WY 2024 Annual Report

Monterey Subbasin

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

April 1, 2025

TABLE OF CONTENTS

List of Tables

List of Figures

Appendices

List of Abbreviations

AC	Advisory Committee
AEM	airborne electromagnetic
AF	acre-feet
AFY	acre-feet per year
ASGSA	Arroyo Seco Groundwater Sustainability Agency
ASR	aquifer storage and recovery
BOD	Board of Directors
CCP	Consensus and Collaboration Program
CCR	California Code of Regulations
CCRWQCB	Central Coast Regional Water Quality Control Board
CCWG	Central Coast Wetlands Group
CEQA	California Environmental Quality Act
COC	constituents of concern
CSIP	Castroville Seawater Intrusion Project
DAC	disadvantaged community
DDW	Division of Drinking Water
DM	Demand Management
DMS	data management system
DWR	California Department of Water Resources
EDF	Environmental Defense Fund
EO	Executive Order
FO	Fort Ord
ft	foot
FY	fiscal year
GAMA	Groundwater Ambient Monitoring and Assessment
GDE	groundwater dependent ecosystem
GEMS	Groundwater Extraction Management System
GMP	Groundwater Monitoring Program
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GTAC	Groundwater Technical Advisory Committee
GWE	groundwater elevation
HEC-RAS	Hydrologic Engineering Center's River Analysis System
HCM	Hydrogeologic Conceptual Model
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
M&A	Mongomery & Associates
MBAS	methylene blue active substances4
MBGWFM	Monterey Subbasin Groundwater Flow Model
MCEHB	Monterey County Health Department's Environmental Health Bureau
MCL	Maximum Contaminant Level
MCWD	Marina Coast Water District
MCWDGSA	Marina Coast Water District Groundwater Sustainability Agency
MCWRA	Monterey County Water Resources Agency
mg/L	milligram per liter
MO	measurable objective
MPWMD	Monterey Peninsula Water Management District
MT	minimum threshold
NAVD 88	North American Vertical Datum of 1988
P&MA	Projects and Management Action
PRISM	Parameter-elevation Regressions on Independent Slopes Model
PVWMA	Pajaro Valley Water Management Agency
QA/QC	quality control/quality assurance
RCA	Recommended Corrective Action
RCDMC	Resource Conservation District of Monterey County
RGS	Regional Government Services
RMS	Representative Monitoring Site
SGM	Sustainable Groundwater Management
SGMA	Sustainable Groundwater Management Act
SMCL	Secondary Maximum Contaminant Level
SMCs	Sustainable Management Criteria
SRDF	Salinas River Diversion Facility
SVA	Salinas Valley Aquitard
SVBGSA	Salinas Valley Basin Groundwater Sustainability Agency
SVGB	Salinas Valley Groundwater Basin
SVIHM	Salinas Valley Integrated Hydrologic Model
SWI	seawater intrusion
SWIG	Seawater Intrusion Working Group
SWRCB	State Water Resources Control Board
TAC	Technical Advisory Committee
TCE	trichloroethene
TDS	total dissolved solids
TLC	Temperature, Level and Conductivity
TSS	technical support services
UCCE	University of California Cooperative Extension
µg/L	microgram per liter

µmhos/cm	micromhos per centimeter
UR	undesirable result
U.S.	United States
USBR	United States Bureau of Reclamation
USGS	United States Geological Survey
WAC	Water Awareness Committee
WBZ	Water Budget Zone
WCR	well completion reports
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 (Figure 1-1; DWR, 2019). To address the long-term reliability of groundwater within the Subbasin, the Marina Coast Water District Groundwater Sustainability Agency (MCWDGSA) 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 Groundwater Sustainability Agencies (GSAs) and submitted to DWR on January 31, 2022 (MCWDGSA and SVBGSA, 2022). The GSP was approved by DWR in April 2023 (DWR, 2024a).

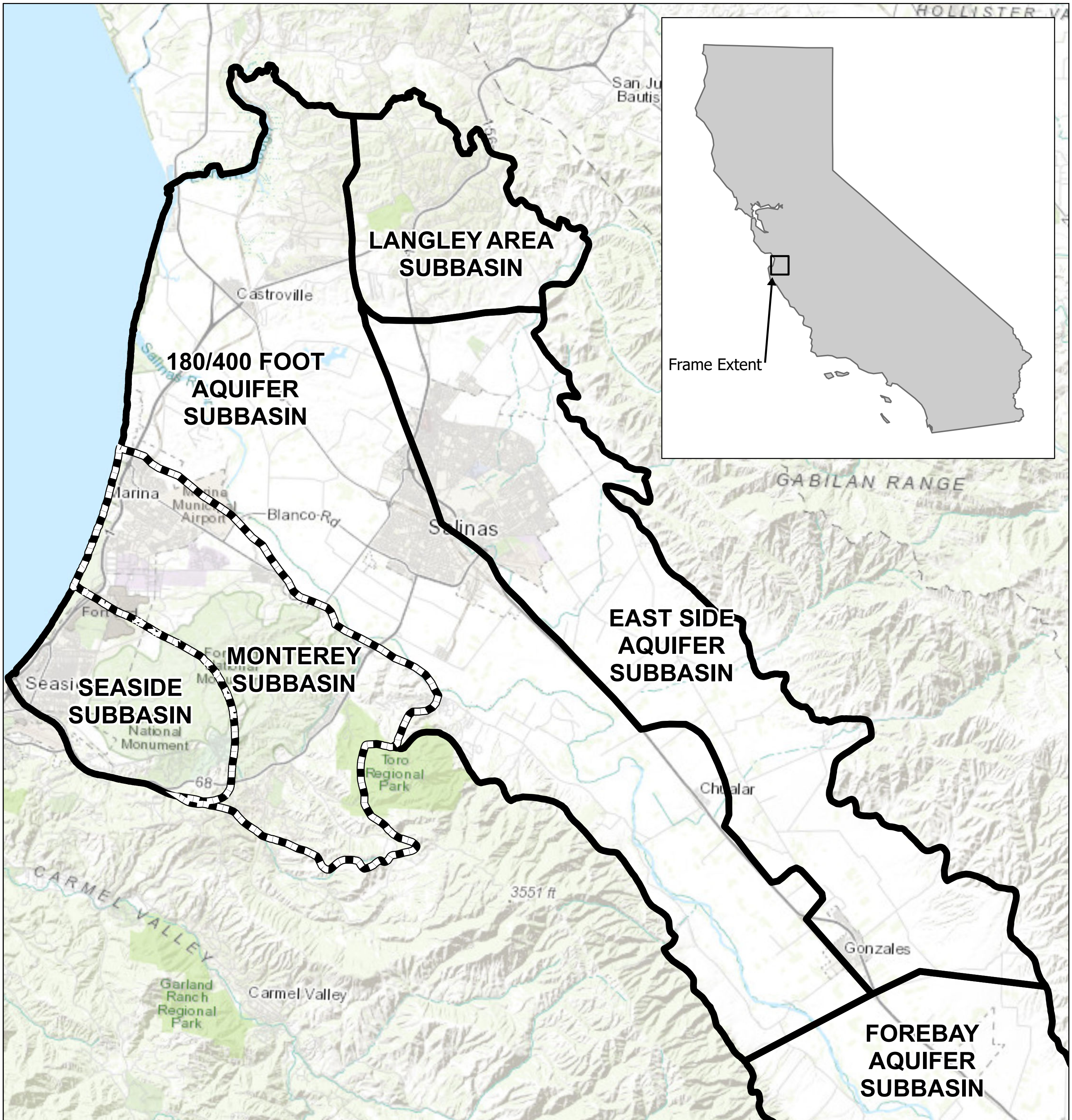
The GSP defined the sustainability goal of the Monterey Subbasin as follows:

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

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) (Figure 1-2). 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 (180/400 Subbasin).

MCWDGSA 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) 2024 Annual Report for the Subbasin has been prepared in compliance with the California Code of Regulations (CCR) 23 §356.2. WY 2024 includes the period from October 1, 2023, through September 30, 2024.

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



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 18 March 2025.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2020 Update.

Monterey Subbasin

Monterey Subbasin

WY 2024 Annual Report

March 2025

Figure 1-1

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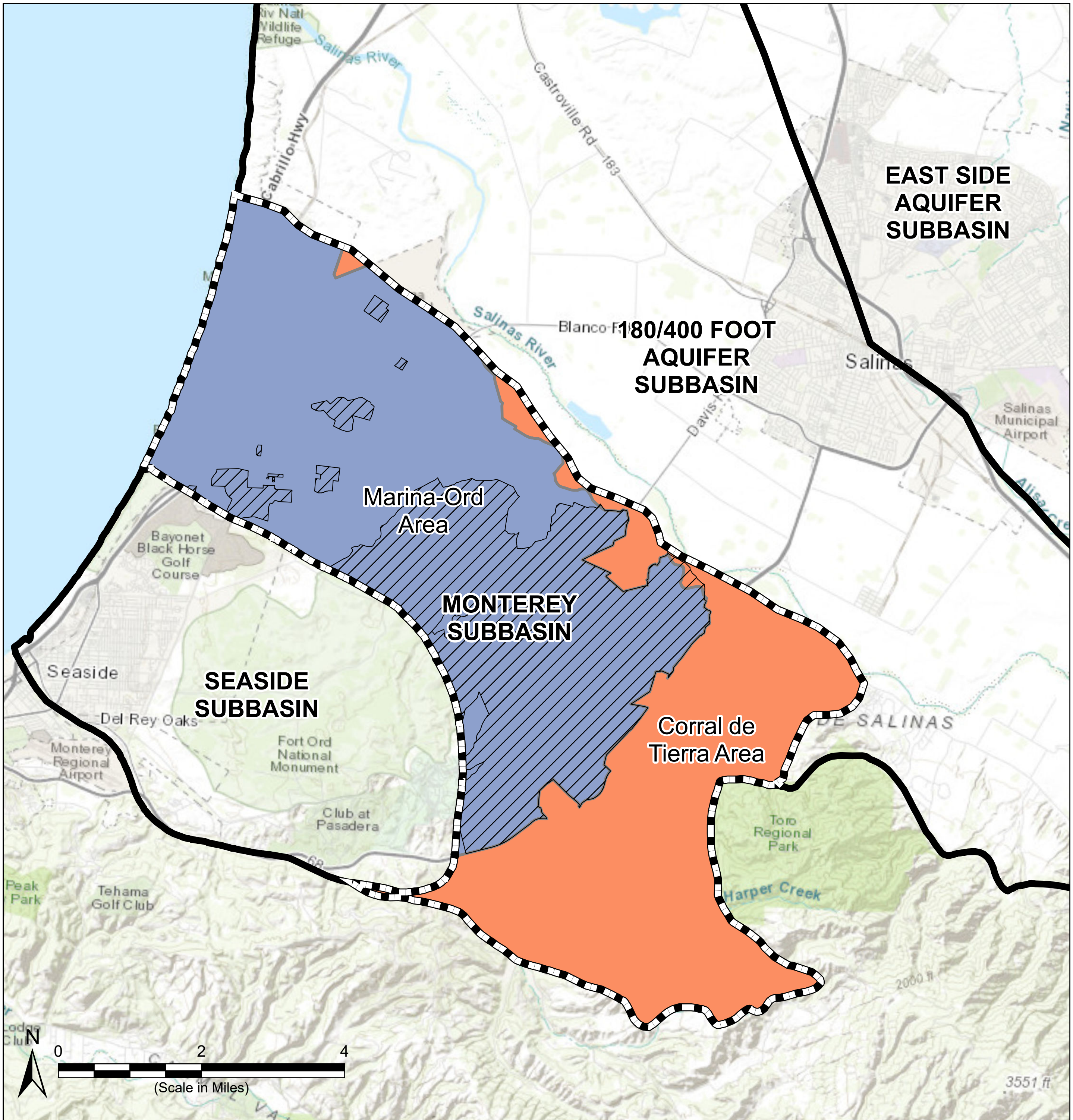

Legend

- 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 18 March 2025.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2020 Update.

Management Areas

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 1-2

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Using the Water Year Type methodology developed by DWR (DWR, 2021), WY 2024 is classified as a wet year, continuing the wet conditions in WY 2023. Recently, an update of the hydrogeologic conceptual model (HCM) was completed for the Monterey Subbasin based on new data available since completion of the Monterey GSP. The findings of the update are incorporated in the analysis of this Annual Report. In WY 2024, groundwater conditions remained similar to conditions in recent years, with slight changes related to specific Sustainability Indicators. Groundwater monitoring data for the Marina-Ord Area and the Corral de Tierra Area during WY 2024 are summarized relative to their respective sustainable management criteria (SMCs) defined in the Monterey GSP below:

Marina-Ord Area

- The Updated HCM redefines the extent of the 400/Deep Aquitard, which exists across the Marina-Ord Area and a portion of the Seaside Subbasin. The aquitard terminates at the Laguna Seca Anticline in the Monterey and Seaside Subbasins. The Deep Aquifers, as they have been defined, underlay the 400/Deep Aquitard and consist of the Lower Paso Robles, Purissima, and Santa Margarita Formations.
- The Updated HCM and available groundwater elevation (GWE) data suggest that the Deep Aquifers can be separated into an upper and a lower zone in the Marina-Ord Area, which are hydraulically connected to the Lower Paso Robles and Santa Margarita Formations in the Seaside Subbasin, respectively. Many wells screened in the Paso Robles Formation in the Marina-Ord Area and Seaside Subbasin that were previously associated with the 400-Foot Aquifer have been reassigned to the upper Deep Aquifer zone. The Updated HCM has resulted in a reassessment of groundwater gradients in the 400-Foot Aquifer and Deep Aquifers with gaps to be verified after data from new MCWDGSA monitoring wells are available. Additionally, updated aquifer-specific water budgets and storage change calculations utilizing the updated HCM and data from new monitoring wells will be developed as part of the 2027 GSP Periodic Evaluation.
- Stable or increases of groundwater elevations in representative monitoring site (RMS) wells screened in the Dune Sand, 180-Foot, and the northern portion of the 400-Foot Aquifers were observed during WY 2024 due to two consecutive wet years. Groundwater elevations in these aquifers have been stable over the past thirty years with fluctuations that correlate to precipitation. Groundwater elevations in Deep Aquifer RMS wells have been declining since 2000s but the rate of decline appears to have slowed in some deep wells since 2018.
- One well out of seven in the Dune Sand Aquifer, two wells out of seven in the lower 180-Foot and 400-Foot Aquifers, and five wells out of nine in the Deep Aquifers exceeded their groundwater elevation minimum thresholds (MTs) during the Fall 2024 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 2024 in the Marina-Ord Area were approximately 3,338 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.
- The estimated change in groundwater storage in the four individual principal aquifers ranges from -356 AFY to +75 AFY between Fall 2023 and 2024 and within the range of changes observed historically.
- Data collected from the expanded MCWDGSA seawater intrusion monitoring program showed slight progression of the seawater intrusion front since 2015. However, measured chloride concentrations in RMS wells do not exceed the seawater intrusion MT or constitute a UR.
- No wells sampled in WY 2024 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 2024.
- 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

- The Updated HCM revealed a bedrock surface that is both shallower and more undulating than previously understood. This bedrock surface hydrogeologically isolates the southern Corral de Tierra Area from the Salinas Valley Basin as the El Toro bowl. As smaller, less isolated bedrock bowl exists near the confluence of Toro Creek and the Salinas River, established as the Highway 68 East bowl.
- Groundwater elevations in the El Toro Primary Aquifer System showed fluctuations during WY 2024 with no specific spatial pattern, but on average groundwater elevation rose by approximately 0.6 feet (ft). Based on groundwater elevations, an increase in groundwater storage was estimated between Fall 2023 and Fall 2024.
- Four wells out of 11 in the El Toro Primary Aquifer System exceeded their groundwater elevation MTs during the Fall 2024 monitoring event. These MT exceedances in the El Toro Primary Aquifer System constitute an UR per the Monterey GSP.
- Groundwater extractions for WY 2024 (October 1, 2023, through September 30, 2024) were approximately 1,164 AF in the Corral de Tierra Area.
- There is no seawater intrusion in the Corral de Tierra Area.
- There were 3 groundwater quality constituents of concern (COCs) – arsenic, iron and manganese - that exceeded their minimum thresholds in WY 2024. However, these were

not determined to be due to GSA groundwater management action or inaction. SVBGSA is in the process of assessing the relationship between groundwater quality and extraction, and plans to include the analysis in the GSP 2027 Periodic Evaluation.
- As mentioned above, no significant subsidence was detected in the Subbasin.
- In November 2024, SVBGSA installed a shallow monitoring well in the Corral de Tierra Area to monitor interconnected surface water. The well is currently dry, indicating lack of groundwater-surface water connection despite the wet water year but monitoring will continue.

During WY 2024, the Subbasin GSAs have taken numerous actions to implement the Monterey GSP. These include:

- ***General Administration*** – The Subbasin GSAs are administering the Sustainable Groundwater Management (SGM) Round 2 Implementation Grant for the Monterey Subbasin. The grant includes efforts to support data expansion and Sustainable Groundwater Management Act (SGMA) compliance, regional project planning, and outreach and engagement activities. Additionally, in 2024, MCWD staffed two more positions to support the District's and MCWDGSA's water management responsibilities. SVBGSA enhanced budget and financial reporting through a revised format and initiated a Groundwater Sustainability Fee 5-year evaluation .
- ***Coordination 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. MCWDGSA continued to meet and coordinate with regional agency partners to facilitate data sharing, expansion of the monitoring network, and project planning. SVBGSA continued robust collaboration with agency partners and held regular meetings of the Monterey Subbasin Implementation Committee. SVBGSA increased efforts to reach out to domestic well owners by initiating the Dry Well Notification Program and contributing to the Water Awareness Committee (WAC). SVBGSA also held 5 Valley-wide workshops titled "Our Water Future" in the Salinas Valley geared toward the general public.
- ***Data Expansion and SGMA Compliance*** – In 2024, the Subbasin GSAs continued is momentum in data expansion and SGMA compliance activities and completed several multi-year efforts. The GSAs collaborated on the filling of data gaps and groundwater modeling efforts to establish a solid basis for planning projects and management actions (P&MAs). Joint efforts include:
    - Completing the Deep Aquifers Study;
    - Convening and participating in the Groundwater Technical Advisory Committee (GTAC);
    - Completing refinement of the Seawater Intrusion Model to support the feasibility studies of regional projects and management actions;

  - Completing the Salinas Valley HCM Update; and
  - Convening and participating in the Groundwater Dependent Ecosystem (GDE) Workgroup as part of the effort to address DWR's Recommended Corrective Actions (RCAs).

