WY 2022 Annual Report

Monterey Subbasin

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

August 2024

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List of Abbreviations

AF	acre-foot
AFY	acre-feet per year
CCR	California Code of Regulations
CCRWQCB	Central Coast Regional Water Quality Control Board
CCWG	Central Coast Wetlands Group
COCs	constituents of concern
COVID-19	coronavirus disease of 2019
DDW	Division of Drinking Water
DMS	data management system
DWR	California Department of Water Resources
FO	Fort Ord
ft	foot
GDEs	Groundwater dependent ecosystems
GEMS	Groundwater Extraction Management System
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GTAC	Groundwater Technical Advisory Committee
GWE	groundwater elevation
HCB	Hexachlorobenzene
IIP	Integrated Implementation Plan
ILRP	Irrigated Lands Regulatory Program
IM	interim milestone
IM5	first interim milestone
InSAR	Interferometric Synthetic Aperture Radar
IPR	indirect potable reuse
ISW	interconnected surface water
JPA	Joint Powers Authority
LULAC	League of United Latin American Citizens
MBGWFM	Monterey Subbasin Groundwater Flow Model
MCL	Maximum Contaminant Level
MCWD	Marina Coast Water District
MCWRA	Monterey County Water Resources Agency
mg/L	milligram per liter
MO	measurable objective
MPWMD	Monterey Peninsula Water Management District
MT	minimum threshold
NAVD 88	North American Vertical Datum of 1988
PRISM	Parameter-elevation Regressions on Independent Slopes Model
P&MAs	Projects and Management Actions

QA/QC	quality control/quality assurance
RMS	Representative Monitoring Site
SGMA	Sustainable Groundwater Management Act
SMCL	Secondary Maximum Contaminant Level
SMCs	Sustainable Management Criteria
SVA	Salinas Valley Aquitard
SVBGSA	Salinas Valley Basin Groundwater Sustainability Agency
SVGB	Salinas Valley Groundwater Basin
SVIHM	Salinas Valley Integrated Hydrologic Model
SWIG	Seawater Intrusion Working Group
SWRCB	State Water Resources Control Board
TAC	Technical Advisory Committee
TCE	trichloroethene
1,2,3 TCP	Trichloropropane
TDS	total dissolved solids
UG/L	microgram per liter
UMHOS/CM	micromhos per centimeter
UR	undesirable result
U.S.	United States
USGS	United States Geological Survey
WBZ	Water Budget Zone
WY	water year

1 EXECUTIVE SUMMARY

The Monterey Subbasin (referred to herein as "the Subbasin"), California Department of Water Resources (DWR) Basin No. 3-004.10, is classified as a medium priority basin (DWR, 2019). To address the long-term reliability of groundwater within the Subbasin, the Marina Coast Water District Groundwater Sustainability Agency (MCWD GSA) and the Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA) co-authored a Groundwater Sustainability Plan[1] (Monterey GSP or GSP), which was adopted by both GSAs and submitted to DWR on January 31, 2022. The Monterey GSP establishes two Management Areas within the Subbasin. These Management Areas include the Marina-Ord Management Area (Marina-Ord Area) and the Corral de Tierra Management Area (Corral de Tierra Area). The Marina-Ord Area consists of the lands within the City of Marina, the City of Seaside, and the former Fort Ord (FO). 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 with the 180/400-Foot Aquifer Subbasin.

MCWD GSA has developed information for the Monterey GSP and ongoing Annual Reports for the Marina-Ord Area, and the SVBGSA has developed information for the Corral de Tierra Area.

This Water Year (WY) 2022 Annual Report for the Subbasin has been prepared in compliance with the California Code of Regulations (CCR) 23 §356.2. WY 2022 includes the period from October 1, 2021, through September 30, 2022.

In WY 2022, groundwater conditions remained similar to conditions in recent years, with slight changes related to specific Sustainability Indicators. Using the Water Year Type methodology developed by DWR (DWR, 2021), WY 2022 is classified as a dry year.

Groundwater conditions monitoring data for the Marina-Ord Area and the Corral de Tierra Area during WY 2022 are summarized relative to their respective sustainable management criteria (SMCs) defined in the Monterey GSP below:

Marina-Ord Area

- Slight decreases of groundwater elevations in representative monitoring site (RMS) wells screened in the upper 180-Foot, lower 180-Foot, and 400-Foot Aquifers in the northern Marina-Ord Area were observed during WY 2022 likely due to the consecutive dry years. However, the observed groundwater elevation declines are within the historical range of fluctuations. Groundwater elevations in the Deep Aquifers increased in WY 2022 in most part of the Marina-Ord Area except for two RMS wells next to the Monterey-Seaside Subbasin boundary.
- Two wells in the Dune Sand Aquifer, one well in the upper 180-Foot Aquifer, four wells in the lower 180-Foot and 400-Foot Aquifers, and six wells in the Deep Aquifers exceeded

[1] The Monterey GSP can be downloaded via the SGMA Portal: https://sgma.water.ca.gov/portal/gsp/preview/128

their minimum thresholds (MTs) during the Fall 2021 monitoring event. MT exceedances in the lower 180-Foot and 400-Foot Aquifers and the Deep Aquifers constitute an undesirable result (UR) per the Monterey GSP.

- Groundwater extractions for WY 2022 in the Marina-Ord Area were approximately 3,491 acre-feet (AF). MCWD was the only agency that pumped groundwater water in the Marina-Ord Area. The groundwater production, measured by direct metering, was for urban water use only.
- No data shows advancement of seawater intrusion in WY 2022.
- No wells sampled in WY 2022 had higher concentrations than groundwater quality regulatory standards (i.e., Title 22), so no MTs for the constituents of concern (COCs) were exceeded in water quality RMS wells in the Marina-Ord Area.
- Land subsidence measurements collected from Interferometric Synthetic-Aperture Radar (InSAR) data and provided by DWR showed no significant land subsidence occurred in the Subbasin during WY 2022.
- The groundwater elevation measured at the interconnected surface water (ISW) RMS well was higher than its MT and measurable objective (MO).

Corral de Tierra Area

- Groundwater elevations decreased in the El Toro Primary Aquifer System during this dry water year, with most RMS wells showing elevations below their MT.
- Seven wells in the El Toro Primary Aquifer System exceeded their MTs during the Fall 2021 monitoring event. These MT exceedances in the El Toro Primary Aquifer System constitute an UR per the Monterey GSP.
- Groundwater extractions for reporting year 2022 (November 1, 2021, through October 31, 2022) were approximately 1,120 AF in the Corral de Tierra Area.
- There is no seawater intrusion in the Corral de Tierra Area.
- The groundwater quality MTs for arsenic and iron in Divisions of Drinking Water wells were exceeded in WY 2022; however, these were not due to GSA groundwater management action(s).
- As mentioned above, no significant subsidence was detected in the Subbasin.
- There are no existing shallow monitoring wells in the Corral de Tierra Area that can be used to measure ISW. SVBGSA will fill this data gap by installing one new shallow monitoring well along El Toro Creek during GSP implementation.

During WY 2022, the Subbasin GSAs have taken numerous actions to implement the Monterey GSP. These include:

- ***GSA policies, operations, and engagement*** – The Subbasin GSAs continued to coordinate regularly through staff and consultant meetings and strengthened collaboration with key agencies and partners. The Subbasin GSAs continued to regularly engage interested parties through their Boards of Directors, stakeholder workshops, and committees. MCWD GSA held as-needed meetings with individual agencies to facilitate data sharing, expansion of the monitoring network, and project planning. SVBGSA developed a 2-year and 5-year work plan and associated budget and continued to strengthen its relationship with partner agencies. It conducted outreach to underrepresented communities. Finally, SVBGSA developed well permit application review processes to comply with Executive Order N-7-22. As the responsibilities of the SVBGSA subbasin planning committees finished with GSP submittal, SVBGSA set up subbasin implementation committees to lead subbasin-specific GSP implementation activities.
- ***GSP planning and implementation*** – In collaboration with basin stakeholders, the Subbasin GSAs completed the Monterey GSP and submitted to DWR in January 2022. Following adoption of the Monterey GSP, the GSAs engaged in continued planning and modeling activities including completion of the WY 2021 Annual Report, development of the Salinas Valley Seawater Intrusion Model, support of United States Geological Survey (USGS) development of the Salinas Valley Integrated Hydrologic Model (SVIHM) and Operational Model (SVOM) and, contracting and then receiving the results of the preliminary investigation of the Deep Aquifers Study, developing the Salinas Valley Basin Integrated Implementation Plan, and initiating an application for the Round 2 SGMA Implementation Grant.
- ***Data collection and monitoring*** – The Subbasin GSAs undertook several efforts to further increase data collection and monitoring. During the reporting period, MCWD GSA engaged in discussions with local water management agencies regarding data and cost-sharing of monitoring efforts that benefits multiple subbasins and identified wells for additional sampling in the Marina-Ord Area. SVBGSA identified existing wells that could potentially fill monitoring network data gaps and engaged in discussions to expand the groundwater extraction monitoring program in the Corral de Tierra Area.
- ***Project implementation activities*** – The Subbasin GSAs developed a sustainability strategy for the Subbasin that outlines the Monterey GSP implementation efforts underway or planned to reach sustainability. During WY 2022, the Subbasin GSAs and project partners focused on initiating implementation actions defined in the Monterey GSP and conducting feasibility studies that lay the groundwork for developing a sustainable strategy and implementing Projects and Management Actions (P&MAs) for the Subbasin as well as the larger Salinas Valley, including:
    - Completing a Recycled Water Feasibility Study by the MCWD GSA for implementation of an indirect potable reuse (IPR) project within in the Marina-Ord Area, which would likely include injecting recycled water into the Deep Aquifer;

- Reviewing extraction and injection activities by MCWD GSA that are being conducted by Fort Ord within the Marina-Ord Area, and their potential impacts on Seawater Intrusion;
- Identifying retention pond for stormwater collection and use in lieu of groundwater in the Corral de Tierra Area;
- Supporting GSP implementation activities in adjacent subbasins including completion of the updated 180/400-Foot Aquifer Subbasin GSP and the Integrated Implementation Plan, as well as receipt of funding from the DWR Round 1 SGMA Implementation Grant in the 180/400-Foot Aquifer Subbasin;
- Initiating the Deep Aquifers Study and received recommendations from the preliminary investigation;
- Continuing to convene and participate in the Seawater Intrusion Working Group (SWIG) and the SWIG Technical Advisory Committee (SWIG TAC); and
- Continuing development of the Seawater Intrusion Model to support the upcoming feasibility studies of regional projects and management actions.

2 INTRODUCTION

2.1 Purpose

The 2014 California Sustainable Groundwater Management Act (SGMA) requires that, following the adoption of a GSP, GSAs annually report on the condition of the Subbasin and show that the Monterey GSP is being implemented in a manner that will likely achieve the sustainability goal for the Subbasin. This report fulfills that requirement for the Salinas Valley – Monterey Subbasin (Subbasin; DWR Basin 3-004.10).

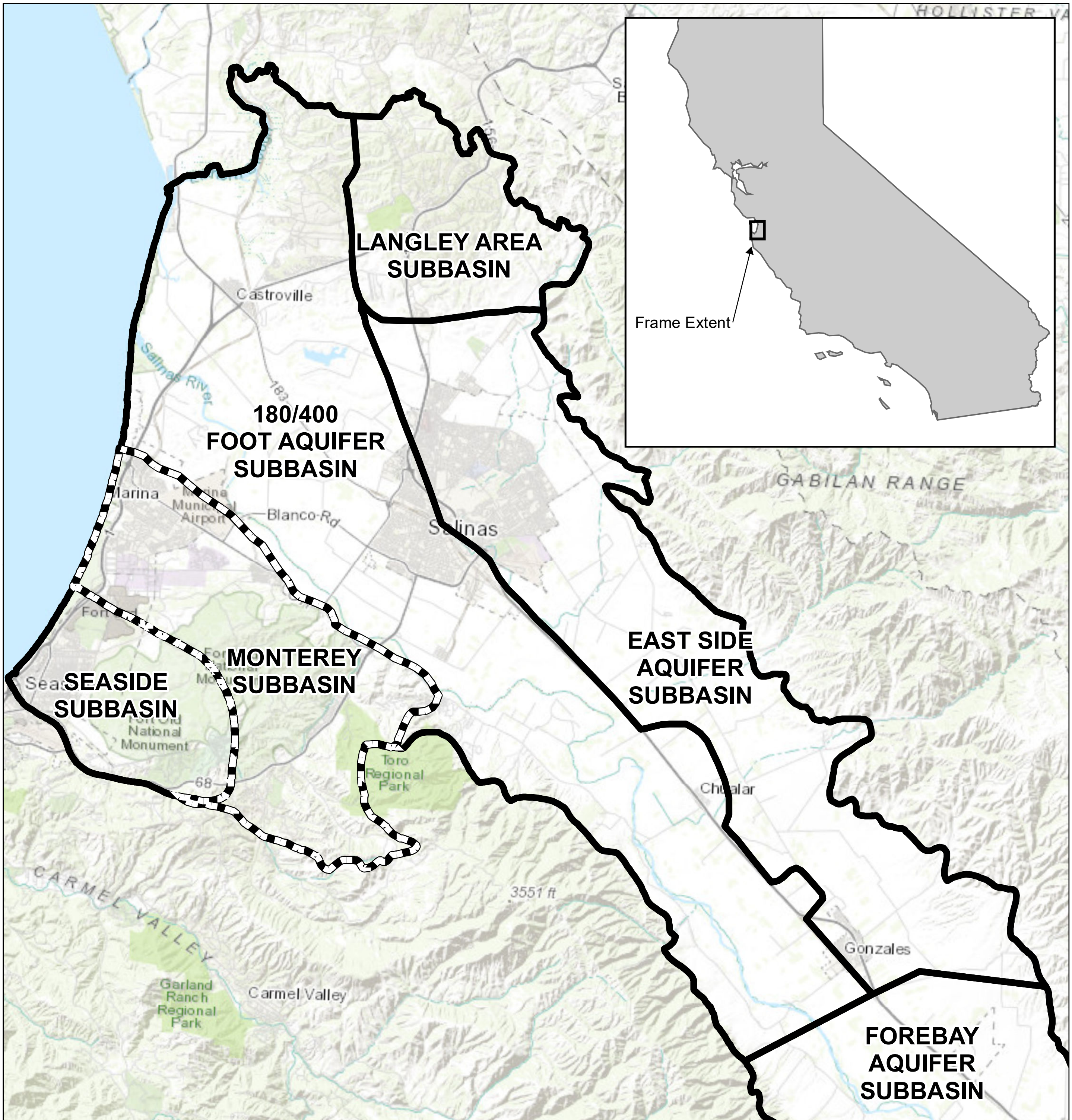
This WY 2022 Annual Report for the Subbasin has been prepared in compliance with CCR 23 §356.2. WY 2022 includes the period from October 1, 2021, through September 30, 2022. This Annual Report also contains available and appropriate historical information back to calendar year 2015, the effective date of SGMA as required by CCR 23 §356.2 (b). These data provide an understanding of Subbasin conditions through the current reporting year. This Annual Report describes Subbasin conditions and includes hydrographs, groundwater elevation contour maps, estimates of changes in groundwater storage, and maps depicting the distribution of groundwater extraction across the Subbasin. It compares WY 2022 data to SMCs as a measure of where groundwater conditions within Subbasin are with respect to the Sustainability Goal that must be reached and maintained by the end of 2042.

2.2 Monterey Subbasin Groundwater Sustainability Plan

The Monterey GSP was co-authored by MCWD GSA and SVBGSA and submitted to DWR on January 30, 2022. The MCWD GSA is a single-agency GSA formed by the MCWD. The SVBGSA is a Joint Powers Authority (JPA) with membership comprising the County of Monterey, Monterey County Water Resources Agency (MCWRA), City of Salinas, City of Soledad, City of Gonzales, City of King, Castroville Community Services District, and Monterey One Water.

The GSAs developed the Monterey GSP in coordination with the five other Salinas Valley Subbasin GSPs: the Eastside Aquifer Subbasin (DWR subbasin 3-004.02), the Forebay Aquifer Subbasin (DWR subbasin 3-004.04), the Upper Valley Aquifer Subbasin (DWR subbasin 3-004.05), the Langley Area Subbasin (DWR subbasin 3-004.09) and the 180/400-Foot Aquifer Subbasin (DWR subbasin 3-004.01).

The Monterey GSP covers the entire Subbasin, which encompasses 30,850 acres (or 48.2 square miles) in the northwestern Salinas Valley Groundwater Basin (SVGB) in the Central Coast region of California (Figure 2-1). The Subbasin has been designated as medium priority by DWR. The Monterey GSP established two Management Areas within the Subbasin (Figure 2-2): the Marina-Ord Area and the Corral de Tierra Area.



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 23 March 2023.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Path: X:\B60094\Maps\2023\03\Fig2-1 MontereySubbasin.mxd

Monterey Subbasin

Monterey Subbasin

WY 2022 Annual Report

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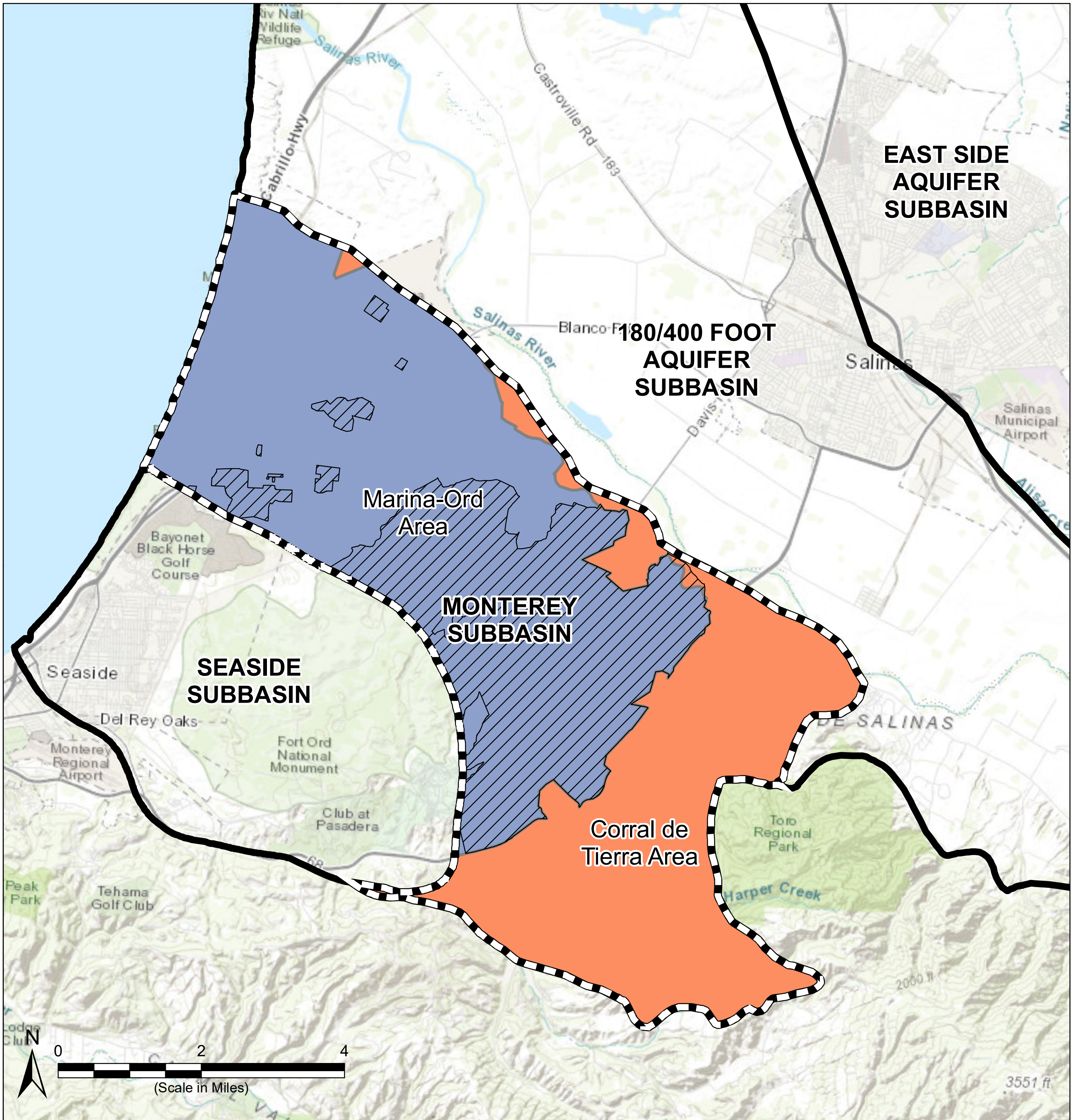
Figure 2-1



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 27 March 2023.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Management Areas

Monterey Subbasin
WY 2022 Annual Report
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Figure 2-2

Path: X:\B60094\Maps\2023\03\Fig2-2_ManagementAreas.mxd

2.3 Organization of This Report

This Annual Report has been developed pursuant to GSP Emergency Regulations §356.2. The Report outlines subbasin conditions, including groundwater elevations, groundwater extractions, surface water use, total water use, and changes in groundwater storage. The Report also reports on actions taken to implement the Monterey GSP and identifies any progress in reaching interim milestones (IMs).

3 SUBBASIN SETTING

The 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. As further detailed in the Monterey GSP, the Subbasin has complex local hydrostratigraphy 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.

3.1 Principal Aquifers and Aquitards

The Monterey GSP defined a series of principal aquifers and aquitards respectively for the Marina-Ord Area and the Corral de Tierra Area.

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 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 principally occurs from the 180-Foot, 400-Foot, and Deep Aquifers.

The aquifers have historically been described within the Corral de Tierra Area 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 and many wells that span multiple formations, these geologic formations are grouped to form the El Toro Primary Aquifer System.

3.2 Natural Groundwater Recharge and Discharge

Natural groundwater recharge occurs through the infiltration of precipitation, overlying surface water bodies, and excess applied irrigation water. Most of the Marina-Ord Area has good recharge potential (i.e., “A” and “B” hydrologic soil types) due to the high permeability of the Dune Sand Aquifer, which subsequently recharges the underlying 180-Foot and 400-Foot Aquifers. Most of the Corral de Tierra Area also has good recharge potential due to high permeability soils that recharge the underlying sandy, gravelly layers of the Aromas Sand and Paso Robles Formation.

