direct delivery of non-potable or potable water to replace groundwater pumping
- Demand management
- Reoperation of reservoir releases to achieve greater or more regular surface water flows available for recharge or direct delivery

For those projects that involve direct recharge or delivery, the benefit is quantified directly through measurement of those flows. For projects that involve indirect recharge or supply augmentation through, for example, reoperation of reservoir releases and delivery flexibility, quantification of the benefit will require a comparison of the observed water supply condition (e.g., total delivered water) against a hypothetical condition where the project was not in place. For management actions that involve water demand reduction, the benefit will be evaluated by comparison of the observed water demand condition (e.g., reported pumping by municipal systems) against a hypothetical condition where the management action was not in place. Because it is not possible to determine with certainty what the condition without the project or management action would be like, quantification of the benefits is inherently uncertain.

The goals and objectives of projects and management actions implementation are not necessary to achieve a certain water budget outcome, but rather to ensure that undesirable results for relevant sustainability indicators are avoided by the end of the SGMA implementation period (i.e., by 2042). For this reason, ultimately the success of the collective implementation of projects and management actions will be determined by whether the SMCs are achieved, which is simulated through numerical modeling in Section 9.5 and will be monitored through the monitoring networks described in Chapter 7.

9.3.4 Cost Assumptions used in Developing Projects

Assumptions used to develop projects and cost estimates are discussed below. Assumptions and issues for each project need to be carefully reviewed and revised during the pre-design phase of each project. Project designs, and therefore costs, could change considerably as more information is gathered.

For projects with feasibility studies or design completed during the first phase of GSP implementation, cost estimates are updated in this GSP Amendment 1.

If a feasibility study has not yet been prepared, the cost estimates are order of magnitude estimates from the original GSP in 2021 dollars. These estimates were made with little to no detailed engineering data. The expected accuracy range for such an estimate is within +50 percent or -30 percent. The cost estimates are based on the GSAs' perception of current conditions at the project location. They reflect our professional opinion of costs at this time and are subject to change as project designs mature.

The capital costs of infrastructure projects include major infrastructure components, such as pipelines, pump stations, customer connections, turnouts, injection wells, recharge basins, and storage tanks. Capital costs also include a 30% contingency for plumbing appurtenances, 15% increase for general conditions, 15% for contractor overhead and profit, and 9.25% for sales tax. Engineering, legal, administrative, and project contingencies were assumed as 30% of the total construction cost and included within the capital cost. Land acquisition at $45,000/acre was also included within capital costs.

Annual operations and maintenance (O&M) fees include the costs to operate and maintain new project infrastructure. O&M costs also include any pumping costs associated with new infrastructure. O&M costs do not include O&M or pumping costs associated with existing infrastructure, such as existing Salinas Valley Reclamation Plant (SVRP) costs, because these are assumed to be part of water purchase costs. Water purchase costs are assumed to include repayment of loans for existing infrastructure; however, these purchase costs will need to be negotiated. The terms of such a negotiation could vary widely.

Capital costs were annualized over 25 years and added with annual O&M costs and water purchase costs to determine an annualized dollar per acre-foot ($/AF) cost for each project. The cost per acre-foot (AF) is the amortized cost of the project divided by the annual yield. It provides a means to compare projects, however, it is not the cost of irrigation nor the domestic cost of drinking water for households on water systems. More refined cost analyses and future benefit analyses will be completed during GSP implementation.

9.4 Multi-subbasin Projects

The Subbasin GSAs recognize that sustained groundwater management in the Monterey Subbasin depends in part on coordinated implementation of PMAs in the adjacent 180/400 Subbasin and elsewhere in the Salinas Valley. Therefore, the PMAs identified in Chapter 9 of the 180/400 GSP Amendment 2 are incorporated herein by reference.

The 180/400 GSP Amendment 2 includes a range of PMAs, placed into two categories: (1) priority PMAs, including PMAs in the SVBGSA preferred IIS portfolio and other PMAs important for managing groundwater sustainability in the 180/400 Subbasin; and (2) contingency PMAs that could be pursued if future conditions indicate that additional actions are needed. The 180/400 PMAs are listed in Table 9-2.

Table 9-2 180/400 Projects and Management Actions

180/400 PMAs	Priority of Implementation
Demand Management and Planning (MA1)	Priority
Fallowing, Fallow Bank, Agricultural Land Retirement, and Multi-benefit Land Repurposing (MA2)	Priority
Conservation and Agricultural BMPs (MA3)	Priority
Demand Management – Deep Aquifers Allocations (MA4)	Priority
Rural Residential Demand Management Water Use Efficiency (MA5)	Priority
Seawater Intrusion Response Plan (MA6)	Priority
Rural Residential Well Mitigation (MA7)	Contingency
Multi-benefit Stream Channel Improvements (P1)	Priority
CSIP System Optimization (P2)	Priority
CSIP Expansion or New Seawater Intrusion Project (P3)	Contingency
Brackish Groundwater Restoration Project (BGRP) (P4)	Priority
Coastal Injection/Aquifer Storage and Recovery (P5)	Contingency
Irrigation Water Supply Project (P6)	Contingency
Castroville and Eastside Canals (ES1)	Priority

As discussed in Chapter 10 of the 180/400 GSP Amendment 2, modeling results indicates that the IIS preferred portfolio comes close to meeting the 180/400 Subbasin seawater intrusion minimum threshold by 2040. SVBGSA anticipates that further refinement of the preferred portfolio will be sufficient to avoid undesirable results in the 180/400 Subbasin. As shown in Chapter 6, when adjacent subbasins achieve sustainability, groundwater levels in the Marina-Ord Area are projected to stabilize at or above minimum thresholds.

The effects of multi-subbasin PMAs on the Monterey Subbasin will ultimately depend on the PMAs implemented and their location, design, scale, operating conditions, and interaction with local Monterey Subbasin PMAs. The Subbasin GSAs will refine project design of relevant 180/400 Subbasin PMAs considering potential effects on the Monterey Subbasin. The evaluation will use appropriate numerical modeling tools, monitoring data, and other technical analyses and will be updated as PMA concepts are developed.

9.5 Marina-Ord Area Local Projects & Management Actions

9.5.1 M1 – MCWD Demand Management Measures

In the past two decades, MCWD has made significant strides in reducing its per capita potable water demand above and beyond targets delineated by the Water Conservation Act. Conservation reductions have come primarily from water conservation retrofits as well as from behavioral changes driven by increasing water rates, drought awareness, and public education programs. During the twenty-year period of 1999 through 2020, per capita water demand within the MCWD service area decreased from 144 gallons per capita per day (GPCD) to 80 GPCD, a decrease of approximately 44% (MCWD, 2021). At the 2020 population of 30,480 served by MCWD, this decrease in per capita water use provides an approximately 2,500 AFY of in-lieu recharge benefits.[35]

Following the 2014-2016 drought, the State of California developed the "Making Water Conservation a California Way of Life (MCCWL)" framework to address the long-term water use efficiency requirements called for in executive orders issued by Governor Brown. In May of 2018, Assembly Bill (AB) 1668 and SB 606 went into effect, which built upon the executive orders implementing new urban water use objectives for urban retail water suppliers.

Water use standards and regulations implementing SB 606 and AB 1668 were adopted by the SWRCB in 2023 and came into effect in 2024. These regulations require all urban retail water suppliers to meet an annual Urban Water Use Objective (UWUO), a supplier-specific water budget with six components: residential indoor standard, residential outdoor budget, CII dedicated-irrigation-meter landscape standard, water loss standard, variance, and bonus. Compliance is judged in aggregate, not component-by-component, and is required beginning January 2027, with standards tightening progressively over a 25-year horizon. The regulations also established Commercial, Institutional, and Industrial (CII) Performance Measures, which are actions to be taken by suppliers to increase water use efficiency by CII water users.

MCWD plans to continue to implement conservation efforts within its service area to meet and exceed new legislative requirements as part of the MCCWL framework. Potable water demand reductions will be achieved through the following strategies.

- MCWD has adopted design standards and guidelines for new construction that exceed the State's plumbing code requirements for water-conserving features, codified in Section 3.36 of the District Ordinances.
- MCWD will implement demand management measures and update its planned measures in its UWMP.[36]

[35] Without these decreases in per capita water use, water demand for MCWD's 2020 population at 30,480 would be approximately 2,500 AFY higher than its current water demand. This reduced demand on groundwater extraction by MCWD creates an in-lieu recharge benefit to the Monterey Subbasin.
[36] MCWD's current demand management measures are available on its website mcwd.org under "Save Water, Save Money".

- Phased redevelopment of the Ord Community will include the replacement of a significant amount of water distribution system that is over 50-years old. These replacements should reduce system water losses.

In addition, MCWD plans on using recycled water to offset non-potable uses or augment groundwater production (see Project M3 – Recycled Water Reuse Through Landscape Irrigation and Indirect Potable Reuse in Section 9.5.3).

9.5.1.1 Relevant Measurable Objectives

The measurable objective benefiting from demand management measures includes:

- **Groundwater elevation measurable objective –** demand management measures will result in less demand on groundwater pumping and higher groundwater levels, particularly near the location of production wells.
- **Groundwater storage measurable objective –** Reducing pumping from the principal aquifers will ultimately have the effect of increasing groundwater in storage.
- **Seawater intrusion measurable objective –** Seawater intrusion has advanced a few miles inland in Monterey Subbasin. Increasing groundwater storage and groundwater elevation will support the natural hydraulic gradient that pushes back against the intruding seawater.

9.5.1.2 Expected Benefits and Evaluation of Benefits

Continued implementation and expansion of demand management efforts will reduce demand on groundwater resources from the Monterey Subbasin and provide in-lieu recharge to the Subbasin. As described above, the decrease in per capita water use historically provided up to 2,500 AFY of in-lieu recharge benefits. As the population expands, these in-lieu recharge benefits will increase.

Pursuant to Section 7.3 of MCWD's 2020 UWMP:

> *The District will continue to track per capita demand rates to assess overall savings, in addition to comparing water consumption of new residential development against older households and households which have been retrofitted with conservation devices. The District will continually reassess rebate programs to address saturation rates and emerging technologies.*

9.5.1.3 Circumstances for Implementation

Implementation of demand management measures is ongoing. No additional circumstances for implementation are necessary.

9.5.1.4 Public Noticing

MCWD's UWMP is updated every five years and documents historical and planned implementation of demand management measures. The plan is adopted by MCWD following a public hearing and is publicly available.

MCWD calculates its urban water use objectives annually and report its water use pursuant to SB 606 and AB 1668.

9.5.1.5 Permitting and Regulatory Process

As detailed above, MCWD is implementing demand management measures to meet and/or exceed the following legislative requirements:

- **Water Conservation Act –** With the adoption of the Water Conservation Act of 2009, also known as SB x7-7, the state is required to reduce urban water use by 20% by the year 2020. Each urban retail water supplier was required to develop a baseline daily per capita water use ("baseline water use") in their 2010 UWMP and establish per capita water use targets for 2015 and 2020 to help the state achieve the 20% reduction. Per the 2020 UWMP, MCWD's 2020 per capital water demand (or 80 GPCD) was approximately 32% lower than its per capita water use target for 2020 (117 GPCD).
- **MCCWL Urban Water Use Objectives –** MCCWL regulations adopted in 2023 implementing the "Making Water Conservation a California Way of Life" framework require all urban retail water suppliers to calculate an annual Urban Water Use Objective (UWUO) beginning in 2024. The UWUO is a supplier-specific water budget with six components: residential indoor standard, residential outdoor budget, CII dedicated-irrigation-meter landscape standard, water loss standard, variance, and bonus. Compliance is judged in aggregate, not component-by-component, and is required beginning January 2027, with standards tightening progressively over a 25-year horizon. Suppliers are assessed against the aggregate UWUO rather than each component individually. Formal compliance is required beginning January 2027, and the underlying standards become progressively more stringent over a 25-year horizon, extending water use efficiency requirements beyond those achieved under SB X7-7.
- **California Plumbing Code and Design Standards –** As discussed above, MCWD has adopted design standards and guidelines for new construction that exceed the State's requirements, including the California Green (CALGreen) Building Code Standards and Model Water Efficient Landscape Ordinance (MWELO).

  CALGreen requires installation of water-efficient fixtures and equipment in new buildings and retrofits. CalGreen includes prescriptive indoor provisions for maximum water consumption of plumbing fixtures and fittings in new and renovated properties. It also allows for an optional performance path to compliance, which requires an overall aggregate 20% reduction in indoor water use from a calculated baseline using a set of worksheets provided with the CalGreen guidelines.

The MWELO establishes a structure for planning, designing, installing, maintaining and managing water-efficient landscapes in new construction and rehabilitated projects. It promotes low-water use landscaping through more efficient irrigation systems, greywater usage, onsite stormwater capture, and limiting the portion of landscapes that can be covered in turf.

- **Water Loss Performance Standards –** In 2022, the SWRCB adopted water loss performance standards for urban retail water suppliers, aiming for a significant long-term reduction in real losses. Effective starting in 2023, the SWRCB established individual volumetric standards for each urban retail water supplier, calculated to reflect the life-cycle cost-effective level of water loss based on specific system characteristics. While annual reporting is ongoing, suppliers will be required to start meeting individual volumetric loss standards over a three-year period, with full compliance required by January 1, 2028. These standards constitute the water loss component of the Making Conservation a California Way of Life (MCCWL) regulatory framework.
- **Nonfunctional Turf Irrigation Ban (AB 1572) –** AB 1572, passed in 2023, is a California law that prohibits the use of potable water to irrigate nonfunctional turf at CII properties as well as common areas of homeowner associations (HOAs). The nonfunctional turf irrigation ban applies to turf (mowed grass maintained for aesthetic purposes) that does not provide recreational or community benefits. Water suppliers are required to identify what landscapes fall under the ban and implement a plan to comply by the required schedule between 2027 and 2031 depending on the property type.

9.5.1.6 Legal Authority

This action is implemented pursuant to MCWD's authority as a public water system. Plumbing standards are adopted in Section 7 of the Marina Coast Water District Code.

9.5.1.7 Implementation Schedule

Implementation of demand management measures is ongoing and will be carried throughout GSP implementation.

9.5.1.8 Estimated Cost

MCWD has increased its conservation program budget in recent years, from a total expense of $336,553 in fiscal year 2018-19 to an estimated budget of $483,405 for fiscal year 2026-27. The increase in conservation program budget reflects increases in MCWD's educational outreach efforts and resultant demand for rebates and retrofits. It is anticipated that MCWD will maintain its current level of conservation spending.

9.5.2 M2 – Stormwater Recharge Management

The Cities of Marina and Seaside, the two major municipalities within the Marina-Ord Area, have policies that will facilitate additional stormwater catchment and infiltration beyond existing efforts as development and redevelopment occurs.

The City of Marina has historically relied on onsite infiltration as a means of stormwater management and continues to implement policies for onsite infiltration. The City of Marina storm drain design standards specify retention of stormwater runoff from new development or redevelopment sites and require that no runoff from a project site to flow to public streets.

The portion of the City of Seaside within the Monterey Subbasin similarly relies on onsite infiltration of stormwater. Although the City of Seaside historically had not required onsite infiltration of stormwater, the city manages stormwater runoff in accordance with its National Pollutant Discharge Elimination System (NPDES) permit, which is through requirement of BMPs that encourages onsite infiltration or other methods of reducing stormwater runoff. Furthermore, the City of Seaside's recent General Plan update includes policies to promote groundwater recharge by implementing stormwater infiltration.

As discussed in Section 3.5.1.4, redevelopment at the former Fort Ord was governed by the Fort Ord Base Reuse Plan, which was later incorporated into each individual jurisdictional area's land use plans. The 1997 Fort Ord Base Reuse Plan called for eliminating all ocean stormwater discharges and infiltrating all stormwater runoff east of Highway 1. Pursuant to this Plan, most stormwater outfall pipes that historically extended into Monterey Bay has been removed and several percolation basins were constructed west of Highway 1. In addition, the US Army Garrison Presidio of Monterey (USAGPOM) is currently developing plans to decommission a 66-inch diameter stormwater outfall located within the Fort Ord Dunes State Park. The percolation basins were considered temporary with the long-term objective to percolate all stormwater on the east side of Highway 1 as part of the redevelopment of the former Fort Ord. The Fort Ord Storm Water Master Plan (Creegan + D'Angelo, 2005) was prepared to provide guidelines for meeting the obligation for onsite infiltration.

The current and planned urbanized areas within the Marina-Ord Area overlies well-drained, highly permeable dune sands. Infiltration basins or subsurface infiltration systems are effective stormwater disposal methods. It is anticipated that as future development and redevelopment within the Marina-Ord Area occur, additional stormwater from urbanized areas and construction sites will be captured and infiltrated, providing recharge to the groundwater basin.

9.5.2.1 Relevant Measurable Objectives

The measurable objective benefiting from demand management measures includes:

- **Groundwater elevation measurable objective** – Promoting and requiring stormwater infiltration will percolate more water into the subsurface, which will raise groundwater elevations and add water to the principal aquifer(s).

- **Groundwater storage measurable objective** – Adding water to the groundwater system will ultimately have the effect of increasing groundwater in storage.
- **Seawater intrusion measurable objective** – Increasing groundwater storage and groundwater elevations will support the creation of seaward hydraulic gradients that push back against the intruding seawater.

9.5.2.2 Expected Benefits and Evaluation of Benefits

Managed stormwater recharge is expected to increase sustainable yield and groundwater elevations. Runoff occurs when the rate of rainfall exceeds the soil infiltration rate. This project captures and infiltrates this runoff, which would otherwise flow to the ocean, and facilitates recharge to principal aquifer(s). Based on land use, stormwater catchment area, and precipitation data gathered for the Monterey Subbasin Groundwater Flow Model (MBGWFM) in the original GSP, it estimated that approximately 540 AFY of stormwater runoff is generated within the current urbanized areas in the Marina-Ord Area. A significant portion of this volume is infiltrated via existing stormwater catchment facilities. The MBGWFM indicates the amount of runoff capture and re-infiltration will increase to approximately 1,100 AFY over time as future development occurs under the existing guidelines. The MBGWFM indicates that net infiltration rates[37] within the Subbasin will increase by approximately 200 AFY to 500 AFY as a result of stormwater catchment and re-infiltration within the Subbasin.

Benefits of stormwater recharge on attaining applicable measurable objectives will be measured using the monitoring networks described in Chapter 7.

9.5.2.3 Circumstances for implementation

Stormwater management policies implemented by the Cities of Marina and Seaside are ongoing. No additional circumstances for implementation are necessary.

9.5.2.4 Public Noticing

No additional public noticing is required.

9.5.2.5 Permitting and Regulatory Process

The Cities of Marina and Seaside comply with the Central Coast Regional Water Quality Control Board's Regional Municipal Stormwater Permit (i.e., Phase II NPDES Permit for Small MS4 systems). Both cities are member entities of the Monterey Regional Stormwater Management Program (MRSWMP). The regional program was developed to respond to SWRCB's implementation of the Phase II NPDES Stormwater Program. The purpose of the Phase II NPDES Stormwater Program is to implement and enforce BMPs to reduce the discharge of pollutants

[37] Net infiltration is the difference between infiltration that occurs as a result of urban catchment and re-infiltration and naturally occurring infiltration under non-urban conditions.

from municipal separate storm sewer systems. The municipalities are responsible for conducting their stormwater management program in accordance with the terms of the regional program.

No additional permitting or regulatory process is required of this action.

9.5.2.6 Legal Authority

This action is implemented by local municipalities. Chapter 8.46 of the City of Marina's municipal code and Chapter 8.46 of the City of Seaside's municipal code respectively provide these municipalities the legal authority to manage stormwater discharge within their jurisdictional limits.

9.5.2.7 Implementation Schedule

Implementation of stormwater recharge management is ongoing and will be carried throughout GSP implementation.

9.5.2.8 Estimated Cost

There are no additional costs to implement this project.

9.5.3 M3 – Recycled Water Reuse Through Landscape Irrigation and Indirect Potable Reuse

The project consists of recycled water reuse through landscape irrigation and/or IPR within MCWD's service area. As described below, the source water for both of these options is recycled water from the M1W Regional Treatment Plant (RTP), which undergo advanced treatment to meet criteria under Title 22 of the California Code Regulations (CCR) for subsurface applications of recycled water. Advanced treated recycled water is non-potable. Reuse of this water through IPR involves injection into a groundwater aquifer and recovery through an appropriately permitted Groundwater Replenishment Reuse Project (GRRP), which provides seasonal storage and generates potable water that can meet a larger portion of MCWD's water demand beyond irrigation and non-potable needs.

Recycled Water Generation, Collection and Treatment

MCWD operates two wastewater collection systems serving the City of Marina and the Ord Community (i.e., communities within the former Fort Ord). Wastewater is conveyed to the M1W RTP north of Marina. The RTP treats wastewater collected from multiple communities in Monterey County, from Pacific Grove to Moss Landing along the coast and inland to the City of Salinas. In 2020, municipal wastewater flows to the RTP were 19,000 AF, with MCWD contributing 2,170 AF, or 11%. Wastewater is treated to secondary treatment standards at the RTP facilities. That water not designated for further treatment and recycling is discharged via an ocean outfall. Water designated for further treatment is conveyed to either the Salinas Valley Reclamation Plant (SVRP) or the Advanced Water Purification Facility (AWPF), as discussed below.

The SVRP has a design capacity of 29.6 million gallon per day (MGD) (33,000 AFY) for producing tertiary-treated recycled water (CCRWQCB, 2014). It currently produces about

10,000-13,000 AFY of tertiary-treated recycled water meeting the standards of unrestricted reuse under Title 22 of the CCR, based on data from 2016 to 2025 in Figure 9 of the New Seawater Intrusion Project (NSIP) feasibility study (Carollo, 2026). SVRP recycled water is delivered to the CSIP, irrigating farmland in the greater Castroville area and reducing demands on Salinas Valley groundwater. As agricultural demands are seasonal, this capacity cannot be fully utilized yearround.

In 2020, M1W completed the AWPF with a capacity to supply advanced treated water to the Seaside Subbasin for IPR and to meet MCWD's recycled water demand.[38]

In 1989, MCWD entered into an annexation agreement with Monterey Regional Water Pollution Control Agency (MRWPCA; now M1W) for wastewater treatment. This agreement established MCWD's first right to receive tertiary treated wastewater from the SVRP. Per Section 12 of the agreement, MCWD has the right to obtain treated wastewater (i.e., Title 22 recycled water) from M1W equal in volume to that of the volume of MCWD wastewater treated by M1W and additional quantities not otherwise committed to other uses. As such, MCWD's Section 12 recycled water supply will increase over time as MCWD's water demand and wastewater generation increases and could be used as source water for a MCWD expansion of the AWPF. MCWD's Section 12 recycled water supply is projected to grow from 2,295 AFY in 2025 to 7,577 AFY by 2050.[39]

Landscape Irrigation

On April 8, 2016, MCWD and M1W entered into the Pure Water Delivery and Supply Project Agreement, as amended by the 2017 First Amendment, wherein the Product Water Conveyance Facilities were designed, constructed, owned, and operated by MCWD with a capacity sufficient to convey a minimum of 5,127 AFY of advanced treated water, including the 3,700 AFY capacity for M1W and a total of 1,427 AFY capacity for MCWD[40]. Both the 2016 Agreement and the 2017 Amendment are provided in Appendix 9-A. The Product Water Conveyance Facilities include a regional advanced treated water transmission line through Marina, the Ord Community, and into the City of Seaside and allow delivery of advanced treated water from the AWPF for landscape irrigation within these communities and IPR in the Seaside Subbasin.