  MCWDGSA continued expanding its monitoring network, leading the development of its seawater intrusion monitoring program, deploying weather stations, and developing a data integration platform. SVBGSA, in addition to the joint data expansion efforts, conducted workstreams including the Well Registration Program, GEMS expansion, GDE verification, and monitoring network expansion.

- ***Projects and Management Actions*** – The SVBGSA led regional project planning efforts with the SGM Round 1 Implementation Grant for the 180/400 Subbasin and initiated development of feasibility studies for three approaches to mitigate seawater intrusion. The GSAs collaboratively conducted modeling to support the feasibility studies. Within the Marina-Ord Area, the MCWDGSA proceeded with monitoring well planning with anticipated construction in second quarter 2025. In the Corral de Tierra Area, SVBGSA engaged the public in the conversation to plan for uncertainty and initiated subbasin-specific dialogues of demand management (DM). SVBGSA also conceptualized and launched a new effort titled the Water Efficiency Pilot Program to support residential water efficiency in rural residential areas. Additionally in the Corral Area, four new monitoring wells were installed in WY 2024.

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 2024 Annual Report for the Subbasin has been prepared in compliance with CCR 23 §356.2. WY 2024 includes the period from October 1, 2023, through September 30, 2024. This Annual Report also contains available and appropriate historical data back to calendar year 2015, the effective date of SGMA as required by CCR 23 §356.2 (b). The data provides 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 2024 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 2042.

2.2 Monterey Subbasin Groundwater Sustainability Plan

The Monterey GSP was co-authored by MCWDGSA and SVBGSA and submitted to DWR on January 30, 2022 (MCWDGSA and SVBGSA, 2022). The GSP was approved by DWR in April 2023 (DWR, 2024a). The MCWDGSA 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, and the Castroville Community Services District.

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; 180/400 Subbasin).

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 1-1). The Subbasin has been designated as medium priority by DWR. The Monterey GSP established two Management Areas within the Subbasin (Figure 1-2): the Marina-Ord Area and the Corral de Tierra Area.

2.3 Organization of This Report

This Annual Report has been developed pursuant to GSP Emergency Regulations §356.2 and DWR's guidelines for annual reports (DWR, 2023a). 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 Monterey GSP and identifies progress towards 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. In 2024, MCWDGSA and SVBGSA completed an update of the Monterey Subbasin hydrogeologic conceptual model to fill known data gaps based on new information that has become available since the development of the GSP. The HCM Update confirmed the distinct hydrostratigraphy in the area north of the Laguna Seca Anticline. The findings of the HCM Update are highlighted below in *blue, italic text* and further described in Appendix A. The analyses in this annual report are updated to reflect findings of the HCM Update.

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. 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, separated by the Intermediate 180-Foot Aquitard. 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 location and extent of aquitards separating principal aquifers in the Marina-Ord Area have been updated based on both well completion reports (WCR) and airborne electromagnetic (AEM) data, and incorporate the results of the Deep Aquifers Study (M&A, 2024). The Deep Aquifers Study indicates that the 400/Deep Aquitard extends, within the Monterey Subbasin, to the Laguna Seca Anticline and into the Seaside Subbasin (M&A, 2024). This aquitard overlies the Deep Aquifers, which are composed of the Lower Paso Robles Formation, the Santa Margarita Sandstone, and the Purisima Formation. In many areas of the Salinas Valley, these formations are grouped into one hydrostratigraphic unit, because long-screened agricultural wells mix their respective productive zones, effectively combining them into one aquifer unit. However, within the Monterey Subbasin, available data shows that the Deep Aquifers are separated into an upper and lower zone. The lower zone overlies the bedrock and extents to approximately 2,000 feet below ground surface at the Monterey-180/400 Subbasin boundary. Water levels in the upper Deep Aquifer zone are significantly lower than in the lower Deep Aquifer zone, given that the *majority of groundwater extraction occurs from the upper Deep Aquifer zone. The Deep Aquifers in the Seaside Subbasin are similarly separated into a shallower Paso Robles Aquifer and a deeper Santa Margarita Aquifer, which likely connects to the upper and lower Deep Aquifer zones within the Marina Ord Area, respectively.*

The reassessment of the depth of the 400/Deep Aquitard indicates that many Paso Robles wells located in the Marina-Ord Area and Seaside Subbasin, historically believed to be associated with the 400-Foot Aquifer, are screened in the upper Deep Aquifer zone. Groundwater elevation contours presented in Section 4.1.1 for the 400-Foot Aquifer and upper and deep Deep Aquifer zones reflect the Updated HCM. These contours will be further updated after data from the new MCWDGSA monitoring wells are available. Additionally, updated aquifer-specific water budgets and storage change calculations utilizing the updated HCM and data from new monitoring wells will be developed as part of the 2027 GSP Periodic Evaluation.

The Corral de Tierra Area has one principal aquifer, the El Toro Primary Aquifer System, which includes the Aromas Sands, Paso Robles Formation, and Santa Margarita Sandstone (Geosyntec, 2007). *The recent HCM updates revealed a bedrock surface that is both shallower and more undulating than previously understood. This bedrock surface, defined as the Monterey Formation or the crystalline rocks, hydrogeologically isolates the southern Corral de Tierra Area from the Salinas Valley Basin in the form of a bedrock bowl defined in the HCM Update as the El Toro bowl. The revised bedrock surface also shows a smaller, less isolated bowl near the confluence of Toro Creek and the Salinas River established as the Highway 68 East bowl in the HCM Update. The results of these revisions impact how the data for the SMC are analyzed and displayed.*

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 where their respective aquitards end. 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; however, there is also high runoff during storm events due to the topography.

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 Subbasin. Toro Creek is generally perennial below the confluence with Watson Creek (Feikert, 2001). Recorded streamflows at U.S. Geological Survey (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 2024 was estimated to be approximately 19.1 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 2024 was classified as a wet year, following the wet year of WY 2023.

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	8.8	11.1	Critical
2022	12.2	10.9	Critical
2023	24.9	20.0	Wet
2024	19.1	21.4	Wet

A summary of the water year context for water use and management in the larger Salinas Valley Basin is provided in Appendix B. Groundwater use, management, and conditions in the larger Salinas Valley Basin, particularly the adjacent 180/400 Subbasin, significantly affect outflows and the water budget in the Monterey Subbasin. As such, they provide context for interpreting water use fluctuations and trends in the Monterey and adjacent Subbasins.

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

4 SUBBASIN CONDITIONS

Groundwater conditions within the Subbasin were assessed based on monitoring data collected during WY 2024. Where WY 2024 data are not available, groundwater conditions are evaluated based on the most recent data available as further described below.

The groundwater elevation and seawater intrusion monitoring networks and RMS networks 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. 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.

4.1 Groundwater Elevations

The groundwater elevation monitoring network in the Subbasin currently consists of 43 RMS wells, including 32 RMS wells in the Marina-Ord Area and 11 RMS wells in the Corral de Tierra Area. The locations of the current groundwater elevation RMS wells within the Marina-Ord Area and the Corral de Tierra Area are shown on the figures in Section 4.1.2. In WY 2024, SVBGSA installed 3 new RMS wells in the Corral de Tierra Area—1 along River Road, another off Corral de Tierra Road, and the third on San Benancio Road. Once transducers are installed in these wells, they will be monitored by MCWRA. Groundwater elevations for these wells will be reported starting the next annual report. The GSAs regularly collect data from both inside and outside the RMS network. The GSAs are working to address data gaps with additional wells to the monitoring network. This section presents groundwater elevation contours from WY 2024 and long-term hydrographs for selected wells in the Subbasin’s monitoring network.

4.1.1 Groundwater Elevation Contours

In the Marina-Ord Area groundwater elevation contours have been developed for Spring (February and March) and August 2024, which reflect seasonal high and low groundwater elevations, respectively. In addition, groundwater elevation contours were prepared for Fall 2024, which corresponds to the October, 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. Groundwater elevation contour maps for each principal aquifer are presented on Figure 4-1 through Figure 4-15.

In the Corral de Tierra Area, groundwater elevation contour maps are presented for Fall 2023, Spring 2024, August 2024 and Fall 2024 on Figure 4-16 through Figure 4-19. The August groundwater elevation contours represent the seasonal low conditions. The Fall contours show the conditions during November and December upon which MTs and MOs have been established.[3] In addition, given that few wells are monitored in the spring season in the Corral de Tierra Area, the Fall contours are used to represent the seasonal high conditions, even though they are more reflective of neutral groundwater conditions that are generally not heavily influenced by either summer irrigation pumping or winter rainfall recharge.

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. Since completion of the last Annual Report, wells screened in the Paso Robles portion of the 400-Foot and Deep Aquifers have been reassigned to reflect findings of the HCM Update.

Dune Sand Aquifer

As discussed in *Section 4* of the Monterey GSP, within the Monterey Subbasin, the Dune Sand Aquifer only exists in the Marina-Ord Area. Groundwater elevations and flow directions observed in the Dune Sand Aquifer during WY 2024 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 are highest in the central portion of the Marina-Ord Area, where a groundwater divide exists (Figure 4-1 through Figure 4-3). At the top of this divide, groundwater elevations were approximately 93 feet above the North American Vertical Datum of 1988 (ft NAVD 88) during Fall 2024. 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 Subbasin and the Salinas River.
- Limited seasonal variations were observed in groundwater elevations within Dune Sand Aquifer during Spring 2024 and August 2024.

[3] Fall 2023 contours for the Corral Area were previously published in the WY 2023 Annual Report. Updated groundwater level contours are developed for Fall 2023 herein (Figure 4-16) based upon the updated HCM to facilitate calculation of storage change in Section 4.3.2.

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 2024 were generally consistent with those observed in the recent past. 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 Subbasin.
- Groundwater elevations in the upper 180-Foot Aquifer were approximately 5 ft NAVD 88 at the coastline during Fall 2024 and generally decreased inland to the east/northeast, where groundwater elevations were approximately -9 ft NAVD 88. Groundwater elevations observed in Spring 2024 and Fall 2024 were generally higher than those observed in August 2024, but as discussed below in Section 4.1.2, seasonal variation in groundwater levels between these time periods is limited to a few feet.
- Groundwater elevations are slightly higher than sea level at the coastline and are below sea level further inland. This inland gradient allows high salinity water to flow into the northwestern portion of the Subbasin in the lower-180 Foot Aquifer. However, inflow from the Dune Sand Aquifer near the coastline protects the upper 180-Foot Aquifer from seawater intrusion in the Marina-Ord Area.

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, as further described below.

400-Foot Aquifer

In the Monterey Subbasin GSP and prior Annual Reports, groundwater elevations in the 400-Foot Aquifer were plotted in combination with those from the Paso Robles Aquifer in the adjacent Seaside Subbasin. However, the recent HCM Update (Section 3.1 and Appendix A) determined that these wells screened in the Lower Paso Robles Formation are in fact included within the Deep Aquifers. As a result, groundwater elevations from the Lower Paso Robles Formation wells have been excluded from 400-Foot Aquifer contours prepared for WY 2024.

- Similar to those in the upper 180-Foot Aquifer, groundwater elevations in the lower 180-Foot Aquifer and 400-Foot Aquifer are highest at the coastline and generally decrease inland to the east/northeast. Flow directions are generally to the northeast toward the 180/400 Subbasin.
- Groundwater elevations in the 400-Foot Aquifer were approximately -2 ft NAVD 88 at the

most seaward well during Fall 2024 and generally decreased towards the center of the Salinas Valley to the northeast, where groundwater elevations were approximately -11 ft NAVD 88. Groundwater elevations during Fall 2024 were similar to those observed during Spring 2024 in the Marina-Ord Area. Groundwater elevations during August 2024 were generally lower than those observed during the spring, but the variation in groundwater levels among these time periods was limited to less than 10 feet.

- Groundwater elevations in the 400-Foot Aquifer are below sea level at the coastline and further below sea level inland. As discussed in *Section 4* of the Monterey GSP, the geologic formations that make up this aquifer extend offshore below Monterey Bay and outcrop beneath a veneer of Pleistocene or Holocene marine sediments that are thin (i.e., less than 5 meters) across much of the offshore shelf but thicker (i.e., up to 32 meters) near the Salinas River Delta (Johnson et al., 2016). The combination of groundwater levels in this aquifer, which are below sea level in the northern portion of the Monterey Subbasin, and offshore outcrops below Monterey Bay allow high salinity water to flow into this aquifer in the northern portion of the Subbasin.
- Groundwater elevation contours for the 400-Foot Aquifer that have been constructed on the basis of the HCM Update and do not include data from MPWMD#FO-11S. The RMS well MPWMD#FO-11S is believed to be screened above the 400/Deep Aquitard based on AEM data reviewed as part of the HCM Update. However, as shown below on Figure 4-23 and discussed in Section 5.1.3 of the Monterey GSP, there is no known extraction in the vicinity of the well and groundwater levels are significantly lower than those measured in other 400-Foot Aquifer wells. Groundwater levels in this well are similar to those measured in the upper Deep Aquifer zone. Further evaluation of the stratigraphy in the southern portion of the Monterey Subbasin will be conducted once new 400-Foot and Deep Aquifers monitoring wells are installed in 2025 (as discussed in Section 5.2.4). Further analysis regarding the principal aquifer that well MPWMD#FO-11S represents will be conducted at that time.

Deep Aquifers

The Deep Aquifers Study completed by SVBGSA for the Salinas Valley identified the Deep Aquifers as the water-bearing sediments that underlay the 400/Deep Aquitard and is comprised of the Lower Paso Robles Formation, the Santa Margarita Sandstone, and the Purisima Formation. The 400/Deep Aquitard, and as a result the Deep Aquifers, extend from the coast to the Laguna Seca Anticline in the southern portion of the Monterey Subbasin and northern portion of the Seaside Basin. No evidence of direct surficial recharge to the Deep Aquifers, which are only defined to exist below the 400/Deep Aquitard, has been found based on the data collected. However, natural recharge from adjacent aquifers, such as aquifers in the southern Seaside Subbasin and the Corral de Tierra area, may flow into the Deep Aquifers as subsurface inflow.

Within the Monterey Subbasin, available data suggests that the Deep Aquifers are separated into an upper and lower zone, similar to the separation of the Lower Paso Robles and Santa Margarita portions of the Deep Aquifers in the Seaside Subbasin. Further evaluation of Deep Aquifer groundwater elevations will be conducted once new monitoring wells are installed in 2025 (as discussed in Section 5.3.4).

Groundwater elevation contours for the Deep Aquifers presented in this Annual report have been updated to reflect the updated HCM which incorporates the results of the Deep Aquifers Study. Separate groundwater level contours have been prepared for the upper and lower portions of the Deep Aquifers, as nested wells show that groundwater levels in these aquifers differ by tens of feet. Groundwater elevations and flow directions observed in the Deep Aquifers during WY 2024 are further described below.