Primary surface water bodies in the Subbasin include the Salinas River and Toro Creek. The Salinas River crosses into the Subbasin in two locations in the Corral de Tierra Area and may provide some recharge in areas that are not underlain by the Salinas Valley Aquitard (SVA) that generally exists in the 180/400-Foot Aquifer Subbasin. Toro Creek is generally perennial below the confluence with Watson Creek (Feikert, 2001). Recorded streamflows at USGS gage 11152540 from 1961 to 2001 indicate a mean annual streamflow of 1,590 acre-feet per year (AFY) for Toro Creek, however, not all years registered flow (GeoSyntec, 2007). Additionally, most flow occurs in the winter and spring months (GeoSyntec, 2007).

3.3 Precipitation and Water Year Type

Precipitation that falls within the Subbasin contributes to runoff and recharge components of the water budget. Precipitation rates within the Subbasin were estimated using the 4-kilometer gridded dataset from the Parameter-elevation Regressions on Independent Slopes Model (PRISM)[2], which reasonably reflects the spatial distribution of precipitation at a daily resolution over the entire extent of the Subbasin. The total precipitation in WY 2022 was estimated to be approximately 12.7 inches (in).

DWR's methodology was used to assign a water year type of critical, dry, below normal, above normal, or wet based on precipitation that occurred in the Subbasin during the current year and prior years (DWR, 2021). Using DWR's methodology, WY 2022 was classified as a dry year, following a dry year in WY 2021.

Table 3-1 identifies the assigned water year type for each water year since 2015.

Table 3-1. Water Year Type

WY	Precipitation (in)	Water Year Index	Water Year Type
2015	12.9	11.1	Dry
2016	19.4	16.8	Above Normal
2017	23.7	22.0	Wet
2018	11.6	16.5	Above Normal
2019	20.5	17.0	Above Normal
2020	14.6	17.0	Above Normal
2021	11.1	12.5	Dry
2022	12.7	12.0	Dry

[2] https://prism.oregonstate.edu/recent/

4 SUBBASIN CONDITIONS

This section details groundwater conditions within the Subbasin based on monitoring data collected during WY 2022. Where WY 2022 data are not available, groundwater conditions are evaluated based on the most recent data available as further described below.

4.1 Groundwater Elevations

The groundwater elevation monitoring network in the Subbasin currently consists of 47 RMS wells, including 35 RMS wells in the Marina-Ord Area and 12 RMS wells in the Corral de Tierra Area. The groundwater elevation monitoring network for the Corral de Tierra Area in the Monterey Subbasin GSP consists of 13 representative monitoring sites (RMSs) monitored by MCWRA. Since last year's annual report, 1 well (16S/02E-03H02) in the RMS network has been removed because the well was withdrawn from MCWRA's water level monitoring programs. The old RMS well was not replaced because of the lack of existing monitoring wells in the Corral de Tierra Area. The GSAs are working to fill data gaps with additional wells to include in the monitoring network. Although there are fewer RMS wells, the monitoring network still provides adequate coverage of the area in the Corral de Tierra where most known groundwater use occurs. The locations of the groundwater elevation monitoring network and RMS wells within the Marina-Ord Area and the Corral de Tiera Area are shown in *Figure 7-1* to *Figure 7-6* of the Monterey GSP.

The groundwater elevation monitoring network and RMS network for each Management Area are broken out by principal aquifer. However, as further discussed in Monterey GSP, the 180-Foot Aquifer is separated into an "upper" and a "lower" portion by a 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 generally more 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.

This section presents groundwater elevation contours from August 2021 and WY 2022 and long-term hydrographs for selected wells in the Subbasin's monitoring network.

4.1.1 <u>Groundwater Elevation Contours</u>

Groundwater elevation contour maps for the Marina-Ord Area during August 2021[3], Fall 2021, Spring 2022, and August 2022 are represented on Figure 4-1, Figure 4-2, Figure 4-3, and Figure 4-4, respectively.

In the Marina-Ord Area, groundwater elevation contour maps for Spring 2022 and August 2022 reflect seasonal high and seasonal low groundwater elevations for each principal aquifer for WY

[3] Although August 2021 was technically not within WY 2022, contours for August 2021 were provided as they were not provided for the WY 2021 Annual Report.

2022, respectively. In addition, groundwater elevation contours for each principal aquifer in the Marina-Ord Area were prepared for Fall 2021, which corresponds to the November and December monitoring timeframe upon which MTs and MOs for the Subbasin and neighboring subbasins within the greater Salinas Valley Basin have been established.

In the Corral de Tierra Area, groundwater elevation contour maps are presented for Fall 2021, August 2022, and Fall 2022 on Figure 4-5, Figure 4-6, and Figure 4-7, respectively. The August 2022 groundwater elevation contours represent the seasonal low conditions. As only few wells are monitored in the spring season in the Corral de Tierra Area, the Fall contours represent the seasonal high conditions, even though they are neutral because they are generally not heavily influenced by either summer irrigation pumping or winter rainfall recharge. In addition to representing the seasonal high, the Fall contours show the conditions during November and December upon which MTs and MOs have been established. Although technically not within WY 2022, the Fall 2022 groundwater elevations contour map for the Corral de Tierra Area is included to be consistent with the other Salinas Valley subbasins managed by SVBGSA.

Groundwater flow directions and groundwater levels observed during these periods in the Marina-Ord Area and Corral de Tierra Area are summarized below.

4.1.1.1 Marina-Ord Area

As mentioned in Section 3.1 above, principal aquifers in the Marina-Ord Area include the Dune Sand Aquifer, 180-Foot Aquifer, 400-Foot Aquifer, and Deep Aquifers.

Dune Sand Aquifer

As discussed in *Section 4* of the Monterey GSP, the Dune Sand Aquifer only exists in the Marina-Ord Area. Groundwater elevations and flow directions observed in the Dune Sand Aquifer during WY 2022 were generally consistent with those observed in the recent past. The groundwater elevations in the Dune Sand Aquifer are further described below.

- Groundwater elevations in the Dune Sand Aquifer in WY 2022 were highest in the central portion of the Marina-Ord Area, where a groundwater divide exists (Figure 4-1 through Figure 4-4). At the top of this divide, groundwater elevations were approximately 96 feet North American Vertical Datum of 1988 (ft NAVD 88) during Spring 2022. Groundwater elevations were lowest at the coast at approximately 8 ft NAVD 88 where the Dune Sand Aquifer merges with the upper 180-Foot Aquifer west of the SVA. 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 towards 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-Foot Aquifer Subbasin and the

Salinas River.

- Limited seasonal variations were observed in groundwater elevations within Dune Sand Aquifer during August 2021, Fall 2021, and August 2022.

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. Conditions in both portions of the 180-Foot Aquifer during WY 2022 were generally consistent with those observed in the recent past but some declines within the historical range of fluctuations were observed at specific RMS wells as described in Section 4.1.2 below. The Groundwater elevations in the upper 180-Foot Aquifer 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-Foot Aquifer Subbasin (Figure 4-1 through Figure 4-4).
- Groundwater elevations in the upper 180-Foot Aquifer were approximately 6 ft NAVD 88 at the coastline during Spring 2022 and generally decreased inland to the east/northeast, where groundwater elevations were approximately -10 ft NAVD 88.
- Groundwater elevations observed in Spring 2022 were generally higher than those observed in August 2021 and August 2022, but the variation in groundwater levels between these time periods is limited to a few feet (ft). The observed increase in groundwater levels between these two time periods is likely the result of increased recharge and seasonal reductions in pumping in the greater Salinas Valley Basin.
- Groundwater elevations observed during Fall 2021 were generally consistent with the those observed during Spring 2022.
- Groundwater elevations are at near sea level at the coastline and are below sea level further inland. This inland gradient allows high salinity water to flow into the Subbasin. However, inflow from the Dune Sand Aquifer protects the upper 180-Foot Aquifer from seawater intrusion.

Lower 180-Foot Aquifer

As discussed in *Section 4* of the Monterey GSP, 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, further described below.

400-Foot Aquifer

Groundwater elevations and flow directions observed in the 400-Foot Aquifer during WY 2022 are generally consistent with those observed in the recent past but some declines within the historical range of fluctuations were observed at specific RMS wells as described in Section 4.1.2 below. Groundwater elevations in this aquifer have been plotted in combination with groundwater elevations observed within the Paso Robles Aquifer identified in the adjacent Seaside Subbasin. Available data indicate that these aquifers are potentially hydraulically connected; however, there is also a possible connection between the Seaside Subbasin Paso Robles Aquifer with the upper portion of the Deep Aquifers in the Subbasin.

- In WY 2022, groundwater elevations in the 400-Foot Aquifer were highest in the southern portion of the Subbasin and generally decreased to the north and east (Figure 4-1 through Figure 4-4). Flow directions are generally toward the northeast and the 180/400-Foot Aquifer Subbasin. A flow divide occurs along the Monterey-Seaside Subbasin boundary.
- A local groundwater depression exists just north of the Monterey-Seaside Subbasin boundary. However, as discussed in *Section 5.1.3* of the Monterey GSP, there is no known extraction in the vicinity of these wells, and groundwater elevation trends observed in these wells are similar to those measured in the Deep Aquifers. These data suggest that (1) these wells are screened within sediments that connect directly to the Deep Aquifers; or (2) leakage is occurring from the 400-Foot Aquifer into the Deep Aquifers in the vicinity of these wells. This potential connectivity will be evaluated as part of the Deep Aquifers Study and MCWD GSA's plans to install additional monitoring wells in this area. The depression is not near supply wells or groundwater dependent ecosystems (GDEs) so beneficial users are not impacted.
- Groundwater elevations in the Marina-Ord Area ranged from 4 ft NAVD 88 at the coast to approximately -10 ft NAVD 88 at the Monterey- 180/400-Foot Aquifer Subbasin boundary during Spring 2022. Groundwater elevations during Fall 2021 were similar to those observed during Spring 2022 in the Marina-Ord Area. Groundwater elevations during August 2021 and August 2022 were generally lower than those observed during Spring 2022, but the variation in groundwater levels among these time periods was limited to less than 10 feet.
- Groundwater elevations are at near sea level at the coastline and below sea level farther inland. As discussed in *Section 4* of the Monterey GSP, the geologic formations that make up this aquifer extend offshore and likely outcrop beneath a veneer of Pleistocene or Holocene marine sediments that is 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 and Bay outcrops allow high salinity water to flow into this aquifer in the northern portion of the Subbasin.

Deep Aquifers

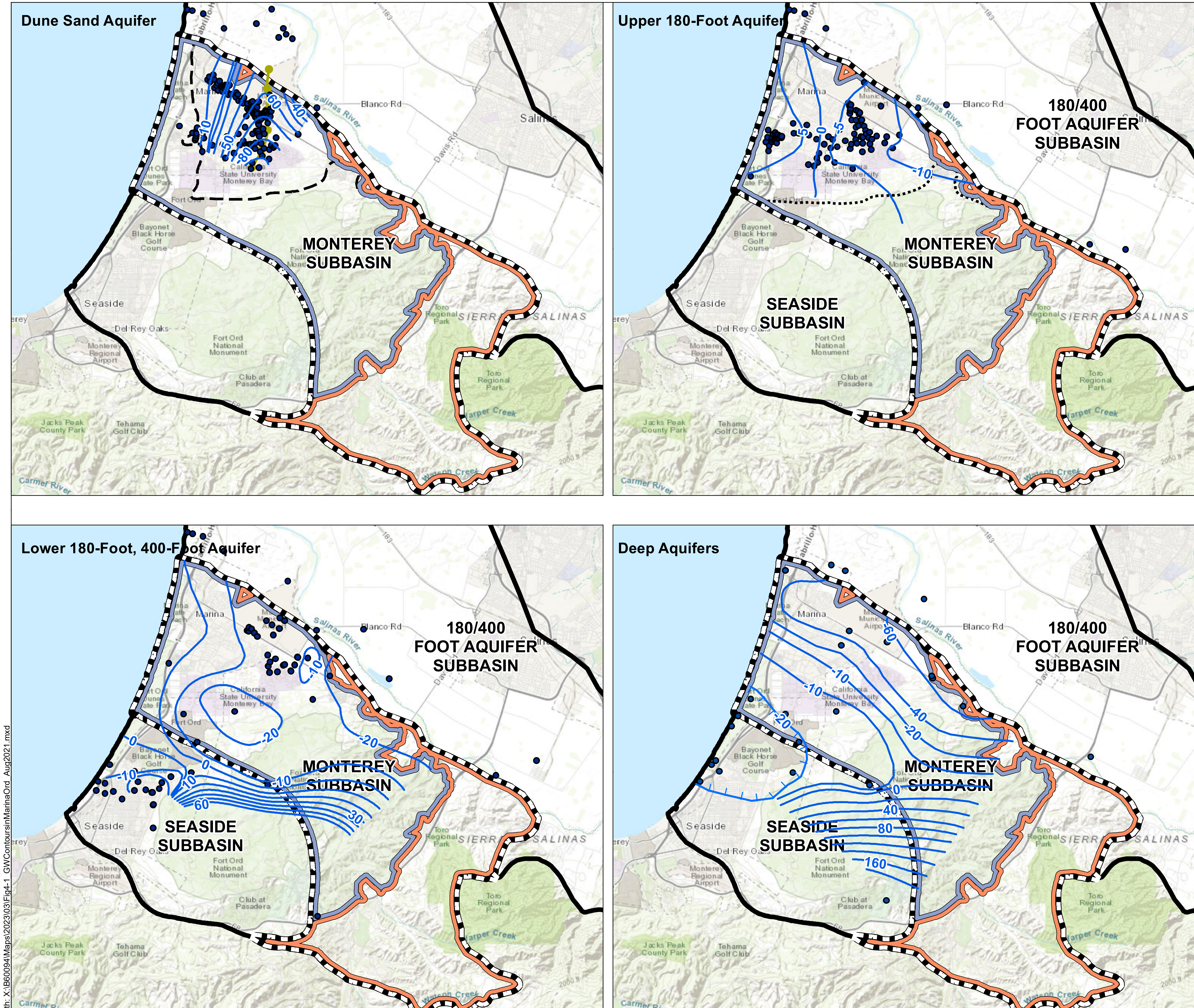
As discussed in *Section* 4 of the Monterey GSP, the Deep Aquifers consist of multiple water-bearing zones and aquitards that appear to be somewhat hydraulically connected. Given the absence of data for the multiple layers that make up this aquifer, this assessment generally describes conditions in the Deep Aquifers as a whole. The Deep Aquifers Study funded by MCWD GSA, SVBGSA, and other cooperative funding partners is examining the extent of the Deep

Aquifers and its connectivity to adjacent aquifers. For this annual report, groundwater elevation contours for the Deep Aquifers follow the extent included in the GSP, where groundwater elevations in the Deep Aquifers have been plotted with groundwater elevations within the Santa Margarita Aquifer in the Seaside Subbasin. Groundwater elevations and flow directions observed in the Deep Aquifers during WY 2022 are generally consistent with those observed in the recent past as further described below.

- Groundwater elevations in the Deep Aquifers were highest in the southeastern portion of the Marina-Ord Area during WY 2022 and generally decreased toward the northwest (Figure 4-1 through Figure 4-4). Groundwater generally flows toward a pumping trough located in the 180/400-Foot Aquifer Subbasin near West Blanco Road and Nashua Road. A groundwater divide exists in the central region of the Marina-Ord Area, running parallel to the boundary of the Monterey-Seaside Subbasins. To the south of this groundwater divide, the groundwater flows in a southerly direction, while to the north, the flow is in a northerly direction.
- Groundwater elevations ranged from 157 ft NAVD 88 near the southeastern Subbasin boundary to -68 ft NAVD 88 in the north near the Monterey-180/400-Foot Aquifer Subbasin boundary during Spring 2022. Groundwater elevations were, for the most part, less than 20 feet lower in August 2021 and August 2022 than in Spring 2022 in the Marina-Ord Area. The Fall 2021 groundwater elevations were between the seasonal high (i.e., Spring 2022) and seasonal low (i.e., August 2022).

4.1.1.2 Corral de Tierra Area

Figure 4-5 shows the Fall 2021 groundwater elevation contours within the El Toro Primary Aquifer System in the Corral de Tierra Area. Groundwater in the El Toro Primary Aquifer System generally flows from the south toward the north, northwest, and northeast. A potential groundwater flow divide occurs near the Monterey-Seaside Subbasin boundary in the Laguna Seca area. There may be localized depressions around pumping centers, but there is insufficient data to show them in the groundwater elevation contours. Additionally, the top of the Monterey Formation, which is the defined bottom of the Subbasin, is uplifted in this area due to structural deformation, and may impact flow direction. In Fall 2021, the groundwater elevations in the El Toro Primary Aquifer System ranged from approximately 900 ft to -40 ft NAVD 88 from south to north. Groundwater elevations contours for August 2022 and Fall 2022 are provided in Figure 4-6 and Figure 4-7, respectively, and show similar flow patterns to the Fall 2021 groundwater elevation contours.



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley
- Southern Extent of FO-SVA (Harding ESE, 2001)
- Dune Sand Groundwater Divide
- Southern Extent of Valley Fill Deposits (Harding ESE, 2001)
- August 2021 Groundwater Contours
- GWE Measurement Locations
- Pumping Depression

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. The groundwater contours for the Deep Aquifers were prepared at 20-foot intervals, and the -10-foot NAVD 88 contours were included to inform the groundwater divide.
4. MPWMD#FO-10S is known to be screened in the Paso Robles Aquifer, which is likely connected to the 400-Foot Aquifer. MPWMD#FO-10D and Sentinel MW#1 are screened in the Santa Margarita Aquifer, which is likely connected to the Deep Aquifers.
5. Groundwater elevations in 400-Foot Aquifer have been plotted in combination with groundwater elevations observed within the Paso Robles Aquifer identified in the adjacent Seaside Subbasin. Groundwater elevations in the Deep Aquifers have been plotted with groundwater elevations within the Santa Margarita Aquifer in the Seaside Subbasin.

Sources

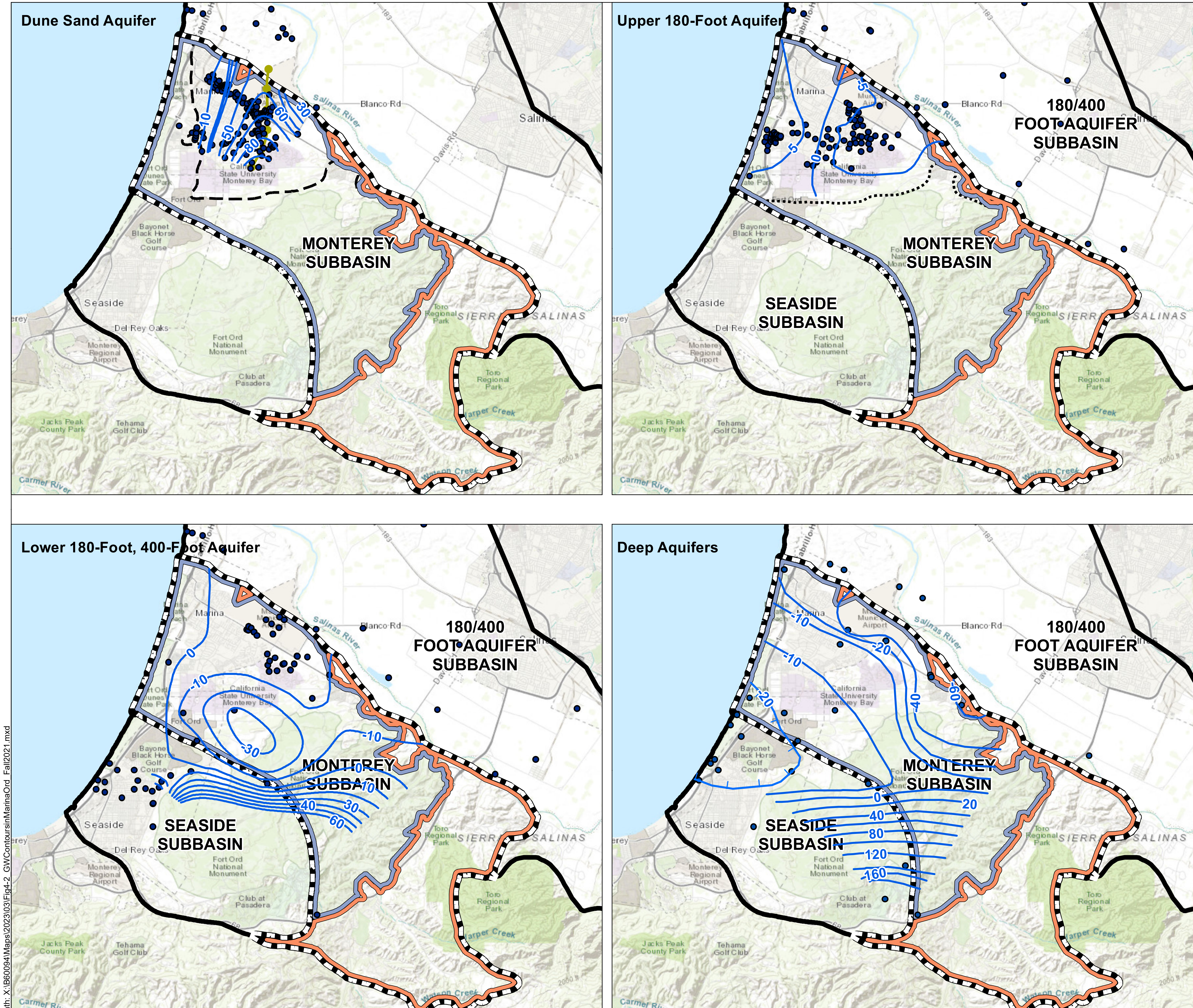
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2023.
2. Groundwater contours are drawn with groundwater elevation measurements collected during August 2021. Only static water levels are plotted.

N
0 2.5 5
(Scale in Miles)

Groundwater Level Contours in the Marina-Ord Area - August 2021

Monterey Subbasin
WY 2022 Annual Report
March 2023
Figure 4-1

Path: X:\B60094\Maps\2023\03\Fig4-1_GWContoursInMarinaOrd_Aug2021.mxd



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley
- Southern Extent of FO-SVA (Harding ESE, 2001)
- Dune Sand Groundwater Divide
- Southern Extent of Valley Fill Deposits (Harding ESE, 2001)
- Fall 2021 Groundwater Contours
- GWE Measurement Locations
- Pumping Depression

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. The groundwater contours for the Deep Aquifers were prepared at 20-foot intervals, and the -10-foot NAVD 88 contours were included to inform the groundwater divide.
4. MPWMD#FO-10S is known to be screened in the Paso Robles Aquifer, which is likely connected to the 400-Foot Aquifer. MPWMD#FO-10D and Sentinel MW#1 are screened in the Santa Margarita Aquifer, which is likely connected to the Deep Aquifers.
5. Groundwater elevations in 400-Foot Aquifer have been plotted in combination with groundwater elevations observed within the Paso Robles Aquifer identified in the adjacent Seaside Subbasin. Groundwater elevations in the Deep Aquifers have been plotted with groundwater elevations within the Santa Margarita Aquifer in the Seaside Subbasin.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2023.
2. Groundwater contours are drawn with groundwater elevation measurements collected during Fall 2021. Only static water levels are plotted.