The regional transmission line was completed in 2019 and placed in operation in 2020 as part of the Pure Water Monterey Project. With completion of the AWPF and the transmission line,

[38] MCWD has the right to utilize up to and including a net 1,427 AFY of the AWPF treatment capacity to serve the Ord Community to implement the recycled water portion of the Regional Urban Water Augmentation Program (RUWAP). The wastewater stream for the MCWD portion of the project is MCWD's own municipal wastewater, which was originally slated for tertiary treatment, in addition to a 650 AFY contribution to RUWAP by MCWRA through M1W during May through August.

[39] In 2025, MCWD generated approximately 2,295 AF of wastewater delivered to M1W, representing approximately 70% of MCWD's potable water demand of 3,267 AF that year, for a wastewater generation factor of 0.70. Applying this factor to MCWD's projected potable water demand, MCWD's Section 12 Title 22 recycled water supply is projected to reach approximately 5,609 AFY by 2040 and 7,557 AFY by 2050.

[40] Per the 1996 Annexation Agreement, MCWD is responsible to supply 300 AFY of source water while M1W is responsible to provide the rest of the source supply.

MCWD is constructing a recycled water distribution system to allow delivery of its 600 AFY of advanced treated water for landscape irrigation in the near-term (RBF, 2003). This distribution system could increase deliveries for landscape irrigation to as much as 1,427 AFY or more in the future through expansion of the AWPF. MCWD's right to purchase recycled water has a contractual upper limit in the summer months, so providing 1,427 AFY of recycled water supply requires the commitment of summertime flows from M1W and MCWRA. The recycled water distribution system currently under construction and the regional transmission line are shown on Figure 9-1.

Landscape irrigation use of recycled water reduces groundwater demand and thus functions as an in-lieu groundwater recharge project.

IPR in Monterey Subbasin

Advanced treated recycled water (also known as "purified water") is non-potable unless it is injected into a groundwater aquifer and recovered as part of an appropriately permitted GRRP. A GRRP provides seasonal storage capacity and generates potable water that can meet a larger portion of MCWD's water demand beyond irrigation and non-potable needs.

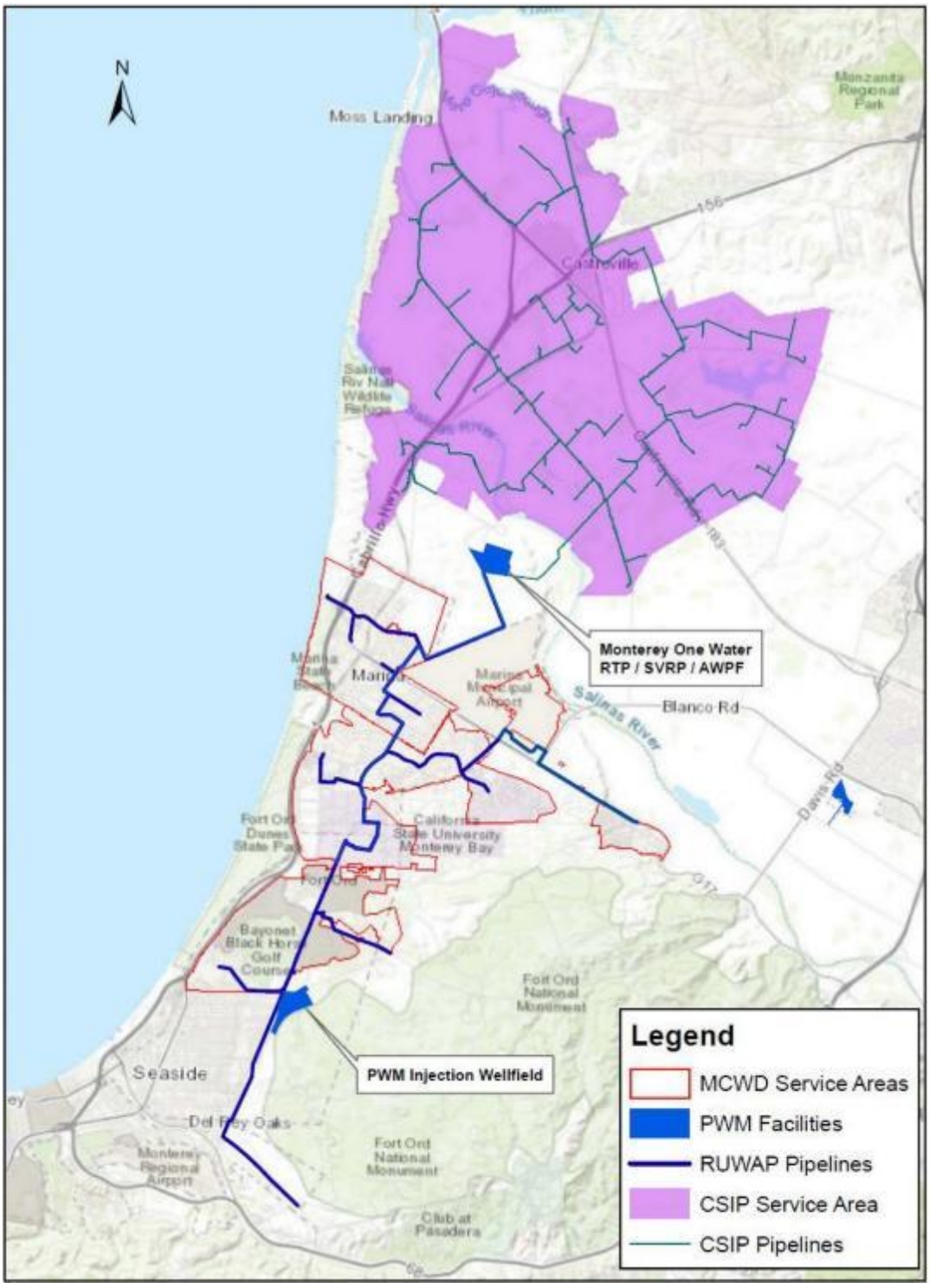
MCWD conducted a joint, regional three-party study with FORA and M1W for water supply planning for redevelopment of the former Fort Ord (2020 Water Supply Augmentation Study) (EKI, 2020). The 2020 Water Supply Augmentation Study conceptualized various groundwater augmentation and direct supply options for screening and systematic evaluation. The study identified IPR through expansion of the AWPF as the recommended option (EKI, 2020). In 2022, MCWD completed a feasibility study that confirmed the possibility of implementing an IPR project and identified injection into the Deep Aquifers as the preferred option (EKI, 2022b). The feasibility study included an evaluation of IPR alternatives using a groundwater flow model and development of a conceptual design.

MCWD is currently advancing environmental review and design of an IPR project at the Sand Tank site near California Avenue, one of the sites identified in the 2022 feasibility study. The project would include injection of approximately 1 MGD, or 1,120 AFY, of advanced treated recycled water through a single injection well with a capacity of approximately 1,000 gallons per minute (gpm), for subsequent extraction by production wells MCWD-10 and MCWD-11. A schematic of the proposed project layout is shown on Figure 9-2.

As described above, MCWD's sewer flows will increase over time as MCWD's water demand increases and could be used as source water for an MCWD expansion of the AWPF. As described above, based upon projected water demands and sewer flows, approximately 5,500 AFY of net advanced treated water could be generated for IPR by MCWD (minus that used directly for landscape irrigation) by 2040. The majority of this water is more likely to be available during winter/spring months when CSIP is not operational and therefore is more compatible with IPR than landscape irrigation.

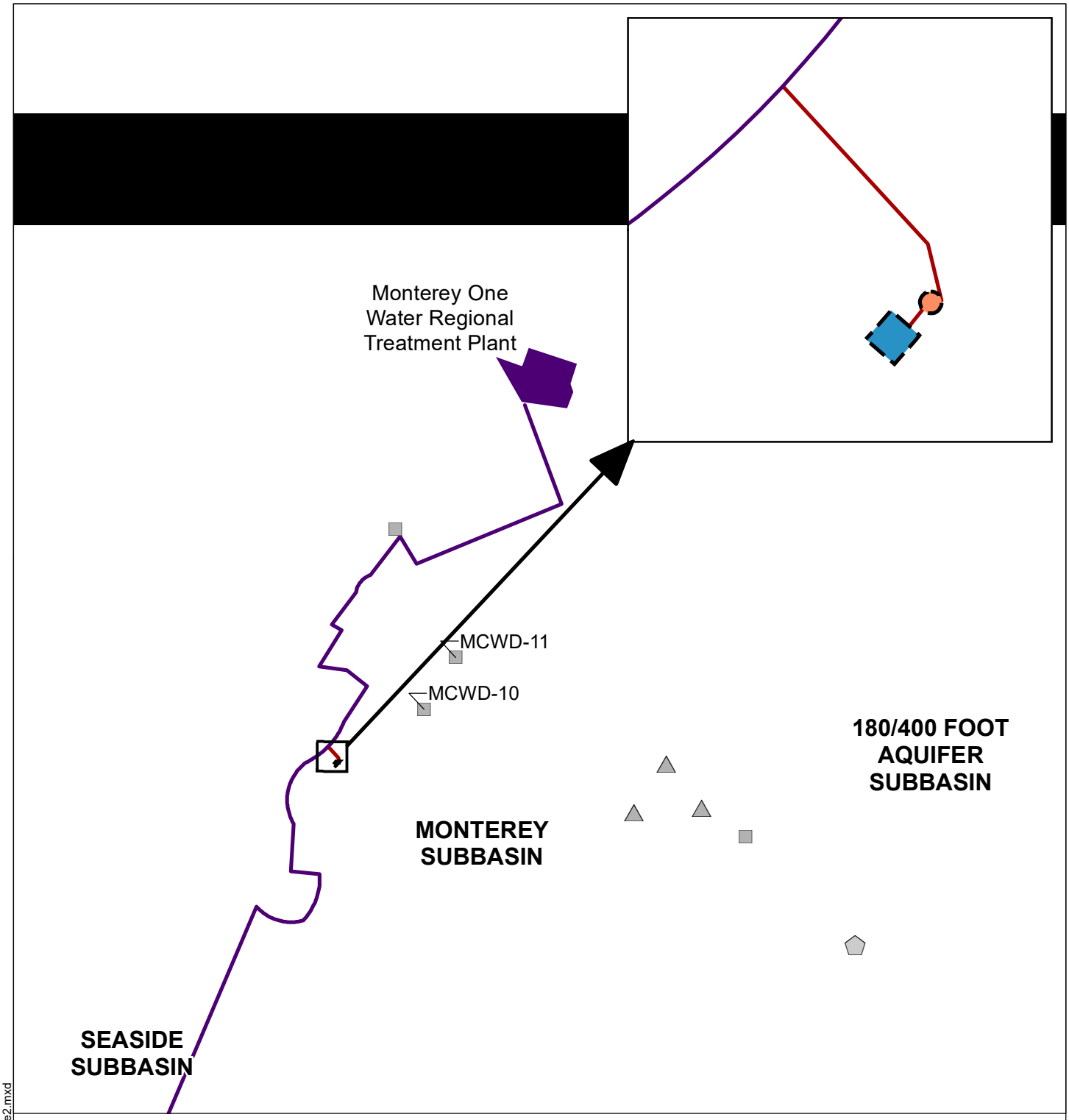
The current operation frequency of MCWD's production wells generally ranges from 10% to 40%. These operation frequencies are low and, barring other constraints (e.g., concerns regarding seawater intrusion), could likely be increased to an operational frequency of up to 70% to capture

injected water. Additional production wells might need to be constructed to provide additional extraction capacity, depending on the volume and rate of injection. As such, the project could be readily expanded beyond 1 MGD to facilitate injection of additional advanced treated water as it becomes available.



Note: The RUWAP pipeline extends to near South Boundary Road in General Jim Moore Boulevard. The extension of the RUWAP pipeline down South Boundary Road (the portion that heads east at the southern part shown herein) is planned but not yet constructed.

Figure 9-1 MCWD Recycled Water System



Legend

- Existing Pure Water Monterey Pipeline
- Regional Treatment Plant
- Potential Pipeline Alignment
- Property Boundary
- Groundwater Subbasins within Salinas Valley Basin
- Potential Backflush Basin Location
- Potential Injection Well Location
- Lower 180-Foot, 400-Foot Aquifer Production Wells
- 400-Foot/Deep Aquifers Production Wells
- Deep Aquifers Production Wells

N

0 1 2

(Scale in Miles)

MCWD IPR Project Components

Monterey Subbasin
Groundwater Sustainability Plan
July 2026

Figure 9-2

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 8 October 2022.

Path: X:\B60094\Maps\2022\10\GRRP_Fig4-2_CA Ave Alternative2.mxd

9.5.3.1 Relevant Measurable Objectives

The measurable objective benefiting from recycled water use through landscape irrigation or a IPR project includes:

- **Groundwater elevation measurable objective** – The project provides either in-lieu groundwater recharge by eliminating irrigation demand and direct recharge through IPR. This has the effect of adding water to the principal aquifer(s). Adding water to the principal aquifer will ultimately increase groundwater elevations or decrease their decline.
- **Groundwater storage measurable objective** – Adding water to the groundwater system will ultimately have the effect of increasing groundwater in storage.
- **Seawater intrusion measurable objective** – Increasing groundwater storage and groundwater elevations will support the natural hydraulic gradient that pushes back against the intruding seawater. The option of injection/extraction into the 180/400-Foot Aquifer may provide additional benefits of creating a barrier near MCWD's existing production wells against seawater intrusion.

9.5.3.2 Expected Benefits and Evaluation of Benefits

The primary benefit from recycled water use is to provide an alternative water supply to address the current overdraft in the Subbasin and supply future redevelopment of the former Fort Ord. Using recycled water for landscape irrigation reduces groundwater demand, which provides an in-lieu recharge benefit and is expected to increase groundwater elevations near groundwater productions. IPR application directly recharges the groundwater aquifers, thereby increasing the Subbasin's sustainable yield and groundwater elevations.

MCWD has updated its evaluation of alternative injection sites since completion of the 2022 feasibility study. The updated evaluation includes three MCWD-owned alternative sites: the currently preferred Sand Tank site, the 4th Avenue site, and the inactive production well MCWD-12. The regional Seawater Intrusion Model, version 4 (SWIM v4), completed in 2026, was used to assess groundwater elevation benefits in the Deep Aquifers. As shown on Figure 9-3, an IPR project of approximately 1 MGD (1,120 AFY) would create a sustained groundwater elevation increase of 1 to 5 feet in the Deep Aquifers throughout the coastal portion of the Monterey Subbasin, with benefits extending into the 180/400 and Seaside Subbasins. Localized increases in water levels exceed 15 feet within the City of Marina.

The proposed IPR sites are located where seawater intrusion is present in the lower 180-Foot and 400-Foot Aquifers (Figure 5-30). Groundwater elevation data from the nearby MCWD-MW-4AVE monitoring well cluster indicates that difference in 400-Foot Aquifer and upper Deep Aquifer groundwater elevations may be as much as 25 feet, creating a downward gradient. This gradient may increase the potential for vertical migration of seawater into the Deep Aquifers. The modeled IPR benefits would substantially reduce this vertical gradient, thereby helping protect the Deep Aquifers from seawater intrusion.

Project deliveries will be quantified directly through volumetric measurements of delivered or injected advanced treated water. Benefits towards attaining applicable measurable objectives will be measured using the monitoring networks described in Chapter 7.

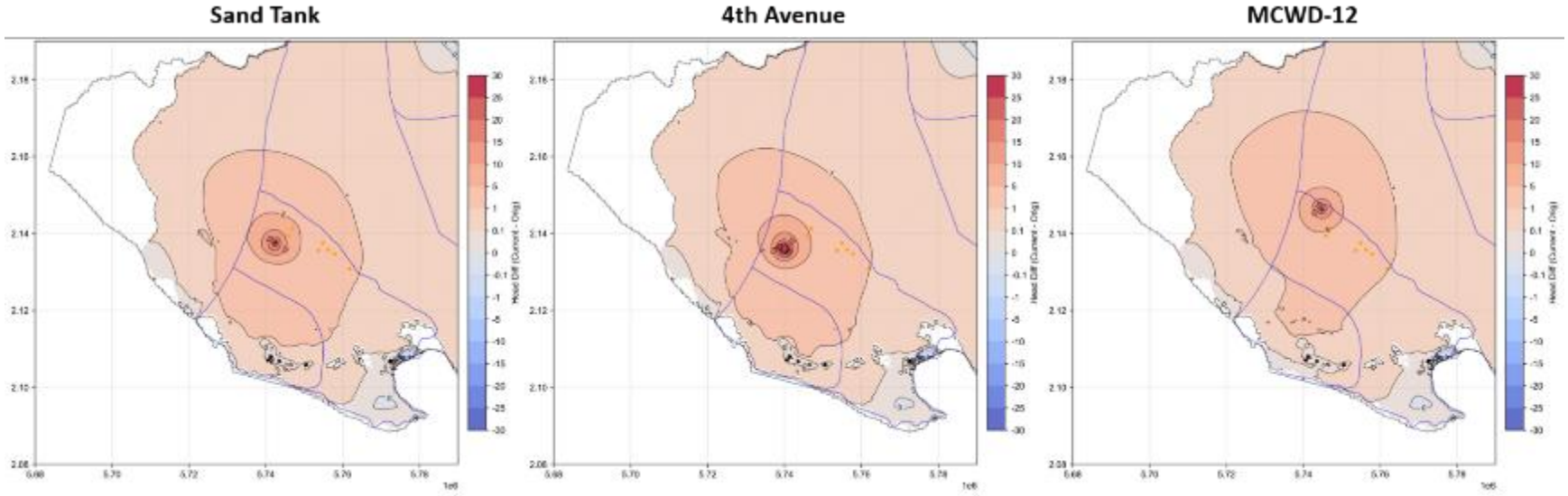


Figure 9-3 Deep Aquifer Groundwater Elevation Benefits of the MCWD IPR Project at Three Alternative Locations

9.5.3.3 Circumstances for Implementation

As discussed above, MCWD is currently constructing its recycled water distribution system to allow delivery of 600 AFY of recycled water for landscape irrigation by 2023. No additional circumstances for implementation are necessary.

Project planning for an IPR project in the Monterey Subbasin is currently ongoing. MCWD plans to initiate preliminary design and environmental review in fiscal year 2026-2027. Further design and construction efforts will be initiated as soon as funds become available. MCWD continues to develop a funding strategy and is actively pursuing state and federal funding opportunities. If grant funding is not secured, the project may be financed through GSA funds or alternative funding mechanisms.

9.5.3.4 Public Noticing

Stakeholder engagement is a critical aspect of developing a successful and implementable project. Key stakeholders include the U.S. Army, local governments and adjacent municipalities, as well as the public. MCWD intends to engage stakeholders early in project development.

Before any project initiates construction, it will go through a public notice process to ensure that all groundwater users and other stakeholders have ample opportunity to comment on projects before they are built.

In addition to the public noticing detailed above, all projects will follow the public noticing requirements per CEQA.

9.5.3.5 Permitting and Regulatory Process

Landscape Irrigation

The regulatory requirements for recycled water use for landscape irrigation are defined in CCR, Title 22, Article 3. M1W and MCWD have existing permits with the RWQCB to produce, transmit, and distribute advanced treated water for landscape irrigation.

Production of disinfected, advanced treated recycled water at M1W facilities is regulated under Waste Discharge Requirements (WDR) permit Order No. R3-2017-0003. Transmission and distribution of advanced treated water from the M1W AWPF are regulated under Order No. WQ 2016-0068-DDW (General Permit). The General Permit allows MCWD's distribution of advanced treated recycled water for non-residential irrigation use in accordance with its Title 22 Engineering Report approved by the SWRCB in April 2020. The report detailed specific uses and the use area requirements for the advanced treated recycled water produced by M1W. The General Permit will need to be modified if significant changes are made to the transmission, distribution, storage, or use, and/or the volume or character of the recycled water applied within MCWD's service area.

IPR in Monterey Subbasin

Major permitting processes required for an Advanced Water Treatment Plant (AWTP) expansion and IPR use include CEQA, SWRCB permitting, and RWQCB permitting.

- **California Environmental Quality Act Compliance:** The project will be required to comply with CEQA requirements likely by preparing an EIR. It is assumed that the EIR would build upon the Pure Water Monterey EIR, and thus may take the form of a supplemental EIR, rather than a standalone EIR.
- **State Water Resources Control Board Permitting:** Regulations for subsurface application of recycled water are included in CCR Title 22, Division 4, Chapter 3, Article 5.2. These regulations include minimum treatment requirements for full advanced treatment at the AWPF, as well as requirements to demonstrate adequate retention time within the aquifer. The SWRCB DDW oversees permitting of such a project.

  Detailed descriptions of all regulatory requirements for the advanced treatment of wastewater as well as implementation of a GRRP are included in Section 2 of the Pure Water Monterey Final Engineering Report (Nellor et. Al., 2017).
- **Regional Water Quality Control Board Permitting:** The Regional Water Quality Control Board is responsible for waste discharge requirements and water recycling requirements for wastewater treatment plants and thus oversees the general water quality effects of discharging treated wastewater into groundwater basins.

  M1W has an existing WDR permit for the Pure Water Monterey project, which applies to both the AWPF, as well as injection of the purified recycled water into the Seaside Subbasin. In order for MCWD to inject the purified recycled water into the Monterey Subbasin, the Pure Water Monterey WDR would either need to be modified to explicitly include this use, or a new WDR would need to be issued by the Central Coast RWQCB.

Additional construction permits are required prior to construction, including but not limited to, City of Marina encroachment permit, grading permit, and building permit, and County approval of use permitting, grading permit, and well construction permit.

9.5.3.6 Legal Authority

This project will be implemented pursuant to MCWD's authority as a water district.

9.5.3.7 Implementation Schedule

Landscape Irrigation

MCWD owns and operates the regional transmission line from the AWPF and is currently constructing a recycled water distribution system that will allow distribution of 600 AFY to customers. MCWD delivered 414 AFY of recycled water in 2025 to the Bayonet and Black Horse Golf Course (MCWD, 2026) and is expanding its recycled water distribution system in the California State University Monterey Bay subarea and in the Dunes Development Area. Future

expansions of the distribution system would allow deliveries up to the 1,427 AFY available from the AWPF.

IPR in Monterey Subbasin

MCWD plans to initiate preliminary design and environmental review in fiscal year 2026-2027. Completion of the IPR project is currently estimated within 3.5 to 5 years depending on funding availability and financing structure (Figure 9-4).