Upper Deep Aquifer Zone

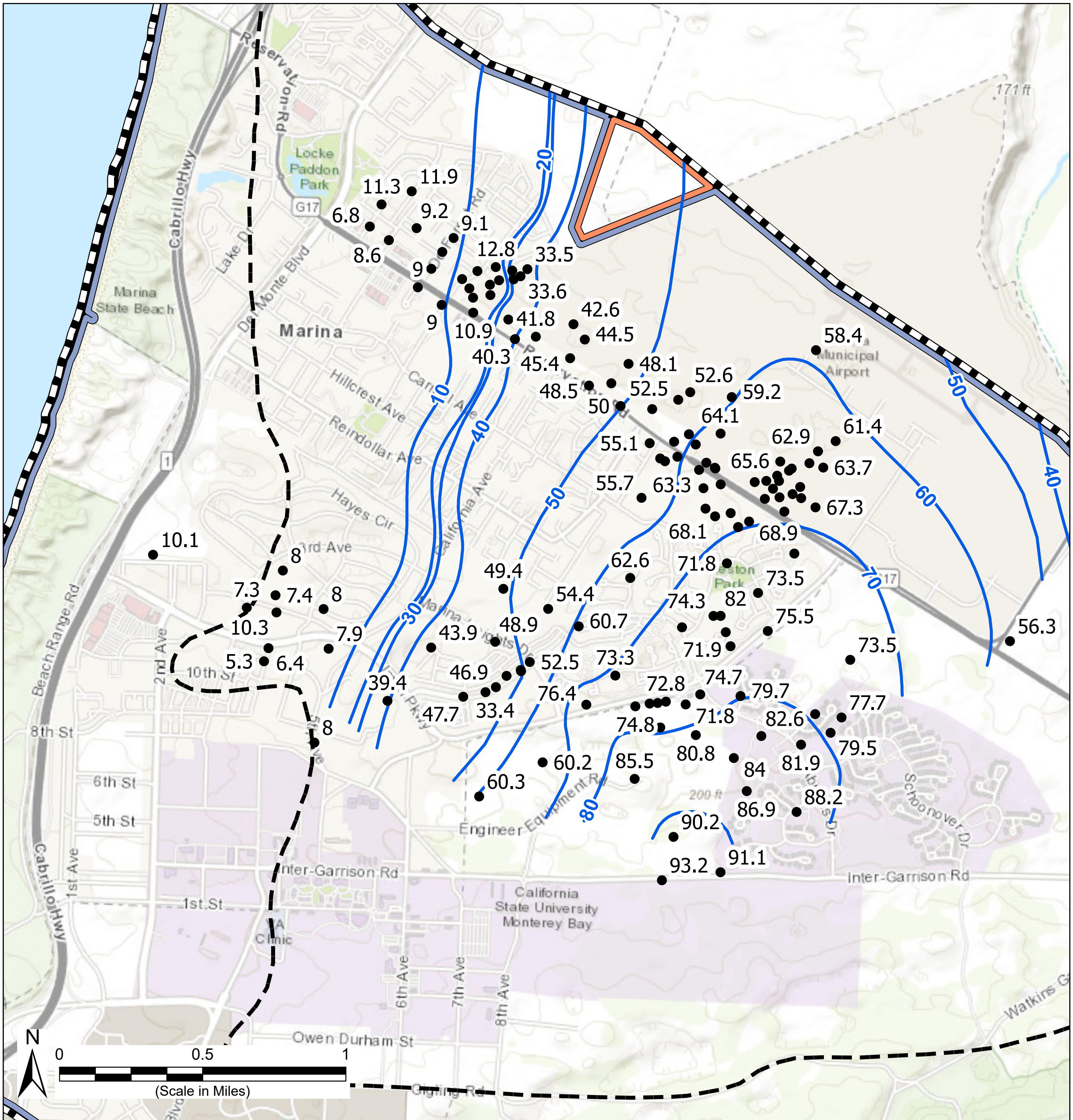
- Groundwater elevations in the upper Deep Aquifer zone are highest in the southeastern portion of the Marina-Ord Area and generally decrease toward the northwest. The Monterey-Seaside groundwater divide in the upper Deep Aquifer zone is located close to the Seaside /Monterey Subbasin boundary. South of this groundwater divide, groundwater flows toward the pumping depression in the Seaside subbasin, while to the north of the divide, groundwater flows northward across the Monterey Subbasin toward a pumping trough located in the 180/400 Subbasin near West Blanco Road and Nashua Road.
- During Fall 2024, groundwater elevations in the upper Deep Aquifer zone in the Monterey Subbasin are highest at the Laguna Seca Anticline and lowest to the north near the Monterey-180/400 Subbasin boundary at approximately -60 ft NAVD 88. Groundwater elevations were up to 40 feet higher in Spring 2024 than in August 2024. The Fall 2024 groundwater elevations were between the seasonal high (i.e., Spring 2024) and seasonal low (i.e., August 2024).
- In the Marina-Ord Area, groundwater elevations in the upper Deep Aquifer zone are 10 to 25 feet lower than those in the lower Deep Aquifer zone The difference in groundwater elevations between these aquifers is likely caused by greater rates of extraction from the upper Deep Aquifer zone within the Monterey Subbasin and 180/400 Subbasin.

Lower Deep Aquifer Zone

- The natural northerly direction of groundwater flow in the lower Deep Aquifer zone is similar to that in the upper Deep Aquifer zone. However, significant groundwater extraction occurs from the lower Deep Aquifer zone in the Seaside basin, which causes groundwater to flow southward in the southern portion of the Monterey Subbasin toward the pumping depression in the Seaside Basin. As such, an (east/west) groundwater divide exists in the center of the Monterey Subbasin within the lower Deep Aquifer zone.
- Groundwater elevations ranged from approximately 140 ft NAVD 88 near the Laguna Seca Anticline to approximately -25 ft NAVD 88 in the north near the Monterey-180/400 Subbasin boundary during Fall 2024. Groundwater elevations were up to 15 feet higher in Spring 2024 than in August 2024. The Fall 2024 groundwater elevations were between the seasonal high (i.e., Spring 2024) and seasonal low (i.e., August 2024).

4.1.1.2 Corral de Tierra Area

Figure 4-19 shows the Fall 2024 groundwater elevation contours within the El Toro Primary Aquifer System in the Corral de Tierra Area. Based on the HCM Update, groundwater elevation contours have changed from what has been presented in previous annual reports. Separate contours were developed for the Highway 68 East and El Toro bowls. In the Highway 68 East bowl, groundwater generally flows from the south toward the north. Provisional groundwater elevations collected during well development at the new monitoring well on River Rd, were used to inform the Highway 68 bowl groundwater elevation contours. In the El Toro bowl, generally groundwater flows from southeast to northwest toward a pumping depression near the boundary with the Seaside Subbasin. There may be potential groundwater flow divide that occurs near the Monterey-Seaside Subbasin boundary in the Laguna Seca area, however, the revised bedrock surface shows that these two areas share the El Toro bedrock bowl, and a groundwater divide reflects pumping centers rather than differing hydrostratigraphy. Additionally, the uplift in the top of the Monterey Formation east of the Hwy 68 intersection with San Benancio Road, which separates the El Toro and Highway 68 East bowls, likely restricts flow northward from the El Toro bowl towards the 180/400 Subbasin. In Fall 2024, the groundwater elevations in the El Toro bowl ranged from approximately 190 ft to 800 ft NAVD 88 and 10 ft to 20 ft NAVD 88 in the Highway 68 East bowl. Groundwater elevations contours for August 2023 are provided in Figure 4-19 and show similar flow patterns to the Fall 2024 groundwater elevation contours.



Legend

- Spring 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area
- Other Groundwater Subbasins within Salinas Valley Basin
- Southern Extent of FO-SVA (Harding ESE, 2001)

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

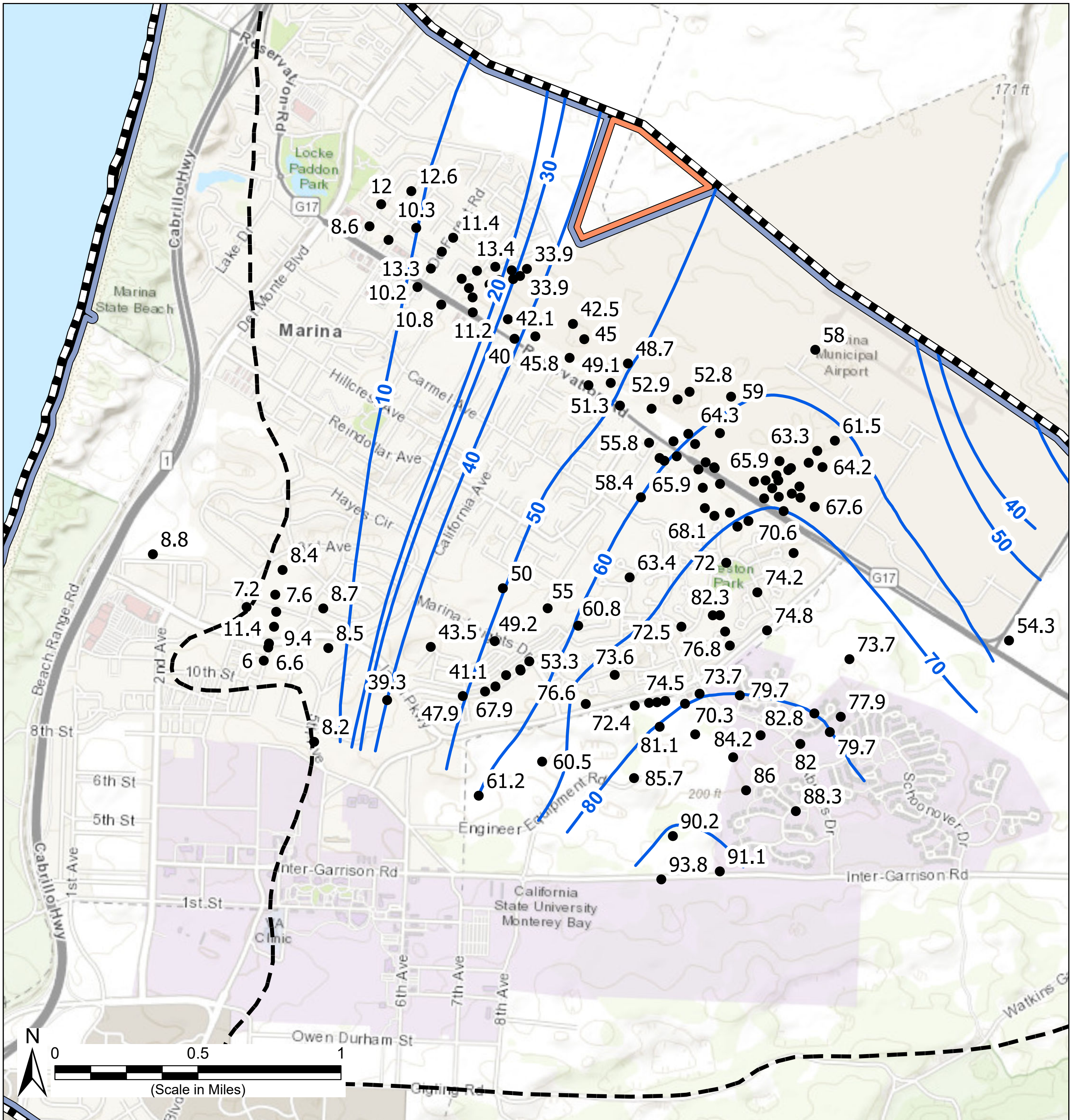
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 23 March 2025.

Groundwater Level Contours in the Marina-Ord Area - Spring 2024 Dune Sand Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-1

Path: X:\B60094\Maps\2025\03\Contours_spr_v2.aprx



Legend

- August 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area
- Other Groundwater Subbasins within Salinas Valley Basin
- Southern Extent of FO-SVA (Harding ESE, 2001)

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

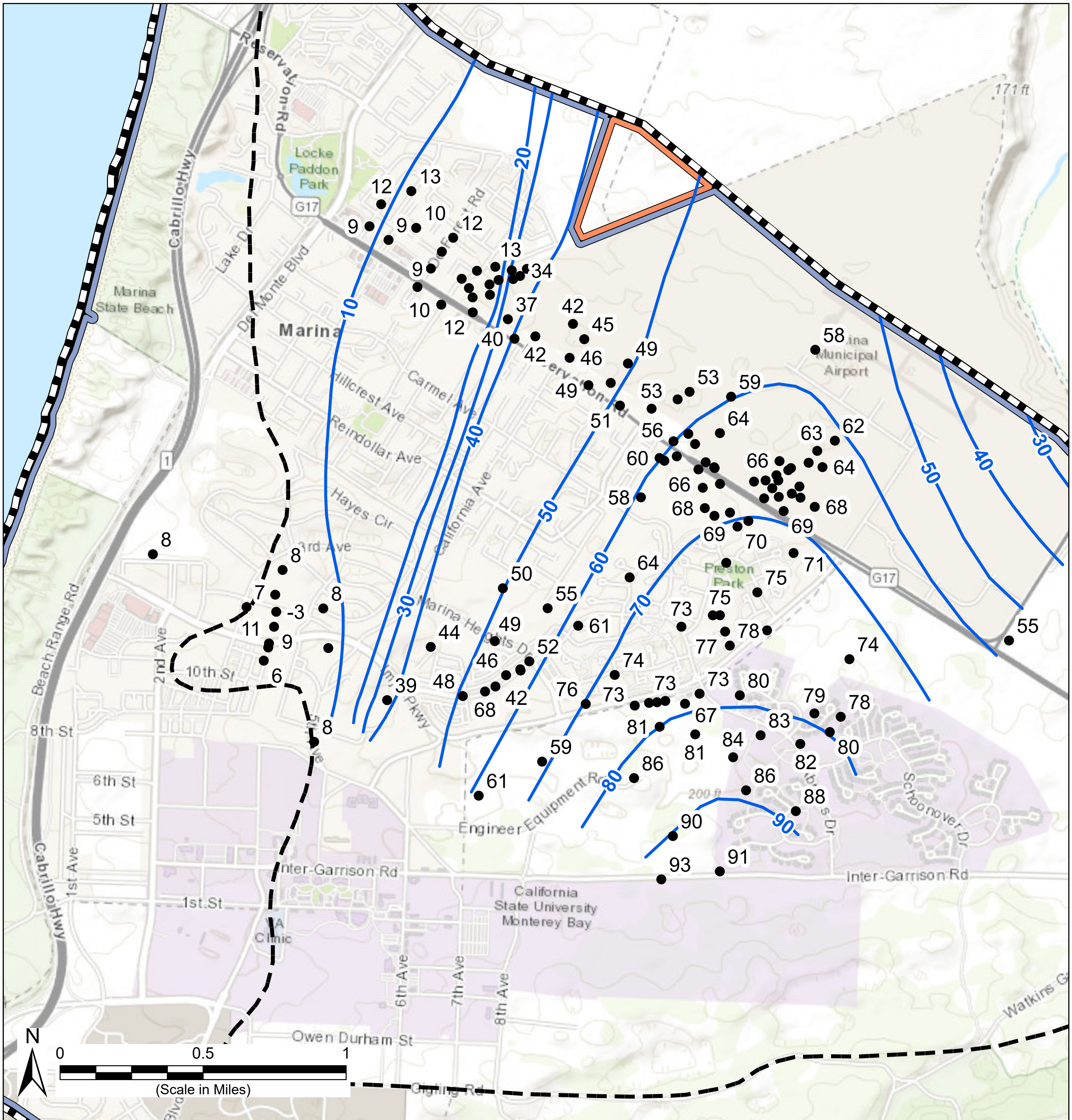
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2025.

Groundwater Level Contours in the Marina-Ord Area - August 2024 Dune Sand Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-2

Path: X:\B60094\Maps\2025\03\Contours_aug_v2.aprx



Legend

- Fall 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area
- Other Groundwater Subbasins within Salinas Valley Basin
- Southern Extent of FO-SVA (Harding ESE, 2001)

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

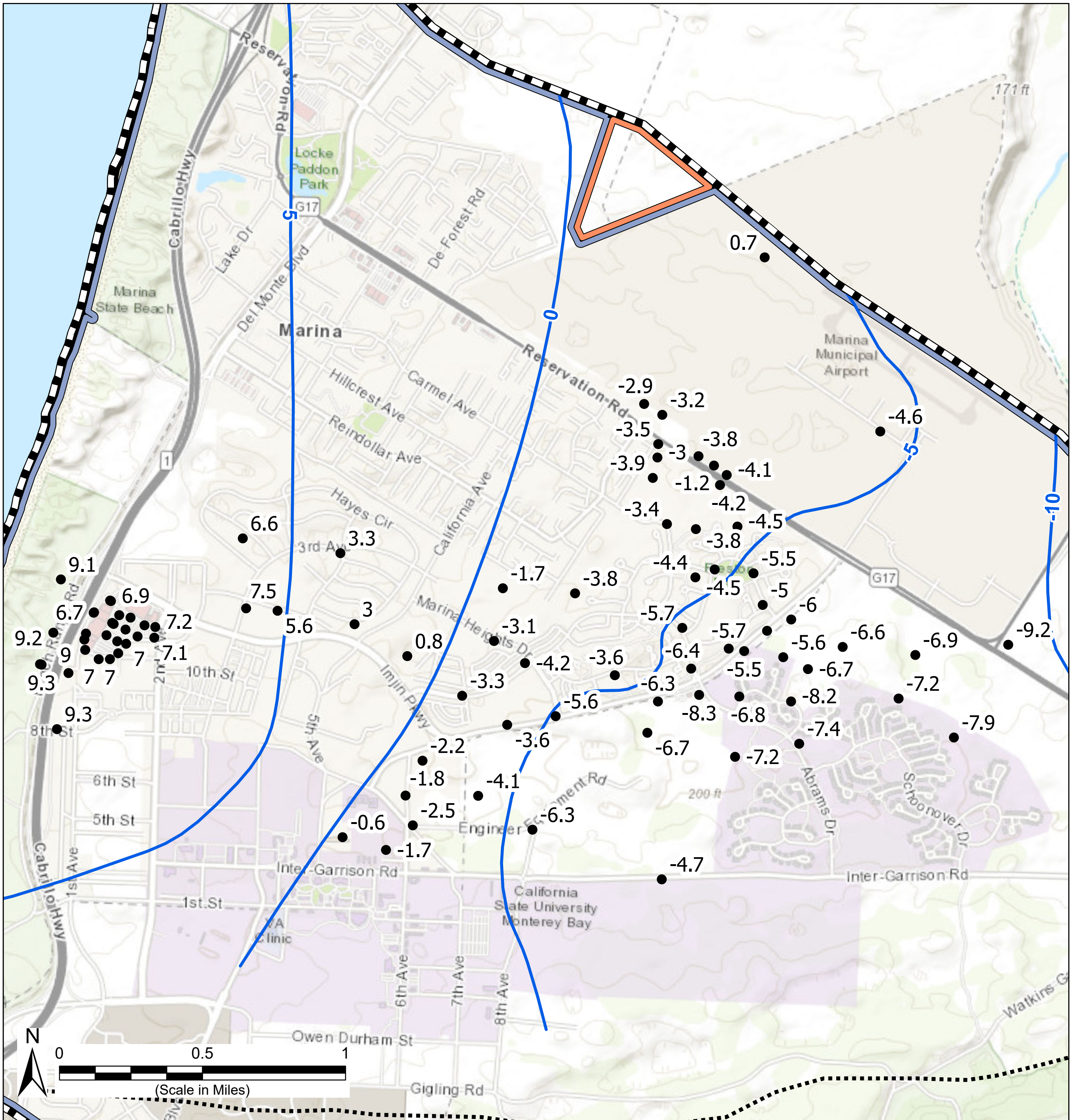
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 23 March 2025.