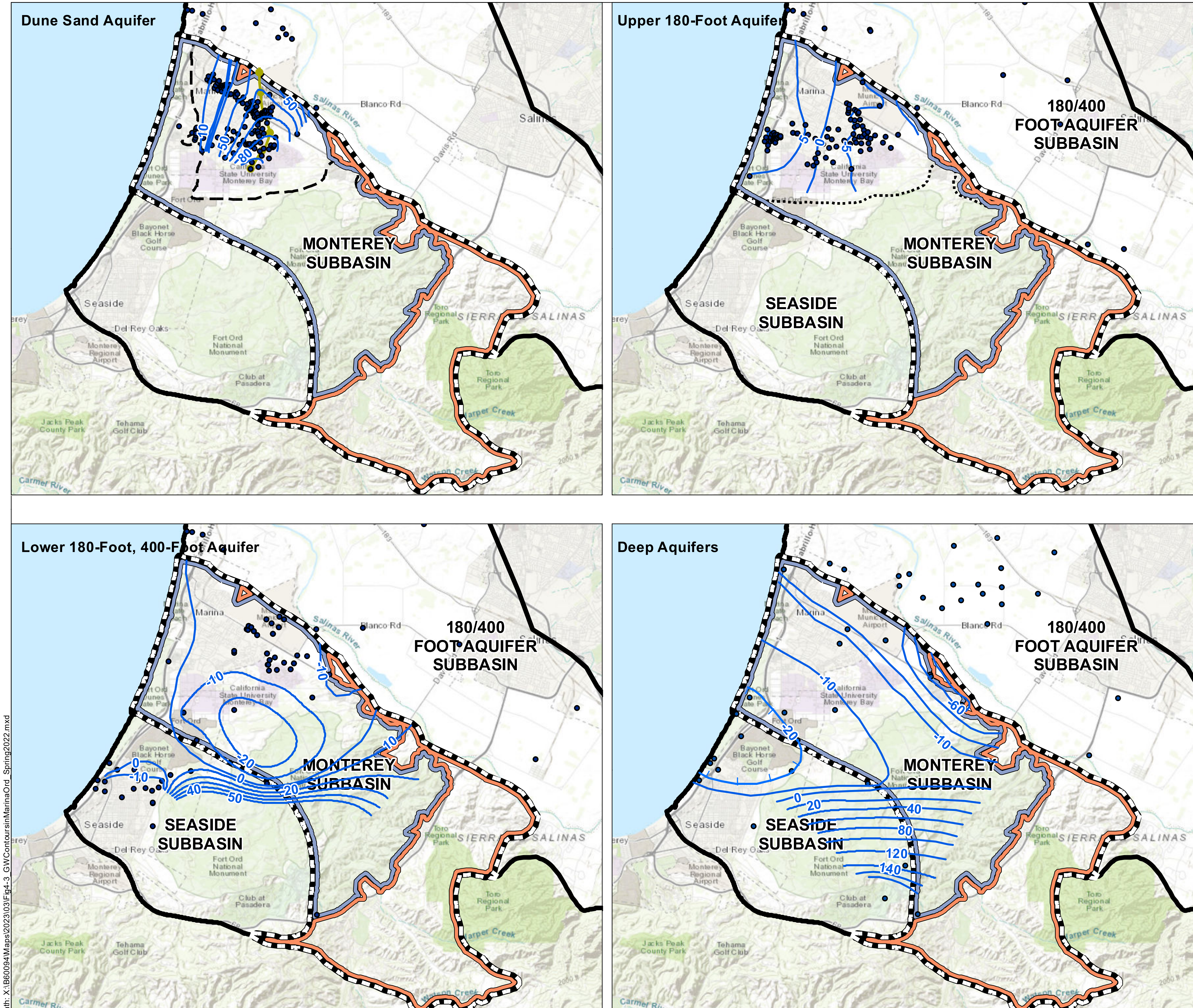
N
0 2.5 5
(Scale in Miles)

Groundwater Level Contours in the Marina-Ord Area - Fall 2021

Monterey Subbasin
WY 2022 Annual Report
March 2023

Figure 4-2

Path: X:\B60094\Maps\2023\03\Fig4-2_GWContoursinMarinaOrd_Fall2021.mxd



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley
- Southern Extent of FO-SVA (Harding ESE, 2001)
- Dune Sand Groundwater Divide
- Southern Extent of Valley Fill Deposits (Harding ESE, 2001)
- Spring 2022 Groundwater Contours
- GWE Measurement Locations
- Pumping Depression

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. The groundwater contours for the Deep Aquifers were prepared at 20-foot intervals, and the -10-foot NAVD 88 contours were included to inform the groundwater divide.
4. MPWMD#FO-10S is known to be screened in the Paso Robles Aquifer, which is likely connected to the 400-Foot Aquifer. MPWMD#FO-10D and Sentinel MW#1 are screened in the Santa Margarita Aquifer, which is likely connected to the Deep Aquifers.
5. Groundwater elevations in 400-Foot Aquifer have been plotted in combination with groundwater elevations observed within the Paso Robles Aquifer identified in the adjacent Seaside Subbasin. Groundwater elevations in the Deep Aquifers have been plotted with groundwater elevations within the Santa Margarita Aquifer in the Seaside Subbasin.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2023.
2. Groundwater contours are drawn with groundwater elevation measurements collected during Spring 2022. Only static water levels are plotted.

N

0 2.5 5

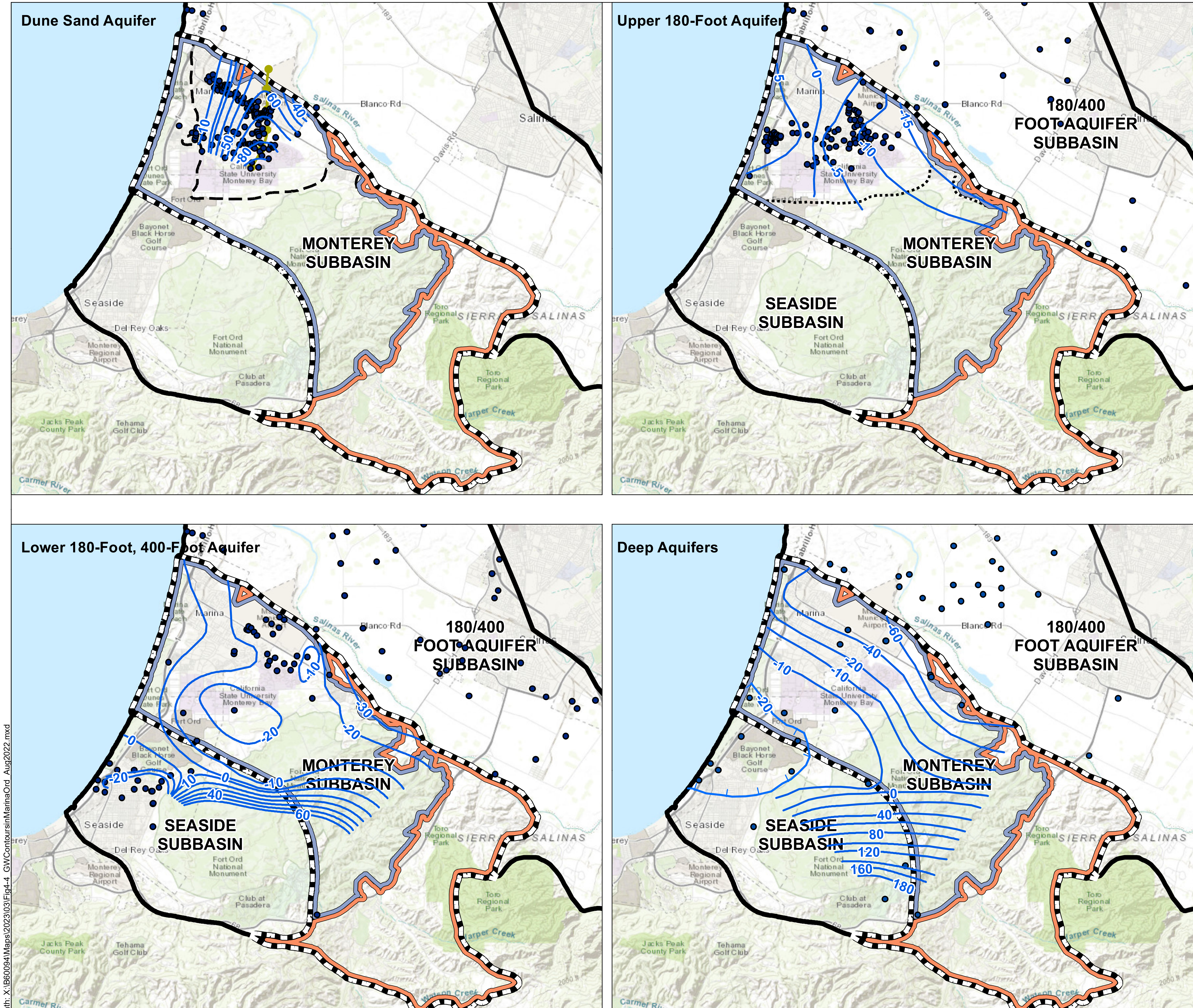
(Scale in Miles)

Groundwater Level Contours in the Marina-Ord Area - Spring 2022

Monterey Subbasin
WY 2022 Annual Report
March 2023

Figure 4-3

Path: X:\B60094\Maps\2023\03\Fig4-3_GWContoursinMarinaOrd_Spring2022.mxd



Legend
- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley
- Southern Extent of FO-SVA (Harding ESE, 2001)
- Dune Sand Groundwater Divide
- Southern Extent of Valley Fill Deposits (Harding ESE, 2001)
- August 2021 Groundwater Contours
- GWE Measurement Locations
- Pumping Depression

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. The groundwater contours for the Deep Aquifers were prepared at 20-foot intervals, and the -10-foot NAVD 88 contours were included to inform the groundwater divide.
4. MPWMD#FO-10S is known to be screened in the Paso Robles Aquifer, which is likely connected to the 400-Foot Aquifer. MPWMD#FO-10D and Sentinel MW#1 are screened in the Santa Margarita Aquifer, which is likely connected to the Deep Aquifers.
5. Groundwater elevations in 400-Foot Aquifer have been plotted in combination with groundwater elevations observed within the Paso Robles Aquifer identified in the adjacent Seaside Subbasin. Groundwater elevations in the Deep Aquifers have been plotted with groundwater elevations within the Santa Margarita Aquifer in the Seaside Subbasin.

Sources
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2023.
2. Groundwater contours are drawn with groundwater elevation measurements collected during August 2022. Only static water levels are plotted.

N

0 2.5 5

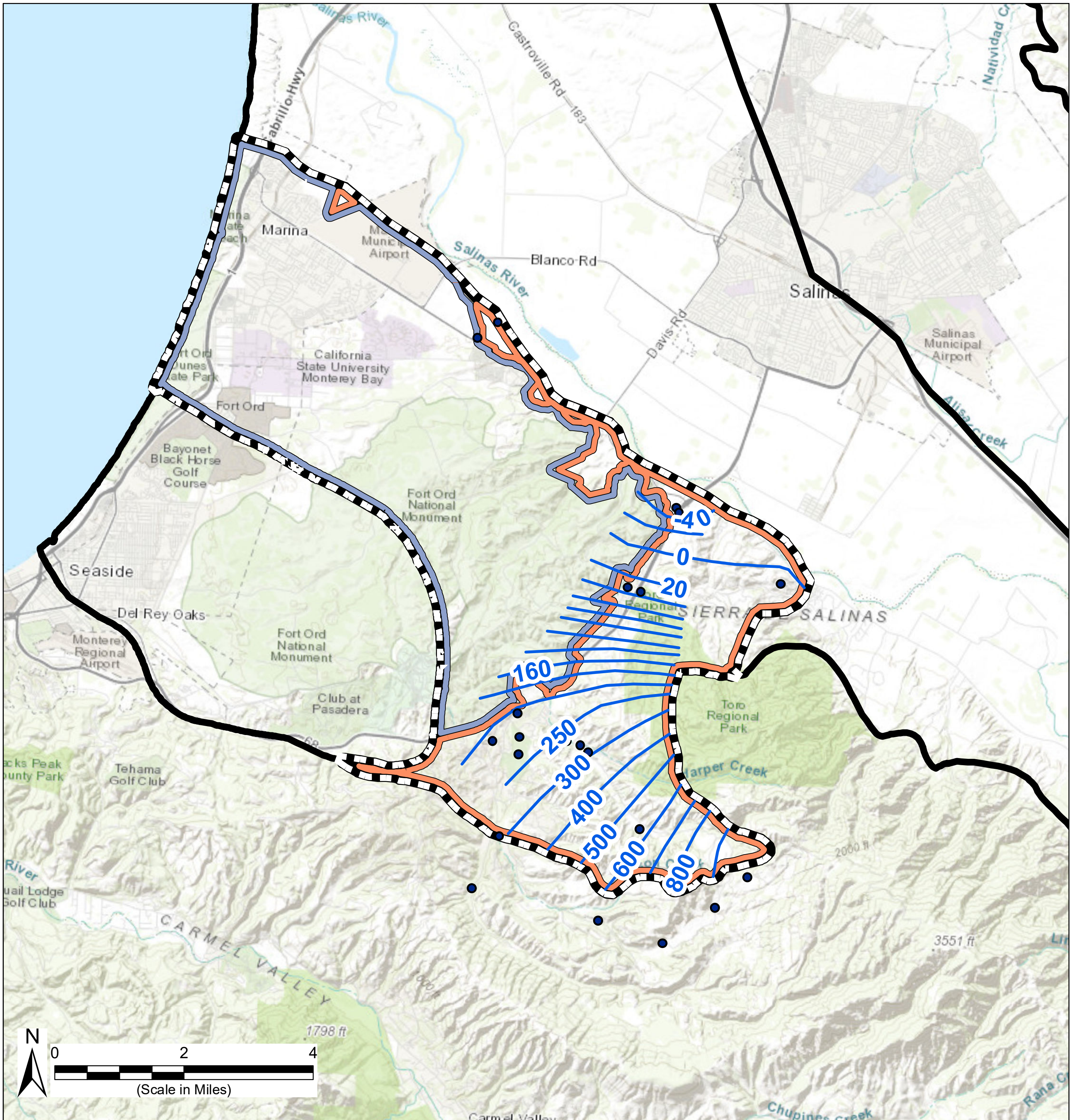
(Scale in Miles)

Groundwater Level Contours in the Marina-Ord Area - August 2022

Monterey Subbasin
WY 2022 Annual Report
March 2023

Figure 4-4

Path: X:\B60094\Maps\2023\03\Fig4-4_GWContoursinMarinaOrd_Aug2022.mxd



Legend

Monterey Subbasin

Other Groundwater Subbasins within Salinas Valley Basin

GWE Measurement Locations

Fall 2021 Groundwater Contours

Management Areas

Marina-Ord Area

Corral de Tierra

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.

Sources

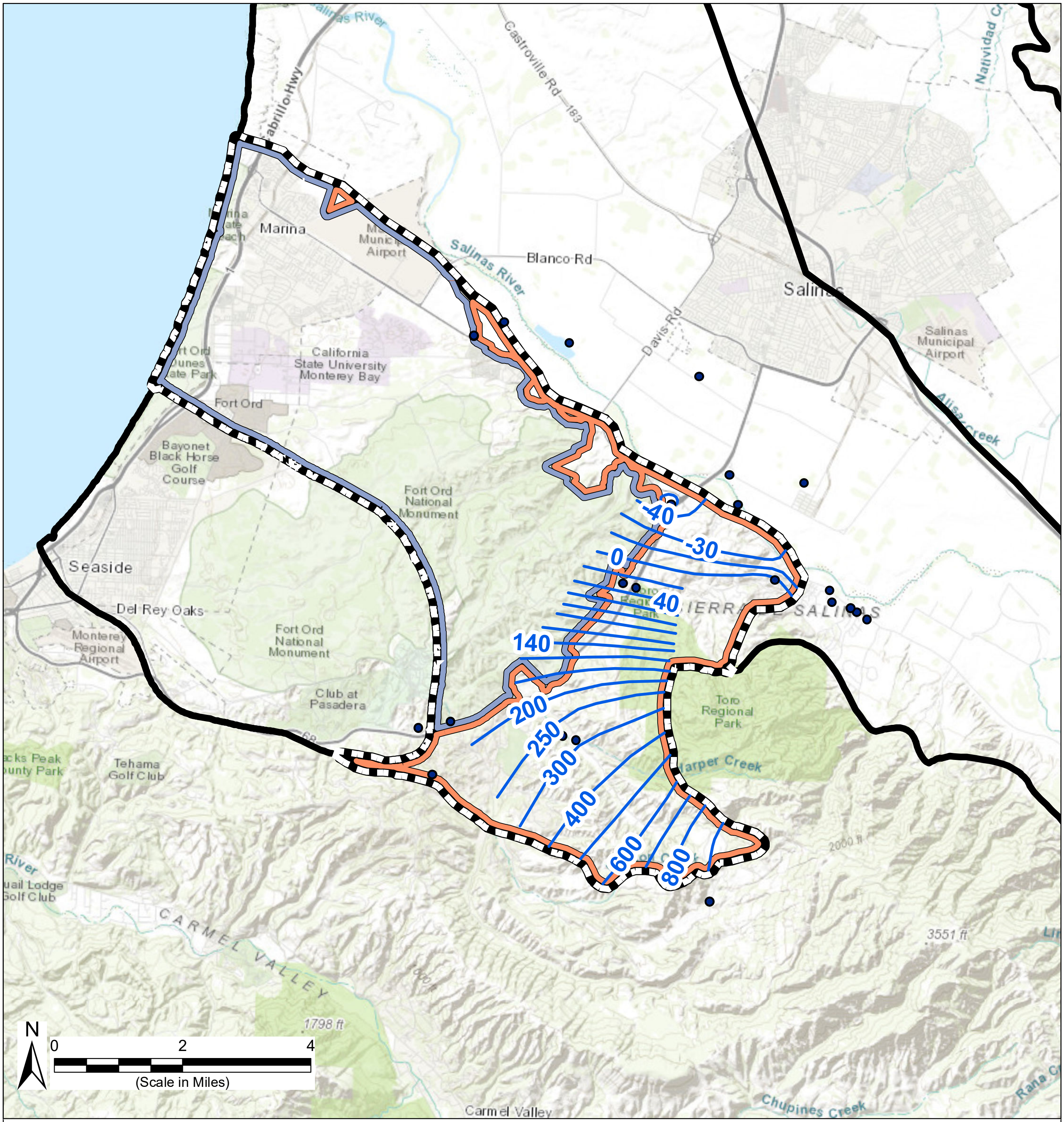
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 27 March 2023.

Groundwater Level Contours in the El Toro Primary Aquifer System - Fall 2021

Monterey Subbasin
WY 2022 Annual Report
March 2023

Figure 4-5

Path: X:\B60094\Maps\2023\03\Fig4-5-CoralFall2021.mxd



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- GWE Measurement Locations
- August 2022 Groundwater Contours

Management Areas

- Marina-Ord Area
- Corral de Tierra

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.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 27 March 2023.

Groundwater Level Contours in the El Toro Primary Aquifer System - August 2022

Monterey Subbasin

WY 2022 Annual Report

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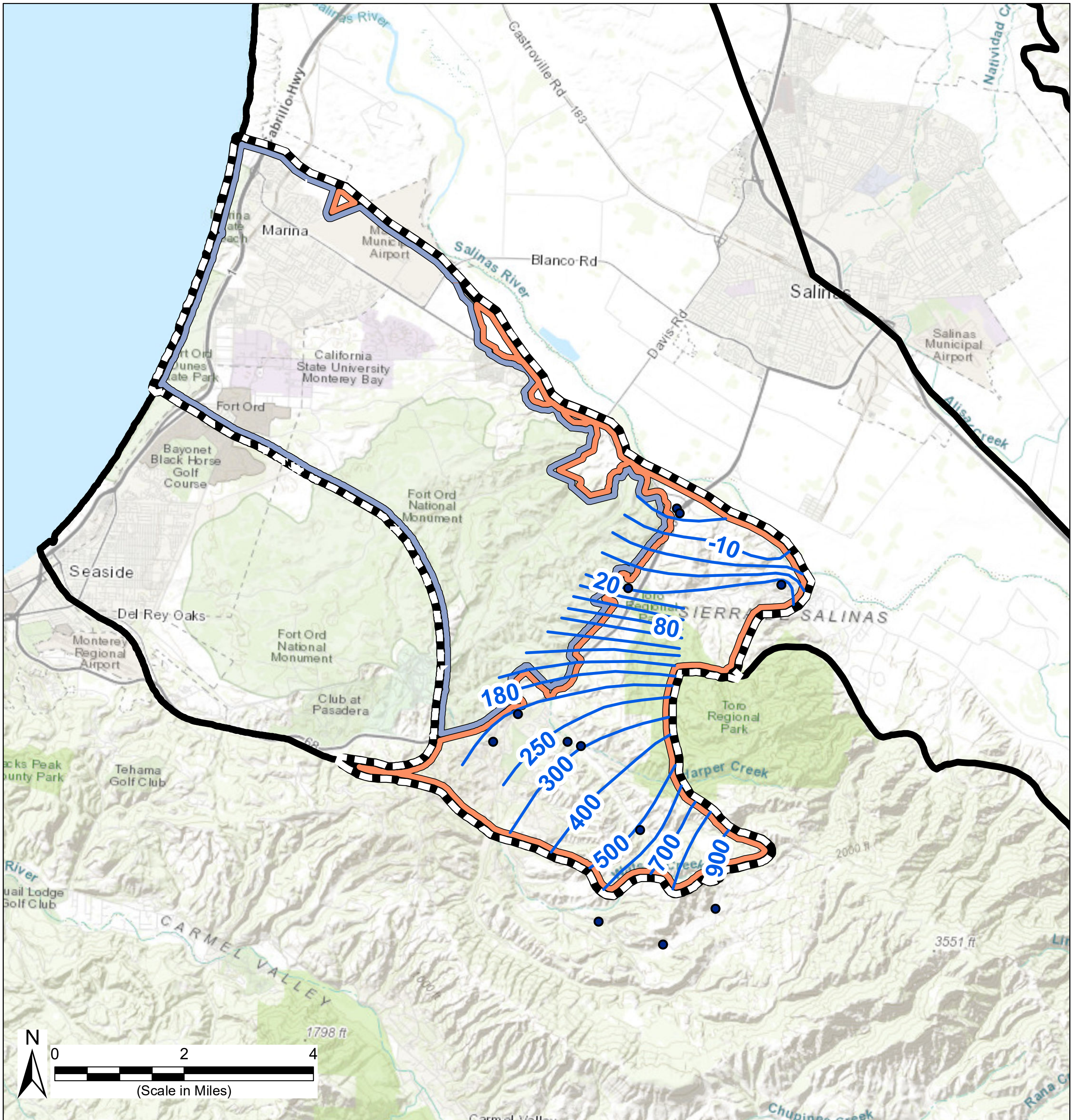
Figure 4-6

Path: X:\B60094\Maps\2023\03\Fig4-6-Coral_August_2022.mxd



Path: X:\B60094\Maps\2023\03\Fig4-7-CoralFall2022.mxd

Legend

Monterey Subbasin

Other Groundwater Subbasins within Salinas Valley Basin

GWE Measurement Locations

Fall 2022 Groundwater Contours

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.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 27 March 2023.