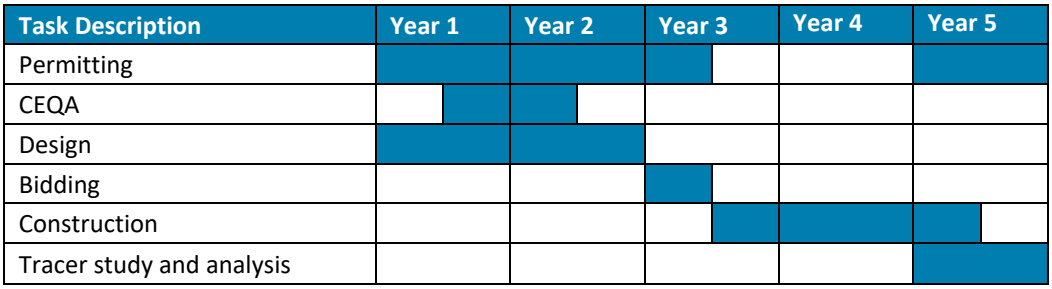


Figure 9-4 Implementation Schedule for MCWD Indirect Potable Reuse

9.5.3.8 Estimated Cost

Landscape Irrigation

Infrastructure needed to treat and deliver 1,427 AFY of advanced treated water for landscape and other non-potable uses within MCWD has already been constructed and funded with State Revolving Fund loans and various grants. The estimated unit cost to MCWD of the advanced treated water is approximately $2,400/AFY.

IPR in Monterey Subbasin

Conceptual costs for an IPR project evaluated as part of the Water Supply Augmentation Study (EKI, 2020) and the Recycled Water Feasibility Study (EKI, 2022b) and adjusted to conform with GSP cost assumptions as described in Section 9.3.4. The project facilities include

- Pipeline to convey advanced-treated recycled water from the regional transmission pipeline to the injection well;
- One injection well, approximately 1,300 feet deep, with a total injection capacity of 1,000 gpm, at the Sand Tank site location plus associated well pads, pedestals, site piping, hydropneumatic tank, and electrical, instrumentation, and controls work;
- Two monitoring wells to monitor and track groundwater levels and water quality; and
- Infrastructure for the disposal of backflush water produced through periodic pumping of the injection well. Options include a percolating basin or disposing into the sewer collection system.

It is assumed that the source water and finished water are available and rights to these sources can be obtained. Planning-level costs are based on prior feasibility evaluations and GSP-level assumptions. Actual costs will depend on the final project capacity, location, conveyance requirements, monitoring facilities, treatment needs, water-supply arrangements, and project phasing.

Capital plus soft costs (planning environmental, permitting, engineering, legal, mitigation etc.) for IPR use at an 873 AFY project capacity evaluated as part of the 2022 Feasibility Study are estimated to be approximately $26 million (EKI, 2022b). Annual O&M costs are estimated at $202,000 for operation of the injection wells. Total annualized cost is $1,000,461. Based on the evaluated project capacity of 873 AFY, the unit cost of water is $1,035/AF. Project per unit cost may decrease with economies of scale.

9.5.4 M4 – Drill and Construct Monitoring Wells

This project includes drilling and construction of monitoring wells screened in the 400-Foot Aquifer and the Deep Aquifers near the southwestern portion of the Subbasin. Additional monitoring wells are needed to fulfill monitoring network data gaps identified in Chapter 7 of the original GSP, and investigate several data gaps related to groundwater conditions identified in this area, including

1) Extent of seawater intrusion in the 400-Foot Aquifer and Deep Aquifers,
2) Connectivity between the 400-Foot Aquifer and the Deep Aquifers;
3) The cause of the groundwater depression observed in monitoring wells MPWMD#FO-10S and MPWMD#FO-11S; and
4) The source of elevated chloride detections in monitoring well MPWMD#FO-10S.

The project is assumed to include three monitoring wells in two locations: one cluster of two wells north of monitoring well MPWMD#FO-10, with separate wells in the 400-ft Aquifer and the Deep Aquifers, and one well near the coast screened in the 400-ft Aquifer.

During well drilling and construction, MCWD will collect geological information at the well sites including soil cores and water samples at selected depths, as well as borehole geophysical logs. Collected data will be analyzed to evaluate the quality and movement of groundwater in the 400-Foot and Deep Aquifers in this area. Findings of the hydrogeological analyses will be integrated into future updates of this GSP. Annual induction logging of the Deep Aquifer monitoring well will also provide additional information regarding potential vertical migration of seawater in this area.

In addition, the project may include geochemical analysis and pilot testing of core and groundwater samples to aid in the design of recycled water injection into the southwestern portion of the Subbasin. As discussed in Project M3 – Recycled Water Reuse Through Landscape Irrigation and Indirect Potable Reuse(Section 9.5.3), MCWD is planning to expand its recycled water use for injection into the 400-foot Aquifer and/or Deep Aquifers. The monitoring wells proposed herein are located seaward of production wells in Monterey and Seaside Subbasins.

Therefore, groundwater injection in this area may have the additional benefit of protecting production wells in both Subbasins from seawater intrusion. The geochemical work will inform future feasibility studies and site selection of the recycled water project.

General steps for the Project would include:

- Preparation of project scope.
- Identification of field locations and (if needed) negotiation for long-term access to the planned well locations.
- Preparation of bid specifications and a request for proposals ("RFP"); a bid walk with potential drilling contractors; and eventually selection of a drilling contractor and negotiation of contracts.
- Preparation and permitting for drilling and well construction with the local agency (Monterey County Health Department); health and safety planning for the project.
- Site walk with the drilling contractor to identify layout, hazards, traffic, and particular constraints such as the need for sound walls or other mitigation measures at each well location; marking and clearing for buried utilities and other hazards.
- Preliminary well and annular materials design.
- Mobilization of the rig and crew to the wellsite, borehole drilling, collection of soil cores and water samples at selected depths, sampling and logging of drilled materials, and downhole geophysical logging (e.g., induction logging, spinner tests).
- Laboratory analysis of soil hydraulic, mineralogical, and potential contaminant leaching properties.
- Laboratory analysis of water quality constituents.
- Geochemical compatibility modeling/bench scale pilot studies of potential water quality impacts from recycled water injection.
- Final design of each well and filter pack based on encountered conditions, interpreted geology, and geophysical data, including indications of general water quality and saline conditions.
- Well construction, including casing, filter pack, transition seal, grout, and surface completion.
- Surveying to determine coordinates and elevation of the wells and water level measurement reference points.
- Development of the wells after at least 72 hours for grout curing.
- Sampling and water-level gauging of the wells.

9.5.4.1 Relevant Measurable Objectives

Relevant measurable objectives benefiting from construction of new monitoring wells described herein include:

- **Groundwater elevation measurable objective –** The proposed monitoring wells will be added to the Subbasin's groundwater elevation monitoring network. After a period of initial monitoring, the GSAs will establish groundwater elevation SMCs at these wells that are consistent with the Subbasin's sustainable goal. Data collected from these wells will inform groundwater elevation measurable objectives in their vicinity and within the Subbasin.
- **Groundwater storage measurable objective –** The proposed monitoring wells will be added to the Subbasin's groundwater storage monitoring network. Groundwater storage SMCs are defined in this Subbasin using groundwater elevation and seawater intrusion measurements as proxies.
- **Seawater intrusion measurable objective –** The proposed monitoring wells will be added to the Subbasin's seawater intrusion monitoring network. Data collected from this project will fill the existing data gap of seawater intrusion extent near the Monterey-Seaside Subbasin boundary. The GSAs will evaluate initial water quality data collected from these wells and establish additional seawater intrusion SMCs. Annual induction logging will also be performed in the Deep Monitoring well to assess potential vertical migration of the seawater intrusion front. Data collected from these wells will provide additional data regarding seawater intrusion in their vicinity and within the Subbasin.

9.5.4.2 Expected Benefits and Evaluation of Benefits

This project would fill critical data gaps regarding hydrostratigraphy, seawater intrusion, and groundwater recharge mechanisms for the 400-Foot Aquifer and Deep Aquifers that would benefit management towards the abovementioned measurable objectives. The hydrogeologic investigations conducted as part of this project will be incorporated into the hydrogeologic conceptual model of future GSP updates. Data from these monitoring wells will help inform the need, placement, and performance of projects to address potential seawater intrusion into the Monterey Subbasin and the northern Seaside Subbasin.

The proposed monitoring wells will be added to the Subbasin's groundwater elevation, groundwater storage, and seawater intrusion monitoring networks. The GSAs intend to establish additional SMCs at these locations after an initial period of monitoring. Progress towards attaining measurable objectives at these locations will be evaluated pursuant to protocols described in Chapter 7.

9.5.4.3 Circumstances for Implementation

This project was implemented immediately upon GSP adoption and completed in 2026.

9.5.4.4 Permitting and Regulatory Process

Drilling permits from Monterey County Health Department (MCHD) will be required for the project. Final Well Construction Reports after completion of the well must be submitted to the DWR.

9.5.4.5 Implementation Schedule

The project was implemented between 2023 and 2026 with funding from DWR's Round 2 Sustainable Groundwater Management Implementation Grant for the Monterey Subbasin.

9.5.4.6 Legal Authority

Legal access to the well sites may require negotiation if the sites are on private land. An easement or right-of-way may be required to ensure access to the wells over the timeframe required by SGMA of at least 20 years.

9.5.4.7 Estimated Cost

A total of 7 monitoring wells were completed in the 400-Foot and Deep Aquifers with actual construction costs of approximately $1.9 million.

9.5.4.8 Public Noticing

As with all SGMA projects and management actions, stakeholder input and involvement are crucial for long-term success in sustainable management of groundwater. Normal notification and updates to the project schedule will be implemented as part of regular public meetings and publications.

9.5.5 M5 – Reservation Road Pilot Desalination Plant

In 1996, MCWD constructed a pilot seawater desalination facility to explore the feasibility of extracting seawater through shallow wells along the beach. The facility, located at the former wastewater treatment plant site on Reservation Road between Dunes Drive and the Monterey Bay, has a capacity of 0.3 MGD. The plant was operated between 1997 and 2003 and has been idle since.

MCWD is currently advancing rehabilitation of the Reservation Road Desalination Plant as a supplemental water supply source. The project involves replacing the well pump, piping, vault, the intake well and brine discharge piping, including pipe inspection and testing and comprehensive facility electrical systems. Upon completion, the facility will deliver 300 AFY of potable water to MCWD customers.

9.5.5.1 Relevant Measurable Objectives

The measurable objective benefiting from the pilot desalination plant includes:

- **Groundwater elevation measurable objective** – The project will result in less demand on groundwater pumping and higher groundwater levels, particularly near the location of production wells.
- **Groundwater storage measurable objective** – Reducing pumping from the principal aquifers will ultimately have the effect of increasing groundwater in storage.
- **Seawater intrusion measurable objective –** Seawater intrusion has advanced a few miles inland in Monterey Subbasin. Increasing groundwater storage and groundwater elevation will support the natural hydraulic gradient that pushes back against the intruding seawater.

9.5.5.2 Expected Benefits and Evaluation of Benefits

Operation of the Reservation Road Pilot Desalination Plant will reduce groundwater demand from the Monterey Subbasin and provide in-lieu recharge. As described above, the project is anticipated to deliver 300 AFY to MCWD. Project deliveries will be quantified directly through volumetric measurements of delivered water. Benefits towards attaining applicable measurable objectives will be measured using the monitoring networks described in Chapter 7.

9.5.5.3 Circumstances for Implementation

As discussed above, MCWD awarded a contract for Phase 1 construction of the renovation project in January 2026 for a planned projection in 2027. No additional circumstances for implementation are necessary.

9.5.5.4 Public Noticing

Stakeholder engagement is a critical component for this project. MCWD is coordinating with the State Parks and the City of Marina. Public outreach continues through MCWD's website and on-site noticeboard updates.

9.5.5.5 Permitting and Regulatory Process

Permitting for this facility was completed with the original construction in 1997. MCWD is updating its water systems permit with California Division of Drinking Water to reinstate the intake well water source. The EIR was completed in May 1995 and final notice of determination was completed in February of 1999. For the rehabilitation project, a public Notice of Exemption (NOE) under the CEQA was filed on September 25, 2025. Because this is the rehabilitation of an existing facility, not new construction, the project qualifies for this exemption. All required permits from State Parks and other agencies are in place.

9.5.5.6 Legal Authority

This project will be implemented pursuant to MCWD's authority as a water district.

9.5.5.7 Implementation Schedule

In 2023, MCWD completed a facility condition assessment and prepared a preliminary cost estimate. Following additional data collection and video inspection of key infrastructure components, MCWD initiated design of the Reservation Road Desalination Plant Renovation Project. The design consultant has completed Phase 1 design documents and is progressing subsequent phase designs. In parallel, MCWD has coordinated with multiple state agencies to address permitting and regulatory requirements. MCWD initiated rehabilitation construction in 2026 for phase 1 of the rehabilitation, including cleaning and rehabilitation of the intake and disposal wells. The second phase will include rehabilitation of the water treatment equipment. Completion of the facility is scheduled in early 2027.

9.5.5.8 Estimated Cost

The approved MCWD Capital Improvement budget for FY 2027 is $13,900,000. This total project cost includes civil improvements, consulting, demolition, general construction, and electrical/instrumentation work including balance of the Dual-Pass RO Membrane Treatment System and the Pre-Treatment Conditioning Package System.

9.5.6 M6 – Aquifer Storage and Recovery at Armstrong Ranch

The Armstrong Ranch Property is a 220-acre vacant site located northeast of the MCWD service area in the 180/400 Subbasin. An aquifer storage and recovery (ASR) project at Armstrong Ranch would consist of infiltration ponds to recharge surface water from the SRDF or alternatively sourced water into the Dune Sand Aquifer and recover stored water through an extraction well field at the site.

MCWD completed a feasibility assessment of the project in May 2025 (EKI, 2025). The primary purpose of the feasibility assessment was to analyze the maximum storage and recovery capacity of an ASR project. The feasibility study involved identifying potential water supply availability assumptions associated with optimization of the SRDF and/or additional recycled water supplies from the M1W AWTP and conducting a detailed modeling evaluation of recharge and recovery well infrastructure design and operational alternatives with a numerical model. Modeling results indicated that the maximum infiltration capacity of an ASR project is approximately 2,500 AFY with an estimated recovery yield of 76% (i.e., 1,900 AFY).

9.5.6.1 Relevant Measurable Objectives

Although the Armstrong Ranch site is located in the 180/400 Subbasin, it is located near the Monterey Subbasin boundary and operates within the Dune Sand Aquifer that extend across both subbasins. Therefore, the ASR project may benefit groundwater conditions in the hydraulically connected aquifers within the Monterey Subbasin. The measurable objectives that may benefit from the project include:

- **Groundwater elevation measurable objective** – The project allows surface water or additional recycled water supplies to be stored in the Dune Sand Aquifer and

subsequently recovered for beneficial use. By increasing the use of surface water or recycled water, this project can increase groundwater elevations or decrease their decline.

- **Groundwater storage measurable objective** – The project offsets groundwater extraction and provides in-lieu recharge, which will ultimately have the effect of increasing groundwater in storage.
- **Seawater intrusion measurable objective** – Increasing groundwater storage and groundwater elevations will support the natural hydraulic gradient that pushes back against the intruding seawater.

9.5.6.2 Expected Benefits and Evaluation of Benefits

The primary benefit from ASR is the direct recharge of groundwater aquifers, thereby increasing the sustainable yield of the Monterey Subbasin and adjacent basins and increasing groundwater elevations. The project is anticipated to have a maximum infiltration capacity of 2,500 AFY with approximately 1,900 AFY available for recovery.

Project deliveries will be quantified directly through volumetric measurements of delivered or injected advanced treated water. Benefits towards attaining applicable measurable objectives will be measured using the monitoring networks described in Chapter 7.

9.5.6.3 Circumstances for Implementation

Implementation will depend on confirmation of a viable water source, completion of additional feasibility and environmental review, regulatory approvals, coordination with regional partners, and availability of funding. The project may be implemented in phases, with its final configuration and timing refined as planning advances.

9.5.6.4 Public Noticing

Stakeholder engagement is a critical aspect of developing a successful and implementable project. As the actual location of the MCWD-owned property for this project is located within the 180/400 Subbasin, key stakeholders include the SVBGSA, MCWRA, local governments and adjacent municipalities, as well as the public. MCWD intends to engage stakeholders early in project development.

Before any project initiates construction, it will go through a public notice process to ensure that all groundwater users and other stakeholders have ample opportunity to comment on projects before they are built.

In addition to the public noticing detailed above, all projects will follow the public noticing requirements per CEQA.

9.5.6.5 Permitting and Regulatory Process

Permits that might be required for the ASR component include:

Environmental Protection Agency (EPA) – All ASR projects must register with the EPA's Underground Injection Control program.

State Water Resources Control Board – All ASR projects must submit an Underground Storage Supplement as part of the application to receive either a Temporary Permit, a Standard Permit, or a Streamlined Permit from SWRCB.

Regional Water Quality Control Board – General Waste Discharge Requirements paperwork must be filed with RWQCB to comply with its General Order that governs the injection of water to recharge aquifers.

Monterey County Health Department (MCHD) – Well construction permits must be obtained from MCHD.

The project will require a CEQA review process. Additionally, any project that coordinates with federal facilities or agencies may require NEPA documentation.

9.5.6.6 Legal Authority

This project will be implemented pursuant to MCWD's authority as a water district.

9.5.6.7 Implementation Schedule

An implementation schedule is under development.

9.5.6.8 Estimated Cost

Estimated project costs are under development.

9.5.7 M7 – Expansion of Desalinated Water Supply

MCWD continues to evaluate seawater desalination alternatives to provide the desalinated water supply identified in RUWAP (see Section 3.5.1.4) and support groundwater management under SGMA. Alternatives may include expansion of the Reservation Road Desalination Plant or development of a new seawater desalination facility at an MCWD-owned site. MCWD owns potential project sites at Armstrong Ranch and Garrison. This project would be developed in phases, with a potential long-term total desalination supply capacity of 2,300 AFY with inclusion of M5 – Reservation Road Pilot Desalination Plant.

9.5.7.1 Relevant Measurable Objectives

The measurable objective benefiting from the pilot desalination plant includes:

- **Groundwater elevation measurable objective** – The project will result in less demand on groundwater pumping and higher groundwater levels, particularly near the location of production wells.
- **Groundwater storage measurable objective** – Reducing pumping from the principal aquifers will ultimately have the effect of increasing groundwater in storage.

- **Seawater intrusion measurable objective –** Seawater intrusion has advanced a few miles inland in Monterey Subbasin. Increasing groundwater storage and groundwater elevation will support the natural hydraulic gradient that pushes back against the intruding seawater.

9.5.7.2 Expected Benefits and Evaluation of Benefits

A higher-capacity seawater desalination project would provide a supplemental potable water supply that could reduce groundwater pumping in the Monterey Subbasin through in-lieu recharge. The project may produce an additional 2,000 AFY of potable water above the capacity of project M5 – Reservation Road Pilot Desalination Plant. Actual project deliveries will be quantified directly through volumetric measurements of delivered water. Benefits towards attaining applicable measurable objectives will be measured using the monitoring networks described in Chapter 7.

9.5.7.3 Circumstances for Implementation

This project is conceptual and will be further developed by MCWDGSA. Implementation of this project will depend on completion of additional feasibility study and whether additional supplemental supply is to improve supply reliability or respond to future water-supply conditions. Development may also depend on the performance and availability of other local and regional PMAs. The project may be implemented in phases, with its final configuration and timing refined as planning advances.

9.5.7.4 Public Noticing

MCWD will conduct public outreach and coordinate with affected agencies, landowners, stakeholders, and the public as the project is further developed. MCWD intends to engage stakeholders early in project development. The extent and timing of public engagement will be determined based on the selected project configuration, location, regulatory requirements, and environmental-review process.

Before any project initiates construction, it will go through a public notice process to ensure that all groundwater users and other stakeholders have ample opportunity to comment on projects before they are built.

In addition to the public noticing detailed above, all projects will follow the public noticing requirements per CEQA.

9.5.7.5 Permitting and Regulatory Process

A higher-capacity seawater desalination project would require project-specific environmental review and permits. Depending on the final project configuration, approvals may be required from federal, State, regional, and local agencies for seawater intake, brine discharge, treatment and distribution facilities, construction, coastal development, water-system operation, and protection of biological and cultural resources.

Regulations for constructing new sea water desalination plants are included in Section III.M. of the SWRCB California Ocean Plan (SWRCB, 2016) and Chapter 5 of the California Coastal Commission's Seawater Desalination and California Coastal Act (CCC, 2004). Additionally, being a national marine sanctuary, the Monterey Bay has specific guidelines for desalination plants prepared by the National Ocean and Atmospheric Administration (NOAA, 2010), who regulates the fishery. The key regulatory considerations are as follows:

- Site locations should be the "best available site", which will minimize intake and mortality of all forms of marine life.
- Seawater intakes and brine discharges should use "best available" design and technologies to minimize impacts, such as impingement and entrainment. Discharges are generally recommended to dilute with wastewater effluent to reduce salt concentration, thus collocating with a wastewater treatment plant is desirable.
- Significant mitigation measures are required such are restoring, expanding, and/or creating marine habitats in another area unaffected by facility operations, or through fee-based mitigation programs, if available by the regulatory agencies.
- A monitoring and reporting program is required to demonstrate compliance with the receiving water limitations for salinity, including facility-specific monitoring. Biological surveys are also needed for the RWQCB to assess any biological impacts from the desalination facility.

The project will undergo CEQA review and any other applicable environmental review before construction. Permitting requirements will be identified and addressed as the project advances through feasibility analysis, conceptual design, and subsequent design phases.

9.5.7.6 Legal Authority

This project will be implemented pursuant to MCWD's authority as a water district.

9.5.7.7 Implementation Schedule

The project is in the conceptual phase. Initial implementation activities may include evaluation of the Reservation Road Pilot Desalination Plant performance; assessment of potential facility capacities and locations; preliminary engineering and feasibility studies; groundwater-model evaluation; stakeholder coordination; environmental review; permitting; and development of funding and financing strategies.

MCWD's 2025 UWMP projects a 500 AFY supply from RUWAP Armstrong will be available in 2030 and 1,500 AFY from RUWAP Garrison will be available by 2035. MCWD's plans will be updated as the desalination planning progresses. The project implementation schedule will be established if and when MCWDGSA advances the project beyond the conceptual phase.

9.5.7.8 Estimated Cost

The estimated cost will be established if and when MCWDGSA advances the project beyond the conceptual phase.

9.6 Corral de Tierra Area Local Projects & Management Actions

9.6.1 C1 – Demand Management and Planning

SVBGSA's approach to planning for demand management (DM) extends beyond solely reducing net pumping. DM is also a planning tool to prepare for droughts as well as increasingly uncertain climate conditions that may affect water supplies from year to year. In this context, DM includes evaluating opportunities to manage groundwater demand while encouraging stewardship of ground- and surface water supplies to support local communities, industries, and the environment.

DM can be accomplished through specific measures (actions) that are developed and carried out through policies, programs, or other management approaches. Because groundwater conditions, water use patterns, and management needs vary across the Salinas Valley, DM measures should be tailored to the specific users and hydrologic conditions of the area in which they are applied. MA1: Demand Management and Planning serves as an umbrella management action for the broad range of potential DM measures that may be prioritized, developed, and activated. While MA1 provides the overarching framework for DM, specific DM measures identified for this subbasin are described in more detail as discrete management actions (MA2 through 5) in this chapter.