Groundwater Level Contours in the Marina-Ord Area - Fall 2024 Dune Sand Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-3

Path: X:\B60094\Maps\2025\03\Contours_fall_v3.aprx



Legend

- Spring 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area
- Other Groundwater Subbasins within Salinas Valley Basin
- Southern Extent of Valley Fill Deposits (Harding ESE, 2001)

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

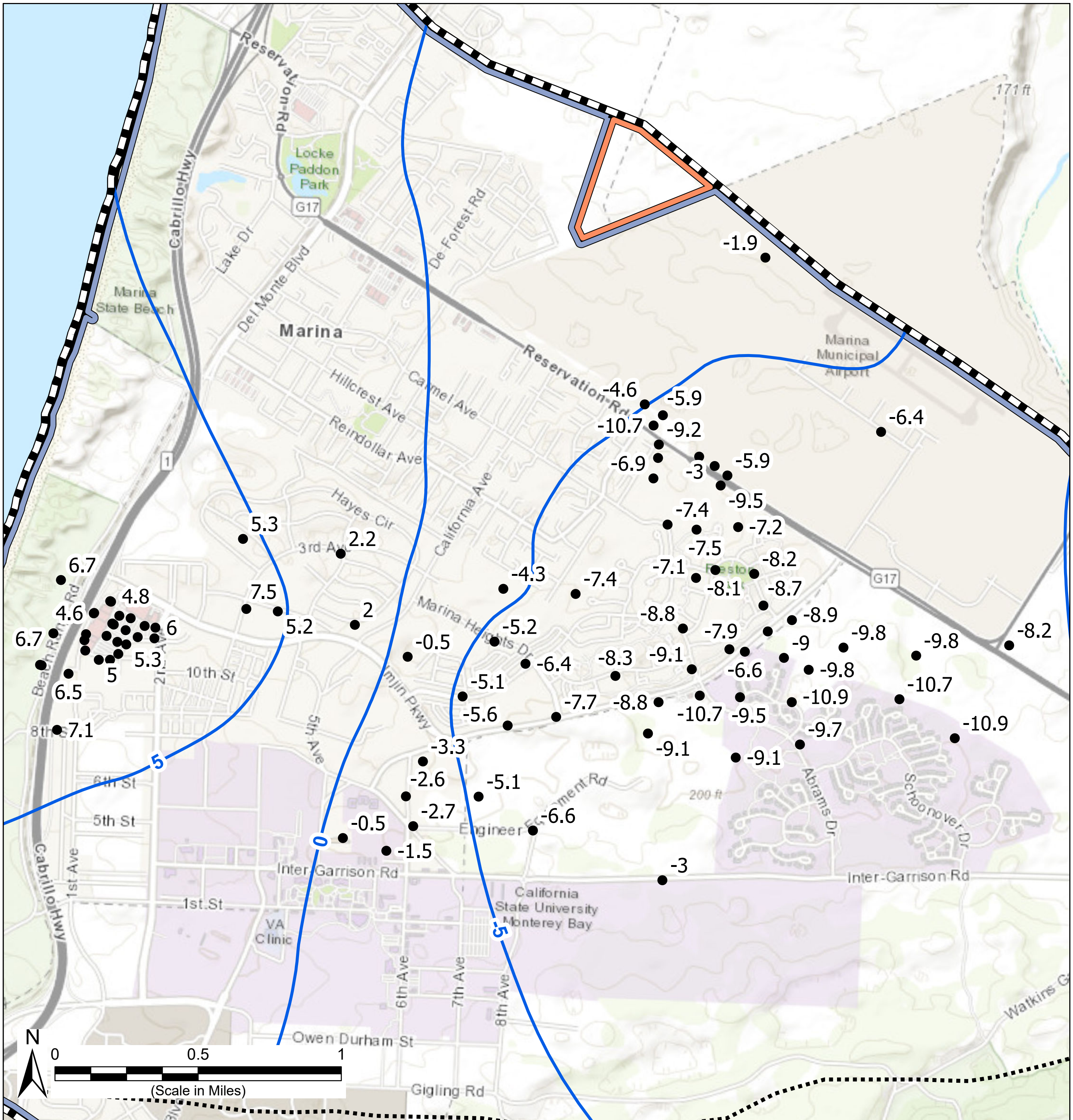
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 23 March 2025.

Groundwater Level Contours in the Marina-Ord Area - Spring 2024 Upper 180-Foot Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-4

Path: X:\B60094\Maps\2025\03\Contours_spr_v2.aprx



Legend

- August 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area
- Other Groundwater Subbasins within Salinas Valley Basin
- Southern Extent of Valley Fill Deposits (Harding ESE, 2001)

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

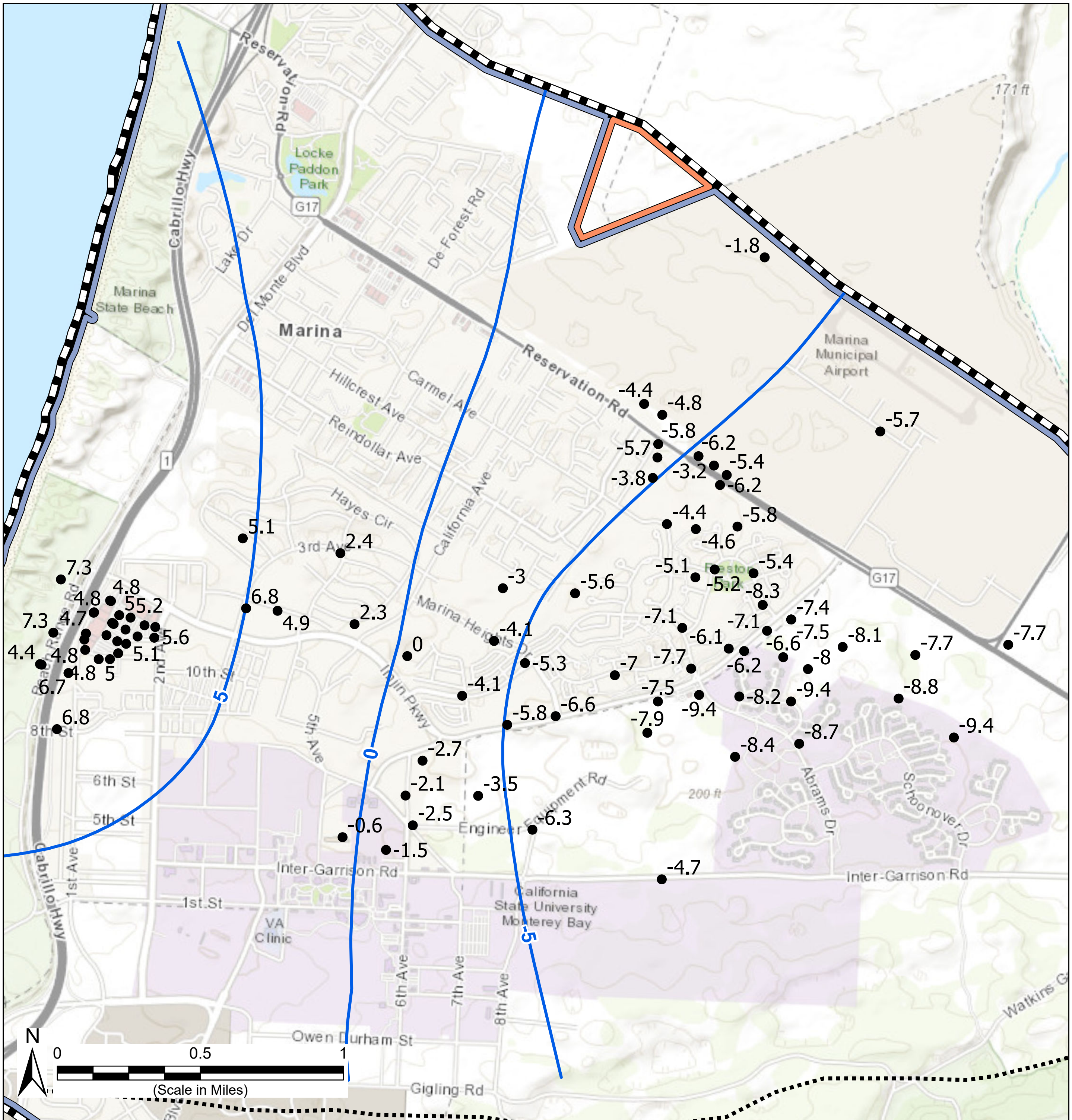
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2025.

Groundwater Level Contours in the Marina-Ord Area - August 2024 Upper 180-Foot Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-5

Path: X:\B60094\Maps\2025\03\Contours_aug_v2.aprx



Legend

- Fall 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area
- Other Groundwater Subbasins within Salinas Valley Basin
- Southern Extent of Valley Fill Deposits (Harding ESE, 2001)

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 23 March 2025.

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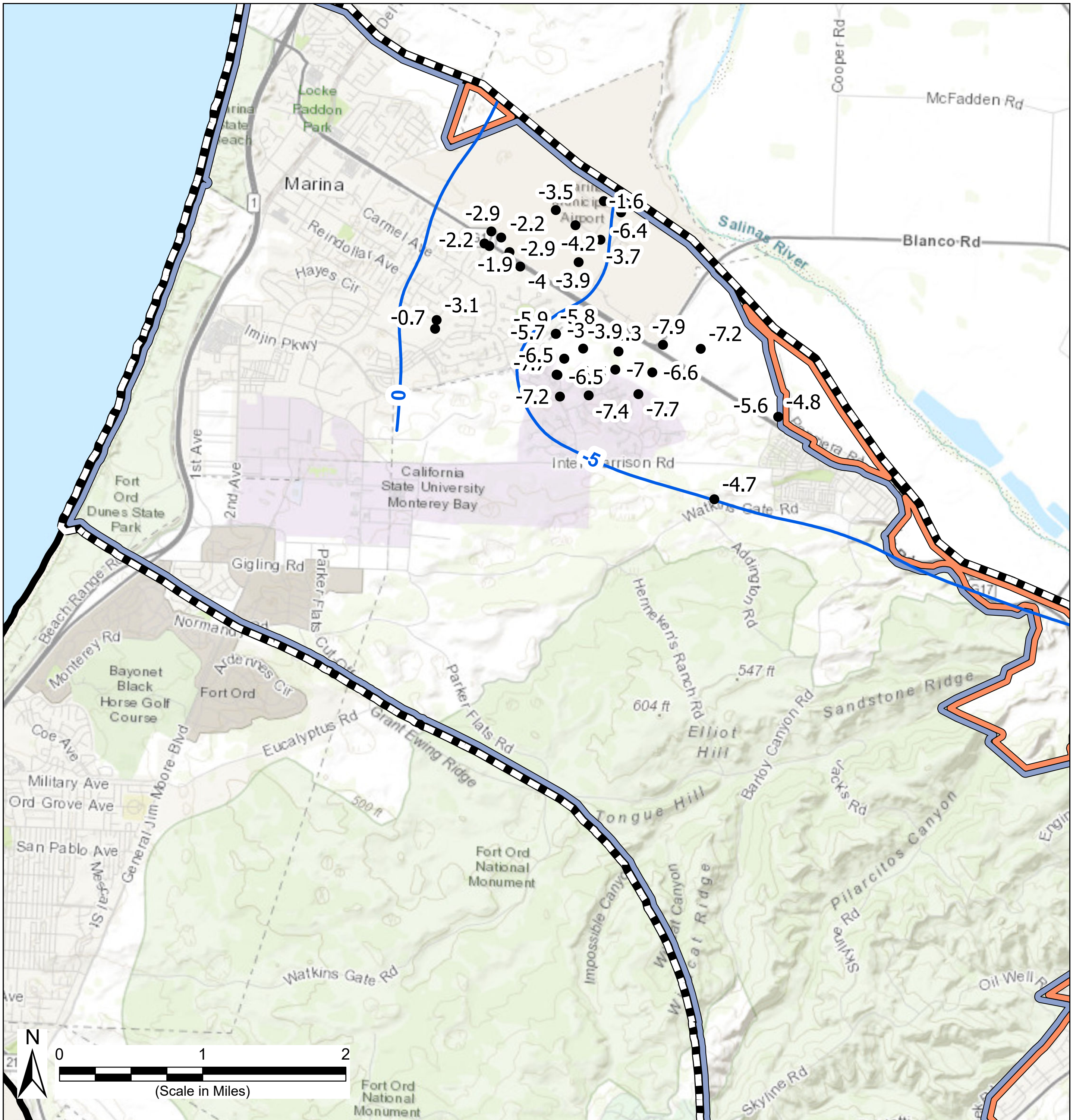
Groundwater Level Contours in the Marina-Ord Area - Fall 2024 Upper 180-Foot Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-6



Legend

- Spring 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

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

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. Groundwater elevation in the 400-Foot Aquifer is currently drawn without data from the RMS well MPWMD#FO-11S. Further evaluation of its screened aquifer will be conducted once new monitoring wells are installed.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 23 March 2025.

Groundwater Level Contours in the Marina-Ord Area - Spring 2024 Lower 180-Foot, 400-Foot Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-7

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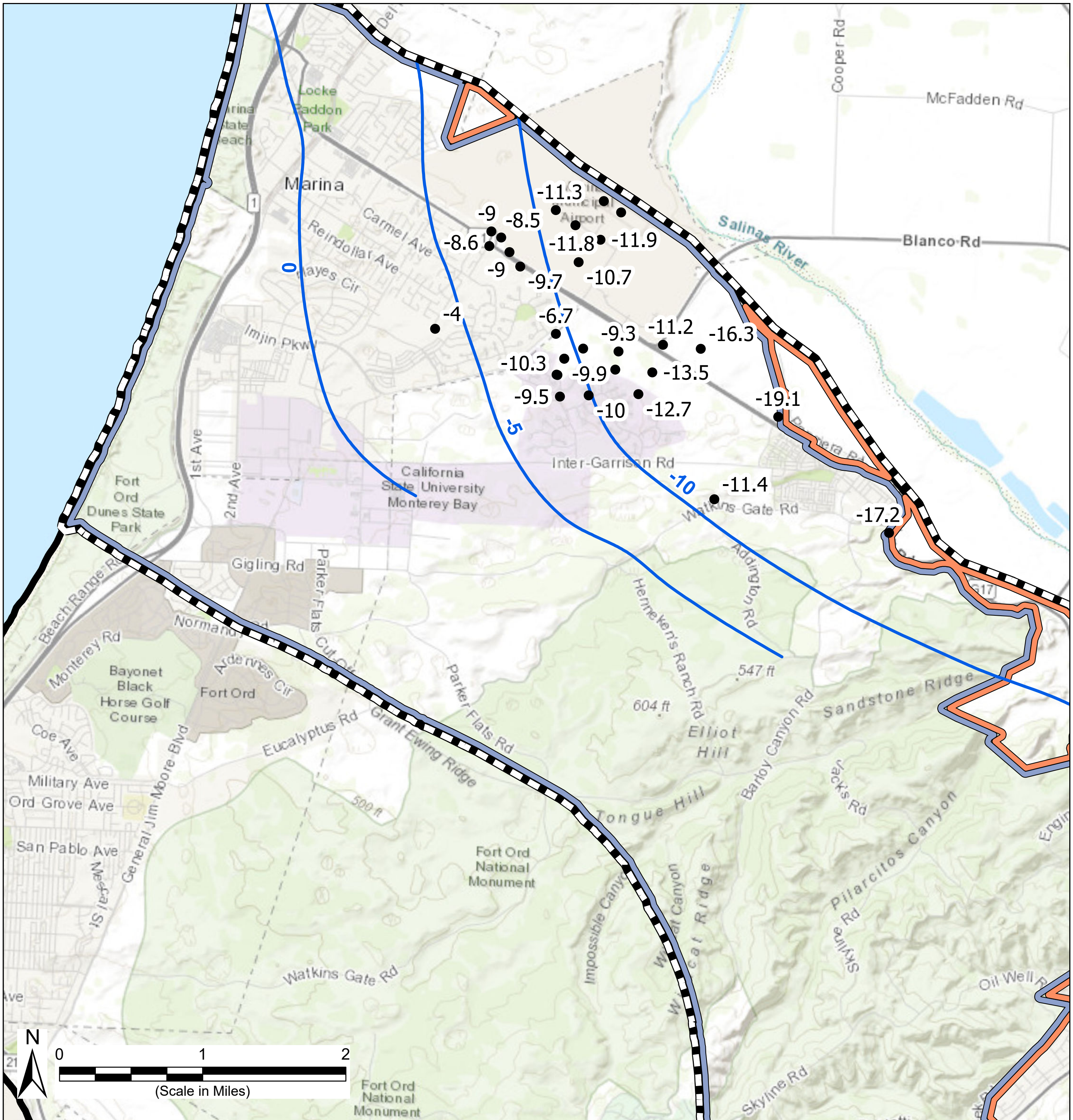

Legend

- August 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

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

Abbreviations

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

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2025.

Notes

1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88.
3. Groundwater elevation in the 400-Foot Aquifer is currently drawn without data from the RMS well MPWMD#FO-11S. Further evaluation of its screened aquifer will be conducted once new monitoring wells are installed.