Groundwater Level Contours in the El Toro Primary Aquifer System - Fall 2022

Monterey Subbasin
WY 2022 Annual Report
March 2023

Figure 4-7

4.1.2 Long-Term Groundwater Elevation Trends

Temporal trends in groundwater elevations can be assessed with hydrographs that plot changes in groundwater elevations over time. Hydrographs for selected monitoring wells within the Subbasin are shown on Figure 4-8 through Figure 4-14.

4.1.2.1 Marina-Ord Area

Groundwater elevations have decreased slightly in portions of the 180-Foot and 400-Foot Aquifers during WY 2022, likely due to consecutive drought over the past two years. However, the observed groundwater elevation declines are within the historical range of fluctuations.

Dune Sand Aquifer

- Groundwater elevations in the Dune Sand Aquifer have been generally stable for over three decades and do not show significant seasonal variations.

180-Foot Aquifer

Upper 180-Foot Aquifer

- Groundwater elevations have been generally stable in the upper 180-Foot Aquifer for the past thirty years. Groundwater elevations near the Monterey and 180/400-Foot Aquifer Subbasin boundary decreased slightly in WY 2022 while the groundwater elevations in other areas were stable or slightly increased. However, the variations were limited to a few feet and are within the historical range of fluctuations.

*Lower 180-Foot Aquife*r

- Groundwater elevations have been stable in the lower 180-Foot Aquifer for the past thirty years. Groundwater elevations generally decreased in WY 2022, likely due to the recent drought and below normal precipitation in the past two years. However, the magnitude of the variations between WY 2021 and WY 2022 was limited to a few feet and are within the historical range of fluctuations.

400-Foot Aquifer

- Groundwater elevations are generally stable in the past thirty years in 400-Foot Aquifer wells in the northern Marina-Ord Area. However, groundwater elevations have been declining consistently near the southern Marina-Ord Area near wells MPWMD#FO-10S and MPWMD#FO-11S. As discussed in Section 4.1.1.1, the cause of this local depression is not known as there is no known groundwater extraction in its vicinity. The depression is not near supply wells or GDEs so beneficial users are not impacted. Further information regarding groundwater conditions in this area is being obtained as part of the Deep Aquifers Study, as discussed in Section 5.1.4, as well as MCWD GSA's plan to install additional monitoring wells in this area5.1.4.

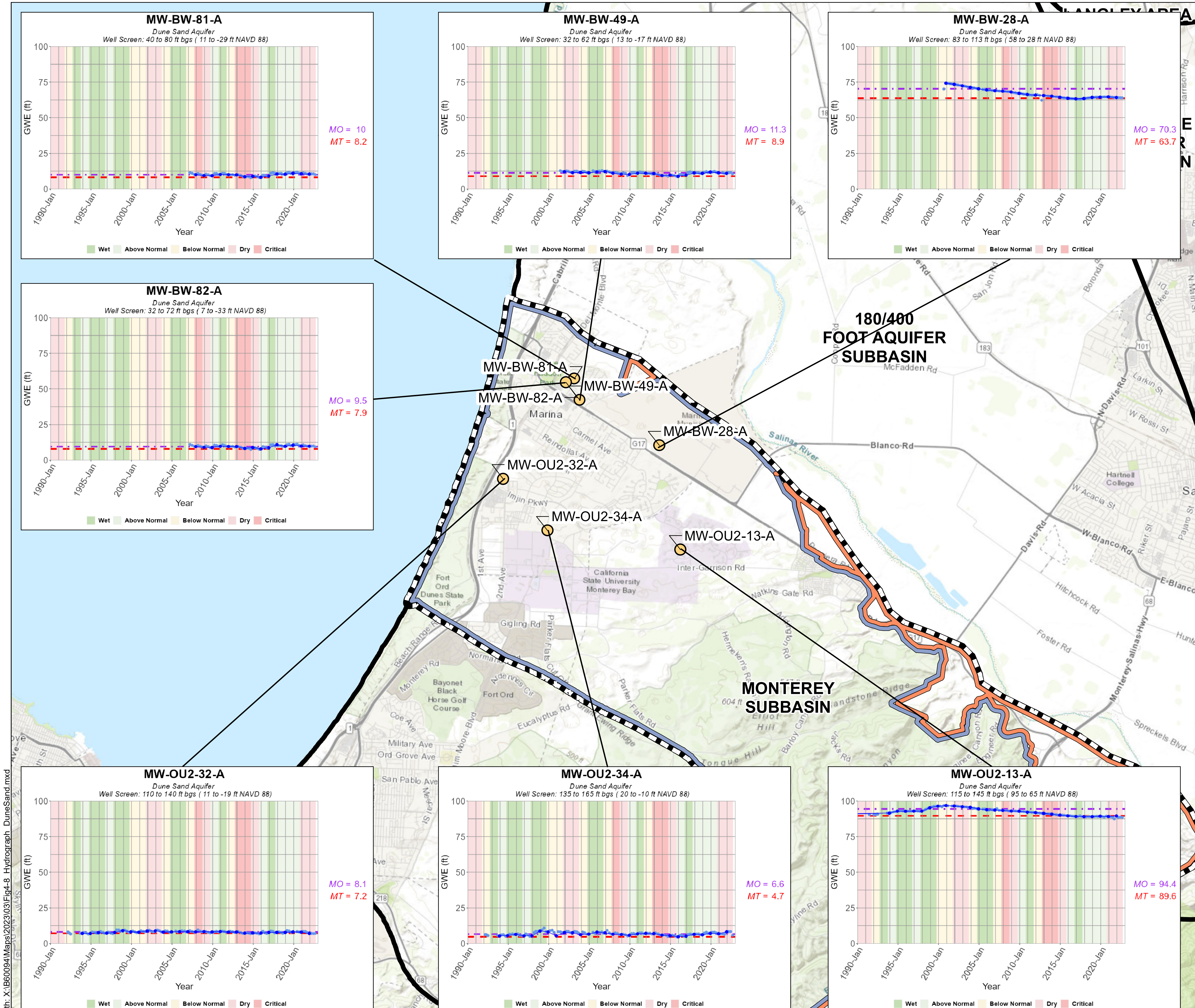
- Groundwater elevations in most RMS wells decreased in WY 2022, likely due to the recent drought and below normal precipitation in the past two years. However, the magnitude of the variations between WY 2021 and WY 2022 was limited to a few feet.

Deep Aquifers

- Groundwater elevations have been decreasing in the Deep Aquifers since 2000. The rate of decline increased from WY 2015 to 2021. However, the groundwater elevations increased slightly in WY 2022 compared to WY 2021 in eight of the Marina-Ord Area Deep Aquifers RMS wells except for the two RMS wells next to the Monterey Seaside Subbasin boundary.

4.1.2.2 Corral de Tierra Area

Figure 4-13 and Figure 4-14 show example hydrographs for RMS in the Corral de Tierra Area. Groundwater elevations in the Corral de Tierra Area have been declining since the 2000s. Between WY 2021 and WY 2022, groundwater elevations fluctuated in this area with no discernible prevalence of spatial patterns with the current RMS wells. SVBGSA is working to fill groundwater level monitoring data gaps to better understand groundwater elevation variation.



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 27 March 2023.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

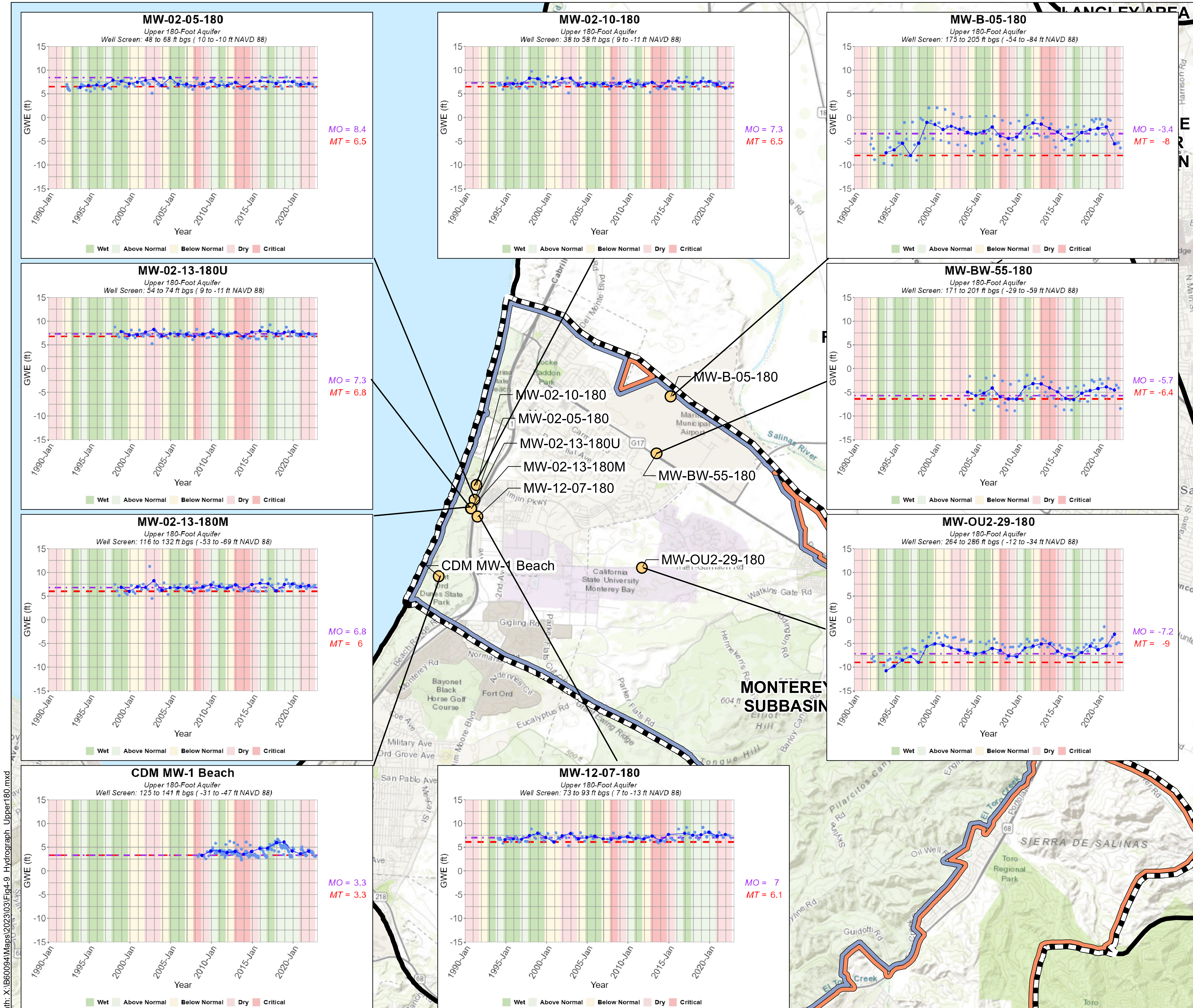
N 0 1.5 3 (Scale in Miles)

Representative Groundwater Elevation Hydrographs in the Dune Sand Aquifer

Monterey Subbasin
WY 2022 Annual Report
March 2023

Figure 4-8

Path: X:\B60094\Maps\2023\03\Fig4-8_Hydrograph_DuneSand.mxd



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
- 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 29 March 2023.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

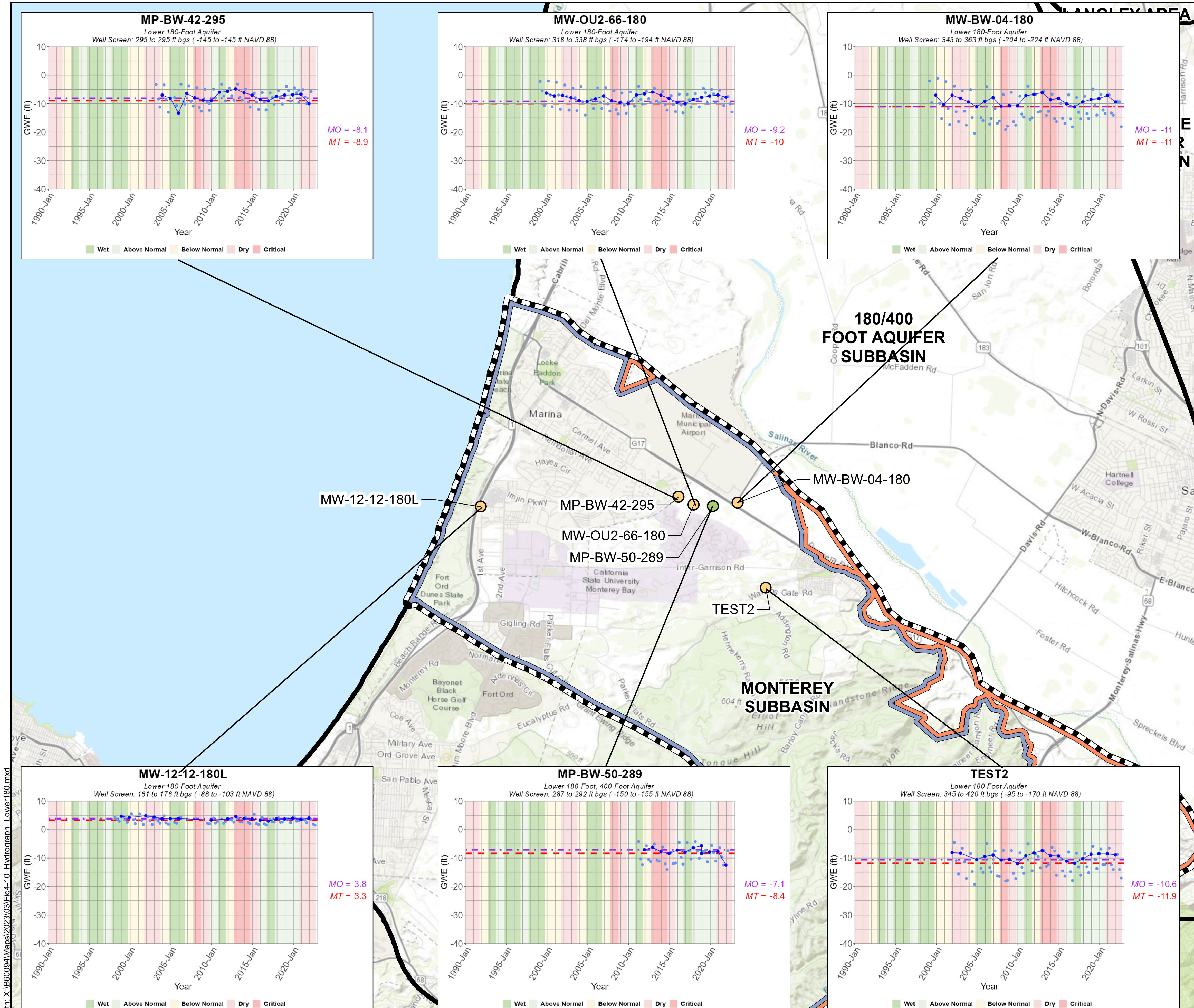
N 0 1.5 3 (Scale in Miles)

Representative Groundwater Elevation Hydrographs in the Upper 180-Foot Aquifer

Monterey Subbasin
WY 2022 Annual Report
March 2023

Figure 4-9

Path: X:\B60094\Maps\2023\03\Fig4-9_Hydrograph_Upper180.mxd



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

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

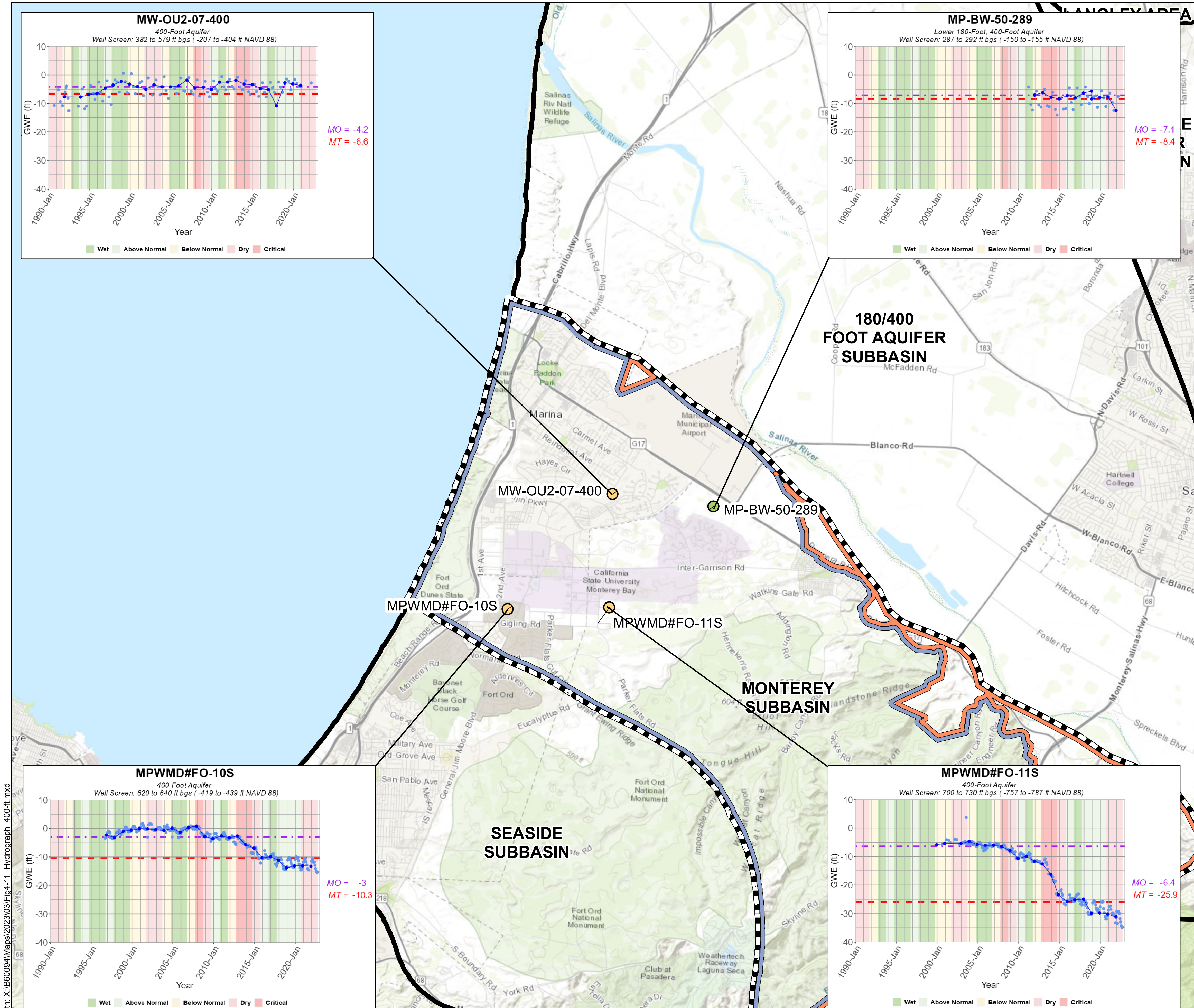
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 27 March 2023.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

N 0 1.5 3 (Scale in Miles)

Representative Groundwater Elevation Hydrographs in the Lower 180-Foot Aquifer

Monterey Subbasin
WY 2022 Annual Report
March 2023

Figure 4-10



Legend

Monterey Subbasin

Other Groundwater Subbasins within Salinas Valley Basin

Representative Monitoring Sites for Groundwater Elevations

400-Foot Aquifer (Paso Robles 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

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.