During the first phase of GSP implementation, SVBGSA developed a DM Framework. MA1 in Amendment 1 expands the concept of DM to include a broader range of planning and management tools. This approach preserves flexibility and does not limit future options to reduce net groundwater pumping.

DM may include voluntary or mandatory measures, ranging from incentivized residential water use efficiency and conservation efforts to pumping allocations or other regulatory mandates. To further evaluate these options, SVBGSA undertook several activities between GSP Amendments 1 and 2.

- Stakeholder Assessment (2022–2023): Assessed how well stakeholders understand and support demand management.
- Legal White Paper (2024): Summarized legal considerations for demand management. The white paper was prepared by Minasian Law in coordination with staff and legal counsel from ASGSA, MCWDGSA, MCWRA, and Monterey County Environmental Health and received by SVBGSA Board on March 13, 2025.
- Community Workshops (2024): SVBGSA held 4 "Our Water Future in the Salinas Valley: Planning for Uncertainty" at locations throughout SVBGSA's jurisdiction.

- DM Framework (2024–2025): Planning tool that provides a structure for how the SVBGSA can evaluate, prioritize, and implement measures if and when they are needed to meet SGMA requirements.
- Economic and Financial Analyses (2024–2025): Evaluated costs and feasibility of different demand management measures identified in the DM Framework.

The DM Framework is a Valley-wide planning document that establishes stages and triggers that indicate when DM may be needed to avoid undesirable results within a particular subbasin. There are triggers for both long-term declines in groundwater levels and short-term declines associated with dleroughts. The Framework recognizes that even if DM may not currently be necessary in a particular subbasin, it remains an available management tool that could be employed if groundwater conditions change or indicate the need for it. Based on extensive public input, the DM Framework describes the 6 agricultural and 4 domestic DM measures that were identified as the most appropriate in the Salinas Valley. It outlines DM administrative requirements, funding approaches, technical and economic analysis, measurement methods, and a water accounting system that would need to be developed for a measure to be activated. The DM Framework provides a preliminary assessment of costs to the agency, water users, and the regional economy to help guide further prioritization and decision making. The 10 measures range from voluntary to mandatory demand reductions. Table 9-2 notes if there is a discrete GSP management action to further describe the respective measure planned in this Subbasin.

Table 9-2 DM Measures Identified in DM Framework

	Agricultural	Urban
Voluntary	On-Farm Water Use Efficiency (MA3) Rotational Fallowing/Fallow Bank Agricultural Land Retirement/ Land Repurposing (MA2)	Education and Outreach (MA5) Incentivized Water Use Efficiency (MA5)
Mandatory	DM Fee Pumping Limits/Allocations (MA4) Penalty Charges	Water Pricing Mechanisms Mandatory Efficiency Measures

Voluntary approaches to managing pumping can reduce demand through incentives rather than mandatory requirements or penalties. For example, through a voluntary fallowing program, willing landowners can reduce pumping and receive compensation if that reduction benefits a larger area and the larger area can contribute to the funding mechanism without changing extraction in all locations. Demand planning also encompasses planning for future demand that may occur from changes in land uses, such as bringing new land into irrigated production, changes in crop types, or new housing developments in areas with no existing water use.

DM measures can also be mandatory to provide a regulatory backstop that can be implemented in less time than it takes to implement water infrastructure projects. For example, pumping limits or allocations are a way to regulate groundwater extraction and determine each extractor's pro-rata share of the sustainable yield or pumping limit. This typically divides the sustainable yield

among beneficial users. Allocations can be developed based on various criteria, such as acreage, land use, historical pumping, or number of connections, or be a hybrid of multiple criteria.

DM measures can be used to:

- Plan for and/or reduce pumping
- Generate funding for PMAs
- Incentivize water conservation and/or recharge projects
- Show there are options for measures that can be developed if needed, but this management action does not establish pumping allocations or pumping controls.

9.6.1.1 Relevant Measurable Objectives

The measurable objectives benefiting from demand management and planning include:

- **Groundwater levels measurable objective.** Reducing pumping will result in higher groundwater levels than otherwise would occur.
- **Groundwater storage measurable objective.** Reducing pumping will result in higher groundwater levels, and therefore greater groundwater in storage, than otherwise would occur.
- **ISW measurable objective.** Pumping reductions that occur near locations of ISW may result in higher shallow groundwater levels in ISW monitoring wells.

9.6.1.2 Expected Benefits and Evaluation of Benefits

The primary benefits expected for this management action are to reduce pumping during droughts or on an ongoing basis, to raise groundwater elevations; quantification of the benefits will be assessed as part of evaluation of specific measures.

Benefits will be evaluated using the monitoring networks described in Chapter 7. Groundwater level responses will be assessed using the MCWRA groundwater monitoring well network. Land subsidence will be tracked using InSAR data provided by DWR, and seawater intrusion will be evaluated based on the location of the 500 mg/L chloride isocontour developed by MCWRA. Reductions in groundwater pumping will be tracked through the GMP. Additional methods for measuring and verifying pumping reductions and their effects on groundwater conditions may be incorporated as part of specific DM programs.

9.6.1.3 Circumstances for implementation

DM and Planning is a priority PMA in the Corral de Tierra Area of the Monterey Subbasin. Stages will be assessed on an ongoing basis throughout GSP implementation and measures will be activated as needed. The DM Framework applies to the entire Salinas Valley, but it is structured to account for differences in subbasin and aquifer conditions. The Framework establishes stages and triggers on a subbasin-scale since SGMA compliance is by subbasin. Stages are used to classify

whether subbasin conditions indicate progressively lower groundwater levels relative to the SMC. Stages are defined on a numerical scale from 0 to 4, with 0 representing sustainable conditions that do not warrant DM and 4 representing chronic undesirable results that indicate the need for DM. Triggers also determine in which stage each subbasin is. DM measures may be implemented for larger or smaller areas that do not align with subbasin boundaries if conditions warrant it. The Framework provides an overview of how each DM measure may relate to different stages. Potential DM measures and appropriate areas will be evaluated and recommended to the Board in coordination with partner agencies.

The DM Framework short-term triggers will be evaluated annually, and long-term triggers will be assessed at least every 5 years for subbasins that have not already been determined to be in Stage 3 or Stage 4 based on long-term conditions. If there are planned infrastructure projects to improve groundwater conditions, evaluation of triggers can consider whether a DM measure is necessary. A DM measure may be temporary based on the timeline for project implementation or under drought conditions.

9.6.1.4 Permitting and Regulatory Process

Activation of specific DM measures requires authorization by the SVBGSA Board of Directors. For example, allocations or pumping limits would be developed and activated through an SVBGSA ordinance or regulation. Such regulations could be structured for automatic implementation when specific criteria are met or require the vote of the Board of Directors to take effect. However, activation of DM measures would not require permits for physical facilities.

9.6.1.5 Legal Authority

Legal authority for MA1 Demand Management and Planning is guided by CWC Part 2.74 Chapter 5, which identifies the powers and authorities of GSAs. CWC §10725.2 provides the GSA with the powers and authorities to “perform any act necessary or proper” to implement SGMA regulations and allows the GSA to adopt rules, regulations, ordinances, and resolutions necessary for SGMA implementation. The Joint Exercise of Powers Agreement establishing the SVBGSA includes power to establish and administer projects and programs for the benefit of the Basin [Subbasin]. Imposition of pumping allocations and controls requires a supermajority plus vote of the SVBGSA Board of Directors.

9.6.1.6 Implementation Schedule

The Board will determine the DM measures to prioritize and implement. The schedule to develop and activate DM measures will depend on the specific measure prioritized.

9.6.1.7 Estimated Cost

Costs for development and activation of DM measures vary based on the measure.

Direct costs to the administering agency (e.g., SVBGSA or another agency) and water users, as well as regional economic implications for the broader Monterey County region were assessed

qualitatively in the Framework. Some relative quantitative estimates are provided but could change based on how a measure is implemented.

Table 9-3 summarizes relative costs for each DM measure. Costs are classified as high, moderate, or low, corresponding to agency level of effort (e.g., staff time, resources, and measurement) and direct costs to water users (e.g., capital costs, O&M, other fees, and impacts to farming operations or households). Regional economic impacts (community costs) are described as positive, negative, or mixed, corresponding to the effect of the measure on regional employment, communities, and economic activity (gross domestic product, or GDP).

Table 9-3 Summary of DM Measure Costs

Agricultural Measures						
Cost Category	**On-Farm Efficiency**	**Land Repurposing**	**Fallow Bank**	**Pumping Limits**	**DM Fee**	**Penalty Charges**
Agency Costs						
Development	*low*	*high*	*moderate*	*high*	*low*	*low*
Administration	*low*	*moderate*	*moderate*	*high*	*low*	*low*
Measurement	*low*	*low*	*moderate*	*moderate*	*moderate*	*low*
Incentive Payments	*none*	*moderate*	*moderate*	*none*	*none*	*none*
Water User Costs						
Capital and O&M	*moderate*	*moderate*	*low*	*low*	*low*	*low*
Rates/Fees	*low*	*moderate*	*moderate*	*low*	*N/A*	*N/A*
Farm/Household Impacts	*low*	*low*	*moderate*	*moderate*	*moderate*	*low*
Community Costs						
GDP	*mixed*	*mixed*	*negative*	*negative*	*negative*	*N/A*
Employment	*mixed*	*mixed*	*negative*	*negative*	*negative*	*N/A*
Community Costs	*none*	*mixed*	*negative*	*negative*	*negative*	*N/A*
Stages Assessment	*low*	*moderate*	*moderate*	*high*	*moderate*	*moderate*

Table 9-3 Summary of DM Measure Costs (Continued)

Domestic Measures				
Cost Category	**Education and Outreach**	**Incentivized Efficiency**	**Mandatory Efficiency**	**Pricing Mechanisms**
Agency Costs				
Development	*low*	*moderate*	*moderate*	*low*
Administration	*low*	*moderate*	*moderate*	*low*
Measurement	*moderate*	*low*	*low*	*low*
Direct Payments	*moderate*	*high*	*N/A*	*none*
Water User Costs				
Capital and O&M	*low*	*low*	*moderate*	*low*
Rates/Fees	*low*	*low*	*low*	*N/A*
Farm/Household Impacts	*low*	*low*	*moderate*	*moderate*
Community Costs				
GDP	*N/A*	*positive*	*positive*	*negative*
Employment	*N/A*	*positive*	*positive*	*negative*
Community Costs	*N/A*	*positive*	*positive*	*negative*
Stages Assessment	*low*	*low*	*high*	*moderate*

9.6.1.8 Public Noticing

As part of the approval of DM measures in the Subbasin, a public notice process will be necessary to ensure that all groundwater users and other stakeholders have the opportunity to comment on it. Development of DM measures will occur at public meetings of the SVBGSA Board and committees, and public noticing will be conducted in accordance with the Brown Act. SVBGSA will share information about the project and opportunities to comment on its website and in newsletters.

The general steps in the public notice process will include GSA staff bringing an assessment of the need for DM to the SVBGSA Board in a publicly noticed meeting. This assessment will include:

- A description of the undesirable result(s) that may occur if action is not taken
- A description of potential DM measures
- For the development of any specific DM measure, GSA staff will bring to the SVBGSA Board in a publicly noticed meeting:

  - An estimated cost and schedule for the proposed management action
  - Any alternatives to the proposed management action

- The SVBGSA Board will notify stakeholders in the subbasin or area of the proposed DM measure and allow at least 30 days for public input to the SVBGSA Board.
- After the 30-day public review period, the SVBGSA Board will vote whether to approve the implementation of the management action and notify the public if approved via an announcement on the SVBGSA website and mailing lists.

Mandatory measures in the form of an ordinance or regulation, such as the imposition of pumping allocations and controls, may also require CEQA review and this process will follow public noticing requirements.

9.6.2 C2 – Rural Residential Demand Management Water Use Efficiency

SVBGSA recognizes that DM should include opportunities for all groundwater user groups to improve water use efficiency. Rural residential users, many of whom rely on individual domestic wells or small water systems, often do not have access to the services and incentives offered by urban water suppliers. Although this sector represents a relatively small share of total groundwater pumping, targeted efficiency measures can reduce localized demand, lower household costs, and improve resilience to drought and groundwater level declines. Building on SVBGSA's Water Efficiency Pilot Program conducted during the first phase of GSP implementation, this management action establishes an ongoing, voluntary, and incentive-based program focused on rural residential users.

This management action will provide a near-term, equitable, and relatively low-cost complement to the other priority PMAs by expanding voluntary water use efficiency services and incentives for these users. The initial program will build on lessons from SVBGSA's Water Efficiency Pilot Program and existing regional water efficiency programs. It will focus on rural households and small systems that are not otherwise well served and supported.

Potential measures include home water-use assessments, leak detection and repair, direct installation or rebates for efficient fixtures and appliances, outdoor irrigation audits and equipment, turf or high-water-use landscape replacement, and technical assistance. Program design will prioritize measures with verifiable savings and will address barriers faced by low-income households, renters, non-English-speaking residents.

Because many private wells and small systems do not have readily available customer-level use records, SVBGSA will consider a tiered measurement approach. Participation and installation will be documented for all measures; standardized or deemed savings may be used for well-established devices; and pre- and post-installation metering or monitoring could be used for higher-cost measures.

9.6.2.1 Relevant Measurable Objectives

The main measurable objectives benefiting from rural residential DM include:

- **Groundwater levels measurable objective.** Reducing pumping will result in higher groundwater levels than otherwise would occur.
- **Groundwater storage measurable objective.** Reducing pumping will result in higher groundwater levels, and therefore greater groundwater in storage, than otherwise would occur.

9.6.2.2 Expected Benefits and Evaluation of Benefits

No uniform mandatory household reduction or fixed percentage target is proposed at this stage. A quantifiable program target will be established after a user inventory, baseline, and pilot evaluation are completed. Expected benefits include reduced local pumping, lower household water and energy costs, greater drought resilience, and reduced vulnerability of domestic wells to declining groundwater levels.

Benefits will be evaluated using the monitoring networks described in Chapter 7. Groundwater level responses will be assessed using the MCWRA groundwater monitoring well network. Reductions in groundwater pumping will be tracked through the GMP. Additional methods for measuring and verifying pumping reductions and their effects on groundwater conditions may be incorporated as part of specific programs. Quantification of the benefits will be assessed as part of evaluation of the rural residential DM programs.

9.6.2.3 Circumstances for Implementation

During the first phase of GSP implementation, SVBGSA conducted a water use efficiency pilot program for rural residents. Rural Residential DM Water Use Efficiencies is a priority PMA in the 180/400 Subbasin. Further water savings will depend on the willingness of rural residents to participate in the program. It will be evaluated annually and adjusted by changing outreach methods, eligible measures, incentive levels, and priority areas.

9.6.2.4 Permitting and Regulatory Process

No permitting or regulatory processes are necessary to develop a rural residential demand management water use efficiency program.

9.6.2.5 Implementation Schedule

Building on the initial pilot phase, continued development of the program is planned over approximately 3 years, and implementation will be ongoing thereafter.

9.6.2.6 Legal Authority

Legal authority for GSA to implement PMAs is guided by CWC Part 2.74 Chapter 5, which identifies the powers and authorities of GSAs. CWC §10725.2 provides the GSA with the powers and authorities to “perform any act necessary or proper” to implement SGMA regulations and allows the GSA to adopt rules, regulations, ordinances, and resolutions necessary for SGMA

implementation. The Joint Exercise of Powers Agreement establishing the SVBGSA includes powers to establish and administer projects and programs for the benefit of the Basin [Subbasin].

9.6.2.7 Estimated Cost

Rural residential demand management and water use efficiency activities will be conducted as an ongoing Valley-wide program funded annually. Program costs will range from year to year, with a range for implementation in all rural residential areas within SVBGSA's jurisdiction. An estimated range of $25,000 to $50,000 will be needed for program development, outreach, and initial implementation. Additional funding may be needed for ongoing implementation and rebates depending on the scale at which the program is implemented.

Presenting costs on a $/AF basis allows direct comparison across very different types of conservation investments, ranging from fixture retrofits to more capital-intensive outdoor landscape conversions. Table 9-4 summarizes typical unit costs for domestic water use efficiency measures (ERA, 2026a). The values are planning-level ranges compiled from published California conservation studies and are intended to illustrate relative costs, not define program-specific costs for any 1 agency or service area. Actual costs will vary depending on local program design, rebate levels, customer participation rates, baseline water use, and other factors.

Table 9-4 Domestic Water Conservation Cost Summary

Conservation Practice	Typical $/AF Range
Leak detection and repairs	$100 - $500
Faucet aerators / showerheads	$200 - $700
High-efficiency toilets	$300 - $800
High-efficiency clothes washers	$400 - $1,000
Smart metering / billing improvements	$500 - $1,500
Public outreach and education	$300 - $1,500
Smart irrigation controllers	$800 - $1,800
Irrigation system upgrades (drip, etc.)	$1,000 - $2,500
Turf replacement / landscape conversion	$1,500 - $3,500+

9.6.2.8 Public Noticing

Public noticing about rural residential water use efficiency programs will be necessary to ensure that all groundwater users and other stakeholders have the opportunity to comment on the program development. Development of the program will occur at public meetings of the SVBGSA

Board and committees, and public notice will be conducted in accordance with the Brown Act. SVBGSA will notify the public about the program at public meetings and on SVBGSA website and mailing lists. The SVBGSA will endeavor to have the broadest possible public educational and outreach through ongoing communications and engagement activities targeting rural residents.

9.6.3 C3 – Rural Residential Well Mitigation Program

The Well Mitigation Program is a management action intended to assist rural residential drinking water users if the PMAs implemented under this GSP are not able to maintain access to reliable domestic water supplies. The program is not intended to replace or substitute for the implementation of groundwater sustainability PMAs. Rather, it provides a framework for responding to localized impacts that may occur despite broader efforts to improve groundwater conditions.

The primary objective of the Rural Residential Well Mitigation Program is to ensure that these domestic users continue to have access to safe and reliable drinking water while SVBGSA works toward achieving and maintaining groundwater sustainability. It is not intended to solve existing water quality exceedances that are unrelated to groundwater management but could help document the need for mitigation for those instances. The program builds upon implementation activities already identified in this GSP, including monitoring network improvements, groundwater level tracking, well registration, dry well reporting and notification systems, demand management planning, groundwater recharge projects, and coordination with agencies and organizations involved in drinking water assistance.

This MA focuses on rural residential users that rely on domestic wells for individual households, small local or small state water systems (2-15 connections) and may have limited ability to respond to declining groundwater levels. Mitigation measures may include short-term emergency assistance, intermediate-term solutions, and permanent measures, depending on the nature and severity of the groundwater conditions. It will be developed to complement existing support programs, such as the SWRCB Safe and Affordable Funding for Equity and Resilience (SAFER) program and County of Monterey Drought Resilience Plan, and avoid SMC undesirable results.

Potential mitigation measures may include:

- Providing temporary water supplies, such as bottled water or water storage tanks.
- Facilitating water hauling services.
- Lowering well pumps, where appropriate.
- Assessing opportunities to connect affected users to a nearby public water system or consolidate with other water systems, where feasible.
- Installing point-of-entry or point-of-use treatment systems if needed to address water quality concerns associated with groundwater conditions.

- Coordinating with local, state, federal, and nonprofit assistance programs that provide drinking water support.
- Providing technical assistance to affected well owners, including support for deepening, modifying, repairing, or replacing existing domestic wells, where no alternative supplies are available and these types of well improvements are determined to be necessary appropriate.

SVBGSA will coordinate with the County of Monterey, water system operators, nonprofit organizations, and other partners to leverage existing programs and funding sources whenever possible before developing new mitigation mechanisms.

9.6.3.1 Relevant Measurable Objectives

The main measurable objectives benefiting from the Rural Residential Well Mitigation Program include:

- **Groundwater level measurable objective.** The program provides a mechanism to address impacts to rural residential users if groundwater level declines are affecting domestic well reliability. It is not intended to raise groundwater levels to measurable objectives, but rather to mitigate the effects of low groundwater levels.
- **Groundwater quality measurable objective.** The program provides a mechanism to address drinking water quality concerns if groundwater quality undesirable results affect domestic well water quality. It is not intended to improve groundwater quality, but rather to help mitigate negative effects on rural residential users.

9.6.3.2 Expected Benefits and Evaluation of Benefits

The primary benefit of this management action is maintaining access to drinking water for rural residential users while longer-term groundwater sustainability PMAs are implemented.

This management action does not directly improve groundwater elevations, seawater intrusion, groundwater quality, or land subsidence. Instead, it mitigates impacts that may occur if groundwater conditions affect domestic water supplies before sustainability goals are achieved.

Program effectiveness will be evaluated through:

- GMP tracking of reported dry or impaired domestic wells.
- Monitoring the number and type of mitigation actions implemented.
- Evaluating response times for addressing reported impacts.
- Reviewing trends in domestic well impacts relative to groundwater conditions.

Monitoring information described in Chapter 7, together with information collected through the Dry Well Notification System and outreach to well owners, will be used to evaluate program performance.

9.6.3.3 Circumstances for Implementation

Rural Residential Well Mitigation is a contingency PMA. SVBGSA will consider implementing it if monitoring, reporting, and/or investigation indicate that groundwater conditions associated with failing to avoid undesirable results are affecting rural drinking water users. Initial program development steps will be undertaken in this next phase of GSP development, and prioritized for implementation when and where conditions warrant it.

Indicators for the need for mitigation may include:

- Documented loss of domestic well production.
- Significant reduction in domestic well yield that affects household water access
- Water quality degradation that is directly attributable to extraction or a GSA action that limits the usability of a domestic well
- Other impacts identified through monitoring, reporting, or site-specific investigation

Before implementing mitigation measures, SVBGSA will evaluate available information to determine whether the impact is reasonably related to groundwater conditions that the GSP is intended to address and has occurred post-2015.

9.6.3.4 Permitting and Regulatory Process

Development of the Well Mitigation Program does not require permits. Individual mitigation actions may require permits or approvals depending on the measure selected. For example, domestic well replacement or modification may require Monterey County well permits. Connections to existing water systems would be subject to the requirements of the receiving water system and applicable regulatory agencies.

9.6.3.5 Implementation Schedule

Development of the Rural Residential Well Mitigation Program will take 2 to 3 years. Key steps include:

- Conducting initial feasibility and a high-level cost estimate.
- Establishing coordination protocols with partner agencies and organizations.
- Developing program criteria and response procedures.
- Identifying available funding sources and assistance programs.
- Developing procedures for evaluating reported impacts.
- Implementing mitigation measures as needed.

The Program will be refined as needed throughout GSP implementation.

9.6.3.6 Legal Authority

Legal authority for GSA to implement PMAs is guided by CWC Chapter 5, which identifies the powers and authorities of GSAs. CWC §10725.2 provides the GSA with the powers and authorities to "perform any act necessary or proper" to implement SGMA regulations and allows the GSA to adopt rules, regulations, ordinances, and resolutions necessary for SGMA implementation. The Joint Exercise of Powers Agreement establishing the SVBGSA includes powers to establish and administer projects and programs for the benefit of the Basin [Subbasin].