Groundwater Level Contours in the Marina-Ord Area - August 2024 Lower 180-Foot, 400-Foot Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-8

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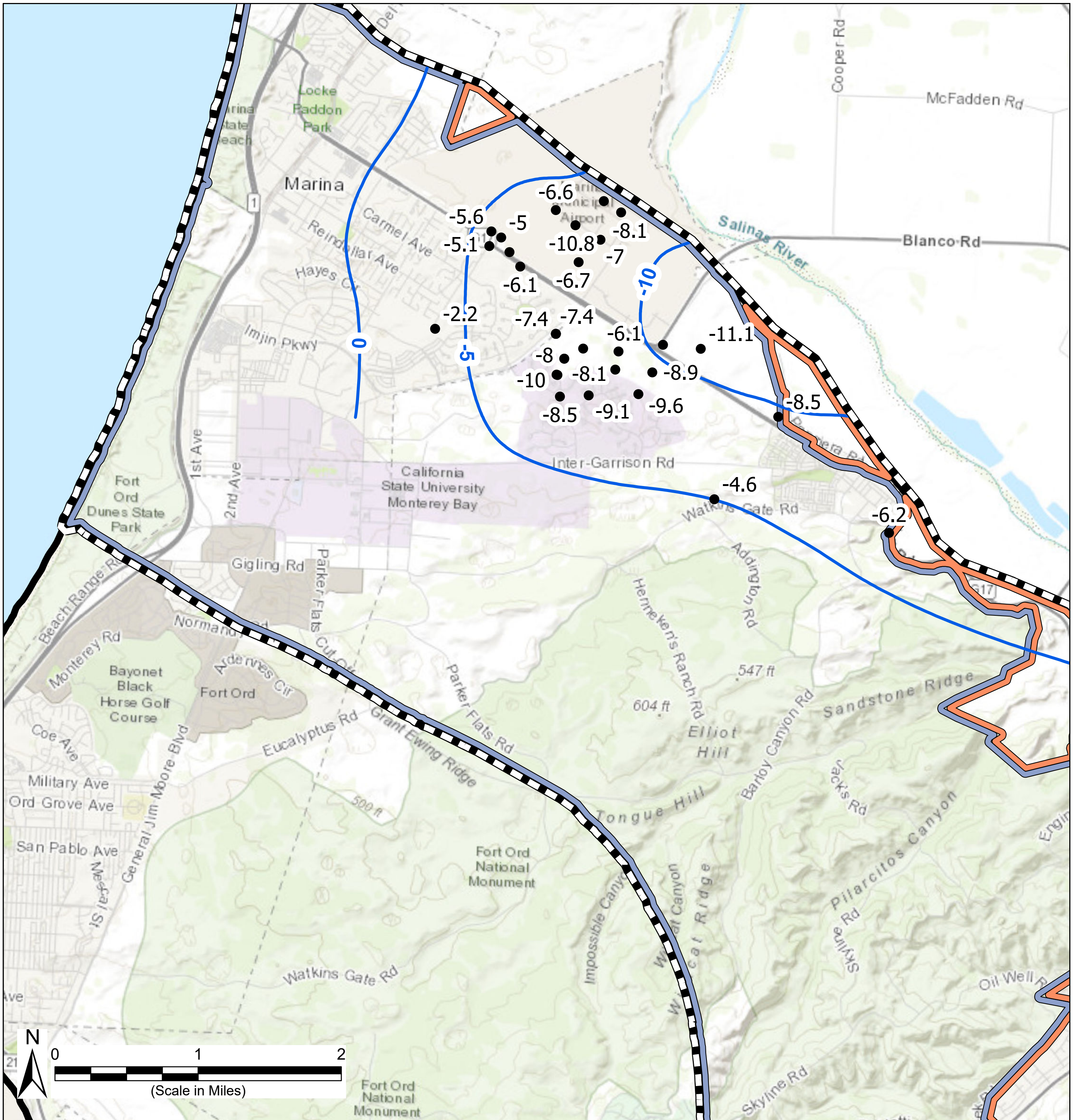


Legend

- Fall 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

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

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. Groundwater elevation in the 400-Foot Aquifer is currently drawn without data from the RMS well MPWMD#FO-11S. Further evaluation of its screened aquifer will be conducted once new monitoring wells are installed.

Sources

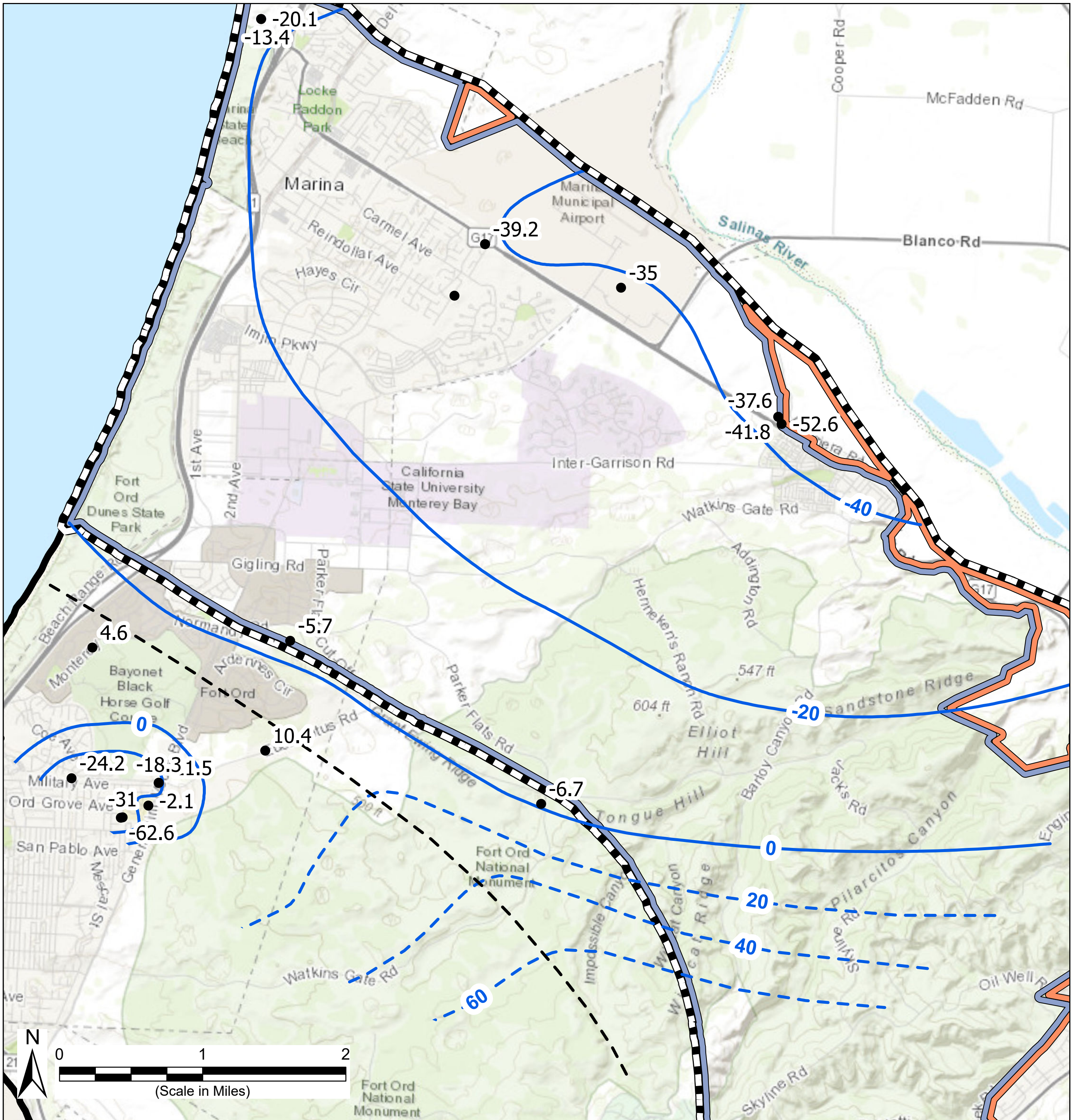
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 23 March 2025.

Groundwater Level Contours in the Marina-Ord Area - Fall 2024 Lower 180-Foot, 400-Foot Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-9

Path: X:\B60094\Maps\2025\03\Contours_fall_v3.aprx



Legend

- Spring 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

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

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 1 April 2025.

Groundwater Level Contours in the Marina-Ord Area - Spring 2024 Upper Deep Aquifer Zone

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-10

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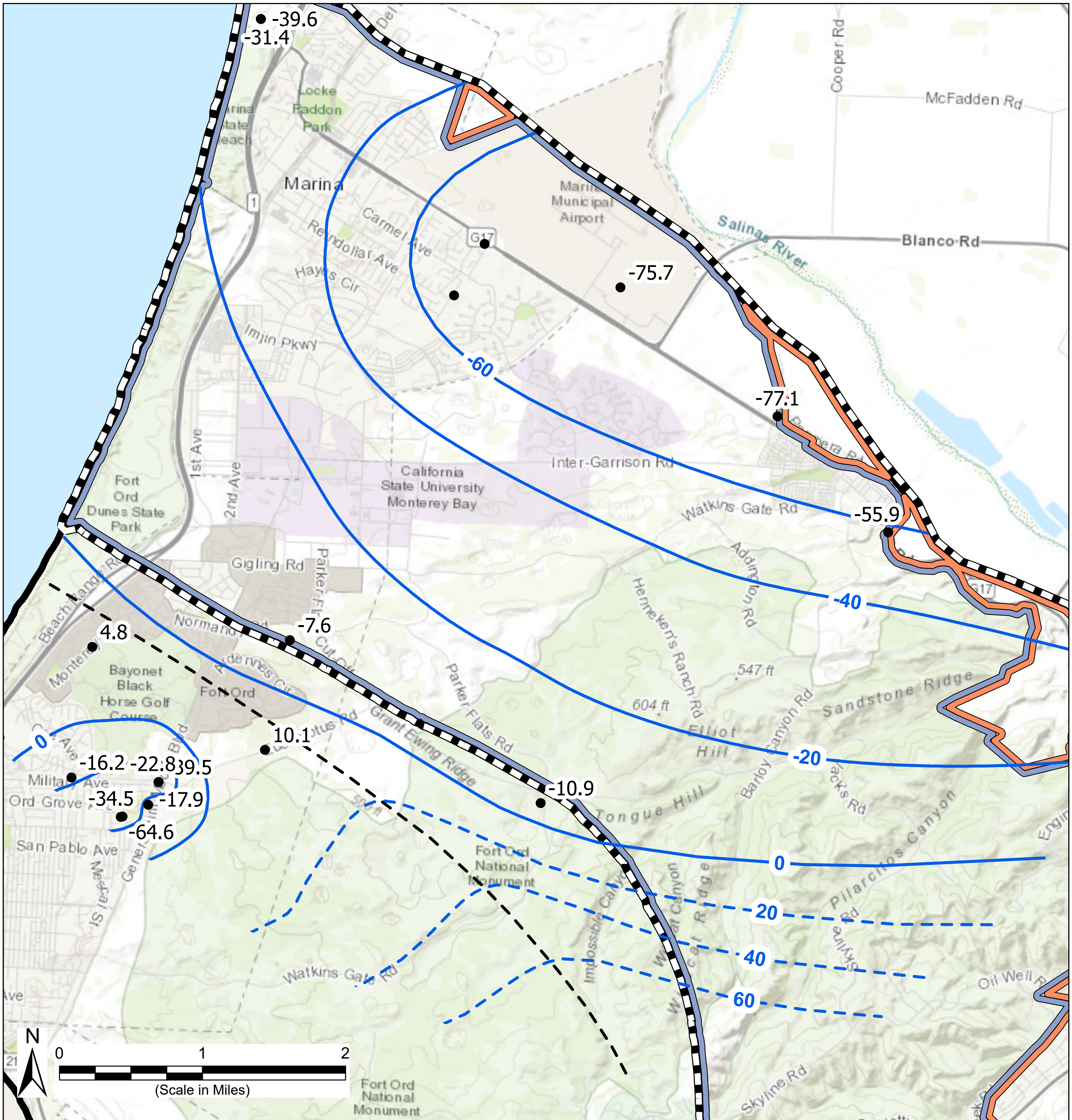

Legend

- August 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

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

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 1 April 2025.

Groundwater Level Contours in the Marina-Ord Area - August 2024 Upper Deep Aquifer Zone

Monterey Subbasin

WY 2024 Annual Report

March 2025

Figure 4-11

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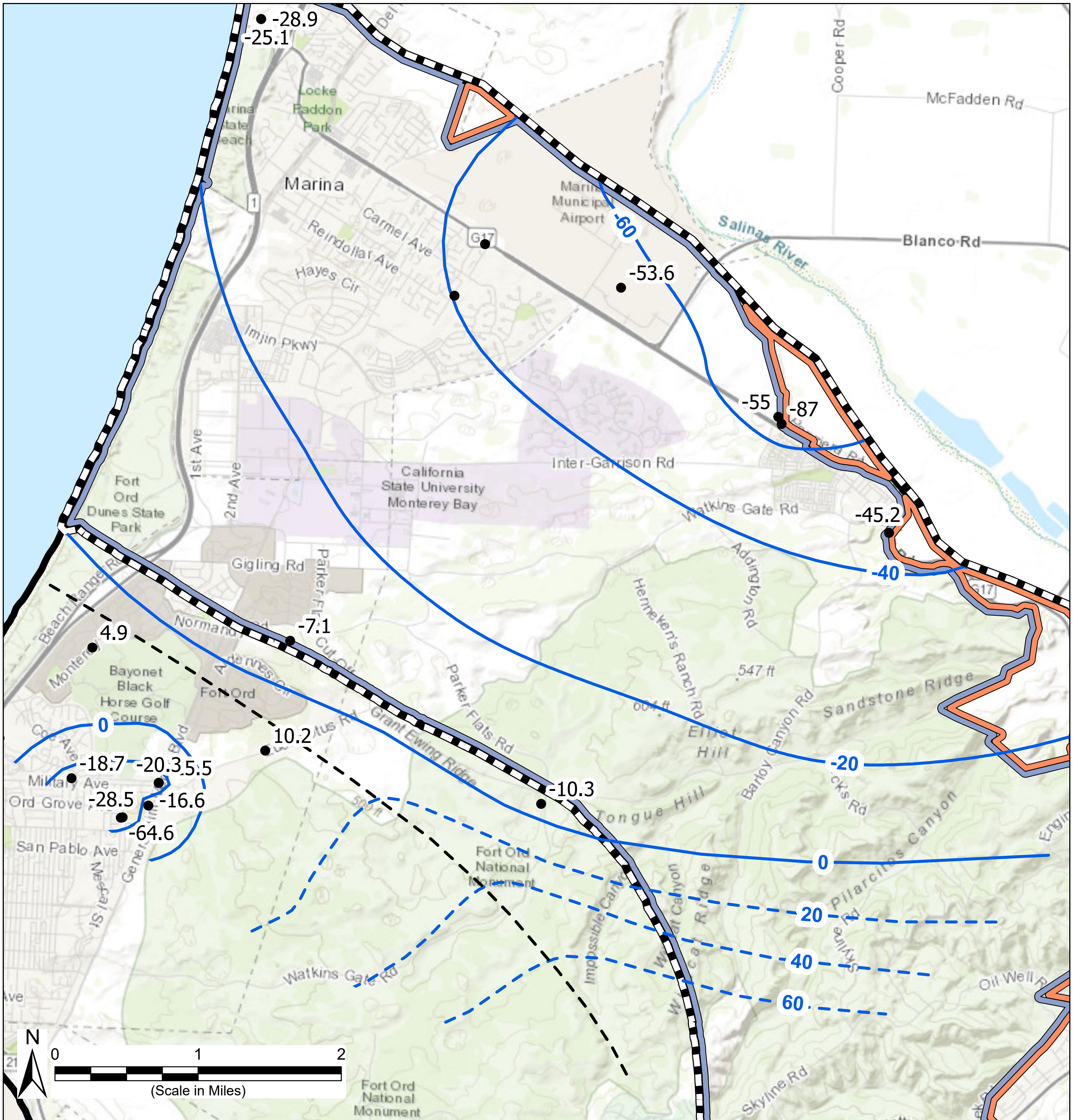

Legend

- Fall 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

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

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 1 April 2025.

Groundwater Level Contours in the Marina-Ord Area - Fall 2024 Upper Deep Aquifer Zone

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-12

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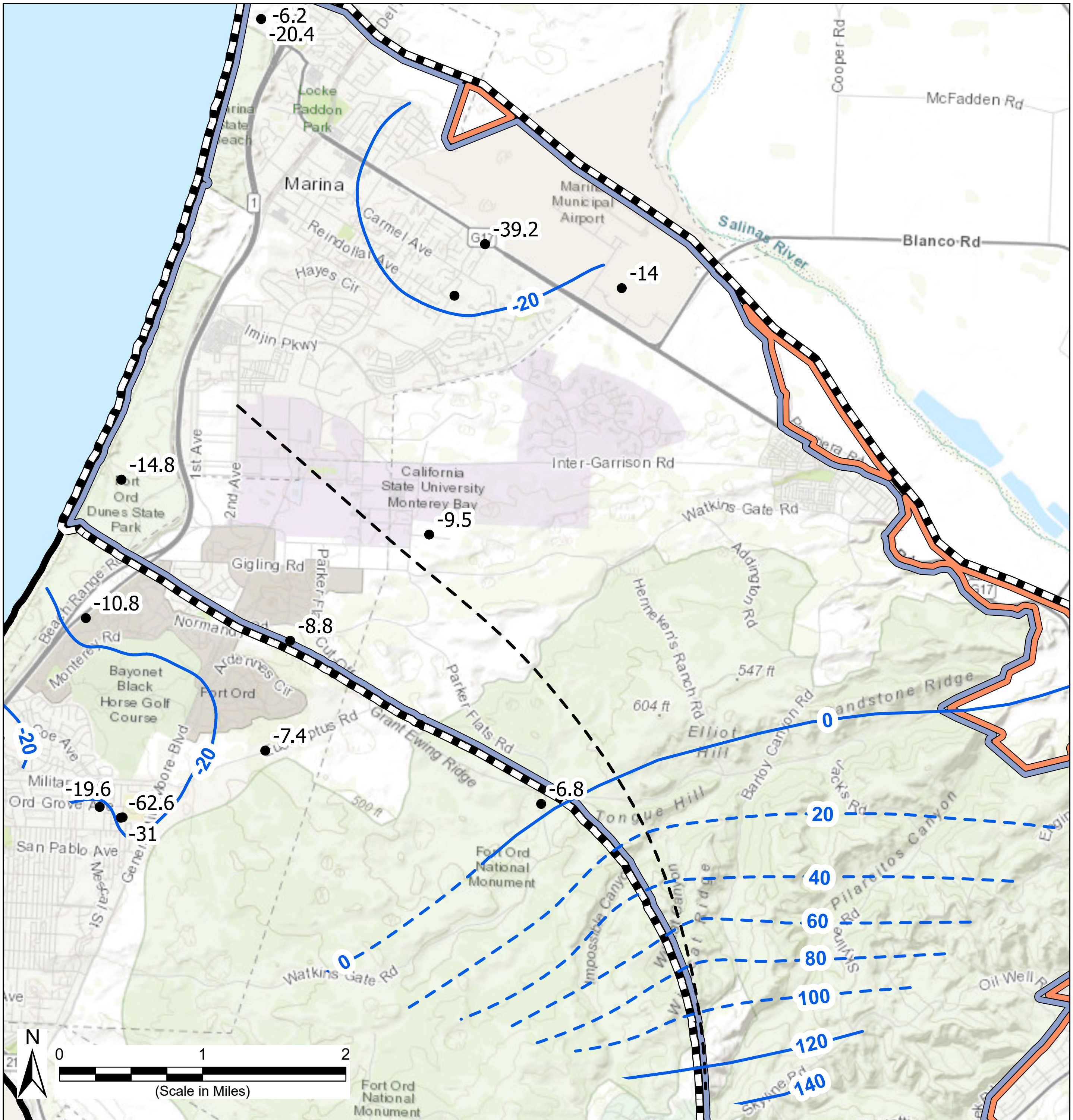

Legend

- Spring 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

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

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 1 April 2025.