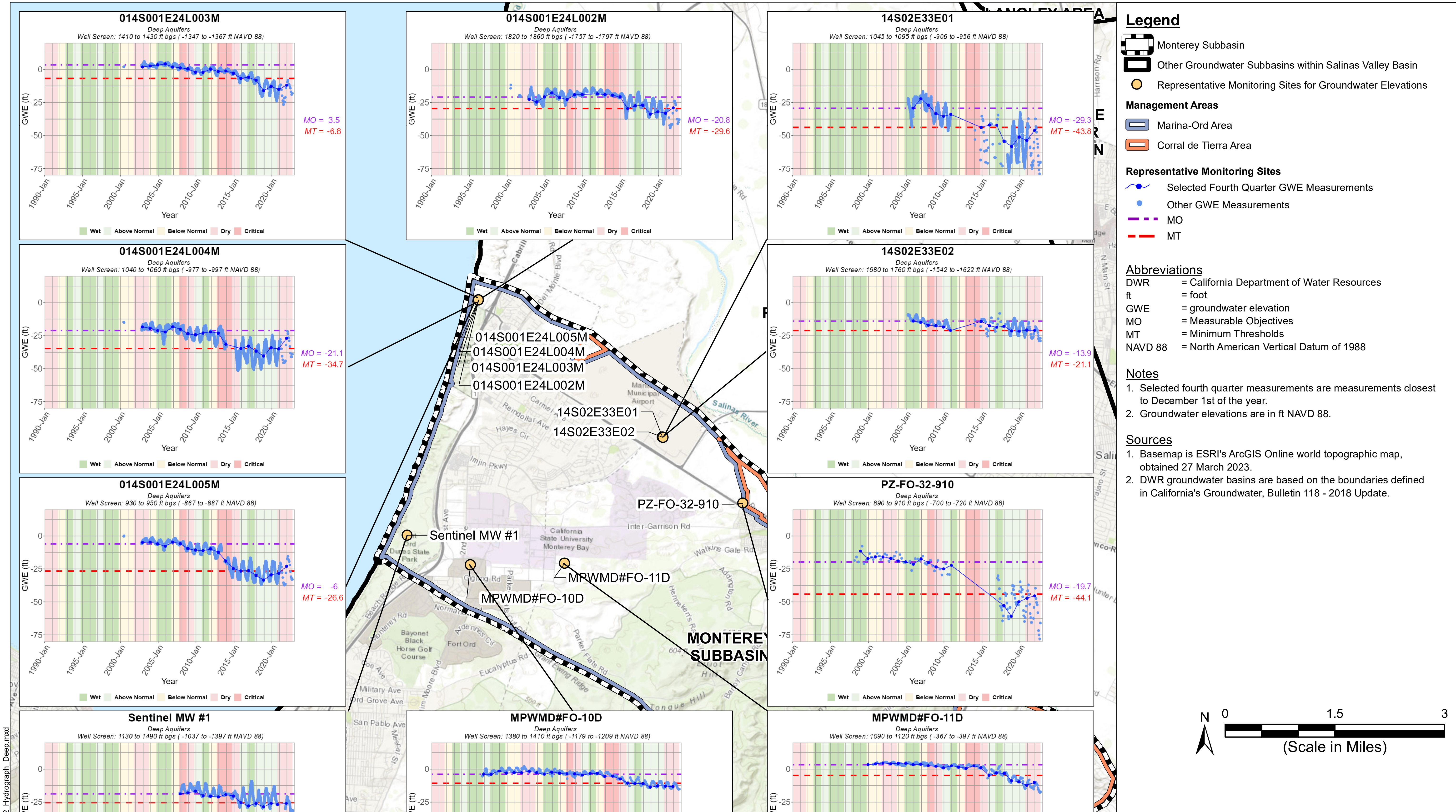
Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 27 March 2023.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Representative Groundwater Elevation Hydrographs in the 400-Foot Aquifer

Monterey Subbasin
WY 2022 Annual Report
March 2023

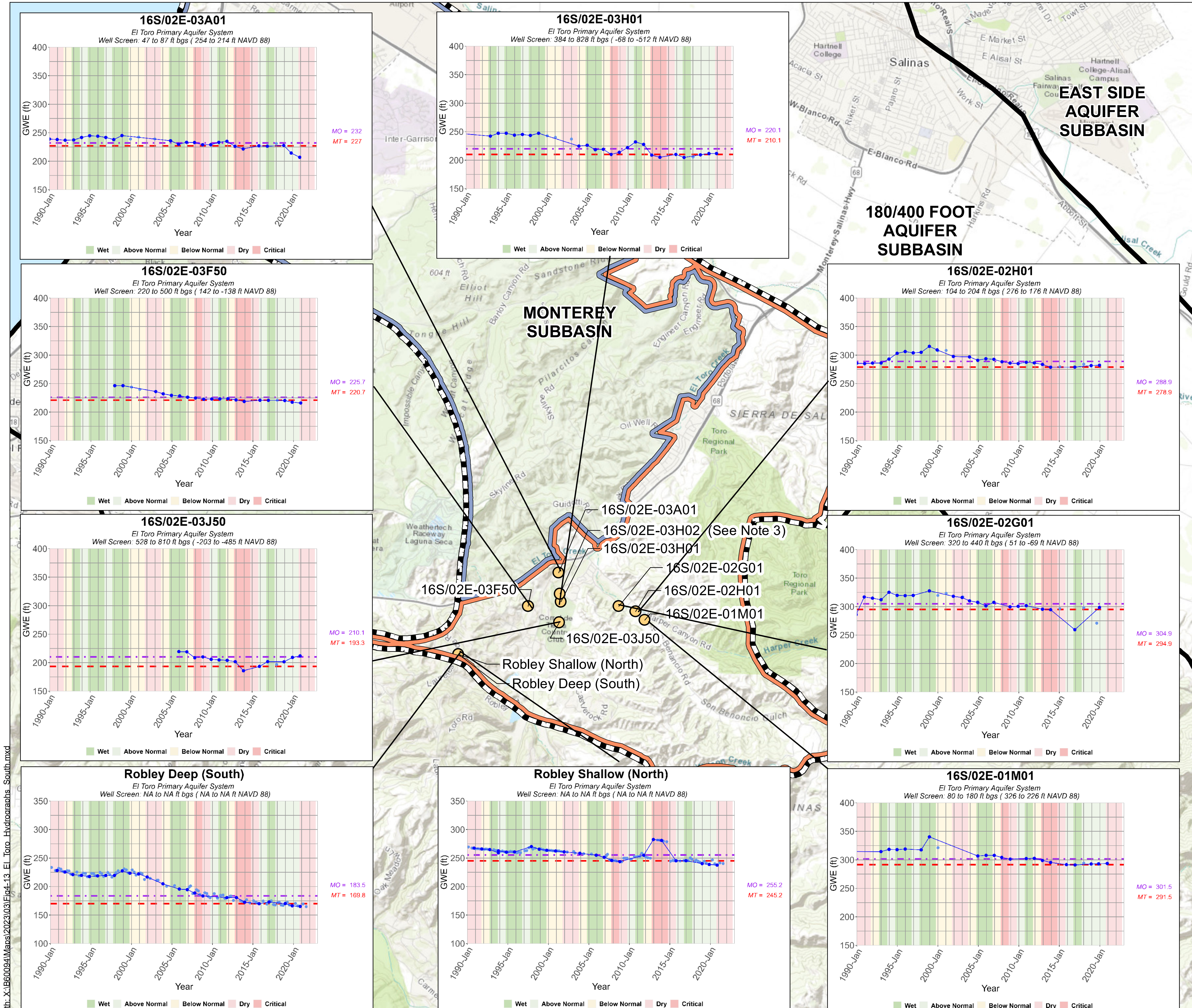
Figure 4-11



Representative Groundwater Elevation Hydrographs in the Deep Aquifers

Monterey Subbasin
WY 2022 Annual Report
March 2023

Figure 4-12



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
- MO
- MT

Abbreviations

DWR	= California Department of Water Resources
ft	= foot
GWE	= groundwater elevation
MCWRA	= Monterey County Water Resources Agency
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. Well 16S/02E-03H02 has withdrawn from MCWRA's water level monitoring programs and therefore could no longer be part of the RMS network.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 27 March 2023.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

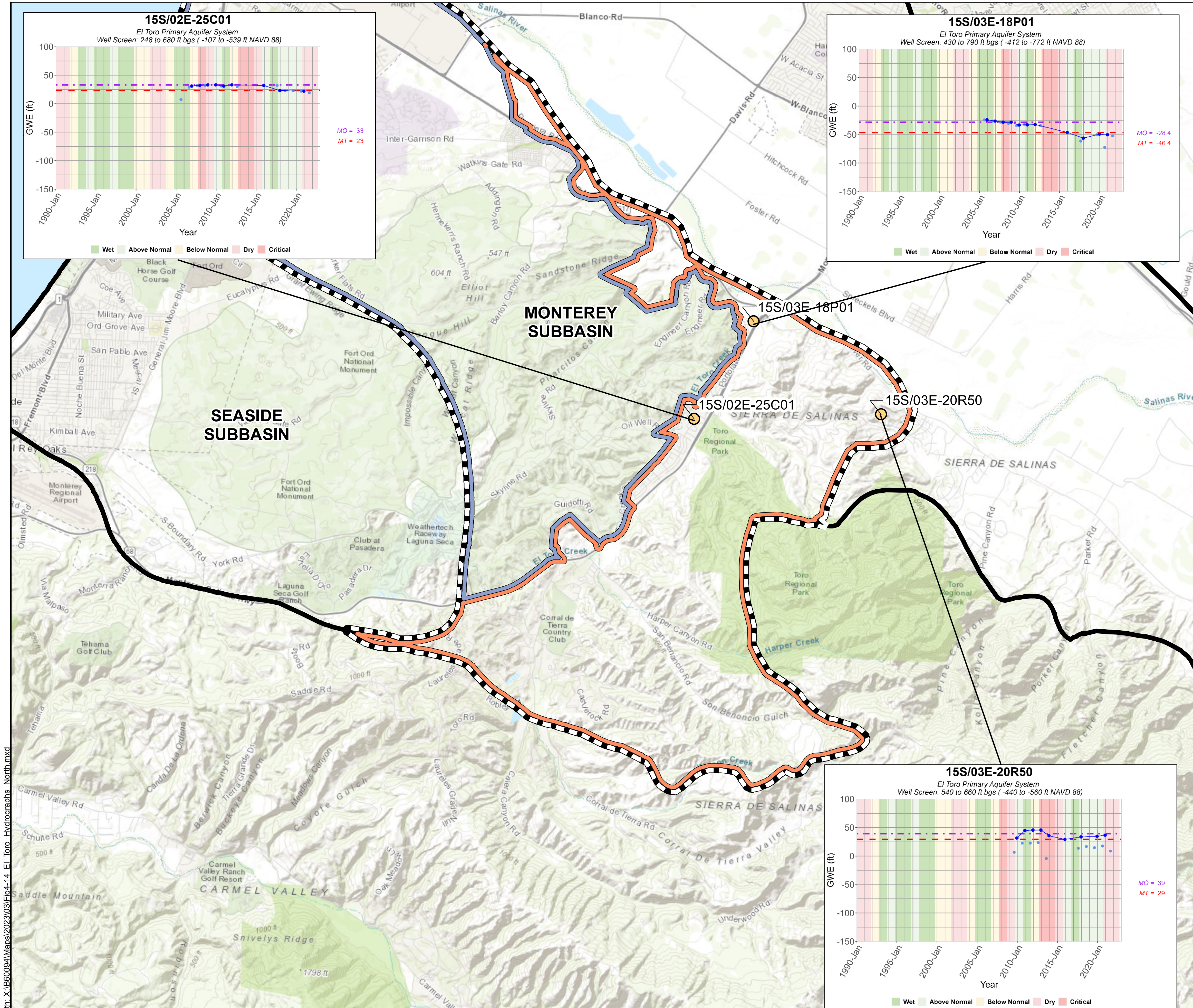
N 0 1.5 3 (Scale in Miles)

Representative Groundwater Elevation Hydrographs in the El Toro Primary Aquifer (South)

Monterey Subbasin
WY 2022 Annual Report
March 2023

Figure 4-13

Path: X:\B60094\Maps\2023\03\Fig4-13_El_Toro_Hydrographs_South.mxd



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
- 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 27 March 2023.
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)

Representative Groundwater Elevation Hydrographs in the El Toro Primary Aquifer (North)

Monterey Subbasin
WY 2022 Annual Report
March 2023

Figure 4-14

4.2 Water Use and Supply

Water use in the Subbasin primarily includes municipal, domestic, and agricultural uses. Groundwater is the only water source in the Subbasin except for a small recycled water supply to the Corral de Tierra as further described below.

4.2.1 Groundwater Extraction

Table 4-1 and Table 4-2 show groundwater extraction rates within each Management Area by sector.

Groundwater extraction within the Marina-Ord Area is primarily conducted by MCWD for municipal water use. A small volume of groundwater is extracted by the United States (U.S.) Army for remediation purposes at the former Fort Ord and is then returned to the groundwater basin. MCWD is the sole water purveyor within the Marina-Ord Area. MCWD collects groundwater extraction data by metering its production wells. As shown in Table 4-1, groundwater extraction rates within the Marina-Ord Area totaled approximately 3,491 acre-feet (AF) during WY 2022.

Water use sectors in the Corral de Tierra Area include municipal water use supplied by various small and large water systems and agricultural and rural domestic water use. Agricultural water use is derived from pumping reported as part of the MCWRA Groundwater Extraction Management System (GEMS). Urban water use in the Corral de Tierra Area is calculated based on extraction reported through GEMS and the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW). Table 4-2 shows the groundwater extraction for the Corral de Tierra Area.

Table 4-1. Groundwater Extraction by Sector in WY 2022 in the Marina-Ord Area

Water Use Section	Groundwater Extraction (AF)	Method of Measurement	Accuracy of Measurement
Urban	3,491	Direct/Meter	Estimated to be +/- 5%.

Table 4-2. Groundwater Extraction by Sector in 2022 in the Corral de Tierra Area

Water Use Sector	Groundwater Extraction (AF)	Method of Measurement	Accuracy of Measurement
Rural Domestic	334	Estimated based on non-agricultural irrigation area and number of households outside of water systems, including parks and the golf courses.	Accurate within a range of ±5% to ±10%
Urban	488	In the Corral de Tierra Area, 84% of the extractions monitored by GEMS and 83% of the water systems that reported pumping to the SWRCB were measured using a flowmeter. Additionally, 16% of the GEMS data used electrical meters. The remaining reported pumping to the SWRCB was not metered.	Flowmeters monitored by GEMs and SWRCB, as well as electrical meters monitored by GEMs, are accurate within a range of ±5%.
Agricultural	298		
Total	**1,120**	--	

4.2.2 Total Water Use

Total water use is the sum of groundwater extraction and recycled water use and is summarized in Table 4-3. In addition to groundwater, wastewater is recycled and used to irrigate development lawns in Las Palmas residential area within the Corral de Tierra Area.

Table 4-3. Total Water Use in WY 2022 in the Monterey Subbasin

Management Area	Water Use Sector	Groundwater Extraction (AF)	Recycled Water (AF)	Total Use by Sector (AF)
Marina-Ord Area	Urban	3,491	0	3,491
Corral de Tierra Area	Rural Domestic	334	0	334
Corral de Tierra Area	Urban	488	76	564
Corral de Tierra Area	Agricultural	298	0	298
	Total	**4,611**	**76**	**4,687**

4.3 Groundwater Storage

The total change in groundwater storage within the Subbasin is equivalent to the change in storage due to groundwater elevation changes and the change in storage due to seawater intrusion. The change in groundwater storage is calculated for the Marina-Ord Area Water Budget Zone (WBZ) and the Corral de Tierra Area WBZ, as presented below[4].

[4] 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; The Corral de Tierra WBZ includes the main portion of the Corral de Tierra Area underlain by the El Toro Primary Aquifer System.

4.3.1 Marina-Ord Area WBZ

The groundwater storage change in the Marina-Ord Area WBZ was estimated by (a) comparing the estimated water level surface in Fall 2020 with the estimated water level surface in Fall 2021 for each principal aquifer and (b) calculating the change in storage based on the observed change in water levels and the estimated storage coefficient within the contoured portion of the Marina-Ord Area WBZ. The estimated storage coefficient defined spatially using parameters derived from the calibrated Monterey Subbasin Groundwater Flow Model (MBGWFM). As described in Section 4.4 and Section 5.2.3 below, no data shows advancement of the seawater intrusion extent during WY 2022. Therefore, the change in groundwater storage estimated herein is based on the estimated change in storage due to groundwater elevation changes.

Specifically, geospatial (raster) surfaces of groundwater elevations were created from the Fall 2020 water level contours (presented in the WY 2021 Annual Report) and Fall 2021 contours (shown in this document) and associated with the MBGWFM grid. Average water levels within each grid cell were subsequently compared to the top and bottom elevations of each principal aquifer defined in the MBGWFM and were multiplied by their respective storage coefficients to determine the total unconfined and confined storage volume at the cell during each bookend date. Storage coefficients used in the MBGWFM are discussed in *Section 2.5.2, Appendix 6B* of the Monterey GSP. Cell-specific storage volumes were then summed for cells located within the contoured areas of the Marina-Ord WBZ to calculate the groundwater available in storage within each principal aquifer in Fall 2020 and Fall 2021. Total storage volumes were then compared to calculate the change in groundwater storage within each principal aquifer between Fall 2020 and Fall 2021. The calculation was only performed for cells outside the seawater intruded area.

The estimated change in groundwater storage for each principal aquifer in the Marina-Ord Area WBZ is shown in Table 4-4 and Figure 4-15. The estimated groundwater elevation changes in the Marina-Ord Area are shown on Figure 4-16. The calculated loss in storage due to changes in elevation in individual aquifers ranges from +16 AFY in the Dune Sand Aquifer to -130 AFY in the 180-Foot Aquifer. The estimated change in groundwater storage in each principal aquifer was insignificant compared to the changes observed historically, which was consistent with the limited variations in groundwater elevations during WY 2022 (see Section 4.1.2).

Table 4-4. Estimate Change in Groundwater Storage in the Marina-Ord Area WBZ

Aquifer	Change in Groundwater Storage, Fall 2020 – Fall 2021 (AF)
Dune Sand Aquifer	16
180-Foot Aquifer	-130
400-Foot Aquifer	-1
Deep Aquifers	-17
Total Marina-Ord Area WBZ	**-131**

Note:
Totals may not sum due to rounding.

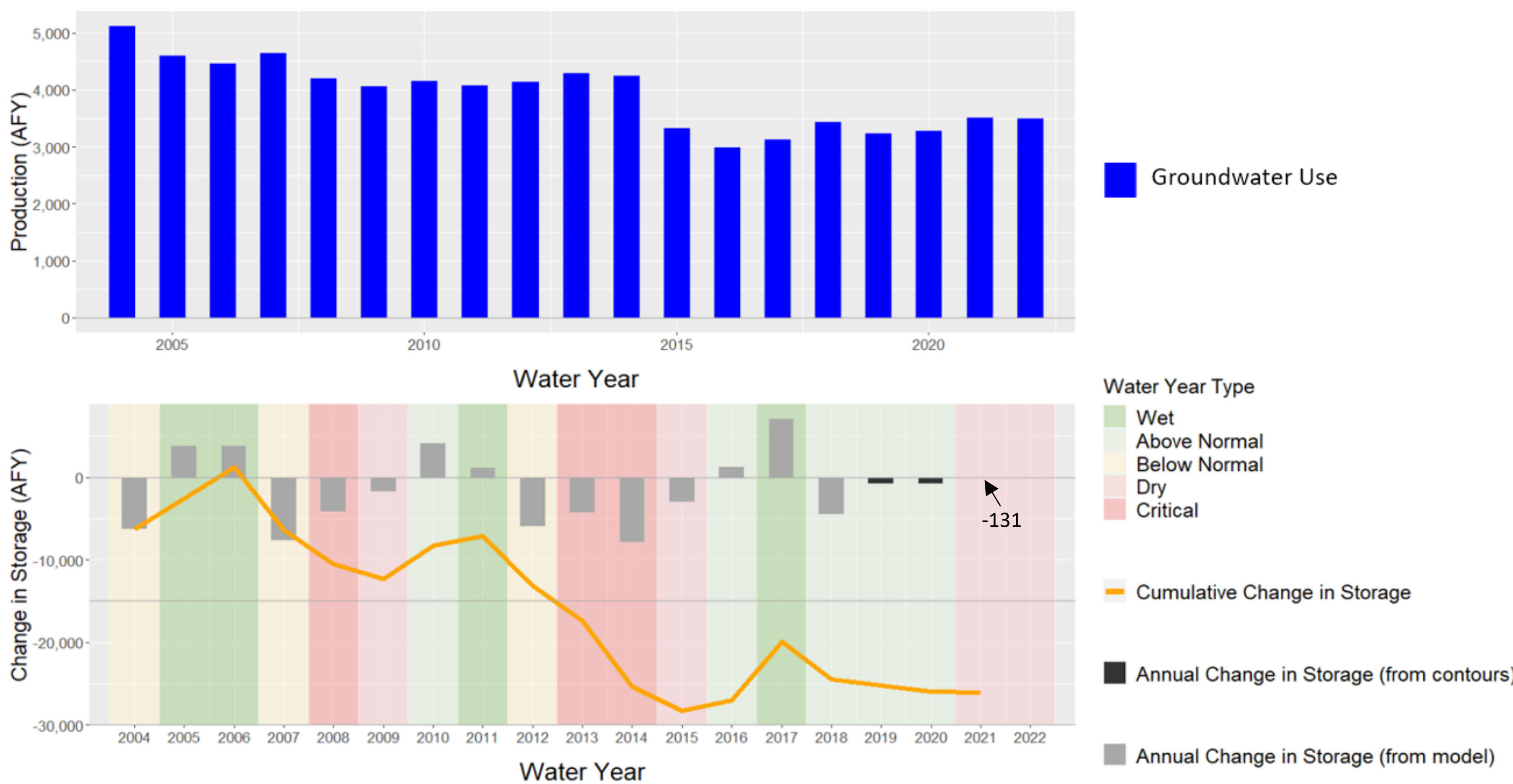
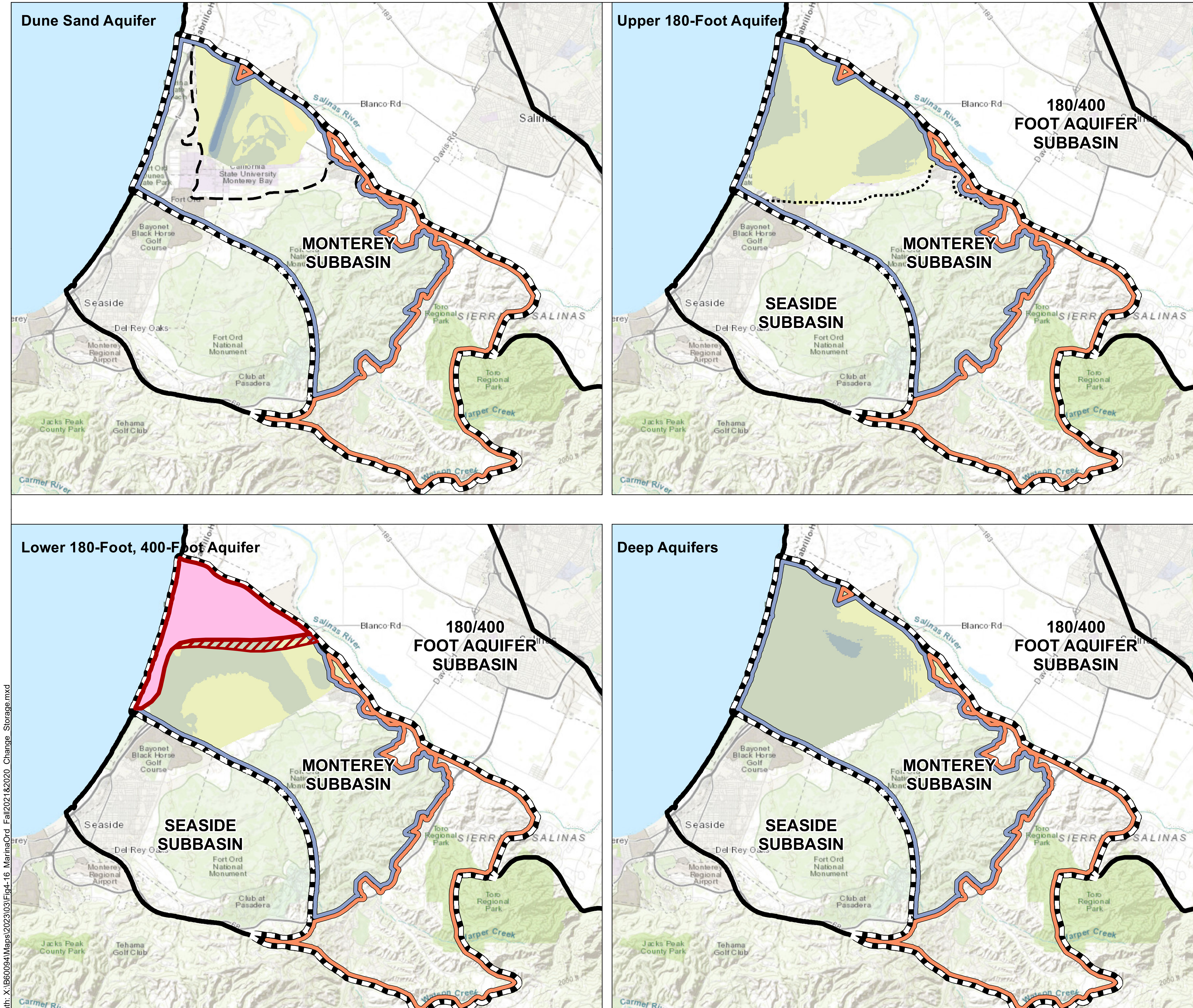


Figure 4-15. Cumulative and Annual Change in Storage in the Marina-Ord Area



Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley
- 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

Estimated Seawater Intrusion in Monterey

- Area of Known Seawater Intrusion
- Area of Potential Seawater Intrusion

Change in Groundwater Elevations

- -30 - -25
- -24.9 - -20
- -19.9 - -15
- -14.9 - -10
- -9.9 - -5
- -4.9 - 0
- 0.1 - 5
- 5.1 - 10
- 10.1 - 15
- 15.1 - 20
- 20.1 - 25

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. The change in groundwater elevation reflects the changes from Fall 2020 to Fall 2021.
4. The estimated seawater intrusion extent is presented and discussed in Section 5.3.3 of the Monterey GSP.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2023.