The Well Mitigation Program will be implemented in coordination with agencies and organizations that have additional authorities and responsibilities related to drinking water supplies and domestic wells. Actions involving well construction, repair, or replacement will be performed in accordance with applicable state and local requirements.

9.6.3.7 Estimated Cost

Costs will depend on the number and severity of domestic well impacts and the mitigation measures implemented.

Initial program development costs are anticipated to be relatively low and primarily associated with program administration, coordination, outreach, planning and evaluation. Costs will vary substantially depending on whether assistance involves temporary water supplies, technical assistance, water system connections, or other measures.

Funding strategies will be evaluated during program development and may include coordination with existing local, state, federal, or third-party funding sources.

9.6.3.8 Public Noticing

As part of the approval of the Rural Residential Well Mitigation program, a public notice process will be necessary to ensure that all groundwater users and other stakeholders have the opportunity to comment. Development of the Rural Residential Well Mitigation program will occur at public meetings of the SVBGSA Board and committees, and public noticing will be conducted in accordance with the Brown Act. SVBGSA will share information about the project and opportunities to comment on its website and in newsletters. Stakeholder engagement will occur throughout the process and will include public workshops, Advisory Committee or subbasin committee meetings, meetings with affected water systems, agricultural representatives, and other interested parties.

The general steps in the public notice process will include GSA staff bringing the proposed program to the SVBGSA Board in a publicly noticed meeting. This will include an estimated cost and schedule for implementation. The SVBGSA Board will notify stakeholders in the subbasin or area of the proposed program and allow at least 30 days for public input to the SVBGSA Board. After the 30-day public review period, the SVBGSA Board will vote whether to approve the implementation of the management action and notify the public if approved via announcement on the SVBGSA website and mailing lists.

Once developed, SVBGSA will conduct ongoing outreach regarding the Rural Residential Well Mitigation Program through its website, mailing lists, stakeholder meetings, and coordination with local agencies and community organizations. Information on program eligibility, reporting procedures, available assistance, and program updates will be made publicly available. Annual reporting on program implementation will be incorporated into GSP implementation and adaptive management activities, as appropriate.

9.6.4 C4 – Small-Scale Aquifer Recharge and Watershed Restoration Program

The Small-Scale Aquifer Recharge and Watershed Restoration Program consolidates several projects included in the original GSP under a broader program to enhance aquifer recharge. These projects were referred to in the original GSP as C2 – Check Dams, C3 – Recharge Basins from Surface Water Diversion, and C6 – Decentralized Stormwater Recharge Projects. In addition to these direct recharge mechanisms, this program adds nature-based watershed and natural drainage restoration projects to support recharge.

This program will identify, evaluate, and implement small-scale aquifer recharge projects to increase groundwater replenishment, improve watershed function, and support long-term groundwater sustainability. The program will begin with a mapping exercise in the Corral area to identify suitable recharge locations based on soil permeability, geology, groundwater conditions, topography, surface water availability, existing drainage patterns, and land use. Considering the project concepts identified in the original GSP, this assessment will further determine the feasibility of opportunity sites for project-level design and implementation. The program should consider projects should consider the extent to which a continuous saturated zone exists from the surface to the water table that would facilitate recharge of the principal aquifer.

The program will support a range of small-scale infrastructure and nature-based projects designed to capture, slow, infiltrate, and store surface water and stormwater. Implementation will involve coordination with landowners, local agencies, and other interested parties to identify project opportunities and partnerships. Priority projects will undergo site-specific feasibility assessments, including hydrogeologic investigations, evaluation of available water supplies, water right requirements, preliminary engineering, environmental review, permitting, and cost estimates. Projects will be advanced through design and construction as funding becomes available.

The program will emphasize cost-effective, distributed recharge opportunities that can be implemented incrementally and provide cumulative benefits across the watershed. Where feasible and applicable, projects will incorporate monitoring to evaluate recharge performance, groundwater benefits, and watershed improvements. In addition to increasing groundwater recharge, the program may provide multiple benefits, including reduced flooding and erosion, improved habitat, enhanced water quality, and increased resilience to drought and climate variability.

Check Dams

The original GSP included the project C2 – Check Dams. Check dams are relatively small, sometimes temporary dams constructed across streams or rivers to reduce or slow flow. Especially when streambeds have high recharge potential, check dams can increase recharge by holding back water while infiltration occurs, rather than running off in the stream. Most streams in the Corral de Tierra Area are intermittent, flowing less than 25% of the year as a result of seasonal rainfall, generally high infiltration rates and low precipitation rates. Check dams will slow this flow down in order to facilitate the additional infiltration of water and increase recharge to the principal aquifer.

Two potential sites for this project were identified downstream of the confluence of Watson Creek and Calera Canyon. The headwaters of Watson Creek at this location are part of a subwatershed that is approximately 20.5 square miles; this subwatershed is part of the larger El Toro Creek Subwatershed, which drains north to the Salinas River. The 2-year return interval flow rate at Watson Creek is approximately 218 cubic feet per second (cfs) based on the flow gage measurements from the USGS gauge that collected data through 2006 (USGS, 2012). The runoff volume for a 2-year, 24-hour rainfall event is estimated to be approximately 250 AF.

These potential sites require further feasibility study, building on the project concept described in the original GSP and evaluating whether other types of check dams that may be more cost-effective, such as gabions. Alternative sites could be identified during GSP implementation. This project assumes acquiring ten acres of land for construction of the check dam structure and associated control facilities. The check dam concept is to detain low stream flows and create a detention volume of approximately 3 AF when runoff is present.

The benefit of this project is dependent on the recharge rate from the creek bed into the underlying aquifers. There is hydraulic connectivity between the alluvial sediments in the stream beds and the underlying El Toro Primary Aquifer System. However, the extent of this connectivity needs to be quantified considering the presence of clay deposits in the subsurface.

Recharge Basins from Surface Water Diversions

The original GSP included project C3 – Recharge Basins from Surface Water Diversions. Surface water in the El Toro Creek watershed can be diverted from the small tributaries, and rerouted to recharge basins to enhance storage, infiltration, and recharge opportunities in this management area. While many of the streambeds have high recharge potential, the topographic relief of the many canyons is too steep and flow in these smaller streams is too intermitted to allow for more storage or recharge. Diverting runoff from these smaller tributaries to recharge basins may allow for increased recharge of the principal aquifer system by increasing the time the water is in contact with permeable sediments in a more stable location.

The original GSP identified four potential locations for recharge basins. El Toro Lake was selected for the development of the cost analysis; however, the other locations, as well as additional locations not yet identified, remain viable options for this project. This project diverts water from Watson Creek downstream of its confluence with Calera Canyon and conveys it to a recharge

basin located at El Toro Lake. These potential sites require further feasibility study, beginning with project concepts in the original GSP.

Decentralized Stormwater Recharge Projects

The original GSP included C6 – Decentralized Stormwater Recharge Projects to promote the installation of stormwater collection features in neighborhood locations downstream of typical flooding spots for the purpose of groundwater recharge. These projects are typically larger than the household-scale projects and have greater potential for the water to reach the local principal aquifers because as more water is captured, larger basins are more able to harness the power of gravity to saturate the subsurface all the way to the aquifer. Secondary benefits are potential improvements to surface water quality and flood hazard mitigation.

Following the recharge suitability analysis, SVBGSA will engage in outreach, identify opportunities for neighborhood-scale stormwater routing and collection features such as bioswales, small surface recharge basins, drywells, or other specific capture structures for enhanced infiltration and recharge purposes. This water can also be captured and used for irrigation in lieu of groundwater. Decentralized stormwater recharge projects may require additional infrastructure and/or maintenance costs.

Watershed and Natural Drainage Restoration

This program will also include Watershed and Natural Drainage Restoration projects that restore natural watershed functions, improve groundwater recharge, and reduce stormwater runoff and erosion. Potential projects include stream channel and floodplain restoration, restoration of natural drainage features, erosion control, vegetation management, and other nature-based improvements that slow surface water flows, increase infiltration, and enhance groundwater replenishment. These projects may also provide multiple benefits, including improved water quality, reduced flood risks, enhanced habitat, and increased watershed resilience.

The program will prioritize restoration opportunities based on watershed conditions, groundwater recharge potential, feasibility, and opportunities for collaboration with landowners and partner agencies. Activities will include site assessments, project planning and design, environmental review, permitting, construction, and monitoring to evaluate project effectiveness. Projects will be implemented incrementally as funding and partnerships become available.

9.6.4.1 Relevant Measurable Objectives

The measurable objectives benefiting from small-scale aquifer recharge projects include:

- **Groundwater elevation measurable objective** - By slowing stormwater and runoff in designated areas , there will be more water added to the principal aquifer. This water will be slowed down and allowed to infiltrate, which has the effect of addition water to the aquifer. Adding water into the principal aquifer will raise groundwater elevations over time.

- **Groundwater storage measurable objective** - Furthermore, adding water to the principal aquifer will ultimately have the effect of increasing groundwater in storage. Groundwater storage is also calculated from measured groundwater elevations. By raising groundwater elevations, the calculation of change in storage will be less negative, or even positive over time.

9.6.4.2 Expected Benefits and Evaluation of Benefits

The Corral de Tierra Area covers approximately 11,500 acres, with multiple small drainages interspersed throughout. The number of small drainages is unknown; however, if 1% of the acreage of the management area is utilized for stormwater capture, that would allow for 115 acres receiving roughly 19 inches of precipitation annually to generate 182 AFY of stormwater runoff to be routed and captured, assuming the applications are large enough to capture all stormwater during rain events. In the original GSP, the estimated benefit from check dams was estimatedto be 150 AFY. It estimated the benefits from surface diversions projects at 250 AFY.

Benefits will be measured using the monitoring networks described in Chapter 7. Groundwater elevations will be measured with a network of wells that is monitored by MCWRA. Various volumetric measurement methods may be installed with this facility to assist in calculating increases in groundwater storage.

9.6.4.3 Circumstances for Implementation

The aquifer recharge suitability analysis is a key first step in the next phase of GSP implementation to develop this program. This mapping exercise will further assess hydrogeologic conditions, including areas with permeable soils, suitable underlying aquifers, and sufficient infiltration capacity to provide meaningful groundwater recharge benefits. Specific projects or opportunity sites will require further feasibility studies, followed by pre-project development including design, environmental review and permitting. Projects will be implemented if determined to be necessary to reach or maintain sustainability.

Opportunities for multiple benefits may be prioritized, for example projects that combine groundwater recharge with habitat restoration, improved water quality, erosion reduction, and climate resilience. Other circumstances for implementation include securing project locations where willing landowners, public agencies, or watershed organizations can facilitate project implementation and long-term maintenance. The availability of funding and opportunities to leverage grants, mitigation funding, or partnerships to implement cost-effective restoration projects are also factors.

A number of agreements and rights must be secured before the project is implemented. In particular, access agreements and surface water rights will be pivotal to the project implementation, as detailed below. A more formal cost/benefit analysis must be completed to determine whether individual projects will provide quantifiable benefits to the principal aquifer. Site specific analyses will help determine the potential recharge benefit.

Decentralized stormwater recharge projects can be initiated at any time. Agencies and organizations in the region are already engaged in efforts to promote stormwater recharge, and their efforts could be leveraged.

9.6.4.4 Permitting and Regulatory Process

Individual projects under this program may require a CEQA review process and may require an EIR or a Mitigated Negative Declaration (the review could also result in a Negative Declaration or Notice of Exemption). Additionally, permits from a variety of state and federal agencies may be necessary, and any project that coordinates with federal facilities or agencies may require NEPA documentation.

There may be a number of local, county, and state permits, rights of way, and easements required depending on the type of project. Permit requirements from the following government organizations that may be required for small scale aquifer recharge projects include:

- ***United States Fish and Wildlife Service*** – These types of projects may require consultation with USFWS in compliance with Section 7 of the Endangered Species Act.
- ***United States Army Corps of Engineers (USACE) –*** – A Regional General Permit may be required if there are impacts to wetlands or connections to waters of the United States..
- ***State Water Resources Control Board*** – Construction that disturbs one acre or more of land and that discharges stormwater requires a General Construction Stormwater Permit (Water Quality Order No. 2009-0009-DWQ). Water quality certification may be required by Section 401 of the Clean Water Act and by the Porter-Cologne Water Quality Control Act (CWC §13000 et seq.). Diversion and use require an appropriative water right permit per Water Code §1200 et seq.
- ***California Department of Fish and Wildlife*** – Projects that may result in the taking of a threatened or endangered species require an Incidental Take Permit (California Endangered Species Act Title 14, §783.2). A Streambed Alteration Agreement (California Fish and Game Code Section 1602) is required if the project may substantially adversely affect fish and wildlife resources.
- ***Monterey County*** – If the project encroaches onto any county-maintained road, an Encroachment Permit (Monterey County Code [MCC] Chapter 14.04) is required from the County. Removal of 3 or fewer trees can be handled by a standalone Tree Removal Permit (Monterey County Code Chapter 16.60). Removal of more than 3 trees should be included in a County Use Permit and/or Coastal Development Permit.
- ***Monterey County Department of Planning and Building Services*** – These projects may require a Use Permit (MCC Chapter 21.72 Title 21). A Grading Permit (Monterey County Code Chapter 16.08) is required if total disturbance onsite equals or exceeds 100 cubic yards. An erosion control plan (Monterey County Code Chapter 16.12) is required if there is risk of accelerated (human-induced) erosion that could lead to degradation of water

quality, loss of fish habitat, damage to property, loss of topsoil or vegetation cover, disruption of water supply, or increased danger from flooding.

- ***Landowners*** –Land lease/sale, easements, and/or encroachment agreements may be required.

9.6.4.5 Implementation Schedule

Development of the Small-Scale Aquifer Recharge and Watershed Restoration Program will follow the implementation schedule presented on Figure 9-5. The schedule may vary depending on the type of project implemented.

Task Description	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Aquifer recharge suitability and mapping analysis							
Studies/preliminary engineering analysis							
Design, environmental Review and Permitting							
Agreements/ROW							
Bid/Construct/Start up							
Operations and maintenance							

Figure 9-5 Implementation Schedule for Small Scale Aquifer Recharge Program

9.6.4.6 Legal Authority

Pursuant to CWC sections 10726.2 (a) and (b), the SVBGSA has the right to acquire and hold real property, and to divert and store water once it has acquired any necessary real property or appropriative water rights. Some rights in real property (whether fee title, easement, license, leasehold or other) may be required to implement a recharge project. A diversion permit or a SWRCB 5-year temporary permit is required for the authority to divert water.

A permit to appropriate water may not needed to infiltrate stormwater if constructed on a parcel without a USGS blue line stream. If a blue line stream crosses the parcel, SVBGSA will evaluate whether a permit is needed. SVBGSA recognizes that this process takes several years to complete. If a permit is needed, SVBGSA will pursue a SWRCB 5-year temporary permit under the Streamlined Permit Process while it applies for the diversion permit.

9.6.4.7 Estimated Cost

The program development costs are estimated at $200,000-$250,000 for the aquifer recharge suitability and mapping analysis, strategic outreach, site assessments and analysis of recharge potential. The original GSP estimated capital costs for check dams at $5,143,000. Assuming a yield of 150 AFY, the unit cost for water stored is estimated at $2,830/AFY. The original GSP estimated capital costs for creek diversions at $5,477,000. Assuming a yield of 250 AFY, based on

operation 40 days of the year the unit cost for water stored is estimated at $1,800/AFY. The construction cost for the decentralized stormwater recharge projects is unable to be estimated until specific projects are scoped. The costs and benefits of these projects will be further evaluated during program development.

9.6.4.8 Public Noticing

During program development, SVBGSA will maintain proactive stakeholder engagement at public meetings of the SVBGSA Board and committees, and public notice will be conducted in accordance with the Brown Act. SVBGSA will share information about the program and opportunities to comment on its website and in newsletters and will maintain an interested parties list for electronic notification about the project.

If specific projects identified through the program are prioritized for further development, public notice will be necessary to ensure that all groundwater users and other stakeholders have the opportunity to comment on the project during its development. Project level environmental review will follow the public noticing requirements of CEQA or NEPA. Additional public notice may be required to obtain permits or project approval, pursuant to the regulatory requirements of the permitting agency.

Depending on the funding strategy, SVBGSA will also provide public notices that may be required to obtain external (grant) funding or to establish new local funding or revenue mechanisms to implement the project, with adequate time and opportunity for public comment.

9.6.5 C5 – Wastewater Recycling for Indirect Potable Use

This project would reclaim up to 232 AFY of treated wastewater at tertiary levels for beneficial reuse within the Corral de Tierra Planning Area. Wastewater flow volumes totaling 232 AFY from the California Utility Service (CUS) wastewater treatment plant that serves the Toro Park and adjacent subdivisions. This wastewater could be recycled for non-potable uses.

An estimated annual demand of 168.5 AFY from the local golf course and 23.3 AFY from area parks, amount to an approximate total demand of 192 AFY This assumes the golf course's full demand would be utilized by recycled water, which may be an over assumption as golf courses may not utilize recycled water to irrigate their greens. An additional 40 AFY to 80 AFY of demand will need to be identified to completely allocate the treated wastewater for beneficial reuse; there may be additional demand within the community's landscaped open spaces found in the public right of way, private developments, or schools not considered at this time. However, this project assumes the project benefit is equivalent to the entire 232 AFY.

The project assumes construction of a tertiary filtration and disinfection system at the CUS-owned wastewater treatment plant (WWTP). The plant is rated for a design flow of 0.30 MGD and sends its secondary-treated effluent to approximately 112 acres for disposal.

This is a contingency project that requires further feasibility analysis based on the project concept developed in the original GSP.

9.6.5.1 Relevant Measurable Objectives

The measurable objectives benefiting from recycled water include:

- **Groundwater elevation measurable objective -** By using recycled water instead of pumping groundwater, there will be more water maintained in the principal aquifer. This has the effect of adding water to the principal aquifer. Adding water into the principal aquifer will either raise groundwater elevations or reduce the rate of groundwater elevation decline. Furthermore, using recycled water instead of pumped groundwater passively increases the groundwater elevations by not diminishing them.
- **Groundwater storage measurable objective -** Furthermore, adding water to the principal aquifer will ultimately have the effect of increasing groundwater in storage. Groundwater storage is also calculated from measured groundwater elevations. By raising groundwater elevations, the calculation of change in storage will be positive.

9.6.5.2 Expected Benefits and Evaluation of Benefits

The primary benefit from this project is increased groundwater elevations and storage that results from reduced groundwater extraction. The existing treatment plant will produce approximately 232 AFY of tertiary recycled water for distribution, and therefore, up to that amount of reduced groundwater extraction may be reduced assuming the timing of water delivery aligned with irrigation needs. The exact location of groundwater elevation impacts would depend on where current extraction is reduced, which would need to be determined during the project design phase.

Benefits will be measured using the monitoring networks described in Chapter 7. Groundwater elevations will be measured with a network of wells that is monitored by MCWRA. Land subsidence will be measured using InSAR data provided by the Department of Water Resources. Seawater intrusion will be measured using select Representative Monitoring Sites wells.

9.6.5.3 Circumstances for Implementation

The Toro WWTP project is a contingency project that will be further evaluated and developed if it is determined to be necessary to reach or maintain sustainability. This project would retrofit existing facilities for treatment and reuse, and proposed pipelines would largely remain in the public right of way. The associated environmental permitting costs for this project may be lower than those for other projects. Further feasibility analysis, design, permitting and CEQA environmental review, and recycled water recipients identified before this project will be considered for implementation.

9.6.5.4 Permitting and Regulatory Process

This project will require a CEQA review and may require an EIR or a Mitigated Negative Declaration (the review could also result in a Negative Declaration or Notice of Exemption).

Additionally, permits from a variety of state and federal agencies may be necessary, and any project that coordinates with federal facilities or agencies may require NEPA documentation.

In addition, permits from the following government organizations that may be required for the recycled water project include but may not be limited to:

- ***State Water Resources Control Board*** – A permit to operate a public water system is required from SWRCB's Division of Drinking Water. Construction that disturbs one acre or more of land and that discharges stormwater requires a General Construction Stormwater Permit (Water Quality Order No. 2009-0009-DWQ).
- ***California Department of Fish and Wildlife*** – Projects that may result in the taking of a threatened or endangered species require an Incidental Take Permit (California Endangered Species Act Title 14, §783.2).
- ***California Department of Transportation (Caltrans)*** – Work that may obstruct a State highway requires an Encroachment Permit.
- ***California Public Utilities Commission*** – A Certificate of Public Convenience and Necessity (California Public Utilities Code §1001 et seq.) is required to show that the project will benefit society.
- ***Monterey County*** – If the project encroaches onto any county-maintained road, an Encroachment Permit (Monterey County Code Chapter 14.04) is required from the County. Removal of 3 or fewer trees can be handled by a standalone Tree Removal Permit (Monterey County Code Chapter 16.60). Removal of more than 3 trees should be included in a Use Permit (see Monterey County Department of Planning and Building Services).
- ***Monterey County Health Department*** – If there will be 55 gallons (liquid), 500 pounds (solid), or 200 cubic feet (compressed gas) of hazardous materials onsite at any one time, a Hazardous Materials Business Plan and a Hazardous Materials Inventory Statement (California Health and Safety Code Chapter 6.95) must be submitted to the Monterey County Health Department's Environmental Health Bureau.
- ***Monterey County Department of Planning and Building Services*** – This project will require a Use Permit (MCC Chapter 21.72 Title 21). A Grading Permit (Monterey County Code Chapter 16.08) is required if total disturbance onsite equals or exceeds 100 cubic yards. An erosion control plan (Monterey County Code Chapter 16.12) is required if there is risk of accelerated (human-induced) erosion that could lead to degradation of water quality, loss of fish habitat, damage to property, loss of topsoil or vegetation cover, disruption of water supply, or increased danger from flooding.
- ***Monterey Bay Air Resources District (MBARD)*** – If the project may release or control air pollutants, an Authority to Construct and Permit to Operate is required (MBARD Rule 200).

- ***Transportation Agency for Monterey County*** – An easement for access to and use of the project site may need to be negotiated with Transportation Agency for Monterey County (TAMC).
- ***Local jurisdictions*** – Permits may also be required by a local jurisdiction depending on location of scalping plant, including but not limited to: land use permits, building permits, public health permits, public works permits, tree removal permits, and encroachment permits.

9.6.5.5 Implementation Schedule

If selected, the schedule will take up at least 5 years to design, permit, and construct the project.

9.6.5.6 Legal Authority

The SVBGSA will use the legal authority and partnerships for this modified project contained in existing distribution, irrigation, and partnership programs. CWC §10726.2 provides GSAs the authority to purchase, among other things, land, water rights, and privileges. This project would be developed in accordance with all applicable groundwater laws and respect all groundwater rights. Section 10726.2 (b) of the CWC provides GSAs the authority to, "Appropriate and acquire surface water or groundwater and surface water or groundwater rights, import surface water or groundwater into the agency, and conserve and store within or outside the agency" (CWC §10726.2(b)).