Groundwater Level Contours in the Marina-Ord Area - Spring 2024 Lower Deep Aquifer Zone

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-13

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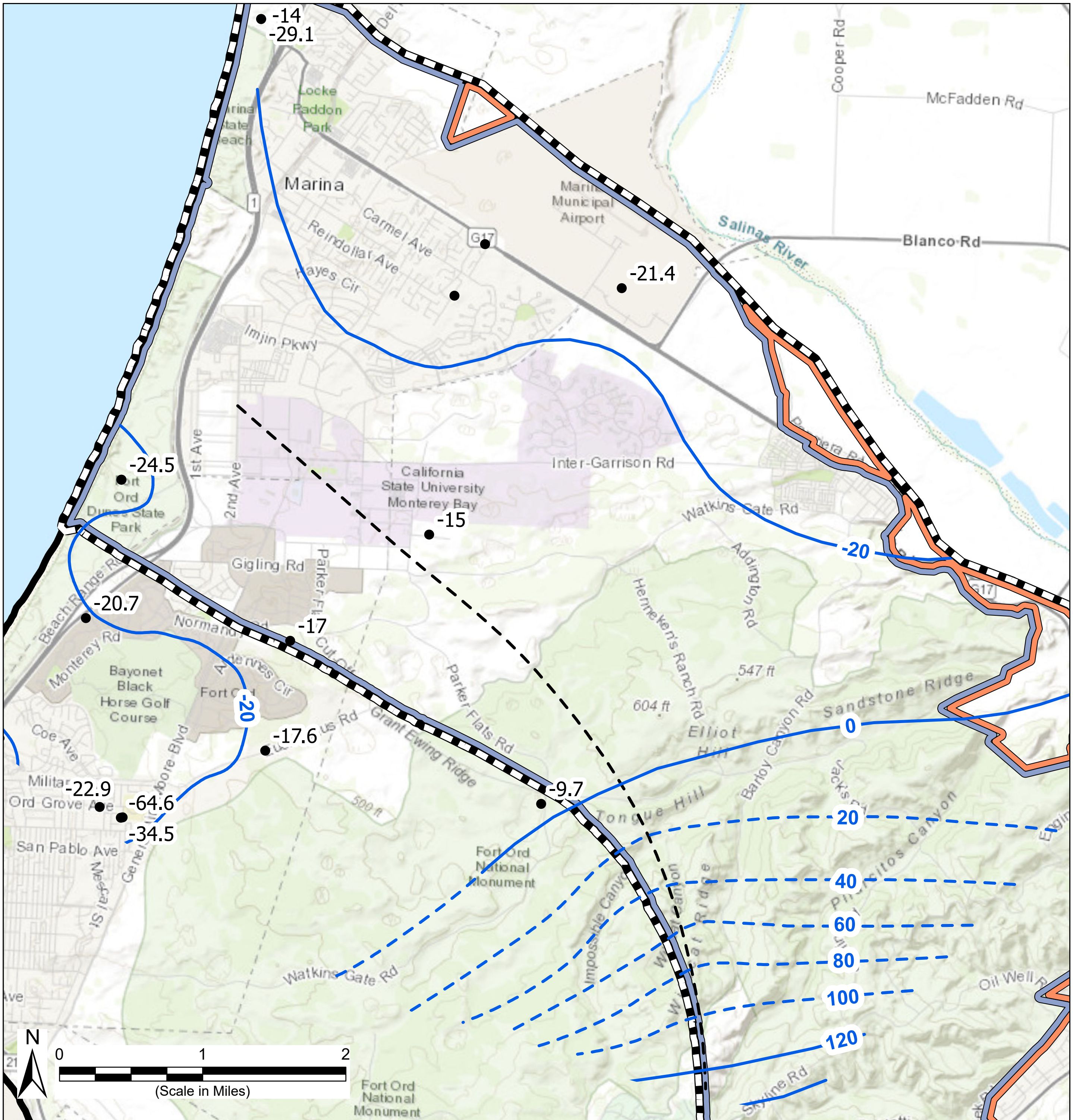

Legend

- August 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

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

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 1 April 2025.

Groundwater Level Contours in the Marina-Ord Area - August 2024 Lower Deep Aquifer Zone

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-14

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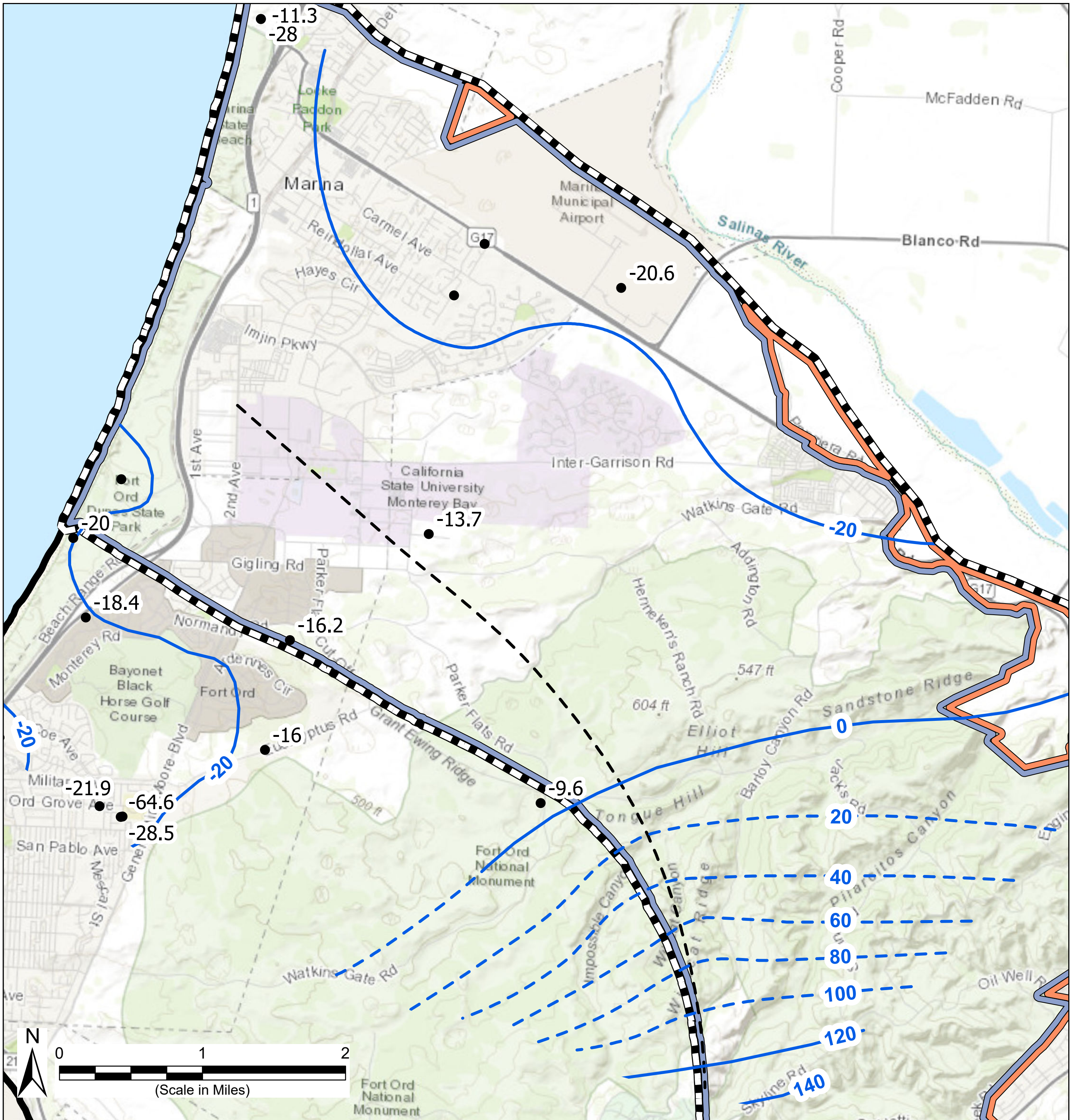

Legend

- Fall 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

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

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 1 April 2025.

Groundwater Level Contours in the Marina-Ord Area - Fall 2024 Lower Deep Aquifer Zone

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-15

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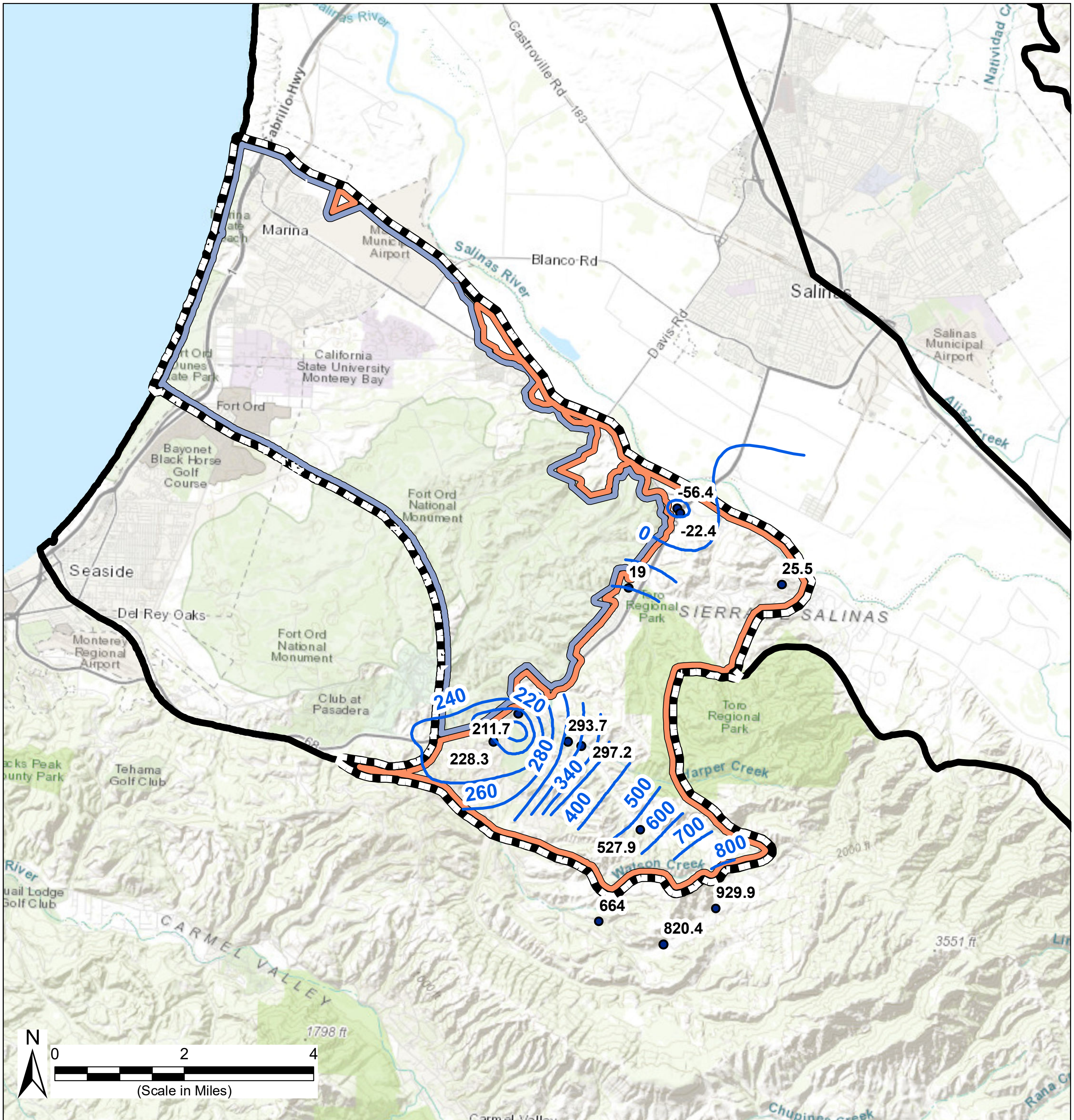


Legend

- Fall 2023 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

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

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. Thess contours reflect the updated HCM and are updated for storage calculation purposes.

Sources

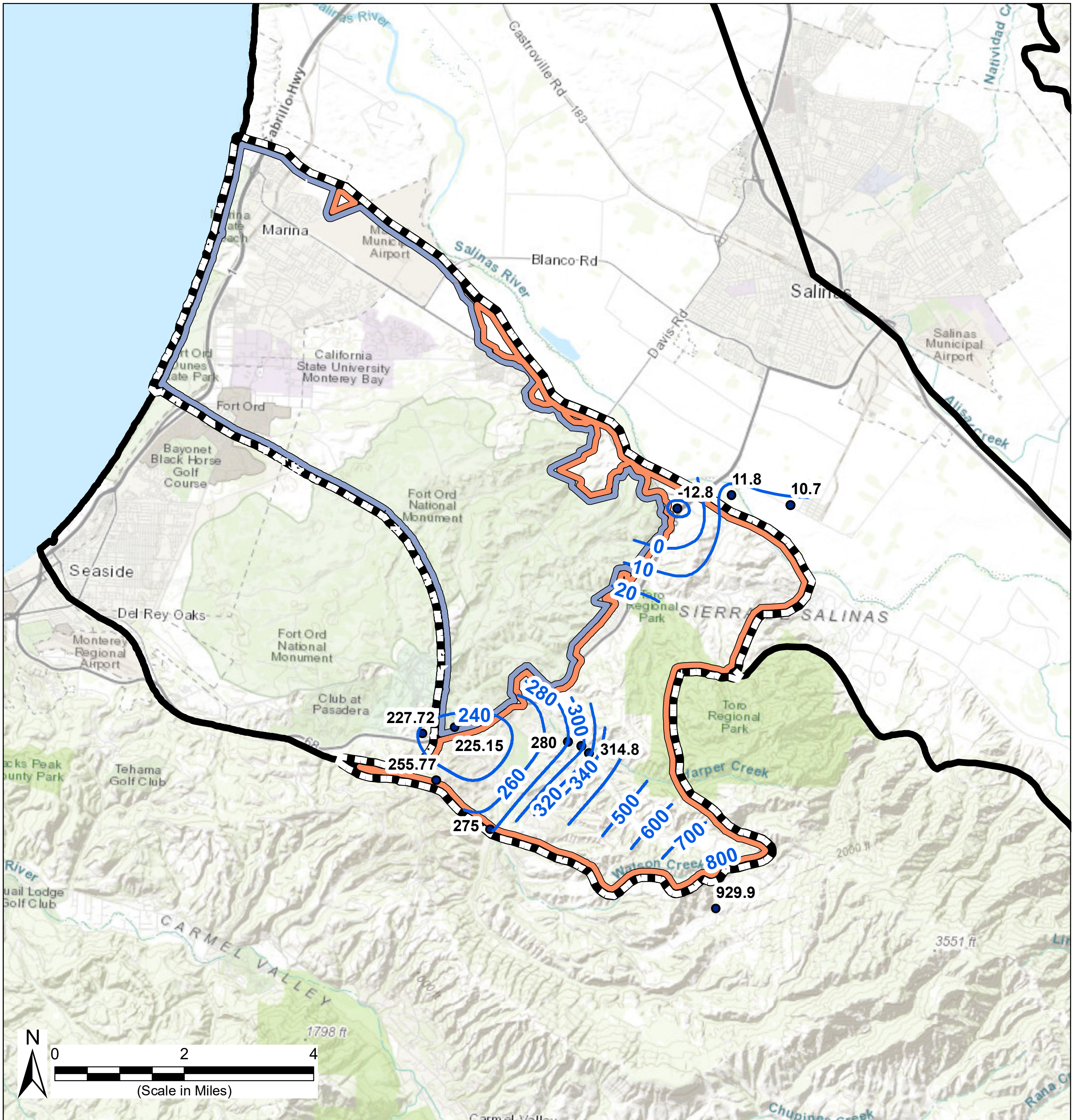
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2025.