N
0 2.5 5
(Scale in Miles)

Change in Groundwater Elevations in the Marina-Ord Area, Fall 2020 to Fall 2021

Monterey Subbasin
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Figure 4-16

Path: X:\B60094\Maps\2023\03\Fig4-16_MarinaOrd_Fall2021&2020_Change_Storage.mxd

4.3.2 Corral de Tierra WBZ

Groundwater storage change in the Corral de Tierra WBZ was estimated by comparing groundwater elevation data from one year to another from Fall 2022 to Fall 2021. The change in storage is calculated by multiplying a change in groundwater elevation by a storage coefficient and the land area of the contoured portion of the Corral de Tierra WBZ. The estimated groundwater elevation changes in the Corral de Tierra Area are shown on Figure 4-18. A storage coefficient of 0.1 is used to calculate the change in storage for the El Toro Primary Aquifer (GeoSyntec, 2007). The average change in groundwater elevation was calculated using the average change in groundwater elevations estimated based on the groundwater elevation contours. Since there are data gaps within the RMS network, the storage change was not calculated in the areas that were not contoured and not covered by the RMS network.

A summary of components used for estimating the change in groundwater storage due to groundwater elevation changes in the Corral de Tierra WBZ is shown in Table 4-5 and Figure 4-17. The estimated groundwater elevation changes in the Corral de Tierra Area are shown on Figure 4-18. Annual groundwater storage changes due to changes in groundwater elevation from Fall 2021 to Fall 2022 decreased 1,900 AF in the Corral de Tierra Area. To be consistent with the Marina Area, the change in storage from Fall 2020 to Fall 2021 are also provided in Table 4-5. The negative signs indicate a decline in groundwater levels or loss in storage.

Table 4-5. Estimated Change in Groundwater Storage in the Corral de Tierra WBZ

Component	Fall 2020 to Fall 2021	Fall 2021 to Fall 2022
Area of contoured portion of Subbasin (acres)	9,675	9,675
Storage coefficient	0.1	0.1
Average change in groundwater elevation (feet)	-0.88	-1.97
Total annual change in groundwater storage (AF/year)	**-800**	**-1,900**

Note: Negative values indicate loss, positive values indicate gain.

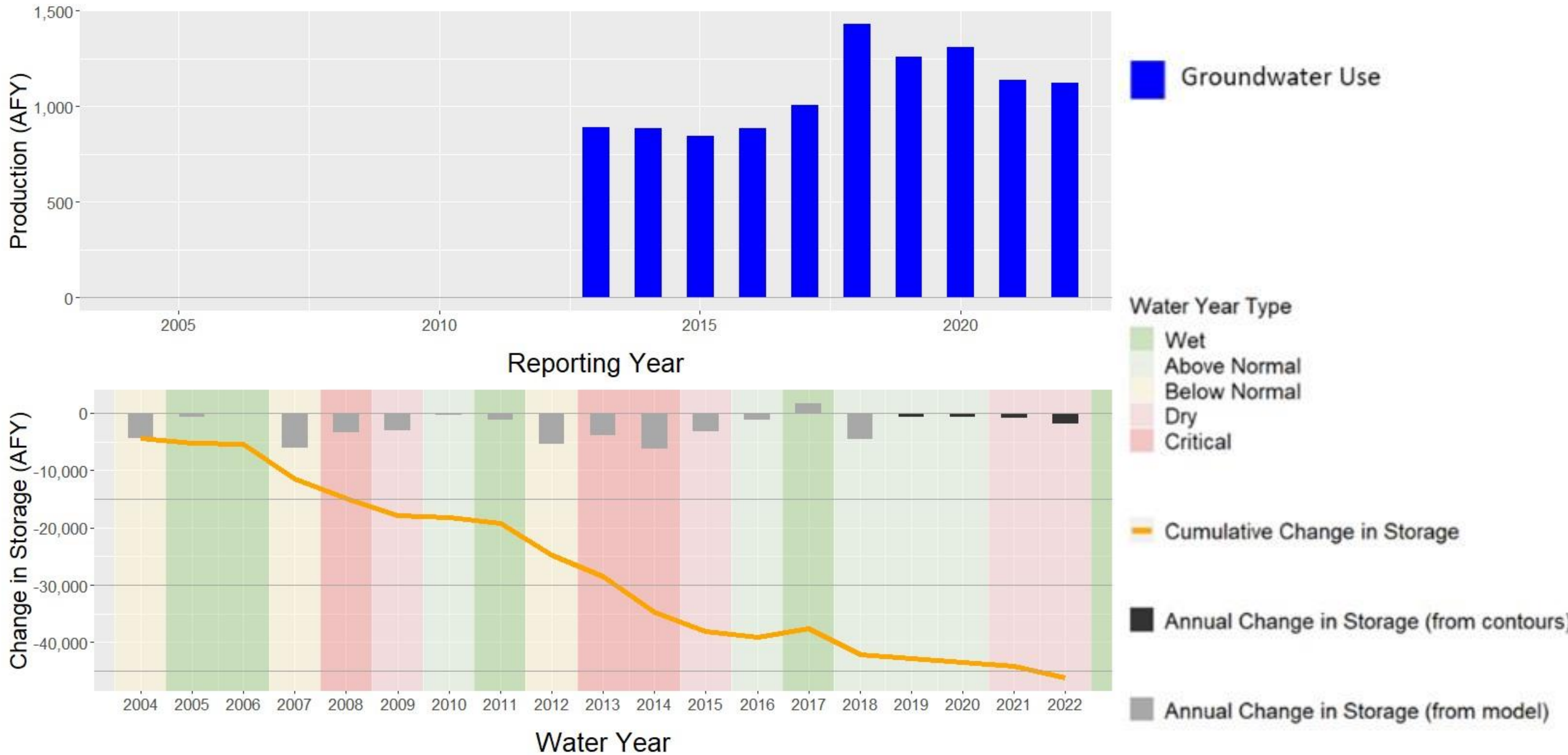
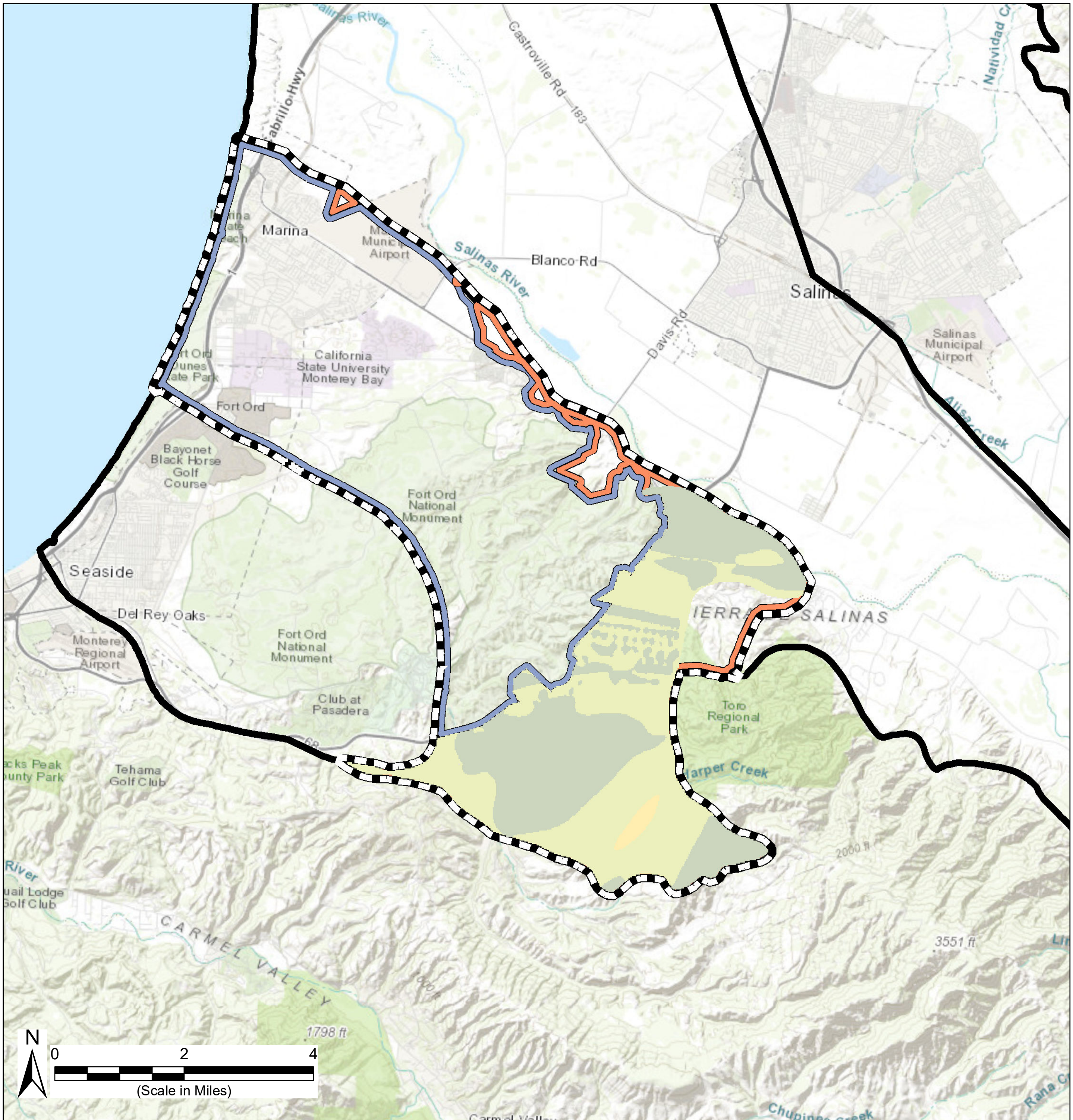


Figure 4-17. Cumulative and Annual Change in Storage in the Corral de Tierra Area



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Legend

Monterey Subbasin

Other Groundwater Subbasins within Salinas Valley Basin

Change in Groundwater Elevation in the El Toro Aquifer System

- -9.9 - -5
- -4.9 - 0
- 0.1 - 5

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. The change in groundwater elevation reflects the changes from Fall 2021 to Fall 2022.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 27 March 2023.

Change in Groundwater Elevations in the El Toro Primary Aquifer System, Fall 2021 to Fall 2022

Monterey Subbasin
WY 2022 Annual Report
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Figure 4-18

4.4 Seawater Intrusion

As shown in Table 4-6, six out of 42 seawater intrusion RMS wells have been sampled for total dissolved solids (TDS) and chloride (Cl) in WY 2022. Among the seawater intrusion monitoring sites sampled recently, only one well (MW-02-13-180M) exceeded the MT defined for seawater intrusion in the Monterey GSP at 500 milligram per liter (mg/L) of chloride or 1,000 mg/L of TDS, which is used as a surrogate where chloride data are unavailable. Well MW-02-13-180M is screened in the intermediate 180-Foot Aquifer and has been seawater intruded since the late 1990s. As mentioned in Section 5.1.25.1.2, MCWD has initiated discussions with the Monterey Peninsula Water Management District (MPWMD), Seaside Watermaster, Monterey County Water Resources Agency, and the U.S. Army at the former Fort Ord to increase monitoring frequency for TDS and Cl constituents so to provide a more comprehensive means for evaluating seawater intrusion within the Subbasin.

Table 4-6. Monterey Subbasin Seawater Intrusion Representative Monitoring Sites

Site Name	Aquifer	Collection Agency	Latest Cl Concentration (mg//L) (e)	Latest TDS Concentration (mg//L) (e)
MW-BW-81-A	Dune Sand Aquifer	MCWD	-	345 (2019) (c)
MW-02-05-180	Upper 180-Foot Aquifer (a)	MCWD	124 (2019)	681 (2019) (c)
MW-02-10-180	Upper 180-Foot Aquifer (a)	MCWD	-	397 (2019) (c)
MW-02-13-180M	Upper 180-Foot Aquifer (a)	MCWD	2,090 (2022)	24,229 (2019) (c)
MW-02-13-180U	Upper 180-Foot Aquifer (a)	MCWD	-	716 (2019) (c)
MW-12-07-180	Upper 180-Foot Aquifer (a)	MCWD	-	555 (2019) (c)
MW-B-05-180	Upper 180-Foot Aquifer (a)	MCWD	-	525 (2019) (c)
MW-BW-55-180	Upper 180-Foot Aquifer (a)	MCWD	-	458 (2019) (c)
MCWD-31	Lower 180-Foot Aquifer (a)	MCWD	79 (2022)	360 (2022)
MW-12-12-180L	Lower 180-Foot Aquifer (a)	MCWD	43.3 (2019)	356 (2019) (c)
MW-BW-04-180	Lower 180-Foot Aquifer (a)	MCWD	-	412 (2019) (c)
MW-OU2-66-180	Lower 180-Foot Aquifer (a)	MCWD	-	660 (2019) (c)
TEST2	Lower 180-Foot Aquifer (a)	MCWD	-	687 (2019) (c)
MCWD-29	Lower 180-Foot, 400-Foot Aquifer (a)	MCWD	127 (2022) (d)	430 (2022) (d)
MCWD-30	Lower 180-Foot, 400-Foot Aquifer (a)	MCWD	110 (2022)	460 (2022)
MP-BW-50-289	Lower 180-Foot, 400-Foot Aquifer (a)	MCWD	-	426 (2019)
MP-BW-50-309	Lower 180-Foot, 400-Foot Aquifer (a)	MCWD	-	358 (2019)
MP-BW-50-339	Lower 180-Foot, 400-Foot Aquifer (a)	MCWD	-	510 (2019)
MP-BW-50-359	Lower 180-Foot, 400-Foot Aquifer (a)	MCWD	-	532 (2019)
MP-BW-50-384	Lower 180-Foot, 400-Foot Aquifer (a)	MCWD	-	486 (2019)
MPWMD#FO-10S	400-Foot Aquifer (a) (b)	Seaside Basin Water Master	96.6 (2022)	296 (2021)
MW-OU2-07-400	400-Foot Aquifer (a)	MCWD	-	506 (2019) (c)
MCWD-10	Deep Aquifers	MCWD	54.1 (2022)	290 (2022)
MCWD-11	Deep Aquifers	MCWD	71.3 (2022)	360 (2022)
MPWMD#FO-10D	Deep Aquifers (b)	Seaside Basin Water Master	120 (2022)	222 (2021)

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 *Section 5* of the Monterey GSP.

(b) Wells MPWMD#FO-10S, and MPWMD#FO-10D are monitored by MPWMD on behalf of the Seaside Watermaster. MPWMD#FO-10S is screened in the Paso Robles Aquifer, which is likely connected to the 400-Foot Aquifer; MPWMD#FO-10D, and Sentinel MW#1 are screened in the Santa Margarita Aquifer, which is likely connected to the Deep Aquifers.

(c) Specific conductance to TDS conversion is based on a derived slope of 0.7025 mg/L PER µS/cm from a linear regression model with existing data.

(d) Three measurements were taken at MCWD-29 on the same day, the table displays the highest values herein.

(e) The year next to the concentration denotes the water year.

4.5 Water Quality

The water quality monitoring network consists of existing water supply wells in the Subbasin. As described in *Section 8* of the Monterey GSP, separate MTs are set for the COCs for public water system supply wells, on-farm domestic wells, and irrigation supply wells. COCs for drinking water are assessed at public water supply wells and on-farm domestic wells, and COCs for crop health are assessed at agricultural supply wells. The municipal public water system supply wells included in the monitoring network were identified by reviewing data from the SWRCB DDW. All on-farm domestic wells and agricultural supply wells have been sampled through the Central Coast Regional Water Quality Control Board's (CCRWQCB's) Irrigated Lands Regulatory Program (ILRP).

Table 4-7 shows the number of wells in the identified water quality monitoring network that were sampled and those wells that had higher concentrations above the than the regulatory standards in WY 2022 for the COCs identified in the Monterey GSP. As shown on this table, no water supply wells sampled in the Marina-Ord Area had any COCs with concentrations above regulatory drinking water standards. In the Corral de Tierra, the COCs that had concentrations above the regulatory standard include arsenic, iron, manganese, and specific conductance. Nine wells in the Corral de Tierra Area had higher concentrations than the regulatory drinking water standard for arsenic. Two and three wells had higher concentrations than the regulatory drinking water standards for iron and manganese, respectively. One well had a higher concentration than the regulatory drinking water standard for specific conductance.

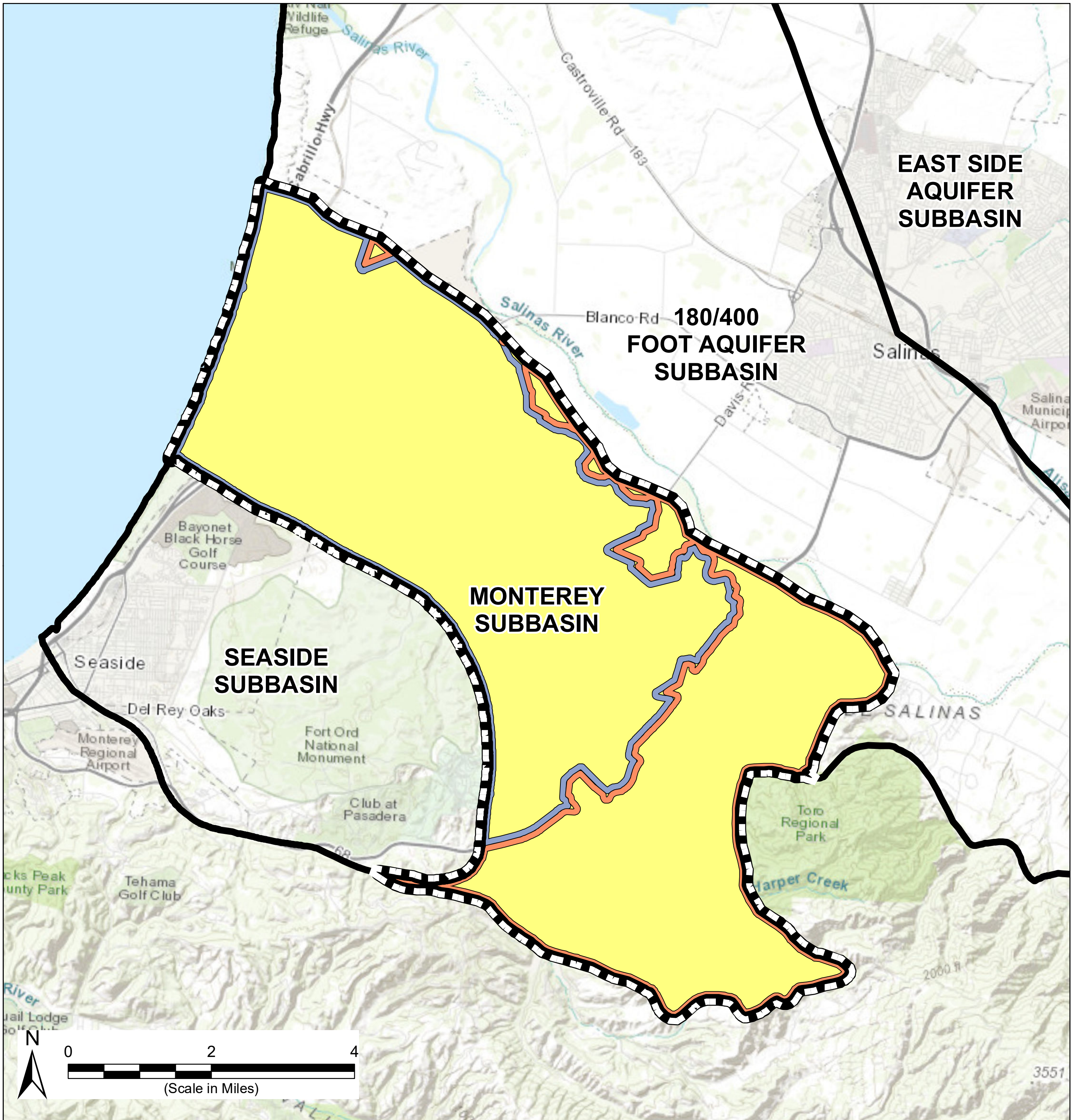
Table 4-7. Water Quality in WY 2022

Constituent of Concern (COC)	Regulatory Standard	Standard Units	Number of Wells Sampled for COC in WY 2022	Number of Wells Sampled in WY 2022 with COC Concentrations Above the Regulatory Standard
Marina-Ord Area				
DDW Wells				
Carbon Tetrachloride	0.5	UG/L	5	0
Trichloroethene (TCE)	5	UG/L	5	0
Corral de Tierra Area				
DDW Wells				
1,2,3-Trichloropropane (1,2,3 TCP)	0.005	UG/L	2	0
1,2-Dibromo-3-chloropropane	0.2	UG/L	0	0
Arsenic	10	UG/L	12	9
Benzo(a)pyrene	0.2	MG/L	2	0
Chromium	50	UG/L	3	0
Dinoseb	7	UG/L	2	0
Hexachlorobenzene (HCB)	1	UG/L	0	0
Iron	300	UG/L	6	2
Manganese	50	UG/L	5	3
Nickel	100	UG/L	2	0
Specific Conductance	1600	UMHOS/CM	3	1
Total Dissolved Solids	1000	MG/L	3	0
Vinyl Chloride	0.5	UG/L	2	0
Zinc	5	MG/L	2	0
ILRP On-Farm Domestic Wells				
Total Dissolved Solids	1000	MG/L	0	0

Abbreviations:
MG/L = milligram per liter
UG/L = microgram per liter
UMHOS/CM = micromhos per centimeter

4.6 Land Subsidence

Land subsidence is measured using InSAR data. These data are provided by DWR on the SGMA data viewer portal (DWR, 2022). Figure 4-19 shows the annual subsidence for the Subbasin from October 2021 to October 2022. Data continue to show negligible subsidence. All land movement was within the estimated error of measurement of +/- 0.1 foot.