The subdivisions served by this facility are part of a County Service Area. County also has the power to impose charges on a parcel or acreage basis under the County Service Area provisions of the Government Code (beginning with Section 25210). These provisions give the County the authority to provide extended services within a specified area, which may be countywide, and to fix and collect charges for such extended services. Miscellaneous extended service for which county service areas can be established include "water service, including the acquisition, construction, operation, replacement, maintenance, and repair of water supply and distribution systems, including land, easements, rights-of-way, and water rights."

9.6.5.7 Estimated Cost

In the original GSP, capital costs were estimated at $28,635,000. On an annualized basis, assuming a 6% discount rate, and 25-year term, this amounts to $2,240,100. Including an annual O&M cost of $486,000 generates a total annualized cost of $2,726,100. Assuming a yield of 232 AFY, the unit cost for water delivered is estimated at $11,750/AF.

These costs do not include the wastewater collection system or the distribution system for treated water to be delivered.

9.6.5.8 Public Noticing

If this contingency project is prioritized for further development, public notice will be necessary to ensure that all groundwater users and other stakeholders have the opportunity to comment

on the project during its development. SVBGSA will maintain proactive stakeholder engagement at public meetings of the SVBGSA Board and committees on the project, and public notice will be conducted in accordance with the Brown Act. SVBGSA will share information about the project and opportunities to comment on its website and in newsletters and will maintain an interested parties list for electronic notification about the project.

Environmental review will follow the public noticing requirements of CEQA or NEPA. Additional public notice may be required to obtain permits or project approval, pursuant to the regulatory requirements of the permitting agency.

Depending on the funding strategy, SVBGSA will also provide public notices that may be required to obtain external (grant) funding or to establish new local funding or revenue mechanisms to implement the project, with adequate time and opportunity for public comment.

9.6.6 C6 – Decentralized Residential In-Lieu Recharge Projects

This project is a set of initiatives that incentivize homeowners to install decentralized in lieu recharge projects, such as rainwater harvesting, graywater reuse, and recharge features on their properties. Harvested rainwater can be used for residential landscaping and domestic animal water purposes and reduce groundwater pumping, thereby functioning as in-lieu recharge. The two main types of in-lieu recharge are rooftop rainwater harvesting and graywater reuse. Decentralized rainwater capture at the residential scale, or graywater use from a laundry-to-landscape system, can assist property owners with outdoor landscaping watering needs, which is typically a significant portion of an individual household's water use. By substituting rainwater or graywater for outdoor irrigation, less groundwater will be pumped and the Corral de Tierra Area benefits from in-lieu recharge. Water used for landscaping is mostly lost to evapotranspiration and is not available to be returned to the groundwater system. Alternatively, rain gardens can be designed to capture rainwater.

This project will engage property owners through outreach, help identify opportunities for residential-scale rainwater harvesting or graywater reuse systems. This project primarily includes workshops to do outreach and education for homeowners, but could also help install or incentivize installation in the future. For example, it could also include the development of a fund to provide financial incentives to help bring down individual costs associated with rainwater harvesting or graywater systems. This could also be expanded to include other residential-scale conservation efforts, such as xeriscaping or lawn buy-back efforts. This project could be a part of the Water Efficiency Program (WEP).

Rain Barrels and Cisterns

Residential rainwater harvesting in rain barrels or cisterns can provide water for outdoor irrigation, and offset the pumping, treatment of, and delivery of groundwater. Appropriately sized cisterns for 2,500 square foot rooftops range from approximately 600 gallons up to 5,000 gallons. Since more of the rain falls in the winter months, having enough storage to last over the summer months is an important factor in sizing cisterns for outdoor irrigation purposes. Use of rainwater for landscaping typically does not require pumping, treatment, or complex

delivery systems. Rainwater harvesting at the residential level could be further enhanced with drip-irrigation systems and timers included with the cistern installations.

Rain Gardens

Rainwater could be captured in small, residential rain gardens to enhance use of rainwater to irrigate landscapes rather than groundwater. Rain gardens are vegetated basins installed at residences to capture and detain rainfall runoff while providing an aesthetic landscaping benefit to landowners. The rain garden temporarily holds water, thereby allowing it to infiltrate the soil and provide moisture for plant roots. Rain gardens include grassed swales, rock lined swales (dry creek beds), and bioswales. Bioswales are typically sized for larger catchments than residential scale. Grassed and rock-lined swales, which are shallow channels designed to convey, filter, and infiltrate runoff, are more often used at the residential scale.

Rain gardens are installed at natural low points on the property and are typically planted with native, water-tolerant plants that are able to thrive in saturated soil conditions. They can be installed in a variety of soils, from clays to sands, but are best suited for soils with high infiltration capacities.

Graywater Systems

Graywater reuse systems can provide additional residential in-lieu water use. These systems direct gently used water from showers or laundry onto landscapes to water plants instead of extracted groundwater. For example, Laundry to Landscape systems and are often installed with dual drainage plumbing that enables the water to be directed to either the landscape or wastewater system. Monterey County has developed and approved its own set of graywater guidelines for discharging graywater onto landscapes.

9.6.6.1 Relevant Measurable Objectives

Relevant measurable objectives benefiting from this project include:

- **Groundwater elevation measurable objective** – Rainwater harvesting, rain gardens, and graywater reuse will increase rainwater used for residential irrigation in lieu of pumped groundwater, thereby decreasing groundwater extraction. By pumping less water, it has a similar effect of adding water to the principal aquifer. Adding water into the principal aquifer, it will raise groundwater elevations over time.
- **Groundwater storage measurable objective** – Adding water to the principal aquifer will ultimately have the effect of increasing groundwater in storage.

9.6.6.2 Expected Benefits and Evaluation of Benefits

The primary benefit from this project is increased use of rainwater in lieu of groundwater for residential irrigation. The Corral de Tierra Area of the Monterey Subbasin is generally characterized by low density or rural density development, covering approximately 11,500 acres with around 3,100 dwellings. A very simplified calculation of potential benefits is applied to the number of dwellings based on a satellite imagery and parcel analysis: there are roughly 2,000

square feet per rooftop receiving 19 inches of rain per year yielding approximately 225 AFY of water potentially available for capture and use. If 75 households implemented rooftop rainwater harvesting, this would yield approximately 5.3 AFY of in-lieu recharge. However, this quantity may be less if rain barrels fill up only once per year in the rainy season. Expected benefits resulting from rain garden installations would be in addition to those described above for rooftop rainwater harvesting. More detailed analyses of land cover and runoff generation are required for refining the evaluation of both rooftop rainwater harvesting systems and rain gardens. During the implementation period, these numbers will be refined that will demonstrate the variation between dry, wet, and normal years. Additionally, these numbers will be refined as more residents implement rainwater capture infrastructure over time.

Increased capture of rainwater will potentially increase groundwater elevations by reducing the amount of residential demand for water for outdoor irrigation. This in-lieu use will yield dividends over a longer period as more residents install rainwater harvesting features, and subsequently use less groundwater for landscaping purposes.

Implementing a laundry-to-landscape program has an expected annual benefit of 0.97 AFY if 75 households in the Corral de Tierra Area installed systems. This is based on an expected water availability of approximately 4,100 gallons per household per April through October season. These values come from assuming a 4-person household, a high efficiency washer that uses 15 gallons per load, and that laundry to landscape water replaces all irrigation water used. Since water for outdoor irrigation takes up a large portion of a household's water use, this would present significant in-lieu water savings during the hottest and driest months. If the laundry to landscape system was used year-round, the benefits would be higher.

Benefits will be measured using the monitoring networks described in Chapter 7. Groundwater levels will be measured with a network of wells that is monitored by MCWRA. A direct correlation between groundwater recharge and changes in groundwater levels is unlikely to be observed unless many individual projects are implemented in the same area; however, the program will ask workshop participants about the projects they have implemented and will use that information to estimate reduced extraction.

9.6.6.3 Circumstances for Implementation

Decentralized residential recharge projects can be initiated at any time. Agencies and organizations in the region are already engaged in efforts to promote rainwater harvesting, rain gardens, and graywater reuse systems, and their efforts could be leveraged to expand these projects throughout the Subbasin.

9.6.6.4 Permitting and Regulatory Process

Individuals implementing residential recharge projects are responsible for any required permitting. Due to the small-scale and decentralized nature of these projects, it is not anticipated that these projects are of a magnitude capable of having a demonstrable impact on the environment that would require a CEQA review process; however, an applicable permit process will make that determination. Larger storage tank sizes may require a permit (WAC, 2021).

For the installation of greywater systems, California Code allows for greywater use from showers, bathtubs, and washing machines, but not from kitchen sinks or dishwashers. The California Plumbing Code Chapter 15 facilitates water conservation, relieves stress on private septic systems, makes legal compliance easily achievable, and provides guidelines for avoiding potentially unhealthful conditions. The Code requires a construction permit for greywater systems that make changes to a home's drain/waste plumbing connected to clothes washers, showers, bathtubs, and bathroom sinks. The Code allows residential greywater landscape irrigation from washing machines to be installed without a construction permit if the system meets all performance guidelines in the Code. For such systems in the unincorporated area of Monterey County on properties containing wells and/or septic systems, residents should apply at the Monterey County Planning Department using the graywater permit template. Applications will be routed to the Monterey County Environmental Health Bureau's Environmental Health Review Services for review to ensure that the graywater system observes required setbacks from onsite wastewater treatment system and wells, if present. City and unincorporated County residents that do not use a well or septic system should contact their Building Department to apply for a graywater permit using the graywater permit template.

9.6.6.5 Implementation Schedule

If this project is selected, the implementation schedule is presented on Figure 9-6. It is anticipated that Phase I will take 2 years. Phase II will overlap with Phase I and take 2 years and be extendable if the project is expanded. Phase III and IV, implementation and ongoing maintenance by residents, will begin in Year 2 and continue into the future.

Task Description	Year 1	Year 2	Year 3	Years 4+
Phase I – Planning and discussions with residents				
Phase II – Education and outreach				
Phase III – Implementation by residents				
Phase IV – Ongoing maintenance by residents				

Figure 9-6 Implementation Schedule for Recharge of Rainwater Initiatives

9.6.6.6 Legal Authority

No legal authority is needed to promote decentralized residential in-lieu recharge projects.

9.6.6.7 Estimated Cost

The success of this project depends on homeowner participation. An important first step is education and outreach. The GSA will host 5 workshops on rainwater harvesting and 5 workshops on graywater reuse for a total cost of $50,000.

Construction costs will be the responsibility of the homeowners with possible incentives from the GSA. A complete rainwater harvesting system for a typical single-family home will generally cost between $4,000 and $10,000, with the largest cost being the storage tank. Many of the other

costs are the gutters, downspouts, and irrigation distribution systems. At $10,000 for a 5,000-gallon tank and respective system, that equates to an annual cost of $800 and a unit cost of $8,800/AF.

For laundry-to-landscape systems, the costs include dual drainage plumbing, labor, materials, and the irrigation distribution system. If each household system costs $2,100 and yields 4,100 gallons from April to October, this equates to an annual cost of $200 and a unit cost of $9,180/AF.

9.6.6.8 Public Noticing

If this contingency project is prioritized for further development, public notice will be necessary to ensure that all groundwater users and other stakeholders have the opportunity to comment on the project during its development. SVBGSA will maintain proactive stakeholder engagement at public meetings of the SVBGSA Board and committees on the project, and public notice will be conducted in accordance with the Brown Act. SVBGSA will maintain information about the project and opportunities to comment on its website and in newsletters and will maintain an interested parties list for electronic notification about the project.

Environmental review will follow the public noticing requirements of CEQA or NEPA. Additional public notice may be required to obtain permits or project approval, pursuant to the regulatory requirements of the permitting agency.

Depending on the funding strategy, SVBGSA will also provide public notices that may be required to obtain external (grant) funding or to establish new local funding or revenue mechanisms to implement the project, with adequate time and opportunity for public comment.

During program development, SVBGSA will maintain proactive stakeholder engagement at public meetings of the SVBGSA Board and committees, and public notice will be conducted in accordance with the Brown Act. SVBGSA will share information about the program and opportunities to comment on its website and in newsletters and will maintain an interested parties list for electronic notification about the project.

9.6.7 C7 – Increase Groundwater Production in the Upper Corral de Tierra Valley for Distribution to Lower Corral de Tierra Valley

This project undertakes additional groundwater production in the Upper Corral de Tierra Valley for distribution in the Lower Corral de Tierra Valley for supplementary water supply. Although additional sites may be identified in the future, this project is scoped for locating the extraction at the artesian well in Watson Creek, with delivery to El Toro Lake, where it can be picked up by a water system to be used in lieu of groundwater extraction or recharged. The existing artesian well supplies water to local water systems in the near vicinity, and reportedly can supply more than the existing demand. However, well yield data is not available. This project includes the construction of a new extraction well at the artesian well location and a conveyance pipeline to El Toro Lake, approximately 3.4 miles to the northwest of the site. Water systems may connect to the conveyance pipeline at El Toro Lake, or the water could be temporarily stored there and recharged, depending on the recharge potential.

Although further site scoping and project design are needed, this project would likely require a surge tank, conveyance pipeline, and connection to water systems that would treat the water prior to use. Due to artesian well conditions, a pump was excluded from the conceptual estimate. Easements may be needed to allow for the installation of the new well, construction of the conveyance pipeline, and storage or recharge site.

9.6.7.1 Relevant Measurable Objectives

The measurable objectives benefiting from outreach and education include:

- **Groundwater elevation measurable objective** - By routing excess artesian groundwater from one location to a recharge basin, there will be more water added to the El Toro Primary Aquifer System nearby areas of groundwater elevation decline. This water will be used in lieu of pumping or allowed to infiltrate at Toro Lake, both of which have the effect of adding water to the aquifer. Adding water into the principal aquifer will raise groundwater elevations over time.
- **Groundwater storage measurable objective** - Furthermore, adding water to the principal aquifer will ultimately have the effect of increasing groundwater in storage. Groundwater storage is also calculated from measured groundwater elevations. By raising groundwater elevations, the calculation of change in storage will be positive.

9.6.7.2 Expected Benefits and Evaluation of Benefits

This project would increase sustainable yield and groundwater elevations through capturing and routing excess artesian groundwater to Lower Corral de Tierra Valley. Artesian conditions occur when the pressure of groundwater is greater than the ground surface elevation, and this groundwater is allowed to easily find the surface. Utilizing excess artesian groundwater presents an opportunity to offset groundwater pumping elsewhere without negatively impacting the current demands on the artesian source. The primary benefit from this project is increased groundwater elevations and storage in the Lower Corral de Tierra Valley that results from in lieu use or increased infiltration of this excess artesian groundwater in El Toro Lake. The project benefit is anticipated to be 160 AFY.

Benefits would be measured using the monitoring networks described in Chapter 7. Groundwater elevations will be measured with a network of wells that is monitored by MCWRA. Various volumetric measurement methods may be installed with this facility to assist in calculating increases to groundwater storage.

9.6.7.3 Circumstances for Implementation

The artesian well project is a contingency project that will be further studied and implemented if is determined to be necessary to reach or maintain sustainability. A number of agreements must be secured before the project is implemented. Before further development, a more formal cost/benefit analysis must be completed to determine if the artesian well will provide

quantifiable benefits to the principal aquifer. Site specific analyses will help determine the potential recharge benefit.

9.6.7.4 Permitting and Regulatory Process

Permits from the following government organizations that may be required for this project include:

- ***United States Fish and Wildlife Service*** – The permitting process for this project may need to consult with USFWS in compliance with Section 7 of the Endangered Species Act.
- ***State Water Resources Control Board*** – A permit to operate a public water system is required from SWRCB's Division of Drinking Water (California Health and Safety Code §116525). Construction that disturbs one acre or more of land and that discharges stormwater requires a General Construction Stormwater Permit (Water Quality Order No. 2009-0009-DWQ). Diversion and use require an appropriative water right permit per Water Code §1200 et seq.
- ***Monterey County Health Department*** – Required permits may include a Well Construction Permit (Monterey County Code Chapter 15.08) and a variation on Monterey County Noise Ordinance (Monterey County Code 10.60.030).
- ***Monterey County Department of Planning and Building Services*** – This project will require a Use Permit (Monterey County Code Chapter 21.72 Title 21). A Grading Permit (Monterey County Code Chapter 16.08) is required if total disturbance onsite equals or exceeds 100 cubic yards. An erosion control plan (Monterey County Code Chapter 16.12) is required if there is risk of accelerated (human-induced) erosion that could lead to degradation of water quality, loss of fish habitat, damage to property, loss of topsoil or vegetation cover, disruption of water supply, or increased danger from flooding.
- ***Monterey County*** – If the project encroaches onto any county-maintained road, an Encroachment Permit (Monterey County Code Chapter 14.04) is required from Monterey County's Public Works & Facilities division. Removal of 3 or fewer trees can be handled by a standalone Tree Removal Permit (Monterey County Code Chapter 16.60). Removal of more than 3 trees should be included in a Use Permit (see Monterey County Department of Planning and Building Services).
- ***Monterey County Water Resource Agency (MCWRA)*** – Participation/ easements/ purchase agreements
- ***Landowners*** –Land lease/sale, easements, and/or encroachment agreements may be required.

9.6.7.5 Implementation Schedule

If selected, the artesian well project would take up to 9 years to complete the design, permitting, and construction.

9.6.7.6 Legal Authority

The SVBGSA will use the legal authority and partnerships for this modified project contained in existing distribution, irrigation, and partnership programs. CWC §10726.2 provides GSAs the authority to purchase, among other things, land, water rights, and privileges. This project would be developed in accordance with all applicable groundwater laws and respect all groundwater rights. Section 10726.2 (b) of the CWC provides GSAs the authority to, "Appropriate and acquire surface water or groundwater and surface water or groundwater rights, import surface water or groundwater into the agency, and conserve and store within or outside the agency" (CWC §10726.2(b)). Some rights in real property (whether fee title, easement, license, leasehold or other) may be required to implement the project.

9.6.7.7 Estimated Cost

In the original GSP, capital costs were estimated at $13,275,000. On an annualized basis, assuming a 6% discount rate, and 25-year term, this amounts to $1,038,500. Including an annual O&M cost of $9,000 generates a total annualized cost of $1,047,500. Assuming a yield of 160 AFY, the unit cost for water stored is estimated at $6,550/AFY.

9.6.7.8 Public Noticing

If this contingency project is prioritized for further development, public notice will be necessary to ensure that all groundwater users and other stakeholders have the opportunity to comment on the project during its development. SVBGSA will maintain proactive stakeholder engagement at public meetings of the SVBGSA Board and committees on the project, and public notice will be conducted in accordance with the Brown Act. SVBGSA will share information about the project and opportunities to comment on its website and in newsletters and will maintain an interested parties list for electronic notification about the project.

Environmental review will follow the public noticing requirements of CEQA or NEPA. Additional public notice may be required to obtain permits or project approval, pursuant to the regulatory requirements of the permitting agency.

Depending on the funding strategy, SVBGSA will also provide public notices that may be required to obtain external (grant) funding or to establish new local funding or revenue mechanisms to implement the project, with adequate time and opportunity for public comment.

10 PLAN IMPLEMENTATION

This section describes the activities that will be performed by Marina Coast Water District (MCWD) and Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA) as part of GSP implementation within the Monterey Subbasin. The chapter serves as a roadmap for activities needed to achieve sustainability by 2042 but focuses on the next 5-year implementation cycle and activities between 2027 and 2032.

Key GSP implementation activities to be undertaken by the Subbasin Groundwater Sustainability Agencies (GSAs) include:

- Refinement and implementation of PMAs;
- Development of funding mechanisms and financing plans for selected PMAs;
- Data collection, monitoring, and SGMA compliance;
    - Annual monitoring and reporting
    - Updating the Data Management System (DMS)
    - Improving monitoring networks
    - Addressing identified data gaps in the Hydrogeologic Conceptual Model (HCM)
- Coordination with interested parties and ongoing community outreach;
- General administration of the GSAs and other ongoing GSP implementation work streams.

Each of these activities is discussed in more detail below. In addition, this chapter outlines a schedule for GSP implementation, an estimate for the GSP implementation cost, and an overview of potential funding mechanisms. It also provides for adaptive management to occur throughout GSP implementation to achieve groundwater sustainability.

The implementation plan is based on the best data available as of GSP Amendment 1 regarding groundwater conditions in the Subbasin and the assessment of PMAs described in Chapter 9. This plan considers management actions defined by the MCWDGSA and SVBGSA in their respective Management Areas, as well as coordinated management of the Subbasin as a whole. The Subbasin's conditions and the details of the projects and actions will evolve over time based on future data collection, model development, policy decisions, project engineering and permit requirements, and input from interested parties and stakeholders.

GSP Amendment 1 updates implementation activities based on work completed in the first five years of GSP implementation, which was the focus of Chapter 10 in the original GSP. This update continues the Subbasin GSA's collaborative approach across multiple subbasins, describes the Valley-wide implementation pathway that will be revised as needed over time, and summarizes how the Subbasin GSAs will manage this Subbasin's groundwater sustainably. It identifies SGMA

implementation activities through the GSP planning horizon, which will be adjusted as needed to adaptively manage groundwater in the Salinas Valley.

10.1 Implementation Within Management Areas

MCWDGSA and SVBGSA are coordinating implementation of the GSP: MCWDGSA is implementing the GSP within the Marina-Ord Management Area and the SVBGSA is implementing the GSP within the Corral de Tierra Management area. These efforts may overlap with regard to regional projects and implementation actions, and in places where Management Areas are very hydrogeologically connected such as the Reservation Road portion of the Corral de Tierra Area.

10.2 Project and Management Action Implementation

To prevent potential Undesirable Results, projects and management actions are planned as part of GSP implementation. As described in Chapter 9, a portfolio of projects and management actions has been developed with the goal of proactively addressing relevant sustainability indicators. MCWDGSA will lead implementation of PMAs within the Marina-Ord Area, and SVBGSA will lead implementation of PMAs within the Corral de Tierra Area. Additionally, SVBGSA will lead the multi-subbasin implementation of the IIS to achieve and maintain groundwater sustainability across the 6 subbasins it fully or partially manages. The GSAs will continue to coordinate regarding monitoring, data collection and sharing, groundwater model development and application, and PMAs that may affect both management areas and adjacent subbasins.

10.2.1 Integrated Implementation of Multi-Subbasin PMAs

As described in Chapter 9, PMAs identified in the 180/400 GSP Amendment 2 are incorporated by reference as multi-subbasin PMAs. A subset of these PMAs is selected as part of SVBGSA's preferred IIS portfolio, which is intended to coordinate groundwater management actions across the Salinas Valley.

10.2.1.1 The SVBGSA Integrated Implementation Strategy

SVBGSA has a unique structure and approach to multi-subbasin coordination that differs from other regions in California. While the inter-subbasin agreement provisions of SGMA do not directly apply to SVBGSA's jurisdiction, SVBGSA believes establishing a collaborative framework is the appropriate approach for the Salinas Valley in Monterey County. SVBGSA remains committed to working cooperatively to achieve and maintain groundwater sustainability across the 6 subbasins it fully or partially manages. This commitment will be further reflected and advanced through the development and implementation of the IIS.