Groundwater Elevation Contours for Storage Calculation in the El Toro Primary Aquifer – Fall 2023

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-16

Path: X:\B60094\Maps\2025\03\Fig4-16_Corral_Fall_2023.mxd



Legend

- Spring 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

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

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

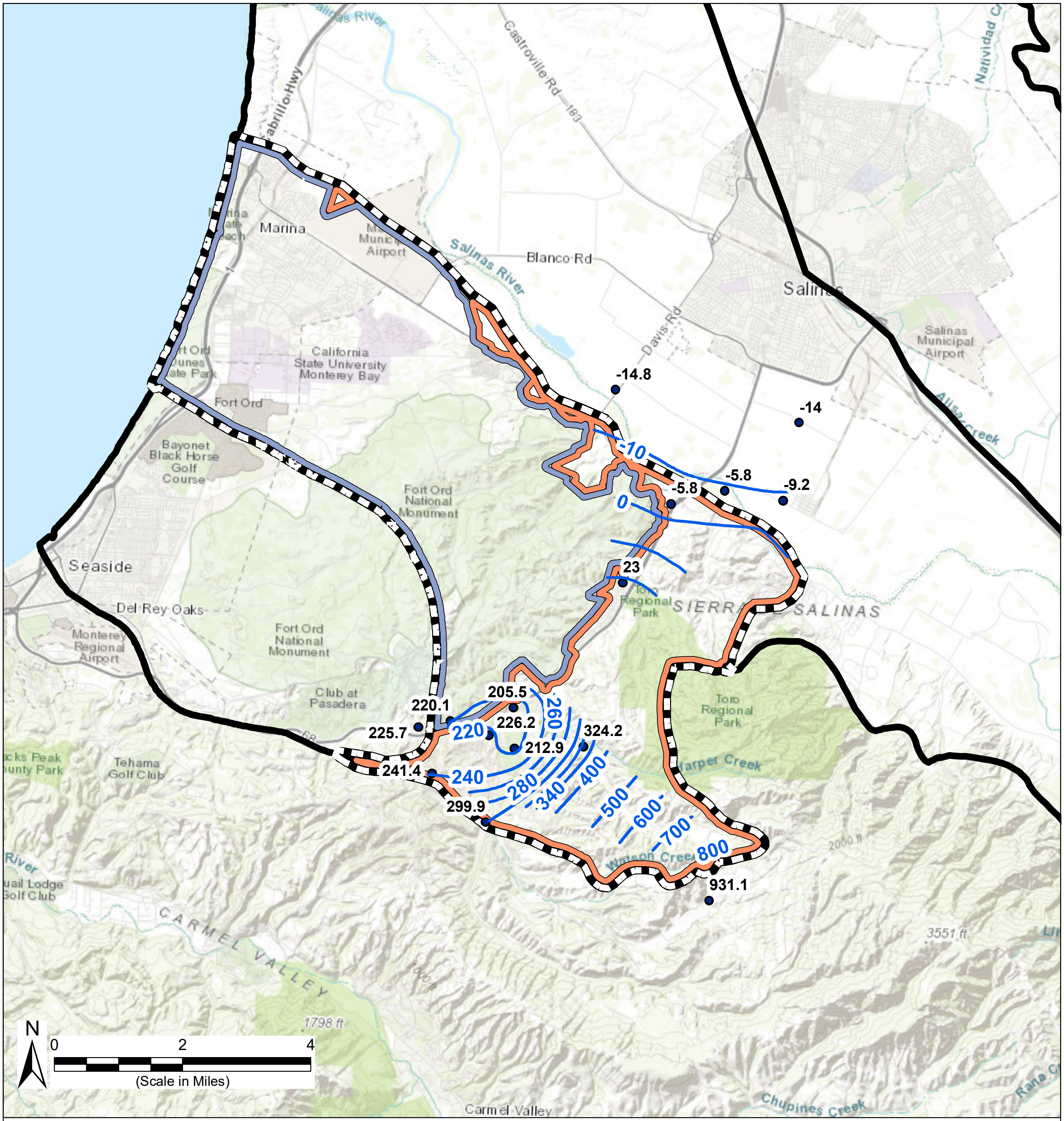
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2025.

Groundwater Level Contours in the El Toro Primary Aquifer System - Spring 2024

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-17

Path: X:\B60094\Maps\2025\03\Fig4-17-Coral_Spring_2024.mxd



Legend

- August 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

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

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

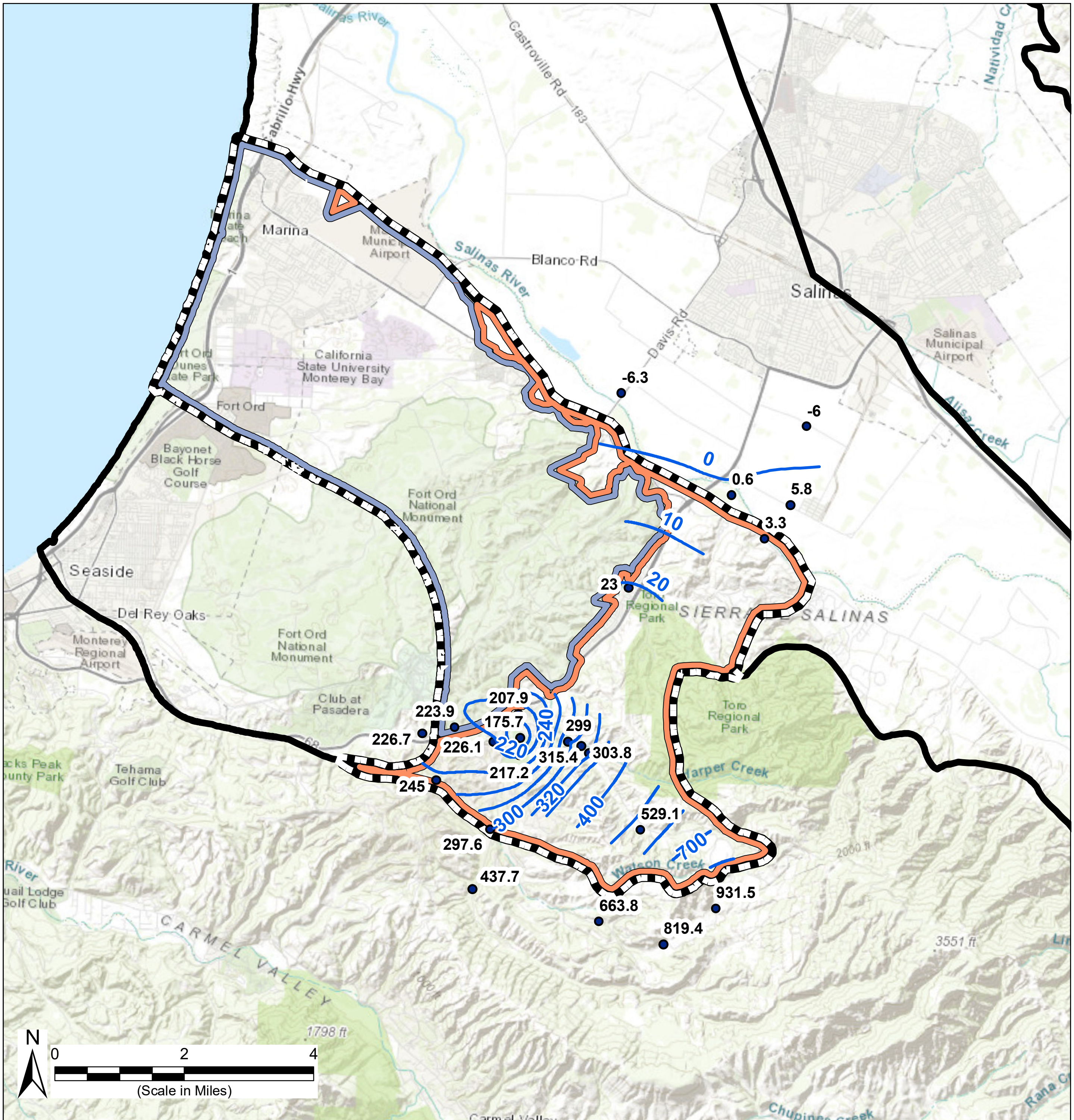
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2025.

Groundwater Level Contours in the El Toro Primary Aquifer System - August 2024

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-18

Path: X:\B60094\Maps\2025\03\Fig4-18-Coral_August_2024.mxd



Legend

- Fall 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

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

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 31 March 2025.

Groundwater Level Contours in the El Toro Primary Aquifer System - Fall 2024

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-19

Path: X:\B60094\Maps\2025\03\Fig4-19-Coral_Fall_2024.mxd

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 4-20 through Figure 4-26, with the full extent of these data provided in Appendix C.

4.1.2.1 Marina-Ord Area

Dune Sand Aquifer

- Groundwater elevations in the Dune Sand Aquifer have been generally stable for over three decades and show long-term fluctuations corresponding to hydrologic conditions. Following the historic drought in 2014-15, groundwater elevations recovered slightly during a series of above normal and wet years between 2016 and 2020, declined during the consecutive dry years of 2021-22, and rebounded again during the wet years of 2023-24. Groundwater elevations in the Dune Sand Aquifer 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 and show long-term trends similar to those observed in the Dune Sand Aquifer. Groundwater elevations increased during WY 2024 in the inland portion of the upper 180-Foot Aquifer and slightly decreased in the former Fort Ord Sites 2 and 12 area near the coast. Seasonal variations are greater than those observed in the Dune Sand Aquifer and typically range between 3 to 7 feet. A larger seasonal variation is observed in wells located inland near the Monterey Subbasin and 180/400 Subbasin boundary (MW-BW-55-180 and MW-B-05-180) and is likely the result of recharge and seasonal agricultural pumping in the 180/400 Subbasin.

Lower 180-Foot Aquifer

- Groundwater elevations have been stable in the lower 180-Foot Aquifer for the past thirty years and show long-term trends similar to those observed in the upper 180-Foot Aquifer. Groundwater elevations increased during WY 2024 across the lower 180-Foot Aquifer. Seasonal variations in the lower 180-Foot Aquifer typically range between 5 to 10 feet.

400-Foot Aquifer

- In the northern Marina-Ord Area, groundwater elevations in the 400-Foot Aquifer are similar to those in the lower 180-Foot Aquifer and have been generally stable for the past thirty years. Groundwater elevations in the northern 400-Foot Aquifer show long-term fluctuations corresponding to hydrologic conditions and an increase during WY 2024 in response to the consecutive wet year. Seasonal variations in these wells are typically around 7 feet.

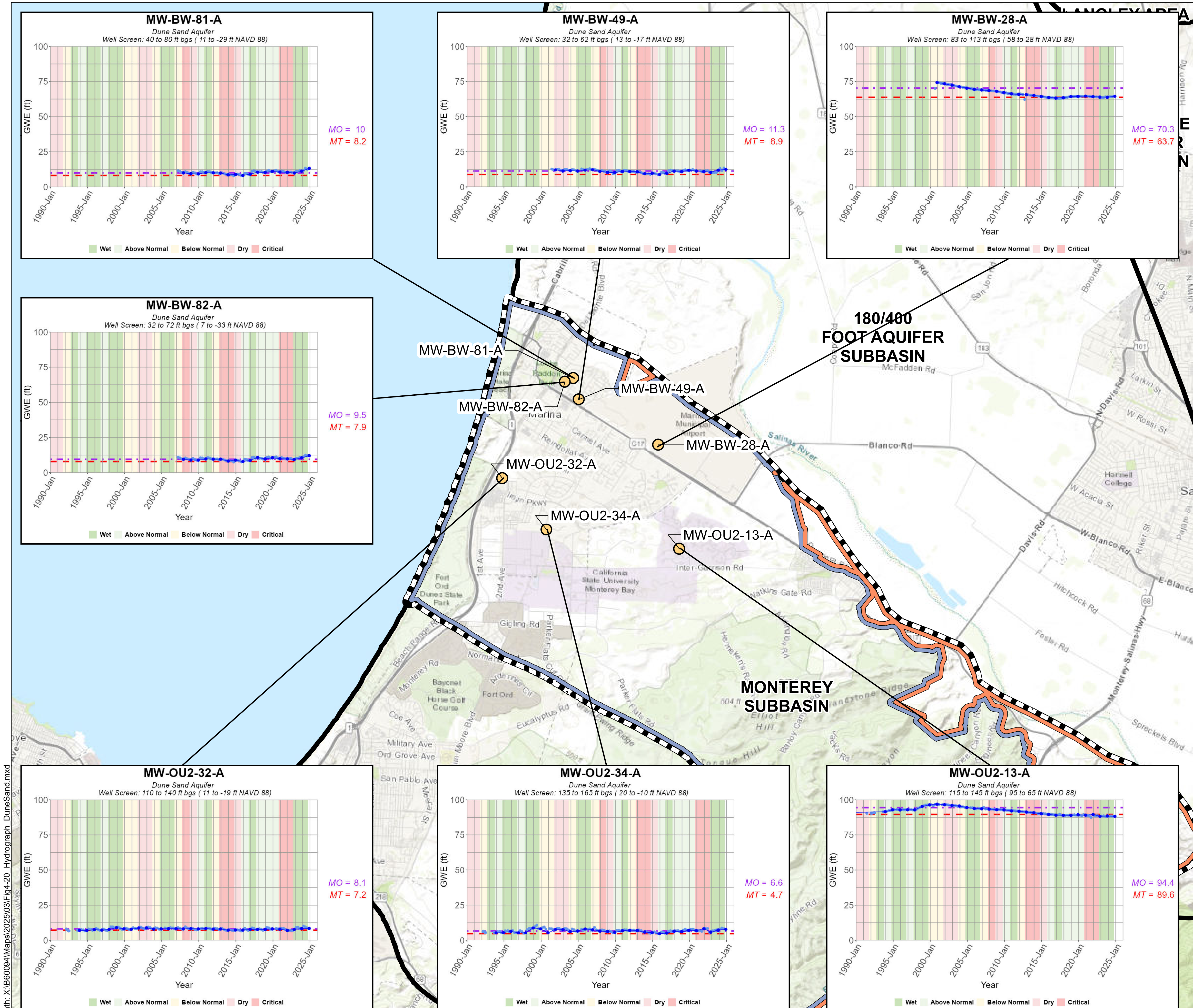
- However, in MPWMD#FO-11S located in the southern Marina-Ord Area, groundwater elevations have been declining consistently since the 2000s. The cause of this local depression is not known as there is no known groundwater extraction in its vicinity. As discussed in Section 4.1.1.1, the groundwater elevations in this well are similar to those from the Deep Aquifers. With the exclusion of Lower Paso Robles Formation wells from the 400-Foot Aquifer as a result of the HCM Update, no additional 400-Foot wells exist near and south of MPWMD#FO-11S. Further information regarding groundwater conditions in this area can be obtained with MCWDGSA's construction of new monitoring wells, as described in Section 5.2.4.

Deep Aquifers

- Groundwater elevations have been declining in the Deep Aquifers since the 2000s and the rate of decline was steepest following the historic drought of 2014-15. In wells screened in the upper portion of the Deep Aquifers (i.e., 014S001E24L004M, 014S001E24L005M, 14S02E33E01, and PZ-FO-32-910), an increase in groundwater elevations was observed between 2018 and 2022, followed by decreases in 2023 and 2024. In RMSs screened in the lower portion of the Deep Aquifers (i.e., 014S001E24L002M, 014S001E24L003M, 14S02E33E02, MPWMD#FO-11D, and Sentinel MW #1), relatively stable groundwater elevations have been observed between 2018 and 2024.

4.1.2.2 Corral de Tierra Area

Figure 4-25. and Figure 4-26 show example hydrographs for the RMS wells in the Corral de Tierra Area. Groundwater elevations in the Corral de Tierra Area have been declining on average since the 2000s. Between WY 2023 and WY 2024, groundwater elevations fluctuated in this area with no discernible prevalence of spatial patterns with the current RMS wells. Of the 11 RMS wells, 7 wells experienced a rise in groundwater elevations. On average groundwater elevations rose 0.8 feet and ranged from –17.3 to 8.1 ft.



Legend

- Representative Monitoring Sites for Groundwater Elevations
- Monterey Subbasin

Management Areas

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

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 10 April 2025.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

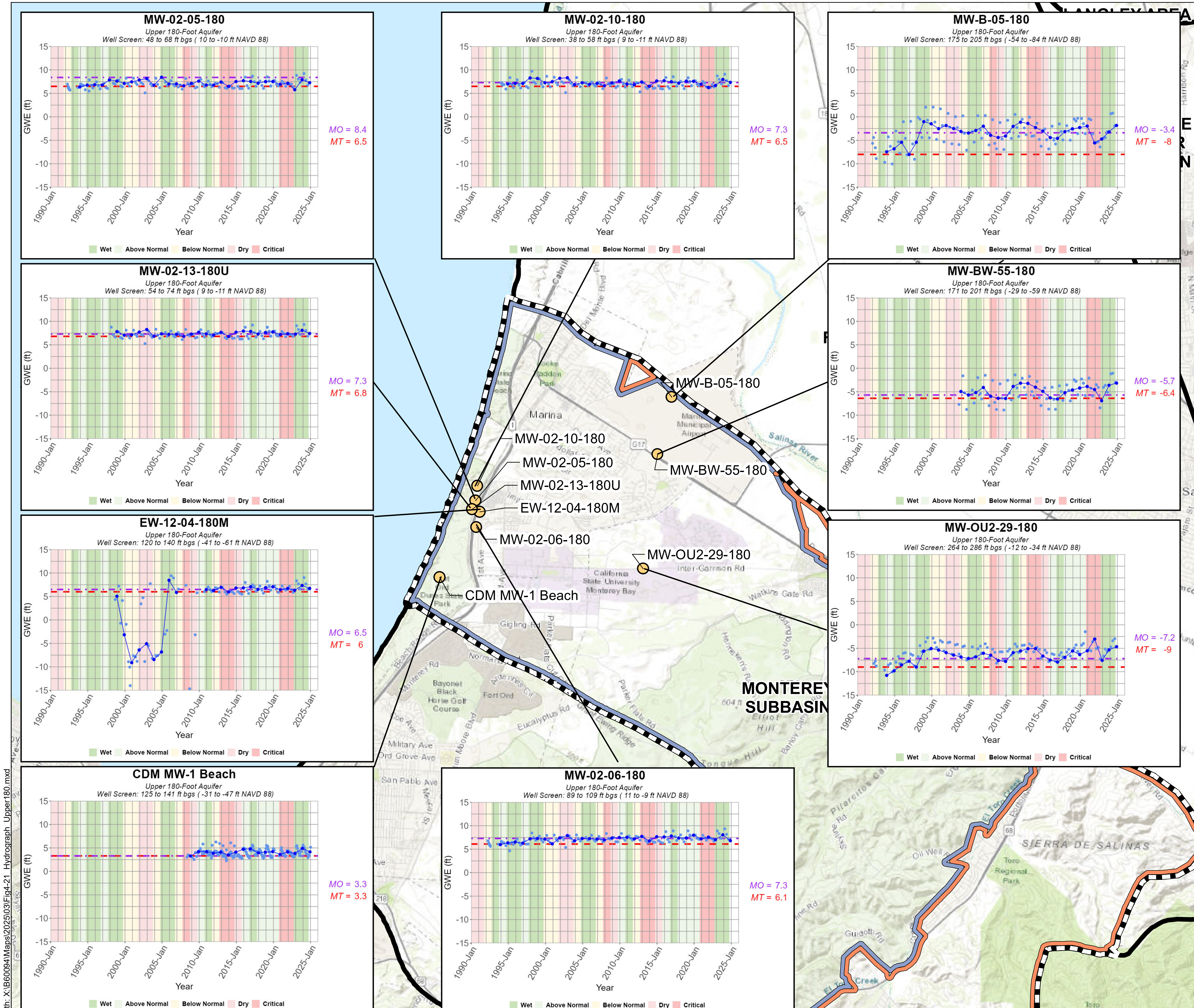
N 0 1.5 3
(Scale in Miles)