Legend

Monterey Subbasin

Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

Marina-Ord Area

Corral de Tierra Area

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 October of 2021 and October of 2022.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 27 March 2023.
2. InSAR subsidence data, "SAR/Vertical_ Displacement_TRE_ALTAMIRA_v2022_ Annual_Rate_20211001_20221001 (ImageServer)." Created by DWR and and obtained from ArcGIS REST Services Directory.

Estimated InSAR Subsidence WY 2022

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Figure 4-19

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4.7 Interconnected Surface Water

4.7.1 Marina-Ord Area

As described in the Monterey GSP, the MT for the depletion of ISW is set to the minimum shallow groundwater elevations historically observed between 1995 and 2015 near locations of ISW. As shown in Table 4-8, the groundwater elevation at the RMS during Fall 2021 and Spring 2022 remained higher than its representative MT and MO.

Table 4-8. Marina-Ord Area Interconnected Surface Water Representative Monitoring Sites

Site Name	Aquifer	Collection Agency	Fall 2021	Spring 2022	MT	MO
Marina-Ord Area						
MW-BW-82-A	Dune Sand Aquifer	Fort Ord	9.8	9.9	7.9	7.9

4.7.2 Corral de Tierra Area

SVBGSA is in the process of establishing a monitoring network for the depletion of ISW in the Corral de Tierra Area and plans to install one new shallow well along El Toro Creek. Once the shallow monitoring well is installed, SVBGSA will use a historical groundwater level contour map to interpolate the MT, MO, and IMs.

5 ANNUAL PROGRESS TOWARDS IMPLEMENTATION OF THE MONTEREY GSP

5.1 WY 2022 GSP Implementation Activities

This section details groundwater management activities that have occurred in WY 2022 associated with GSP implementation. These include the activities of MCWD GSA, SVBGSA, and partners that promote groundwater sustainability and are important for reaching the sustainability goal defined in the Monterey GSP. MCWD GSA and SVBGSA continued to strengthen their collaboration throughout WY 2022 with regular meetings on planning and implementing the Monterey GSP.

In WY 2022, MCWD GSA, SVBGSA, and project partners undertook four main categories of activities to begin GSP implementation and further groundwater sustainability goals: GSA policies, operations, and engagement; data collection and monitoring; planning; and sustainability strategy and activities.

5.1.1 Coordination and Engagement

The Subbasin GSAs coordinated regularly through staff and consultant meetings during the reporting period. Additionally, they advanced their respective policies and operations, and coordinated and engaged with stakeholders and agencies in their respective Management Areas described below.

5.1.1.1 Inter-basin Coordination

The Subbasin GSAs continued robust stakeholder engagement and strengthened collaboration with key agencies and partners. MCWD GSA and SVBGSA worked throughout the year with subbasin stakeholders to develop the Monterey GSP, submitted to DWR in January 2022. Between October 2021 and submittal of the GSP, MCWD GSA held two stakeholder workshops, and SVBGSA held two meetings of the Monterey Subbasin Planning Committee.

The Subbasin GSAs' staff and consultants continued to meet regularly during WY 2022 to coordinate implementation activities including data management, monitoring, model development, funding and grant applications, and P&MA development.

5.1.1.2 MCWD GSA Activities

The MCWD GSA practices stakeholder engagement through its GSA website (http://mcwd.org/) and through public meetings and workshops, which were held online during WY 2022 while health-protective restrictions due to the coronavirus disease of 2019 (COVID-19) were in force. During the reporting period, MCWD GSA held stakeholder workshops on October 13 and 27, 2021 and MCWD Board of Director public meetings regarding the Monterey GSP on October 18, 2021 and January 17, 2022. The GSA will continue to meet regularly in WY 2023.

MCWD participates in regular intra- and inter-basin coordination by being a member of the Seaside TAC, SVBGSA Advisory Committee, and the Monterey Subbasin Implementation Committee.

Additionally, MCWD GSA held as-needed meetings with individual stakeholders and agencies to coordinate. These included meetings with:

- The Seaside Watermaster, MPWMD, MCWRA regarding regular data sharing and groundwater monitoring in the Seaside and Monterey Subbasins;
- Monterey One Water (M1W) to confirm recycled water availability for MCWD's Recycled Water Reuse Through Landscape Irrigation and IPR Project (Project M3).
- The U.S. Army regarding their extraction and injection activities to further understand the mechanism of seawater intrusion within the Subbasin. The U.S. Army has been extracting groundwater as part of the remediation effort in the former Fort Ord and injecting treated water in locations near the coast, which has contributed to higher groundwater elevations in the Dune Sand and 180-Foot Aquifers near the Fort Ord Dunes Park.

As described in *Section 10.2.3* of Monterey the Monterey GSP, MCWD GSA intends to combine data collected from the Subbasin's SGMA Monitoring Network into a basin-wide data management system (DMS). The SGMA Monitoring Network is described in the Monterey GSP and includes information from RMS wells as well as specific other information. In early 2022, MCWD GSA evaluated options for it to post data online along with data collected by SVBGSA from the Subbasin and proceeded with working with SVBGSA to host data on the Salinas Valley Web Map, so that data collected from the GSAs' RMS wells are available for the public to review. The two agencies are coordinating to work out accessibility to the Web Map and procedures for data upload and quality control/quality assurance (QA/QC).

5.1.1.3 SVBGSA Activities

The SVBGSA practices stakeholder engagement through its GSA website (www.svbgsa.org) and through public meetings and workshops, which were held online during WY 2022 while health-protective restrictions due to the COVID-19 were in force.

Corral de Tierra Area: During the reporting period, SVBGSA held Monterey Subbasin Planning Committee Meetings on October 10 and December 13, 2021, and a public outreach meeting for the Corral de Tierra Area on November 11, 2021. The SVBGSA Board of Director public meeting regarding the Monterey GSP was held on January 13, 2022, following a September 9, 2021 meeting in WY 2021.

As the responsibilities of the subbasin planning committee finished with the Monterey GSP submittal, SVBGSA set up a subbasin implementation committee to lead Monterey GSP implementation activities within the Corral de Tierra Area. The SVBGSA Monterey Subbasin Implementation Committee was formed with 12 subbasin committee members, including a staff member from the MCWD GSA. SVBGSA held four meetings of the Monterey Subbasin Implementation Committee during WY 2022 to begin implementation of the Monterey GSP.

SVBGSA Agency-level: During WY 2022, SVBGSA streamlined its committee structure. The SVBGSA Board of Directors transitioned the responsibilities of the SWIG and Integrated Implementation Committee to the existing Advisory Committee, and the responsibilities of the SWIG Technical Advisory Committee to a new, broader GTAC. SVBGSA continued its engagement across all Salinas Valley subbasins through its Board of Directors and Advisory Committee, holding 12 Board meetings and nine Advisory Committee meetings over the course of WY 2022.

SVBGSA Work Plan, Budget, and Operating Fee: SVBGSA developed a 2-year and 5-year work plan and associated budget, which set the basis for the annual operating fee. The Board of Directors passed a portion of the fee increase. During the budget discussions, the Board directed staff to determine whether the regulatory fee needed to be applied for some projects and management actions at a specific subbasin level. As a result of the partial funding, some workstreams moved forward while others remained unfunded, slowing the implementation of certain activities.

Well Permitting: Governor Gavin Newsom released Executive Order N-7-22 on March 28, 2022. The Executive Order creates a role for GSAs in the groundwater well permitting process during droughts. Specifically, a well permitting agency shall not "approve a permit for a new groundwater well or for alteration of an existing well in a basin subject to the Sustainable Groundwater Management Act and classified as medium- or high-priority without first obtaining written verification from a Groundwater Sustainability Agency managing the basin or area of the basin where the well is proposed to be located that groundwater extraction by the proposed well would not be inconsistent with any sustainable groundwater management program established in any applicable Groundwater Sustainability Plan adopted by the Groundwater Sustainability Agency and would not decrease the likelihood of achieving a sustainability goal for the basin covered by such a plan." In addition, a proposed well cannot cause subsidence that would adversely impact or damage nearby infrastructure.

SVBGSA conducted meetings throughout the year to reach out to additional agencies and stakeholders to coordinate. These included meetings with:

- Monterey County Health Department on data and the existing well permitting and water quality monitoring programs
- Central Coast Regional Water Quality Control Board to discuss the Water Quality Coordination Group
- Integrated Regional Water Management Plan, including coordinating with Central Coast Wetlands Group (CCWG) on watershed coordinator grant

Outreach: Underrepresented communities are an important stakeholder for the SVBGSA to develop meaningful and long-term relationships with regards to groundwater sustainability. Outreach to underrepresented communities included two different methods of communication for making workshop materials more accessible. For the first in-person workshop since GSP implementation, SVBGSA offered Spanish interpretation services for attendees, both in-person on online. In addition, SVBGSA informational workshops are archived on a YouTube channel which is easily accessible to interested parties. A workshop on demand management was also translated and presented in Spanish with the video archived for accessible viewing.

SVBGSA worked very closely with the Watershed Coordinator for the Lower Salinas/Gabilan watershed. SVBGSA intends to learn from and apply lessons learned and outreach tools from the Lower Salinas/Gabilan watershed to the rest of the Salinas Valley Basin. The Watershed Coordinator is collaborating with the League of United Latin American Citizens (LULAC) and developing materials to reach residents to increase their general understanding of water resources. A 'water 101' will help residents build a foundation for better voicing their needs regarding particular projects and management actions. In addition, the Watershed Coordinator is working with the School District in hopes of scheduling future groundwater-related educational programs, co-funded by the SVBGSA.

5.1.2 Data Collection and Monitoring

Both GSAs undertook efforts to move data collection and monitoring forward in their respective Management Areas. During WY 2022:

- MCWD GSA and the Seaside Watermaster began discussions on cost-sharing of the destruction and replacement of monitoring well MPWMD#FO-09 Shallow in the Seaside Subbasin;
- MCWD GSA and the Seaside Watermaster began discussions on data and cost-sharing of groundwater monitoring in the Subbasin;
- MCWD and the MPWMD facilitated data transfers for semi-annual groundwater elevation submittals to DWR pursuant to 23 CCR § 354.34(c)(1)(B) and § 354.40 and are in the progress of discussing additional TDS sampling from wells in the Subbasin;
- MCWD and SVBGSA began hosting data collected by MCWD in the Subbasin on the Salinas Valley GSP Web Map, which is open to the public, along with data collected in the larger Salinas Valley;
- SVBGSA reviewed MCWRA and DWR databases to identify any potential existing wells that could fill data gaps and reviewed the data gaps with interested parties.
- SVBGSA and MCWRA began discussions on expanding and enhancing the GEMS program. This effort will primarily take place in 2022 and 2023. These early discussions focused on understanding the challenges to changing the program and steps involved.

5.1.3 Planning

MCWD GSA and SVBGSA began WY 2022 by finalizing the Monterey GSP working with the Subbasin stakeholders and members of the Monterey Subbasin Planning Committee. Final stages included responding to and addressing comments on the draft GSP, reviewing changes through MCWD's stakeholder workshops, the Monterey Subbasin Planning Committee, and individual stakeholders, and each GSA presenting to their respective Boards of Directors for final approval and adoption. The Monterey GSP was submitted to DWR in January 2022. The Monterey Subbasin Groundwater Flow Model (MBGWFM) was completed and documented along with the submittal of the Monterey GSP.

Following adoption of the Monterey GSP, the Subbasin GSAs conducted the following planning and modeling activities to support GSP implementation in WY 2022:

- The GSAs completed the first Annual Report for WY 2021, with both GSAs coordinating and preparing report components for their respective Management Areas. The WY 2021 Annual Report provides a template and foundation for future monitoring and reporting.
- The GSAs provided information for the Subbasin to be included in the Salinas Valley Integrated Implementation Plan (see Section 5.1.45.1.4).
- SVBGSA and its technical consultant conducted preliminary investigation for the Deep Aquifers Study and confirmed that the Deep Aquifers extend into the Subbasin. The boundary of the Deep Aquifers will be refined with additional data during the remainder of the Study (see Section 5.1.45.1.4).
- SVBGSA's technical consultant, Montgomery & Associates, continued development of the Salinas Valley Seawater Intrusion Model, which will enable the assessment of projects and management actions to address seawater intrusion.
- The MCWD GSA supported the development of the Seawater Intrusion Model by providing the MBGWFM and the data collected for the MBGWFM, as well as feedback on the model's consistency with hydrogeologic conditions in the Subbasin.
- SVBGSA continued to support the USGS through the Cooperative Agreement for the development of the Salinas Valley Integrated Hydrologic Model (SVIHM).
- In September 2022, MCWD GSA initiated an application for the Round 2 SGMA Implementation Grant for the Subbasin in collaboration with SVBGSA. The Subbasin GSAs developed detailed work plans for immediate GSP implementation tasks before 2026 and the funding needed for these tasks. The GSAs identified data expansion as a priority and developed work plans for installing monitoring wells to address data gaps identified in the Monterey GSP and refining representation of the Subbasin in the regional SVIHM and Seawater Intrusion Model. The grant application further requests funding for construction-ready projects that will provide the Subbasin with new sources of water supply, as well as development of feasibility studies for other projects. The grant application was submitted for DWR review in December 2022.
- MCWD continued to evaluate potential seawater intrusion impacts of the proposed Monterey Peninsula Water Supply Project, located within 1.5 miles of the Subbasin.

MCWD GSA and SVBGSA will work on filling data gaps, modeling, and communicating results to interested parties during WY 2023.

5.1.4 Project and Implementation Activities

Section 9 of the Monterey GSP identified 26 P&MAs that collectively will allow the Subbasin to meet and maintain its sustainability goal within the 20-year SGMA implementation period (i.e., by 2042), which will be further developed and prioritized during the first years of GSP implementation. In addition, the Monterey GSP identified Implementation Actions that contribute to groundwater management and GSP implementation but do not directly help the Subbasin achieve and maintain its sustainability goal.

The Monterey GSP highlighted the hydraulic connection between the Subbasin and the adjacent subbasins, and therefore, the Subbasin GSAs have developed an implementation approach that includes both basin specific projects and regional coordination actions, and participation in multi-subbasin projects. Many of the P&MAs included in the Monterey GSP are part of a larger set of integrated projects and actions for the entire Salinas Valley Basin.

Building on the Monterey GSP, MCWD GSA, and SVBGSA have a more comprehensive sustainability strategy to reach sustainability across all 6 sustainability indicators that build on GSA policies, operations, and engagement; data and monitoring; and planning activities. As shown on Figure 5-1, the sustainability strategy builds on the Monterey GSP to show their initial workstreams for implementing the Monterey GSP. Workstreams include Marina-Ord Area local P&MAs, Corral de Tierra Area local P&MAs, as well as multi-subbasin projects. Both agencies plan to fill data gaps and participate in relevant multi-subbasin projects and management actions. In addition, MCWD GSA plans to continue several existing programs and further pursue recycled water reuse, and SVBGSA plans to move from core initial assessments into high-level feasibility and discussions on a more refined sustainability approach in WY 2023 and WY 2024.

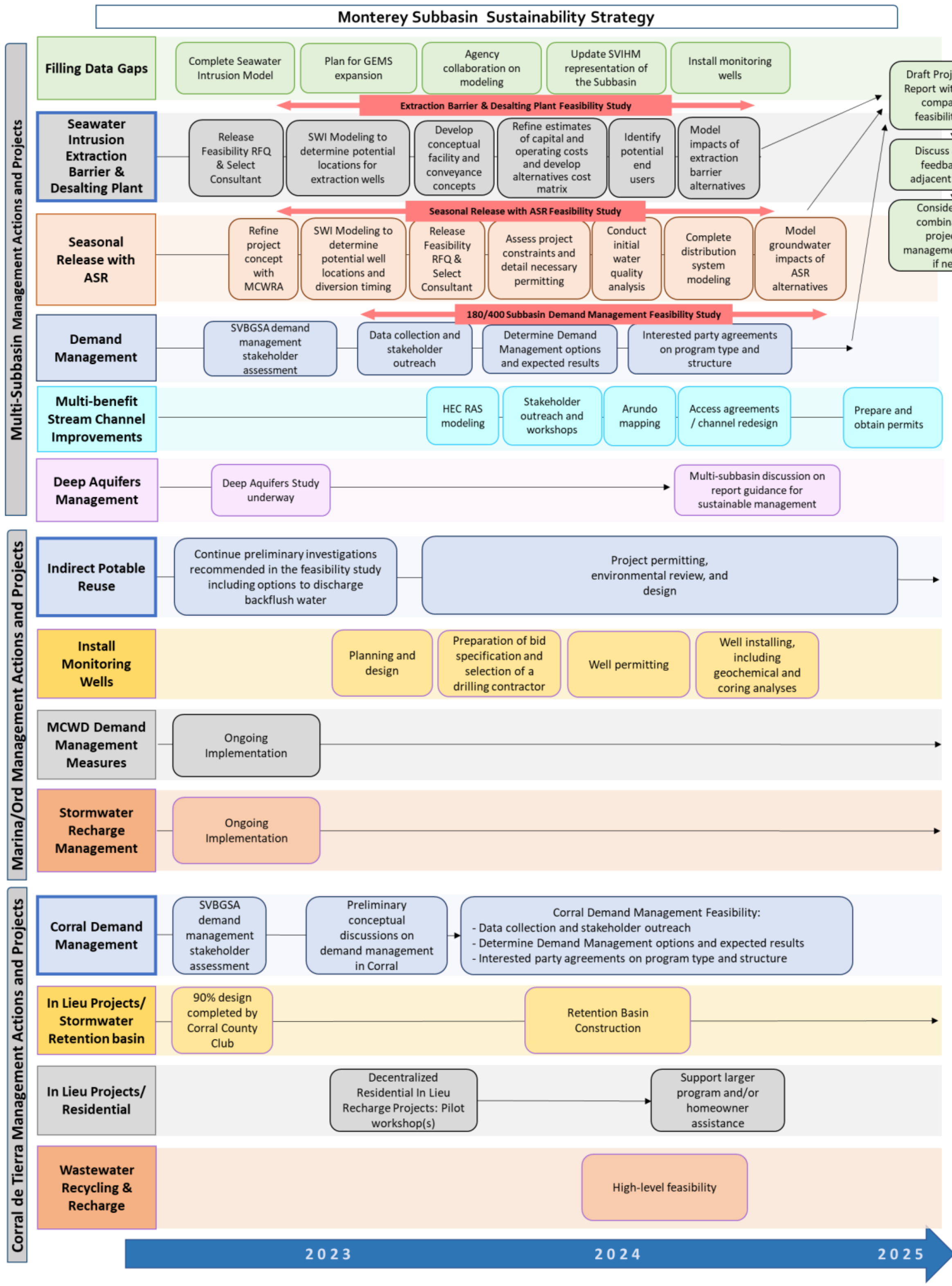

Figure 5-1. Monterey Subbasin Sustainability Strategy

The following is a brief overview of the progress made towards implementing the implementation actions and P&MAs during WY 2022. The Subbasin GSAs focused on conducting feasibility studies that lay the groundwork for developing a sustainable strategy for the larger Salinas Valley and further development and implementation of P&MAs.

Monterey Subbasin Projects and Management Actions

- 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. During WY 2022, MCWD focused on completing the feasibility study that confirmed the possibility of implementing an IPR project and recommended injection into the Deep Aquifers as the preferred option. The study was partially funded by a grant through the SWRCB's Water Recycling Funding Program and was finalized and submitted to the SWRCB in November 2022.

  The study aimed to identify a preferred project for injecting 827 AFY advanced treated recycled water into the Subbasin for future extraction by MCWD's municipal production wells. Injection of advanced treated recycled water and IPR is intended to utilize recycled water from M1W to replenish groundwater and supplement MCWD's groundwater supplies. The study:

  - Identified existing MCWD and M1W facilities related to water, wastewater, and recycled water;
  - Determined the projected quantity of advanced-treated recycled water available based on MCWD's existing recycled water agreements;
  - Outlined relevant permitting requirements for an IPR project through groundwater replenishment and recovery;
  - Conducted a screening of project alternatives operating in the 180-Foot, 400-Foot, and/or Deep Aquifers, considering factors such as costs, implementability, groundwater management benefits, flexibility, and technical feasibility, while highlighting the project's goal to improve groundwater conditions in the Marina-Ord Area;
  - Performed numerical modeling for alternatives selected for detailed evaluation to define the capture zone of the project extraction wells and verify that siting of the alternatives provides sufficient aquifer residence times;
  - Performed engineering evaluation, including analyses of economic and energy impacts, as well as non-quantified benefits and costs;
  - Recommended injection to the Deep Aquifers at MCWD's Well 9 site (or MCWD-09) for extraction by production wells MCWD-10 and MCWD-11 as the preferred alternative; and

  - Developed an implementation plan and financing plan for the recommended project, including projections of costs and revenues.

- C6 – Decentralized Stormwater Projects: The Corral de Tierra Country Club proposed to build a retention basin to collect and reuse stormwater on the golf course in lieu of groundwater extraction. The Country Club has completed a 90% design of the retention basin, and SVBGSA began working with the Country Club to include the construction of the basin in the SGMA Round 2 Implementation Grant.