A multi-subbasin approach is necessary and appropriate for GSP implementation in the Salinas Valley due to the following factors:

- Aquifers across the 6 Salinas Valley Subbasins are hydraulically connected to varying degrees and cross subbasin boundaries.
- Low groundwater levels in the 180/400, Eastside, and Monterey Subbasins contribute to seawater intrusion.
- Salinas River connects 4 of the subbasins (180/400, Monterey, Forebay, and Upper Valley) and is the main source of groundwater recharge for the Valley.
- Nacimiento and San Antonio Reservoirs store water under MCWRA water rights, and reservoir releases provide both surface water and groundwater benefits across subbasins.
- Seawater intrusion occurs in the 180/400 Subbasin and Monterey Subbasins and threatens Eastside Subbasin if it is not halted.
- Potential costs and repercussions of failing to avoid undesirable results are of regional importance and a Countywide concern.

SVBGSA will use the IIS to manage the 6 Salinas Valley subbasins jointly. As part of the IIS, SVBGSA evaluated comprehensive portfolios of PMAs to identify the most effective and coordinated path to sustainability. The evaluation weighed various factors including technical feasibility, cost-effectiveness, stakeholder impacts, and the ability of each project or management action to contribute to meeting sustainable management criteria within SGMA-mandated deadlines. This integrated approach recognizes that sustainability cannot be achieved across the entire Salinas Valley by addressing each subbasin in isolation. A coordinated strategy spanning SVBGSA's jurisdiction is essential to long-term groundwater management success.

In 2026, a comprehensive evaluation of portfolios of PMAs resulted in identification of the most effective and coordinated path to sustainability. The process started with presenting the completed studies of individual PMAs that were components of the portfolios. The SVBGSA Advisory Committee considered proposed portfolios, provided feedback to staff, and forwarded their input to the SVBGSA Board of Directors.

On August 13, 2026, the SVBGSA Board of Directors selected a preferred IIS portfolio of PMAs to guide further development and refinement of the preferred implementation pathway. The portfolio addresses undesirable results throughout the Salinas Valley, including seawater intrusion and chronic lowering of groundwater levels in multiple subbasins. Although individual PMAs may affect specific areas, the portfolio was developed to help avoid undesirable results across the entire Salinas Valley.

Selection of a preferred portfolio identifies the long-term implementation pathway for further development and refinement but does not lock the SVBGSA into a fixed project configuration, authorize individual projects, or commit funding. Each PMA will continue to require separate planning, environmental review, permitting, financing, and future Board approvals before implementation. SVBGSA will continue to refine projects, evaluate alternatives, and revise the preferred portfolio as needed during GSP implementation.

Other PMAs identified in Chapter 9 of the 180/400 GSP Amendment 2 are contigency projects that may be implemented if a component of the selected portfolio proves infeasible or if further analysis indicates an alternative approach would better achieve GSA objectives, including meeting GSP goals, maintaining affordability, and addressing other key considerations. In addition, Chapter 9 of the 180/400 GSP Amendment 2 includes ongoing and as-needed contingency PMAs that are necessary to prevent worsening conditions, improve groundwater conditions beyond minimum thresholds, advance progress toward measurable objectives, and address specific local issues. Together, these actions support ongoing assessment and adaptive management throughout GSP implementation.

PMAs in the preferred IIS portfolio include the following:

- Demand Management – Deep Aquifers Allocations / Pumping Limits
- Seawater Intrusion Response Plan
- Demand Management – 10% Agricultural Pumping Reduction
- Demand Management – Rural Residential Water Efficiency Programs
- Castroville Seawater Intrusion Project Optimization
- Brackish Groundwater Restoration Project (Small)
- Eastside Recharge Basins (100 cfs diversion)

These PMAs constitute the core actions that will avoid SGMA undesirable results within SVBGSA's jurisdiction.

10.2.1.2 Anticipated Effects of the Preferred IIS Portfolio

Figure 10-1 shows the modeled extent of seawater intrusion in the coastal Salinas Valley in 2040 following full implementation of the preferred IIS portfolio. As discussed in Chapter 10 of the 180/400 GSP Amendment 2, modeling results indicates that the IIS preferred portfolio comes close to meeting the 180/400 Subbasin seawater intrusion minimum threshold by 2040. Within the Monterey Subbasin, these results show that extent of seawater intrusion was reduced in some areas but was drawn farther inland in other areas.

The IIS portfolio includes BGRP as the primary regional project to mitigate inland migration of seawater intrusion. This project includes extracting brackish groundwater near the coast to form a hydraulic barrier and reduce inland seawater intrusion migration, injection of a portion or all of the treated water inland of the seawater intruded area, and opportunity for direct delivery of treated water. Depending on its final design and operation, the project is anticipated to lower groundwater elevations in the vicinity of the extraction wells. Although those effects may contribute to seawater intrusion control within the project area, they could affect groundwater elevations, groundwater gradients, and seawater intrusion conditions in areas outside the project extent, including the Monterey Subbasin. SVBGSA and MCWDGSA intend to coordinate on regional projects, as noted throughout the document. Accordingly, during the next phase of

project design and environmental review, both alternative projects, such as seawater desalination, as well as potential affects on the ability of portions of the Monterey Subbasin to meet groundwater level SMCs or an increase seawater intrusion risk south of the project's extent will need to be evaluated in greater depth and project refinements made as needed.

SVBGSA anticipates that further refinement of the preferred portfolio will be sufficient to avoid undesirable results in the 180/400 Subbasin and adjacent subbasins. Modeling was completed with SWIM v3 and will be further refined using SWIM v4 and any future versions of the model. Further refinement of BGRP will be needed to adjust injection and extraction locations and rates to address seawater intrusion on the edges of the minimum threshold isocontour. The Seawater Intrusion Response Plan (SIRP) will assess near-term risk or impact from seawater intrusion on beneficial uses and users in this vicinity. The effects of multi-subbasin PMAs and the preferred IIS portfolio on the Monterey Subbasin will ultimately depend on the PMAs implemented and their location, design, scale, operating conditions, and interaction with local Monterey Subbasin PMAs. The GSAs will evaluate those potential effects as the PMAs and the IIS portfolio are refined.

10.2.1.3 Coordination and Responsibilities

SVBGSA will continue to refine the scale, location, design, and implementation details of the multi-subbasin PMAs. A funding strategy will be developed and applied for individual projects in the IIS portfolio. As part of upcoming phased implementation, additional investigations, field and pilot testing, environmental review, permitting, and design activities, SVBGSA will continue improving its understanding of projects and management action design and implementation and modify them appropriately. Furthermore, additional analysis may provide opportunities for better PMA integration and cost savings. SVBGSA is committed to adaptive management, modifying the approach to sustainability as additional data and analyses become available.

Modeling of the portfolio's effects on groundwater conditions include assumptions based on the continuation of current conditions, including existing land use patterns, reservoir operations, and climate conditions. Changes to any of these factors could affect the ability of the Salinas Valley to achieve and maintain sustainable groundwater management and will continue to be evaluated as PMAs are developed. Contingency PMAs may be considered as needed, drawing from a range of options identified in Chapter 9 of the 180/400 GSP Amendment 2.

Funding for PMAs can follow multiple cost allocation approaches. These could be based on physical benefits, proportional contribution to the problem being assessed, joint and separable costs associated with each project component, or a negotiated allocation.

MCWDGSA continues SVBGSA's implementation activities by providing input on the development and refinement of PMAs, participating in modeling and technical evaluations, and evaluating potential PMA effects from the perspective of the Monterey Subbasin. MCWDGSA has substantially supported construction and calibration of regional groundwater modeling tools and will continue to participate in modeling efforts used to evaluate the potential effects of multi-subbasin PMAs on Monterey Subbasin groundwater conditions and SMCs.

MCWDGSA retains responsibility for independent decisions regarding implementation of this GSP and PMAs needed to achieve sustainability in the Marina-Ord Area. Incorporation of 180/400 PMAs by reference does not constitute adoption of a final multi-subbasin project configuration, commitment of MCWDGSA funding, or acceptance of adverse effects on the Monterey Subbasin. Any future participation by MCWDGSA in a multi-subbasin PMA will be considered separately based on the project's anticipated effects on the Monterey Subbasin, implementation requirements, and funding.

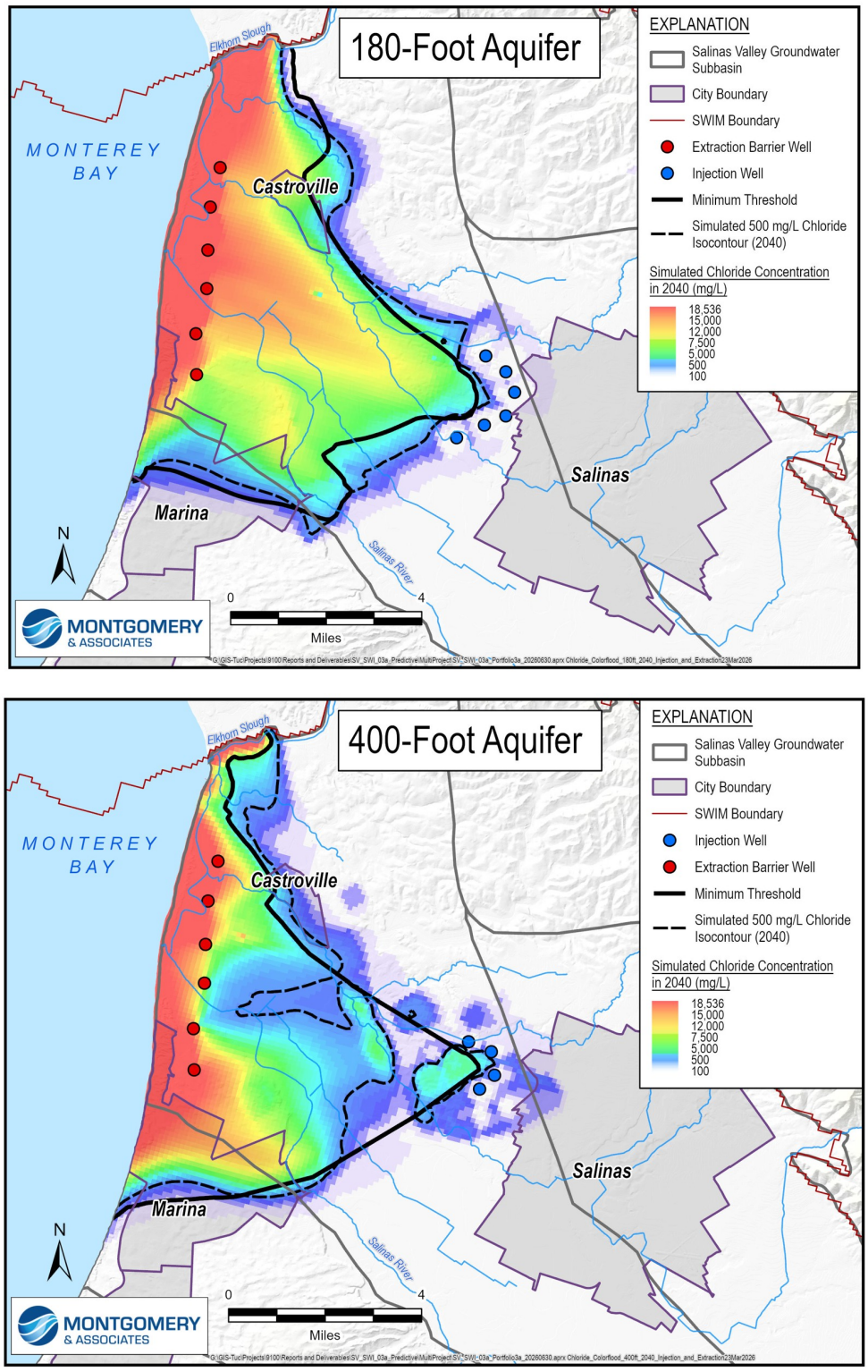


Figure 10-1 IIS Portfolio Seawater Intrusion Results for 180-Foot and 400-Foot Aquifers

10.2.2 Marina-Ord Area Projects and Management Actions

Two local ongoing management actions within the Marina-Ord Area will continue to be implemented after GSP submittal. These management actions include M1 – MCWD Demand Management Measures and M2 – Stormwater Recharge Management.

Monitoring wells identified under M4 – Drill and Construct Monitoring Wells were constructed during the first five years of GSP implementation.

Two local projects are in design and construction phases. Recycled water is currently delivered of landscape irrigation under M3 – Recycled Water Reuse Through Landscape Irrigation and Indirect Potable Reuse. The IPR component is under design and is anticipated to advance during fiscal years 2026–27. The pilot desalination plant of M5 – Reservation Road Pilot Desalination Plant is under construction.

Two projects remain conceptual and will be further evaluated and developed as appropriate. These projects include M6 – Aquifer Storage and Recovery at Armstrong Ranch and M7 – [placeholder].

MCWDGSA will continue an iterative, ongoing process to evaluate the effectiveness of Marina-Ord Area PMAs post implementation, including assessment of groundwater conditions, and the need for additional projects. Project status information will be provided through Annual Reports and Periodic Evaluations.

10.2.3 Corral de Tierra Projects and Management Actions

The priority PMAs for the Corral Area are drawn from SVBGSA's IIS preferred portfolio of PMAs and other PMAs that contribute to preventing undesirable results, reaching measurable objectives, or otherwise addressing the needs of beneficial users.

Demand management provides options since supply-side projects are likely not sufficient to reach sustainability. During development of the original GSP, the SVBGSA Monterey Subbasin Planning Committee prioritized pumping allocations and control as the top project or management action within the Corral de Tierra Area. The original GSP management action has been updated in Amendment 1 C1 Demand Management and Planning to encompass SVBGSA's Demand Management Framework. From C1, Amendment 1 includes C2 Rural Residential Demand Management Water Use Efficiencies as a priority for the Corral rural residential areas. It also adds C3 - Rural Residential Well Mitigation Program as a contingency should groundwater conditions create undesirable results for domestic beneficial uses.

Several types of projects focused on direct recharge that were in the original GSP have been consolidated under the C4 - Small-Scale Aquifer Recharge and Watershed Restoration Program. Although specific projects that may be developed under this program are considered contingency projects for the Corral area, SVBGSA will prioritize conducting an aquifer recharge suitability and mapping analysis in this next phase of GSP implementation. Other projects in Chapter 9 are contingency projects should they be determined to be needed to reach sustainability.

Projects and management actions will be approved by the respective Board of Directors and will be implemented in a coordinated manner across the entire Salinas Valley.

10.3 Funding for Projects and Management Actions

Projects and management actions implemented by other agencies and organizations that contribute to groundwater sustainability will follow the funding strategies developed by those respective agencies and organizations. For projects funded by the Subbasin GSAs or funding the GSAs raise to contribute to the implementation of projects, the GSAs will evaluate the most appropriate funding mechanisms and engage stakeholders and the respective Board of Directors in this analysis. These include:

- **Grant funding** – The GSAs will pursue federal, state, and local grants to the extent possible to fund projects and management actions.
- **Contributions from local jurisdictions, partner agencies, organizations, and companies –** Where appropriate, the GSAs will work with partners to solicit contributions to jointly implement a project or management action.
- **Benefit assessment (218 vote)** – For projects with substantial capital costs or benefits that extend across multiple subbasins, the GSAs may consider a Proposition 218-compliant local funding mechanism, depending on the project purpose, beneficiaries, legal authority, and method of cost recovery. If structured as an assessment, the GSAs would evaluate the parcels receiving special benefit, distinguish special benefits from general benefits, define the applicable assessment area or zone of benefit, and develop a proportional method for calculating each parcel's assessment. If structured as a property-related fee or charge, the GSAs would instead evaluate the cost of providing the applicable service, identify the parcels subject to the charge, and calculate charges so that revenues do not exceed the cost of the service and each parcel's charge does not exceed its proportional cost responsibility. The appropriate structure, procedural requirements, and supporting documentation would be developed in consultation with legal counsel before initiating any Proposition 218 proceeding.
- **Fee –** Fees may be collected for a variety of purposes, such as funding a regulatory program or providing a product or service (e.g. Proposition 26). Fees are not subject to a vote or protest proceeding, but they cannot exceed the cost of running the program or providing the product or service. Some regulatory programs need to be implemented via ordinance.
- **Fines and Penalties –** With the establishment of an ordinance, the GSAs have the authority to impose fines and penalties, such as may be associated with a regulatory program. Imposition of a fine or penalty must provide due process, usually a hearing after notice/citation and before assessment of the fine or penalty, and funds must be put back into the program.

- **Special tax –** The GSAs have the authority to levy a special tax for a specific purpose, such as a parcel tax or some sales tax components. This requires a two-thirds vote of the electorate.
- **Other funding mechanisms –** The GSAs are evaluating other potential funding approaches including but not limited to private partnerships, broader assessments, and partnerships.

The GSAs understand that PMA costs will need to be funded through a combination of external funding, local funding mechanisms, financing approaches, and partner contributions.

For the IIS portfolio, SVBGSA commissioned development of a funding strategy (ERA, 2026b) that (1) provides planning-level project and portfolio cost estimates and (2) evaluates potential financing, revenue, and cost-allocation approaches. Because IIS PMAs differ in beneficiaries and funding needs, SVBGSA will develop project-specific funding strategies as PMAs are refined, using an appropriate combination of sources. SVBGSA will coordinate with partner agencies, stakeholders, and its Board of Directors to ensure that funding approaches reflect project beneficiaries, legal authorities, and implementation feasibility.

10.4 Data Collection, Monitoring, and SGMA Compliance

Successful sustainable groundwater management relies on a foundation of data to support decision making. As such, collection of data within the Subbasin will be a key part of GSP implementation. These data collection efforts include monitoring of each Sustainability Indicator from the SGMA monitoring network, as well as other data and information required for management and reporting under the SGMA, as described this section.

During the first five years of GSP implementation, data collection and monitoring network expansion were a major focus of the GSAs' efforts to implement the GSP and comply with SGMA. MCWDGSA and SVBGSA made substantial progress in addressing priority data gaps, refining the HCM and groundwater models, expanding monitoring networks and monitoring programs, and verifying GDEs and ISW conditions. With most priority data gaps addressed and monitoring programs sufficiently established, these efforts established a stronger technical framework for developing PMAs and tracking progress toward sustainability goals across the Salinas Valley.

10.4.1 Improving Monitoring Networks

As of GSP Amendment 1, most monitoring network data gaps have been filled. As part of the required periodic evaluations, the GSAs will review the monitoring networks every 5 years to determine whether additional monitoring wells are needed.

10.4.2 Address Identified Data Gaps in the Basin Setting

Key data gaps related to the basin setting have also been addressed through GSP Amendment 1, including:

- Updated characterization of the Deep Aquifers through completion of the Deep Aquifers Study, which described the hydrogeology and extents of the multi-subbasin Deep Aquifers and initiated a Deep Aquifers monitoring program;
- Improved understanding of the HCM in the Corral de Tierra Area through incorporation of AEM data, well information, and updated hydrogeologic interpretations;
- Expanded MCWDGSA's groundwater elevation and seawater intrusion monitoring program and improved characterization of seawater intrusion conditions in the Marina-Ord Area;
- Expanded information in the southern and central Marina-Ord Area through completion of new monitoring wells, however, some hydrostratigraphy uncertainties remain and are under MCWDGSA's investigation;
- Conducted field verification of GDEs and developed of monitoring protocols with CCWG; and
- Improved groundwater extraction estimates through well registration activities and expansion of the Groundwater Extraction Management System under the MCWRA Groundwater Monitoring Program.

If new data gaps are identified, or if additional information is needed to support project development or subbasin management, the GSAs and their partner agencies will evaluate opportunities to collect the necessary data and improve the understanding of subbasin conditions.

10.4.3 GMP and Well Registsration

The data collection networks in the GMP are designed to accomplish SVBGSA's monitoring of groundwater levels, seawater intrusion, and groundwater extractions. Well registration is also part of the GMP, which, when coupled with other monitoring programs, aids in assessing how wells could be affected by changing groundwater conditions. All groundwater production wells, including wells used by de minimis pumpers, are required to be registered with MCWRA under the GMP. Well registration is intended to establish a relatively accurate count of all the active wells in the Subbasin. This implementation action will help gain a better understanding of the wells in active use, verses those that have been decommissioned. Well registration will collect information on active wells such as well owner, well operator, well location, well construction, and type of well use. Well locations and construction information supports more accurate planning that helps guide sustainable groundwater management decisions.

If a well goes dry and a new well is drilled, both the new well and inactive (dry) well must be documented during well registration. If the well is dry due to declining groundwater elevations, the SVBGSA, local partner, and state agencies are also informed through the "Household Water Supply Shortage System," which is intended to document drought impacts. If the well is dry due to declining groundwater elevations, the SVBGSA could convene a working group to assess the

groundwater situation and inform the Well Mitigation management action if a number of wells are going dry in a specific area. The Well Mitigation management action is intended to assist rural residential drinking water users if PMAs are not able to maintain access to reliable domestic water supplies due to groundwater management and provides a framework for responding to localized impacts that may occur despite broader efforts to improve groundwater conditions.

SGMA requires GSAs to manage groundwater extractions within a Basin's [subbasin's] sustainable yield. Accurate extraction data is fundamental to groundwater management. MCWRA has collected groundwater extraction data through GEMS since 1993. In collaboration with SVBGSA, with the establishment of the GMP, GEMS was updated and expanded by Ordinance 5426. MCWRA provides SVBGSA annual GEMS data that can be used for groundwater management. A GSA may not require de minimis users (as defined) to meter or otherwise report annual extraction data. Other public agencies such as the County of MCWRA may have such authority. Currently, all non-de minimis are required to report extraction data. The groundwater extraction information will be used to report total annual extractions in the Subbasin.

10.4.4 Arsenic Implementation Action

The original GSP included an implementation action provides for additional analysis on the relationship between arsenic and groundwater conditions in the Corral de Tierra Area. While arsenic is naturally occurring and often increases with depth, the 2007 *El Toro Groundwater Study Monterey County, California* (Geosyntec, 2007) found that in this area, arsenic concentrations are higher in the Paso Robles Formation, which is closer to the ground surface, than in the deeper Santa Margarita Formation. Additionally, municipal water providers show a wide range and lack of trends of arsenic concentrations with respect to reported extraction (Geosyntec, 2007). However, at the time of the original GSP, the available data and published reports for the Corral de Tierra Area do not have sufficient data to affirm or invalidate a relationship between arsenic, groundwater levels, and/or extraction without additional analysis.

During the first phase of GSP implementation, SVBGSA conducted further analysis of the relationship between arsenic concentrations, groundwater levels, and extraction within the Corral de Tierra. The analysis found a positive correlation between arsenic concentration and groundwater level trends. Aligning with the *El Toro Groundwater Study,* increases in arsenic concentrations when groundwater levels are higher is likely due to greater naturally-occurring arsenic in the Paso Robles Formation as compared to the underlying Santa Margarita Sandstone. This implementation action has been completed and was taken into account in the revisions to the Water Quality SMC.

10.4.5 Models

The GSAs continue to develop, maintain, refine, and apply a suite of groundwater, surface water, seawater intrusion, flood, and economic models that support SGMA implementation throughout the Salinas Valley. These models provide the analytical framework for evaluating basin conditions, forecasting future groundwater responses, assessing the effectiveness of PMAs, supporting

required reporting, and informing decision making. These tools can be periodically updated to incorporate new monitoring data, improved hydrogeologic understanding, and evolving management needs.