Regional Projections and Management Actions

- R1 through R3 Multi-Subbasin Projects: The Monterey GSP identified three multi-subbasin projects that require infrastructure or rely on a supply source outside the Subbasin to provide supply augmentation to the Subbasin. These regional projects include R1 – Seasonal Releases from Reservoirs, R2 – Regional Municipal Supply Project, and R3 – Multi-benefit Stream Channel Improvements. In WY 2022, the Subbasin GSAs focused on supporting Round 1 Implementation Grant in the 180/400-Foot Aquifer Subbasin, as well as the development of the regional Seawater Intrusion Model.

  During WY 2022, SVBGSA received $7.6 million funding through the DWR Round 1 Implementation Grant in the adjacent 180/400-Foot Aquifer Subbasin. This grant includes activities that may have an indirect benefit for the Subbasin and feasibility studies on projects including aquifer storage and recovery and the extraction barrier related to projects R1 and R3, as well as demand management measures.

Implementation Actions

- I1 – 180/400-Foot Aquifer Subbasin GSP Implementation and Seaside Watermaster Actions: This implementation action involves MCWD GSA's continued support of projects implemented in the 180/400-Foot Aquifer Subbasin and in the larger Salinas Valley Basin.

  In WY 2022, MCWD GSA supported SVBGSA's 2022 update to the 180/400-Foot Aquifer Subbasin GSP, which was submitted to DWR in September 2022, and the development of the Salinas Valley Basin Integrated Implementation Plan (IIP). Following submittal of the 2022 GSPs in the Salinas Valley Basin, the SVBGSA developed an IIP for the medium- and high-priority subbasins to provide a Valley-wide basis for the SVBGSA to implement the subbasin GSPs in an integrated manner. It described how the Salinas Valley's groundwater system functions holistically, outlined a Valley-wide water budget, and provided an integrated understanding of current groundwater conditions and SGMA sustainability goals, highlighting how the subbasin GSPs align.

  The MCWD GSA and SVBGSA worked together to develop information for the Subbasin to include in the IIP, including a set of SMC contours and information regarding the Subbasin's water budget.

- I2 – Deep Aquifers Investigation: This Study focuses on describing the geology, hydrogeology, and extent of the Deep Aquifers, the water budget, and guidance for management and is led by the SVBGSA. In October 2021, the following agencies and entities entered into an Agreement for Contribution to Funding the Deep Aquifers Study: SVBGSA; Monterey County; MCWRA; Castroville Community Services District; MCWD; City of Salinas; Alco Water; and California Water Service. In WY 2022, SVBGSA initiated the Study to better understand the extent, groundwater conditions, and water budget of the Deep Aquifers of the Salinas Valley.

The MCWD GSA is actively supporting the Deep Aquifers Study by being a funding partner and collaborating on technical input. Technical committee meetings regarding the Deep Aquifers Study were conducted through the SWIG TAC during WY 2022, where the definition of what constitutes the Deep Aquifers was discussed and later the preliminary investigation results were presented, including the extent of the Deep Aquifers and recommended interim monitoring and management actions. The MCWD GSA provided technical input regarding the geologic composition and the definition of the Deep Aquifers, as well as input regarding recommended actions to mitigate overdraft and prevent seawater intrusion.

- I5 – Seawater Intrusion Working Group (SWIG): The SWIG membership was comprised of nine agencies and municipalities and multiple stakeholders to develop consensus on the current understanding of seawater intrusion in the Subbasin and adjacent subbasins subject to seawater intrusion, identify data gaps, and develop a broad-based plan for controlling seawater intrusion. Additionally, the SWIG provided a platform for understanding Deep Aquifers issues that accompanies seawater intrusion in the coastal Subbasins. During WY 2022, MCWD GSA and SVBGSA continued to work through the SWIG and SWIG TAC. The SWIG TAC meetings provided a platform for technical meetings regarding the Deep Aquifers Investigation (see I4 above) and development of the Seawater Intrusion Model (see I6 below). The SWIG discussed and provided input on the various project types to stop seawater intrusion and which feasibility studies were included in the 180/400-Foot Aquifer Subbasin Round 1 SGMA Implementation Grant application.

  As mentioned above, the SVBGSA Board of Directors transitioned the responsibilities of the SWIG to the existing Advisory Committee, and the responsibilities of the SWIG TAC to a new, broader GTAC. MCWD is currently a member of the Advisory Committee and have applied to become a member of the GTAC. Continued investigation of multi-subbasin groundwater management strategies including management of seawater intrusion and the Deep Aquifers will be conducted through the GTAC in WY 2023.

- I6 – Future Modeling of Seawater Intrusion and Projects The SVBGSA is leading development of a three-dimensional variable-density model that will provide a critical tool in assessing which P&MAs can adequately address seawater intrusion and assist with scoping them in the Subbasin and the greater Salinas Valley Basin. This model intends to build upon the MBGWFM completed by MCWD, the Seaside Basin Model, and the SVIHM developed by the USGS. In WY 2022, SVBGSA continued the development of the Seawater

Intrusion Model with data and information support from MCWD GSA. The two GSAs plan to coordinate further on model development. The MCWD GSA is currently conducting a review of the model's consistency with hydrogeologic conditions in the Subbasin. Completion of the model for further assessment of predictive scenarios is anticipated in Spring/Summer 2023.

5.2 Sustainable Management Criteria

The Monterey GSP includes descriptions of significant and unreasonable conditions, MTs, IMs, MOs, and URs for DWR's six sustainability indicators. This section describes the Subbasin's progress towards achieving the first IM (IM5) and avoiding URs based on data presented in Section 4.

The Monterey Subbasin GSP includes descriptions of significant and unreasonable conditions, minimum thresholds, interim milestones, measurable objectives, and undesirable results for each of DWR's six sustainability indicators. The MCWD GSA and SVBGSA determined locally defined significant and unreasonable conditions based on public meetings and staff discussions. The SMC are individual criterion that will each be met simultaneously, rather than in an integrated manner. A brief comparison of the data presented in Section 4 and the SMCs are included for each sustainability indicator in the following sections.

Significant and unreasonable conditions occur due to inadequate groundwater management and qualitatively describe groundwater conditions deemed insufficient by beneficial users of groundwater and stakeholders in the Subbasin. 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 shows a significant and unreasonable condition across the Subbasin as a whole. 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 GSP and annual reports must demonstrate that groundwater management will not only avoid undesirable results, but can reach measurable objectives by 2042. DWR uses interim milestones every 5 years to review progress from current conditions to the measurable objectives.

Since the GSP addresses long-term groundwater sustainability, some of the metrics for the sustainability indicators may not be applicable in each individual future year. The GSP is developed 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). 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.

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 prolonged droughts, which could be more extreme than those that have been anticipated based on historical data and anticipated climate change conditions. Such temporary exceedances do not constitute an undesirable result.

5.2.1 Chronic Lowering of Groundwater Levels

Table 5-1 compares Fall 2021 groundwater elevations to IMs set at RMS wells established for chronic lowering of groundwater levels in the Monterey GSP. For SGMA monitoring purposes, fall measurements are those collected during the fourth quarter (i.e., October, November, and December) and correspond to the measurements used to define the Subbasin's SMCs.

The MT value for each RMS well within the groundwater elevation monitoring network is provided in Table 5-1. Fall groundwater elevation data are color-coded on this table: orange cells indicate the groundwater elevation is below the MT, yellow cells indicate the groundwater elevation is above the MT but below the MO, and green cells indicate the groundwater elevation is above the MO.

Table 5-1. Groundwater Elevations and Relevant Sustainable Management Criteria for Chronic Lowering of Groundwater Levels Sustainability Criteria

Site Name	Aquifer	Collection Agency	Fall 2021	MT	MO	IM5
Marina-Ord Area						
MW-BW-28-A	Dune Sand Aquifer	Fort Ord	64.2	63.7	70.3	70.3
MW-BW-49-A	Dune Sand Aquifer	Fort Ord	10.9	8.9	11.3	11.3
MW-BW-81-A	Dune Sand Aquifer	Fort Ord	10.4	8.2	10	10
MW-BW-82-A	Dune Sand Aquifer	Fort Ord	9.8	7.9	9.5	9.5
MW-OU2-13-A	Dune Sand Aquifer	Fort Ord	89.5	89.6	94.4	94.4
MW-OU2-32-A	Dune Sand Aquifer	Fort Ord	7.0	7.2	8.1	8.1
MW-OU2-34-A	Dune Sand Aquifer	Fort Ord	8.2	4.7	6.6	6.6
CDM MW-1 Beach	Upper 180-Foot Aquifer	Seaside Basin Water Master	4.2	3.3	3.3	3.3
MW-02-05-180	Upper 180-Foot Aquifer	Fort Ord	7.1	6.5	8.4	8.4
MW-02-10-180	Upper 180-Foot Aquifer	Fort Ord	6.2	6.5	7.3	7.3
MW-02-13-180M	Upper 180-Foot Aquifer	Fort Ord	7.2	6	6.8	6.8
MW-02-13-180U	Upper 180-Foot Aquifer	Fort Ord	7.4	6.8	7.3	7.3
MW-12-07-180	Upper 180-Foot Aquifer	Fort Ord	7.7	6.1	7	7
MW-B-05-180	Upper 180-Foot Aquifer	Fort Ord	-5.6	-8	-3.4	-3.4
MW-BW-55-180	Upper 180-Foot Aquifer	Fort Ord	-4.5	-6.4	-5.7	-5.7
MW-OU2-29-180	Upper 180-Foot Aquifer	Fort Ord	-3.0	-9	-7.2	-7.2
MP-BW-42-295	Lower 180-Foot Aquifer	Fort Ord	-10.0	-8.9	-8.1	-8.1
MW-12-12-180L	Lower 180-Foot Aquifer	Fort Ord	4.0	3.3	3.8	3.8
MW-BW-04-180	Lower 180-Foot Aquifer	Fort Ord	-9.4	-11	-11	-11.0
MW-OU2-66-180	Lower 180-Foot Aquifer	Fort Ord	-7.7	-10	-9.2	-9.2
TEST2	Lower 180-Foot Aquifer	Fort Ord	-8.9	-11.9	-10.6	-10.6
MP-BW-50-289	Lower 180-Foot, 400-Foot Aquifer	Fort Ord	-12.5	-8.4	-7.1	-7.1
MPWMD#FO-10S	400-Foot Aquifer (a)	Seaside Basin Water Master	-13.3	-10.3	-3	-20.4
MPWMD#FO-11S	400-Foot Aquifer	Seaside Basin Water Master	-31.1	-25.9	-6.4	-44.4
MW-OU2-07-400	400-Foot Aquifer	Fort Ord	Not Sampled	-6.6	-4.2	-4.2
014S001E24L002M	Deep Aquifers	USGS	-29.0	-29.6	-20.8	-34.9
014S001E24L003M	Deep Aquifers	USGS	-12.0	-6.8	3.5	-18.9
014S001E24L004M	Deep Aquifers	USGS	-27.0	-34.7	-21.1	-41.6
014S001E24L005M	Deep Aquifers	USGS	-23.0	-26.6	-6	-39.7

Site Name	Aquifer	Collection Agency	Fall 2021	MT	MO	IM5
14S02E33E01	Deep Aquifers	MCWRA	-46.0	-43.8	-29.3	-69.9
14S02E33E02	Deep Aquifers	MCWRA	-21.0	-21.1	-13.9	-22.6
PZ-FO-32-910	Deep Aquifers	MCWRA	-45.4	-44.1	-19.7	-65.6
MPWMD#FO-10D	Deep Aquifers (a)	Seaside Basin Water Master	-13.2	-10.6	-3.8	-18.7
MPWMD#FO-11D	Deep Aquifers	Seaside Basin Water Master	-12.9	-4.8	3.3	-15.7
Sentinel MW #1	Deep Aquifers (a)	Seaside Basin Water Master	-26.0	-25.4	-18.8	-37.8
Corral de Tierra Area						
15S/02E-25C01	El Toro Primary Aquifer System	MCWRA	21	23	33	21
15S/03E-18P01	El Toro Primary Aquifer System	MCWRA	-53.4	-46.4	-28.4	-53
15S/03E-20R50	El Toro Primary Aquifer System	MCWRA	34.5	29	39	37
16S/02E-01M01	El Toro Primary Aquifer System	MCWRA	289.6	291.5	301.5	295.3
16S/02E-02G01	El Toro Primary Aquifer System	MCWRA	291.8	294.9	304.9	299.2
16S/02E-02H01	El Toro Primary Aquifer System	MCWRA	278.3	278.9	288.9	282
16S/02E-03A01	El Toro Primary Aquifer System	MCWRA	216.1	227	232	188
16S/02E-03F50	El Toro Primary Aquifer System	MCWRA	217.6	220.7	225.7	211
16S/02E-03H01	El Toro Primary Aquifer System	MCWRA	205.7	210.1	220.1	213.6
16S/02E-03J50	El Toro Primary Aquifer System	MCWRA	211.9	193.3	210.1	210.1
Robley Deep (South)	El Toro Primary Aquifer System (a)	MCWRA	164.7	169.8	183.5	160.5
Robley Shallow (North)	El Toro Primary Aquifer System (a)	MCWRA	237.6	245.2	255.2	230.7

Abbreviations:

IM5 = Interim milestone in 5 years after GSP Implementation

Notes:

(a) Wells MPWMD#FO-10S, MPWMD#FO-10D, and Sentinel MW#1 in the Marina-Ord Area, and the Robley wells in the Corral de Tierra Area are monitored by MPWMD on behalf of the Seaside Watermaster. MPWMD#FO-10S and Robley Shallow (North) are known to be screened in the Paso Robles Aquifer, which is likely connected to the 400-Foot Aquifer; MPWMD#FO-10D, Sentinel MW#1, and Robley Deep (South) are screened in the Santa Margarita Aquifer, which is likely connected to the Deep Aquifers.

(b) Orange cells indicate the groundwater elevation is below the MT, yellow cells indicate the groundwater elevation is above the MT but below the MO and green cells indicate the groundwater elevation is above the MO.

5.2.1.1 Minimum Thresholds

In the Marina-Ord Area, the MTs for chronic lowering of groundwater levels were set to minimum groundwater elevations historically observed between 1995 and 2015, and in the Corral de Tierra Area, groundwater elevations observed in 2015. In WY 2022, two wells in the Dune Sand Aquifer, one well in the upper 180-Foot Aquifer, four wells in the lower 180-Foot and 400-Foot Aquifers, six wells in the Deep Aquifers, and ten wells in the El Toro Primary Aquifer System exceeded their MTs, as indicated by the orange cells.

5.2.1.2 Measurable Objectives and Interim Milestones

The MOs for chronic lowering of groundwater levels represent target groundwater elevations higher than the MTs. These MOs provide operational flexibility to ensure that the Subbasin can be managed sustainably over a reasonable range of hydrologic variability. Three RMS wells in the Dune Sand Aquifer, six in the upper 180-Foot Aquifer, four in the lower 180-Foot Aquifer, and one in the El Toro Primary Aquifer System had groundwater elevations higher than their MO in WY 2022, as represented by the green cells in Table 5-1**.** No RMS well in the Deep Aquifers had groundwater elevations higher than their MO.

To help reach MOs, the MCWD GSA and SVBGSA set IMs at 5-year intervals. The 2027 IM (IM5) for groundwater elevations are also shown in Table 5-1. The WY 2022 groundwater elevations in 29 wells are already higher than the 2027 IMs[5].

In the lower 180-Foot and 400-Foot Aquifers, the Deep Aquifers, and the El Toro Primary Aquifer System, the 2027 interim milestones continue the downward trend of groundwater elevations in most RMS wells before increasing toward the measurable objectives because of the time lag associated with seeing groundwater benefits from projects and management actions. This was done to set more realistic interim milestones where groundwater elevations have been declining historically; however, the goal is to raise groundwater levels as quickly as possible. It is acknowledged that these groundwater level declines may have additional impact to beneficial uses and users beyond those associated with the minimum threshold.

5.2.1.3 Undesirable Result

The chronic lowering of groundwater levels UR is a quantitative combination of groundwater elevation MT exceedances. For the Subbasin, the groundwater elevation UR is:

Over the course of any one year, exceedance of more than 20% of the groundwater level MTs 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

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[5] The IMs at the Deep Aquifers were lower than MT since most P/MAs will not be implemented by 2027, and the water levels at the Deep Aquifers were assumed to decrease until 2032.

c) the Deep Aquifers, or

d) the El Toro Primary Aquifer System.

Marina-Ord Area

Dune Sand Aquifer and Upper 180-Foot Aquifer

- Two RMS wells in the Dune Sand Aquifer and one RMS well in upper 180-Foot Aquifer, out of 16 RMS wells that screened the Dune Sand and upper 180-Foot Aquifers, exceeded their MTs, which represents 19% of the total RMS wells in the Dune Sand and upper 180-Foot Aquifers. Since the differences between the Fall 2021 measurements and MTs at those wells were within 1-foot, the exceedances are likely due to seasonal fluctuations and dryer climate conditions in WY 2022.

Lower 180-Foot and 400-Foot Aquifer

- Four out of nine RMS wells, or 44%, that screened the lower 180-Foot and 400-Foot Aquifers exceeded their MTs.

Deep Aquifers

- Six out of 10 RMS wells, or 60%, that screened the Deep Aquifers exceeded their MTs.

Corral de Tierra Area

- Ten out of 12 RMS wells[6], or 83%, in the El Toro Primary Aquifer exceeded their MTs.

The WY 2022 conditions in the lower 180-Foot and 400-Foot Aquifer, the Deep Aquifers, and the El Toro Primary Aquifer, as described above, constitute an UR per the Monterey GSP. Due to the conditions in the Marina-Ord Area and Corral de Tierra Area, the Subbasin GSAs will work to implement P&MAs to improve groundwater conditions.

5.2.2 Reduction in Groundwater Storage

The SMCs for chronic lowering of groundwater levels and seawater intrusion are proxies for the reduction in groundwater storage SMC. As discussed in Section 5.2.1 above, groundwater levels that constitute an UR have been observed in WY 2022, and therefore, by definition, it constitutes an UR for reduction in groundwater storage.

5.2.3 Seawater Intrusion

No RMS wells sampled in WY 2022 show advancement of the seawater intrusion isocontour, and therefore there has been no observed change in the seawater intrusion extent in WY 2022. The GSAs will conduct additional water quality sampling in WY 2023.

[6] As stated in Section 5.2.1, one well (16S/02E-03H02) in the RMS network has been removed because the well has withdrawn from MCWRA's water level monitoring programs since the last annual report dated in 2022.

5.2.4 Water Quality

The MT values for each well within the groundwater quality monitoring network are provided in **Table** 5-2. **Table** 5-2 also shows the wells sampled in WY 2022 that had higher concentrations than the regulatory standard, as previously discussed in Section 4.5, and the running total of wells above the 2019 baseline that have had higher concentrations than the regulatory standard, which is used to measure against the MTs. Only the latest sample for each COC at each well is used for the running total. The MTs are set at no additional wells with concentrations above the regulatory standard for each constituent, above those that existed in 2019. These conditions were determined to be significant and unreasonable because groundwater quality with higher concentrations than these values may cause a financial burden on groundwater users. Public water systems with COC concentrations above the Maximum Contaminant Level (MCL) or Secondary Maximum Contaminant Level (SMCL) are required to add treatment to the drinking water supplies or drill new wells. Agricultural wells with COCs that significantly reduce crop production may reduce grower's yields and profits.

In WY 2022, there were two exceedances of the MTs established for DDW public water system supply wells and none for the ILRP on-farm domestic and irrigation wells in the Corral de Tierra Area. There were no exceedances of the MTs in the Marina-Ord Area. The last column in **Table** 5-2 includes the number of wells above the MTs, with the COCs that exceeded the MT highlighted in orange. The negative numbers in the last column indicate the number of wells that now are above the regulatory limit is lower than those above the regulatory limit in 2019.

The degradation of groundwater quality UR is a quantitative combination of groundwater quality MT exceedances. Any groundwater quality degradation as a direct result of GSP implementation is unacceptable. Some groundwater quality changes are expected to occur independent of SGMA activities; because these changes are not related to SGMA activities they do not constitute an UR.

Table 5-2. Water Quality Exceedances in WY 2022

Constituent of Concern (COC)	Minimum Threshold/ Measurable Objective (Baseline number of wells with COC concentrations above the regulatory standard in 2019)[1]	Number of Wells Sampled in WY 2022 with COC Concentrations Above the Regulatory Standard	Total Number of Wells with COC Concentrations Above the Regulatory Standard in Most Recent Sample[1]	Number of Wells above the Minimum Threshold (negative if fewer than MT)
Marina-Ord Area				
DDW Wells				
Carbon Tetrachloride	0	0	0	0
Trichloroethane	0	0	0	0
Corral de Tierra Area				
DDW Wells				
1,2,3-Trichloropropane (1,2,3 TCP)	1	0	1	0
1,2-Dibromo-3-chloropropane	2	0	2	0
Arsenic	7	9	16	9
Benzo(a)pyrene	1	0	1	0
Chromium	2	0	2	0
Dinoseb	3	0	2	-1
Hexachlorobenzene (HCB)	1	0	1	0
Iron	13	2	15	2
Manganese	11	3	11	0
Nickel	1	0	1	0
Specific Conductance	2	1	1	-1
Total Dissolved Solids	2	0	0	-2
Vinyl Chloride	3	0	3	0
Zinc	1	0	1	0
ILRP On-Farm Domestic Wells				
Total Dissolved Solids	1	0	1	0

Note: highlighted cells indicate the exceedance of MT.
[1] The Monterey GSP did not include the baseline number of wells with COC concentrations above the regulatory standard for the Marina-Ord Area, because no RMS wells were detected above the MCL. Therefore, the baseline for these COC is 0.

5.2.5 Land Subsidence

Accounting for measurement errors in the InSAR data, the MT for land subsidence in the Monterey GSP is zero net long-term subsidence, with no more than 0.1 foot per year of estimated land movement to account for InSAR errors. Because the MTs of zero net long-term subsidence are the best achievable outcome, the MOs and IMs are identical to the MTs. The land subsidence UR for the Subbasin is defined as zero exceedances of the MTs for subsidence in any one year.

Annual subsidence data from October 2021 to October 2022 demonstrated land subsidence of less than 0.1 feet/year, as shown on Figure 4-19. Therefore, the land subsidence IM and MO are being met, and the Subbasin has not experienced a land subsidence UR.

5.2.6 Interconnected Surface Water

Groundwater elevation is used as a proxy in ISW RMS wells to monitor the potential depletion of ISW and the health of GDEs located near the City of Marina. As shown in Section 4.7 and Table 4-6, groundwater elevation in Fall 2021 was above the MT and MO set at the ISW RMS monitoring well. Once SVBGSA installs the shallow monitoring well along Toro Creek, SVBGSA will use it to monitor ISW in the Corral de Tierra Area.

6 REFERENCES

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