During the first phase of GSP implementation, the GSAs invested significantly in development and enhancement of technical modeling tools to provide a consistent, valley-wide basis for evaluating groundwater sustainability. Building on previous efforts by Monterey County and MCWRA, this work included updates to regional groundwater flow models, development of predictive planning tools, advancement of seawater intrusion modeling capabilities, evaluation of surface water and flood-related processes, and development of economic models and cost analyses of PMAs. These tools also support stakeholder engagement.

- **SVIHM**: The SVIHM, originally developed by the USGS, serves as the primary regional historical groundwater and surface water model for much of the Salinas Valley. The model simulates groundwater flow, groundwater recharge, stream-aquifer interactions, groundwater storage changes, and other hydrologic processes across multiple subbasins.

  After the USGS finalized the SVIHM in April 2025, SVBGSA, MCWRA, and MCWDGSA worked together to update and refine the SVIHM in October 2025 using additional monitoring data, updated hydrogeologic information, and findings from recent technical studies. These updates improve the model's ability to represent current basin conditions and provide a stronger foundation for evaluating groundwater sustainability and future management options.

- **SVOM**: Building upon the SVIHM, USGS developed and SVBGSA, MCWRA, and MCWDGSA updated a predictive planning tool for evaluating potential future groundwater conditions under a range of implementation scenarios. The SVOM incorporates operational assumptions related to reservoir releases, water management infrastructure, groundwater demands, and anticipated future conditions.

  The model is used to evaluate projected groundwater elevations, groundwater storage, interconnected surface water conditions, and the potential benefits of PMAs through the SGMA planning horizon. Alongside the SVIHM updates, SVBGSA, MCWRA, and MCWDGSA updated the SVOM in March 2026.

- **SWIM**: SVBGSA and Monterey County also developed the SWIM specifically to evaluate seawater intrusion conditions and management strategies within the coastal portions of the Salinas Valley. In early 2026, SVBGSA worked with MCWDGSA and Seaside Watermaster to update the model. The model simulates groundwater flow and chloride transport while accounting for density-dependent movement of freshwater, brackish water, and seawater.

  The SWIM is used to evaluate both existing and potential future seawater intrusion conditions, assess the effectiveness of proposed PMAs, identify areas at risk of continued intrusion, and support development of strategies intended to protect the 180-Foot, 400-

Foot, and Deep Aquifer systems. Model results are used extensively to support planning efforts in the 180/400, Monterey, Eastside, and Langley Subbasins.

- **MBGWFM:** The MBGWFM is a groundwater flow model developed by MCWDGSA to evaluate groundwater budgets and PMAs for the original Monterey GSP. Following development of the SWIM, the Subbasin groundwater budget was updated using SWIM. MCWDGSA continues to use the MBGWFM as one of the tools to evaluate the effectiveness of local PMAs in the Subbasin.
- **HEC-RAS**: For modeling related to the fluvial dynamics of the Salinas River, SVBGSA uses the HEC-RAS model developed for the Salinas River Stream Maintenance Program and supported 2026 updates to the HEC-RAS model. This model helps assess river and floodplain conditions, recharge opportunities, project hydraulics, flood-related constraints, and interactions between proposed infrastructure and surface water systems.

  As project concepts advance, HEC-RAS modeling provides a tool for evaluating engineering feasibility, permitting considerations, flood conveyance requirements, and potential benefits associated with recharge and water management projects located along the Salinas River and its tributaries.
- **Economic Modeling**: Recognizing that successful PMA implementation requires consideration of economic as well as hydrologic outcomes, SVBGSA has supported development and application of economic modeling tools to evaluate the costs, benefits, and potential regional economic effects of groundwater sustainability strategies.

  Economic analyses are used to assess implementation scenarios, evaluate project or management alternatives, estimate potential economic impacts to agricultural and municipal groundwater users, and evaluate funding mechanisms. These efforts help ensure that groundwater sustainability strategies remain technically feasible as well as economically and financially, and sensitive to the importance of groundwater resources within the Salinas Valley.

Each of these models were developed by different entities at different timeframes for specific purposes and therefore reflect unique design features and functionalities. Collectively, these modeling tools provide the GSAs with an integrated framework for evaluating groundwater conditions, assessing future risks, prioritizing PMAs, supporting regulatory compliance, and advancing long-term groundwater sustainability throughout the Salinas Valley. As implementation progresses, the models will continue to be refined and applied to support adaptive management and informed decision-making.

10.4.6 Updating the Data Management System

The MCWDGSA and SVBGSA have respectively developed DMS that are used to store, review, and upload data collected from the monitoring programs outlined in Chapter 7. The DMSs are

updated as new information is collected for annual reports, developed as part of GSP implementation, and provided by stakeholders.

The GSAs have provided public access to their monitoring data:

- A web application is available on the SVBGSA's website for stakeholders to view data collected within the Salinas Valley (https://svbgsa.org/gsp-web-map-and-data/).
- A public data portal for the Monterey Subbasin is currently being developed by MCWDGSA and anticipated to be online by the end of 2026.
- RMS monitoring data submitted to DWR along with other groundwater management datasets are available on DWR's SGMA Data Viewer (https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer).

10.4.7 Annual Monitoring and Reporting

SGMA requires completion of annual reports to document Subbasin conditions relative to the SMC presented in Chapter 8. MCWDGSA and SVBGSA submits annual reports for the Monterey Subbasin to DWR and make them publicly available. The purpose of the reports is to provide monitoring, groundwater extraction, and total water use data to DWR, compare monitoring data to the SMCs, and adaptively manage actions and projects implemented to achieve sustainability.

Chapter 7 outlines the data collected through the monitoring programs that will be used to complete annual reports. Where possible, the GSAs will leverage data collection and analysis completed by the U.S. Army, MCWRA, and Seaside Basin Watermaster to avoid duplication of efforts. The GSAs perform the following monitoring related efforts with partner agencies:

- Collection and/or compilation of water level data at least on a quarterly basis at groundwater elevation RMS wells, with the potential for monitoring of additional well site(s).
- Collection and/or compilation of water quality data at least on an annual basis at seawater intrusion RMS wells, with the potential for monitoring of additional well site(s).
- Water quality data compilation from the State Water Resources Control Board's (SWRCB) GeoTracker GAMA groundwater information system for Division of Drinking Water (DDW) and Irrigated Lands Regulatory Program (ILRP) wells.
- InSAR data compilation from the California Department of Water Resources (DWR) SGMA Data View to assess land subsidence.
- Collection and/or compilation of quarterly water level data at the shallow RMS wells for interconnected surface waters to inform groundwater conditions near GDEs.
- Quality assurance and quality control checks.
- Data Management System (DMS) importation.

- Data gap filling as it pertains to the monitoring network.

10.4.8 Periodic Evaluations of GSP

Per the GSP Emergency Regulations (23-CCR §356.4), the Subbasin GSAs will conduct a periodic evaluation of its GSP, at least every five years, and will modify the GSP as necessary to ensure that the Sustainability Goal for the Subbasin is achieved. The GSP elements that will be covered in the periodic evaluation are described below.

The periodic evaluations may include updating the groundwater models with newly collected data and updating model scenarios to reflect both the additional data and refinements in designs or assumptions. They also include a comparison of the hydrology experienced to that anticipated in the GSP in the review of groundwater conditions.

10.4.8.1 Sustainability Evaluation

This section will evaluate the current groundwater conditions for each sustainability indicator, including progress toward achieving interim milestones and measurable objectives.

10.4.8.2 Plan Implementation Progress

This section will evaluate the current implementation status of projects and management actions, along with an updated implementation schedule and any new projects and management that are not included in this GSP.

10.4.8.3 Reconsideration of GSP Elements

Per 23-CCR §356.4(c), elements of the GSP, including the Basin Setting, SMCs, and projects and management actions sections will be reviewed and revised if necessary.

10.4.8.4 Monitoring Network Description

This section will provide a description of the SGMA monitoring network, including identification of data gaps, assessment of monitoring network function with an analysis of data collected to date, identification of actions that are necessary to improve the monitoring network, and development of plans or programs to fill data gaps.

10.4.8.5 New Information

This section will provide a description of significant new information that has been made available since the adoption or amendment of the GSP, or the last five-year assessment, including data obtained to fill identified data gaps. As discussed above under Section 10.4.8.3, if evaluation of the Basin Setting or SMCs definitions warrant changes to any aspect of the GSP, this new information would also be included.

10.4.8.6 Regulations or Ordinances

The Subbasin GSAs possess the legal authority to implement regulations or ordinances related to the GSP. This section will provide a description of relevant actions taken by the GSAs, including a summary of related regulations or ordinances, as appropriate.

10.4.8.7 Legal or Enforcement Actions

This section will summarize legal or enforcement actions taken by the GSA in relation to the GSP, along with how such actions support sustainability in the Subbasin.

10.4.8.8 Plan Amendments

This section will provide a description of proposed or complete amendments to the GSP.

10.5 Interested Parties Coordination

Successful implementation of SGMA requires ongoing coordination among agencies, groundwater users, and other interested parties throughout the Salinas Valley. Because groundwater resources, management responsibilities, and sustainability challenges extend across jurisdictional and subbasin boundaries, implementation of GSPs depends on collaboration among organizations with differing authorities, expertise, and stakeholder interests.

The GSAs recognize that achieving groundwater sustainability is not solely a technical or regulatory effort. It also requires effective communication, information sharing, and engagement with the communities, businesses, agencies, and organizations that rely on groundwater resources. Coordination and outreach activities help ensure that groundwater management decisions are informed by regional perspectives, local knowledge, regulatory considerations, and stakeholder input.

The following subsections describe ongoing and completed efforts related to interagency coordination, integration of groundwater sustainability considerations into land use planning, coordination with water quality agencies and programs, and stakeholder outreach and engagement activities that support GSP implementation within the Monterey Subbasin and throughout the Salinas Valley.

10.5.1 MCWDGSA and SVBGSA Coordination

Both intra- and inter-basin coordination will continue to be conducted between MCWDGSA and SVBGSA, which covers the Monterey Subbasin and the adjacent 180/400-Foot Aquifer Subbasin. Coordination efforts between MCWDGSA and SVBGSA are primarily conducted through the technical and steering committees established in the 2018 Framework Agreement. The Technical Committee includes staff and technical consultants from the two GSAs. The Steering Committee consists of the General Managers and one board member from each GSA. Additionally,

MCWDGSA's staff and consultants are engaged as members of SVBGSA joint committees and technical working groups.

10.5.2 Agency Coordination and Collaboration

The Subbasin GSAs continue to coordinate with partner GSAs and other groundwater management agencies to support integrated implementation of GSPs across the Salinas Valley. Coordination occurs through formal agreements, joint committees, technical working groups, staff collaboration, data sharing, project development efforts, and regular communication among agencies responsible for groundwater management and SGMA compliance.

Agency coordination supports development and implementation of monitoring programs, technical studies, groundwater models, grant-funded projects, annual reporting, periodic evaluations, and implementation of PMAs that may affect multiple subbasins. Coordination also helps ensure that groundwater management decisions account for the hydraulic interconnectedness of the Salinas Valley subbasins and the regional nature of groundwater sustainability challenges such as overdraft, seawater intrusion, groundwater quality, and climate resilience.

Leading up to submittal of the original GSPs and during the first phase of GSP implementation, the GSAs respectively established multiple interagency coordination agreements and expanded collaboration through steering committees, technical committees, implementation committees, and staff collaboration. The GSAs will continue to support coordinated groundwater management throughout the Salinas Valley through these efforts and will periodically review and adjust coordination as needed during different phases of SGMA implementation.

10.5.3 Land Use Coordination

Many decisions affecting groundwater—such as development patterns, agricultural practices, and infrastructure investments—are made through local land use processes. SGMA recognizes that sustainable groundwater management must be done in coordination with cities and counties responsible for land use decisions. Land use authority remains under the jurisdiction of counties and cities. Most land use agencies in the Salinas Valley are members of the SVBGSA Joint Powers Authority, including the County of Monterey and cities of Salinas, Gonzales, Soledad, and King. The City of Greenfield is within the ASGSA's ASCMA of the Forebay Subbasin. The City of Marina is within the MCWDGSA's Marina-Ord Management Area of the Monterey Subbasin. During the first phase of GSP implementation, SVBGSA requested land use plan information from each jurisdiction to update Appendix 3B Land Use Plans.

SVBGSA coordinates with the County and cities by convening meetings with each jurisdiction to review GSP amendments and the findings of the periodic evaluations, to review land use plans or projects to assess activities that may potentially create risks to groundwater quality or quantity and to consider the local groundwater conditions in relation to the GSP SMC in the planning area

or development location, to consider relevant land use plans during PMA development and implementation, and as needed or as requested by any agency.

Land use changes may result in changes to groundwater pumping to support new uses and should consider the applicable subbasin conditions and SMC. Land use agencies must now consider adopted GSPs when:

- Updating or amending general plans
- Approving land use entitlements or development projects
- Revising or adopting policies related to groundwater resources or that may affect groundwater resources

Effective coordination between groundwater management and land use planning can support multiple environmental and community objectives. These strategies not only support groundwater sustainability but also improve resilience to drought, flooding, and climate change. Key opportunities include:

- Strategic location and design of new development
- Improved stormwater management to enhance groundwater recharge
- Protection and enhancement of local water resources
- Maintenance of base flows in streams
- Protection of natural recharge areas and upper watershed resources
- Restoration and protection of floodplains
- Conservation of groundwater-dependent ecosystems

10.5.4 Water Quality Coordination

SVBGSA coordinates with agencies that have primary responsibility for groundwater quality regulation and drinking water protection. The primary goal is to support implementation of SGMA, while acknowledging existing regulatory authorities and opportunities to collaborate. Under SGMA, SVBGSA monitors groundwater quality conditions and evaluates potential groundwater quality impacts associated with groundwater management activities but does not replace or assume the responsibilities of existing water quality regulatory agencies.

Key coordination partners include the CCRWQCB, Monterey County Health Department, non-profit Central Coast Water Quality Preservation, Inc, and other agencies and organizations as appropriate.

During the first phase of GSP implementation, SVBGSA expanded collaboration with groundwater quality agencies and initiated development of a Water Quality Coordination Group to facilitate communication among the key coordination partners. The Water Quality Coordination Group convenes at least annually to review the water quality data from the Salinas Valley Annual

Reports. In addition, they discuss data coordination, trend analysis, programs available for alternative water supplies and current priorities and challenges among the partners.

Water quality coordination also supports SVBGSA's commitment to protecting beneficial uses of groundwater and advancing policies that recognize the human right to safe, clean, affordable, and accessible drinking water. SVBGSA will continue these efforts throughout SGMA implementation.

10.5.5 Communications and Engagement

The GSAs conduct ongoing outreach and engagement activities to promote transparency, foster stakeholder participation, and ensure that groundwater users and interested parties remain informed about groundwater conditions and GSP implementation activities. Outreach is designed to provide meaningful opportunities for public involvement and to support communication and engagement with diverse stakeholder groups throughout the Salinas Valley.

MCWDGSA and SVBGSA's Stakeholder Communication and Engagement Plans will continue to be refined, updated, and executed during GSP implementation. Anticipated stakeholder engagement activities include, but are not limited to:

- Public meetings, workshops, an advisory committee and subbasin committees, technical or ad-hoc working groups;
- One-on-one stakeholder communications with community organizations and groundwater users;
- Posting of relevant announcements and information on the respective websites (mcwd.org and svbgsa.org) and other direct mailings, as needed;
- Electronic newsletters.
- Interested parties list maintenance; and
- Stakeholder Communication and Engagement Plan evaluation and updates.

The GSAs will continue to inform the public on GSP implementation progress and implementation of projects through the stakeholder engagement activities identified above. The GSAs' websites will be maintained as a communication tool for posting data, reports, and meeting information. In addition, each PMA may be subject to specific public noticing requirements as detailed in their respective project descriptions in Chapter 9. The Annual Reports to be prepared by April 1 each year will assess progress towards sustainability and will provide an important opportunity to reengage subbasin stakeholders in their review.

The GSAs also maintain communications and engagement with DACs, underrepresented communities, small water systems, and domestic well owners to help ensure that groundwater sustainability planning reflects the needs of all beneficial users and uses of groundwater. Outreach efforts support awareness of groundwater conditions and sustainability goals, PMAs,

monitoring programs, reporting requirements, and opportunities for stakeholder participation in SVBGSA decision making.

During the first five years of GSP implementation, SVBGSA and MCWDGSA expanded their communication and engagement programs, strengthened stakeholder committee structures, increased opportunities for public participation, and developed additional tools and resources to improve transparency and accessibility of groundwater information. The activities described in Chapter 2 will be continued, providing a foundation for collaborative groundwater management across all Salinas Valley subbasins.

10.6 Plan Implementation Costs

GSP implementation costs can be organized into 3 general categories. First, administration, which includes the ongoing cost of GSA governance, staffing, monitoring, reporting, stakeholder engagement, GSP updates, and other regulatory activities. Second are project development (planning and capital) and operations and maintenance, which includes the full financial costs of planning, designing, permitting, constructing, financing, operating, and maintaining PMAs in the IIS portfolio for groundwater sustainability. Finally, there are costs imposed on water users, which are the local financial or economic impacts that result from implementation actions, such as agricultural land fallowing, pumping reductions, domestic conservation, replacement water costs, or other impacts associated with changes in groundwater levels, groundwater quality, or project performance.

Per the GSP Emergency Regulations (23-CCR §354.6(e) and 354.44(b)(8)), this section provides estimates of the costs to implement this GSP and potential sources of funding to meet those costs.

Costs herein are estimated and discussed for each GSA. A presumed contribution from each GSA is estimated for certain activities that will be carried out via collaboration, such as preparation of annual reports, DMS hosting and maintenance, and preparing the 5-year GSP update. These costs may shift during GSP implementation depending on how the GSAs decide to undertake each specific task.

10.6.1 MCWDGSA Start-up Budget and Funding to Meet Costs

Table 10-1 summarizes the conceptual planning-level costs for the 5 years of GSP implementation following the 2027 GSP Amendment 1 (i.e., 2027-2032) by MCWDGSA within the Monterey Subbasin. These costs are developed for Subbasin specific activities, including

- Monitoring and data collection beyond tasks already undertaken by other agencies;
- Annual analysis and reporting of sustainability conditions;
- GSA staff overhead and legal support;
- Continued stakeholder outreach and coordination;

- Periodic evaluation and five-year update of the GSP;
- Data gaps filling and model refinements;
- Implementation of projects and management actions.

These planning level costs include Marina-Ord Area PMAs that are anticipated to be advanced during these next 5 years. It also includes some funding for evaluating and refining multi-subbasin PMAs for the Monterey Subbasin. It does not include development or construction of multi-subbasin PMAs as MCWDGSA's participation in such PMAs will be considered based on the project's anticipated effects on the Monterey Subbasin, implementation requirements, funding, and applicable approvals. These are initial estimates of costs and will likely change as more data become available.

As shown in Table 10-1, direct costs for GSP implementation are estimated to be a total of [placeholder] over the next five years, including GSA staff time. The MCWDGSA will likely meet the estimated costs through a combination of contributions through rate payers and from grant funding, if available.

Table 10-1 MCWDGSA Monterey Subbasin Specific Estimated Planning-Level Costs for First 5 Years of Implementation

[Pending]

10.6.2 SVBGSA GSP Implementation Cost and Funding

10.6.2.1 SVBGSA Groundwater Sustainability Fee

SVBGSA established a Groundwater Sustainability Fee (pursuant to California Water Code Sections 10730 through 10730.2) to fund the regulatory activities necessary to implement SGMA and sustainably manage groundwater resources across the Salinas Valley subbasins. The fee funds ongoing activities such as groundwater sustainability planning and implementation, monitoring and reporting, technical studies, groundwater modeling, stakeholder engagement, communications and outreach, administrative operations, and support for development and evaluation of PMAs. The fee could also provide local matching funds if required by state and federal grant guidelines.

The fee was originally established in 2019 based on a study prepared by Hansford Economic Consulting. The fee structure allocates program costs between agricultural and non-agricultural beneficiaries and is reviewed annually by the SVBGSA Board of Directors in conjunction with adoption of the Agency's budget and work plan.

During the first phase of GSP implementation, SVBGSA completed several modifications to its fee structure. In 2023, the Board adopted a tiered fee approach to better align costs with the

activities associated with individual subbasins. The current fee structure includes Tier 1 funding for activities that benefit all subbasins and Tier 2 funding for activities that are specific to one or more subbasins.

In 2024, the Board received and accepted a comprehensive 5-year evaluation of the Groundwater Sustainability Fee prepared by Hansford Economic Consulting. The evaluation assessed the fee structure, cost allocations, and implementation experience since adoption of the fee.

Based on the findings of the evaluation, the Board approved updates to the fee methodology in 2025, including transitioning from irrigated acreage to cropped acreage for agricultural fee calculations, refining allocation methods for parcels that span multiple subbasins, and updating the data used to determine cost allocations among groundwater user groups. These changes were incorporated into the fiscal year (FY) 2026 fee calculations and provide a more appropriate basis for supporting SGMA implementation throughout the Salinas Valley.

SVBGSA will continue to administer the fee and conduct periodic reviews to ensure that the fee meets the revenue requirements and is appropriately assessed, as well as develop other funding mechanisms, as necessary.

10.6.2.2 SVBGSA Cost of GSP Implementation

Table 10-2 summarizes the conceptual planning-level costs for the 5 years of GSP implementation following the 2027 GSP Amendment 2 for the Monterey Subbasin.

Table 10-2 SVBGSA Monterey Subbasin Specific Estimated Planning-Level Costs for First 5 Years of Implementation

[Pending]

10.7 Schedule for Implementation and Adaptive Management

Implementing the Monterey Subbasin GSP will be coordinated with the implementation of the five other GSPs in the Salinas Valley. The schedule for GSP implementation reflects the significant integration and coordination needed to implement all 6 SVBGSA GSPs in a unified manner. Changes to the schedule during the GSP implementation will be discussed in the 5-year periodic evaluations.

A general schedule showing the major tasks and estimated timeline during the first 5 years of GSP implementation is provided on Figure 10-2. This includes the main tasks that will comprise the next phase of GSP implementation, with a focus on the 5 years following the 2027 GSP Amendment 1. PMAs will be revisited and adjusted as needed throughout GSP implementation.

MCWDGSA and SVBGSA will adaptively manage groundwater and the implementation of the GSP. The work of the GSAs and stakeholders to complete this GSP provides a solid base to guide

groundwater management; however, certain conditions may provide the need to adapt and change management as envisioned in this plan. For example, if existing conditions change, such as a prolonged drought that affects groundwater conditions, or additional funding for specific projects becomes available, MCWDGSA and SVBGSA may adapt their management strategy. If that occurs, the GSAs will work through an open and transparent process with stakeholders, partner agencies, and DWR to ensure it continues to meet regulatory requirements and reaches sustainability.

Figure 10-2 General Schedule During First Five-Years of GSP Implementation

[Pending]

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