Representative Groundwater Elevation Hydrographs in the Dune Sand Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-20

Path: X:\B60094\Maps\2025\03\Fig4-20_Hydrograph_DuneSand.mxd



Legend

- Representative Monitoring Sites for Groundwater Elevations
- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

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.
3. EW-12-04-180M is a former extraction that stopped pumping in 2009.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 10 April 2025.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

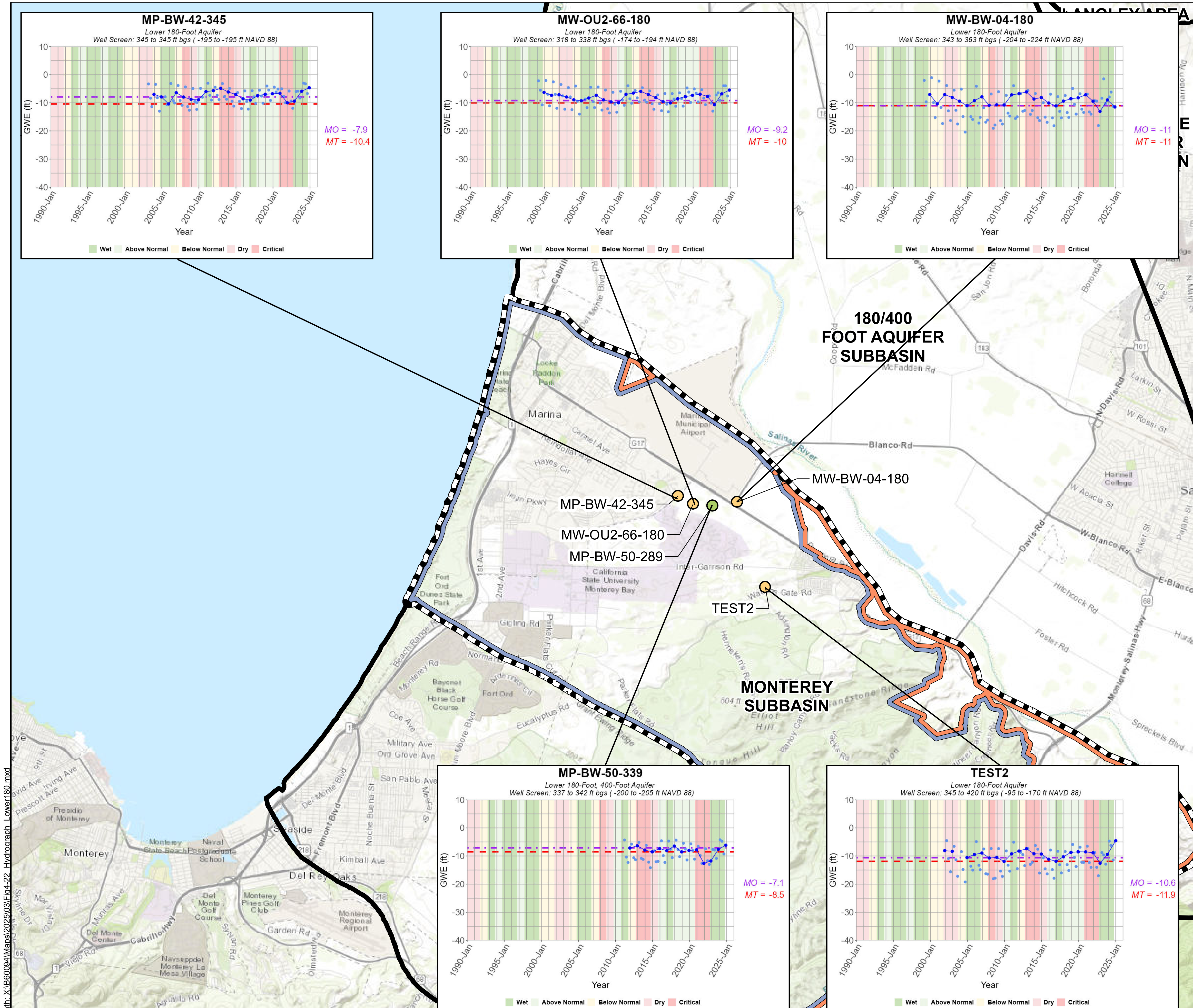
N 0 1.5 3 (Scale in Miles)

Representative Groundwater Elevation Hydrographs in the Upper 180-Foot Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-21

Path: X:\B60094\Maps\2025\03\Fig4-21_Hydrograph_Upper180.mxd



Legend

- Monterey Subbasin

Management Areas

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

Representative Monitoring SItes for Groundwater Elevation

- Lower 180-Foot Aquifer
- Lower 180-Foot, 400-Foot Aquifer

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

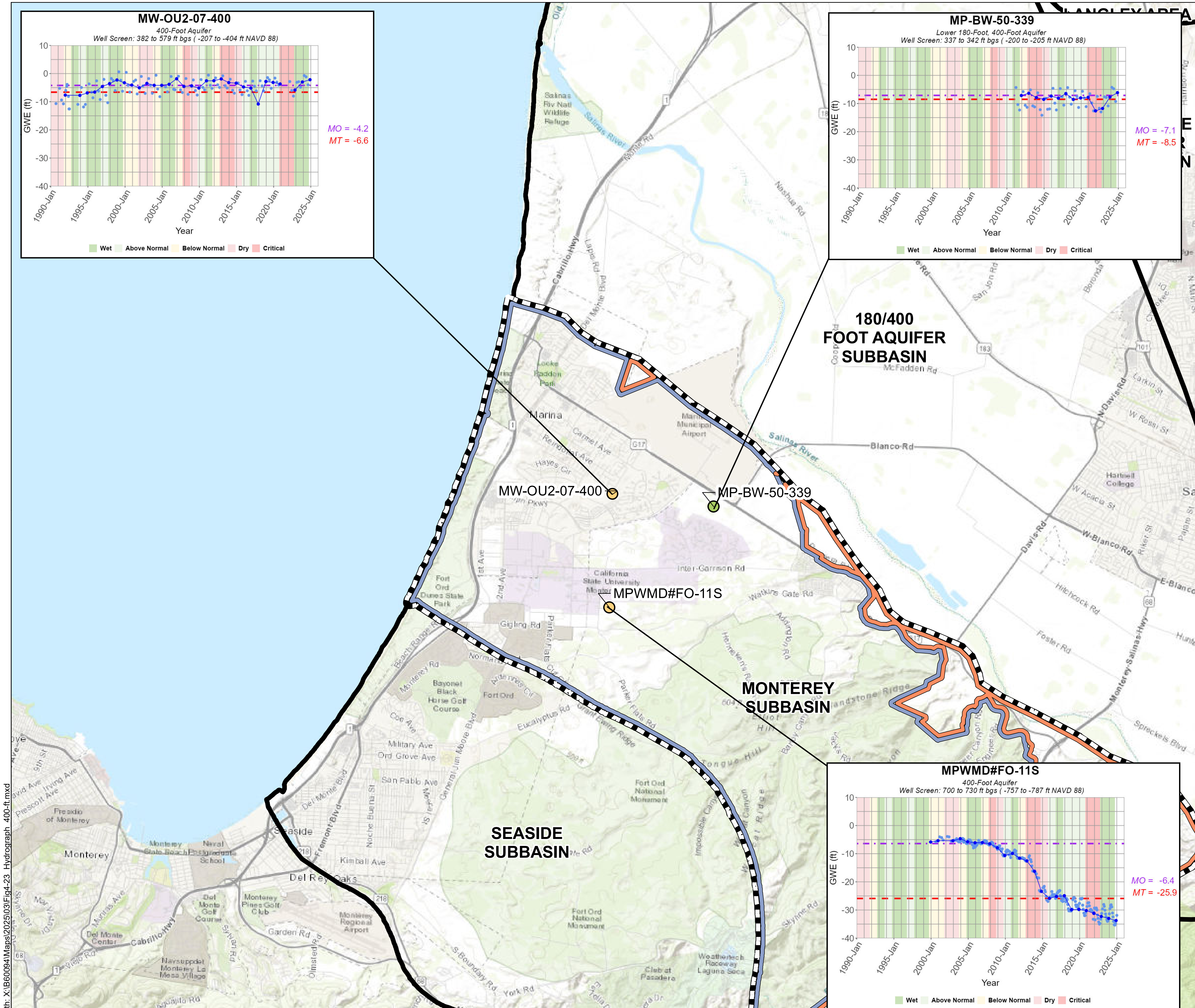
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 10 April 2025.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

N
0 1.5 3
(Scale in Miles)

Representative Groundwater Elevation Hydrographs in the Lower 180-Foot Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-22



Legend

Representative Monitoring Sites for Groundwater Elevations

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

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

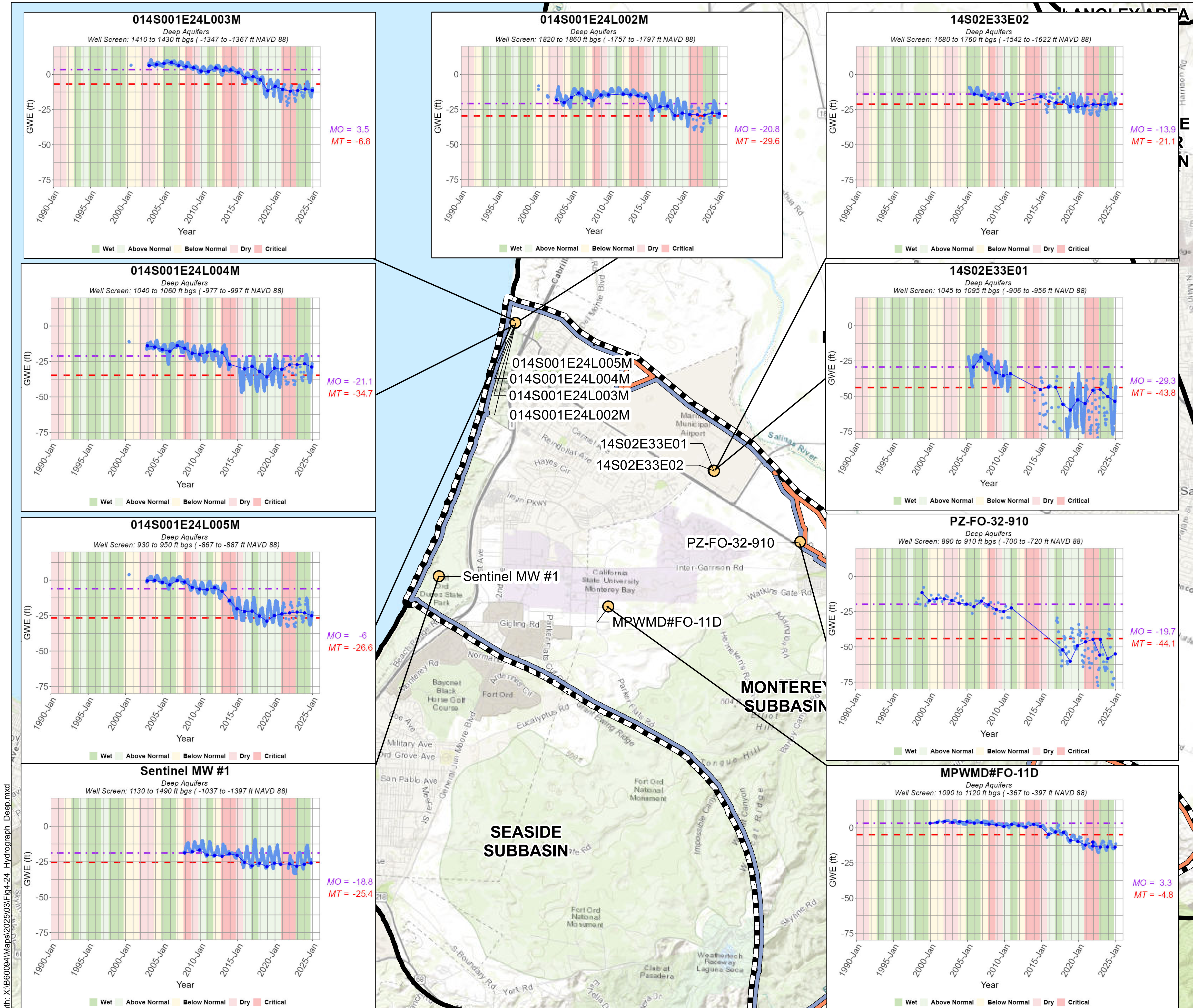
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 10 April 2025.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Representative Groundwater Elevation Hydrographs in the 400-Foot Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-23

Path: X:\B60094\Maps\2025\03\Fig4-23_Hydrograph_400-ft.mxd



Legend

- Representative Monitoring Sites for Groundwater Elevations
- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

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 10 April 2025.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

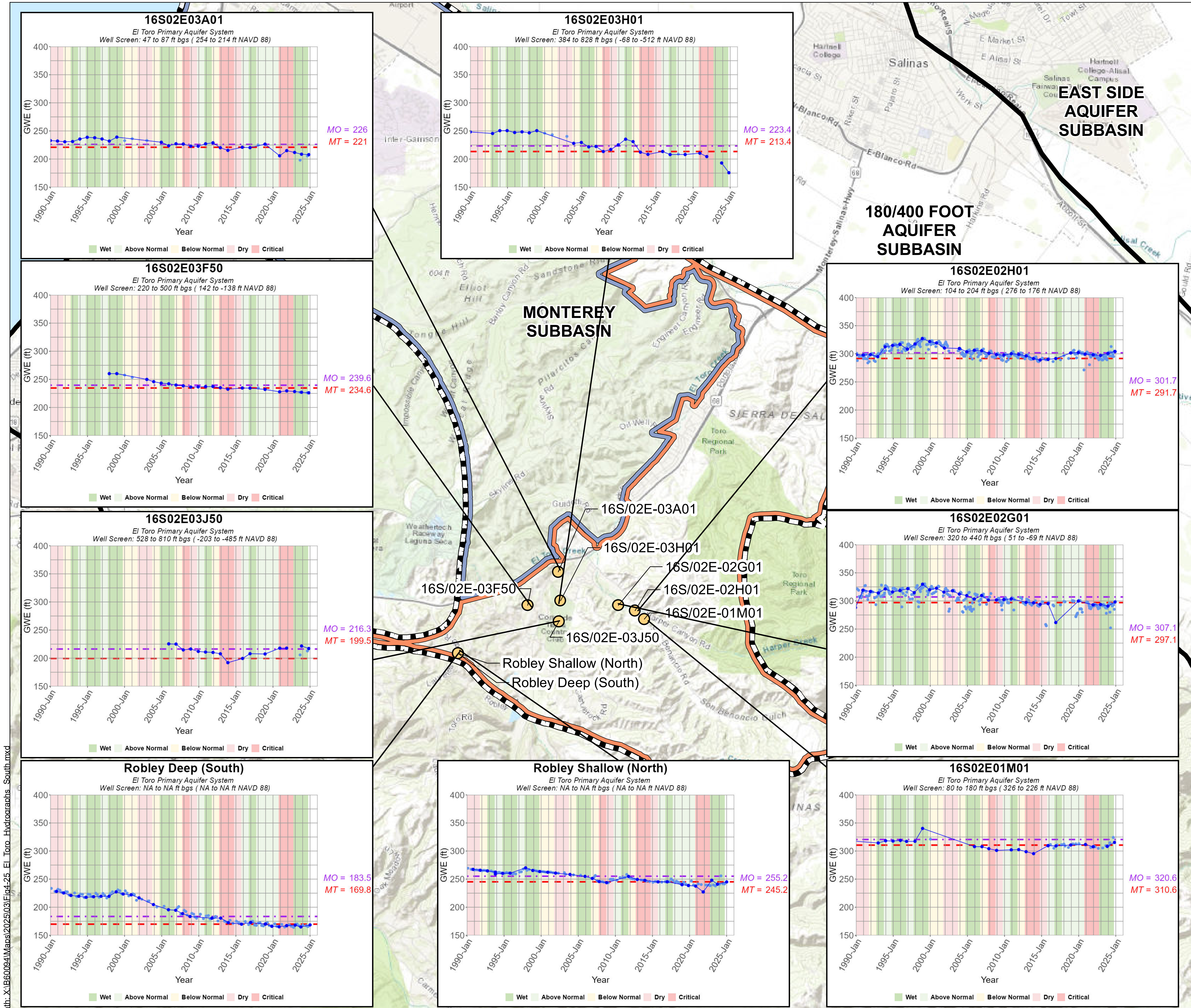
N 0 1.5 3 (Scale in Miles)

Representative Groundwater Elevation Hydrographs in the Deep Aquifers

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-24

Path: X:\B60094\Maps\2025\03\Fig4-24_Hydrograph_Deep.mxd



Legend

- Representative Monitoring Sites for Groundwater Elevations
- Monterey Subbasin

Management Areas

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

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.

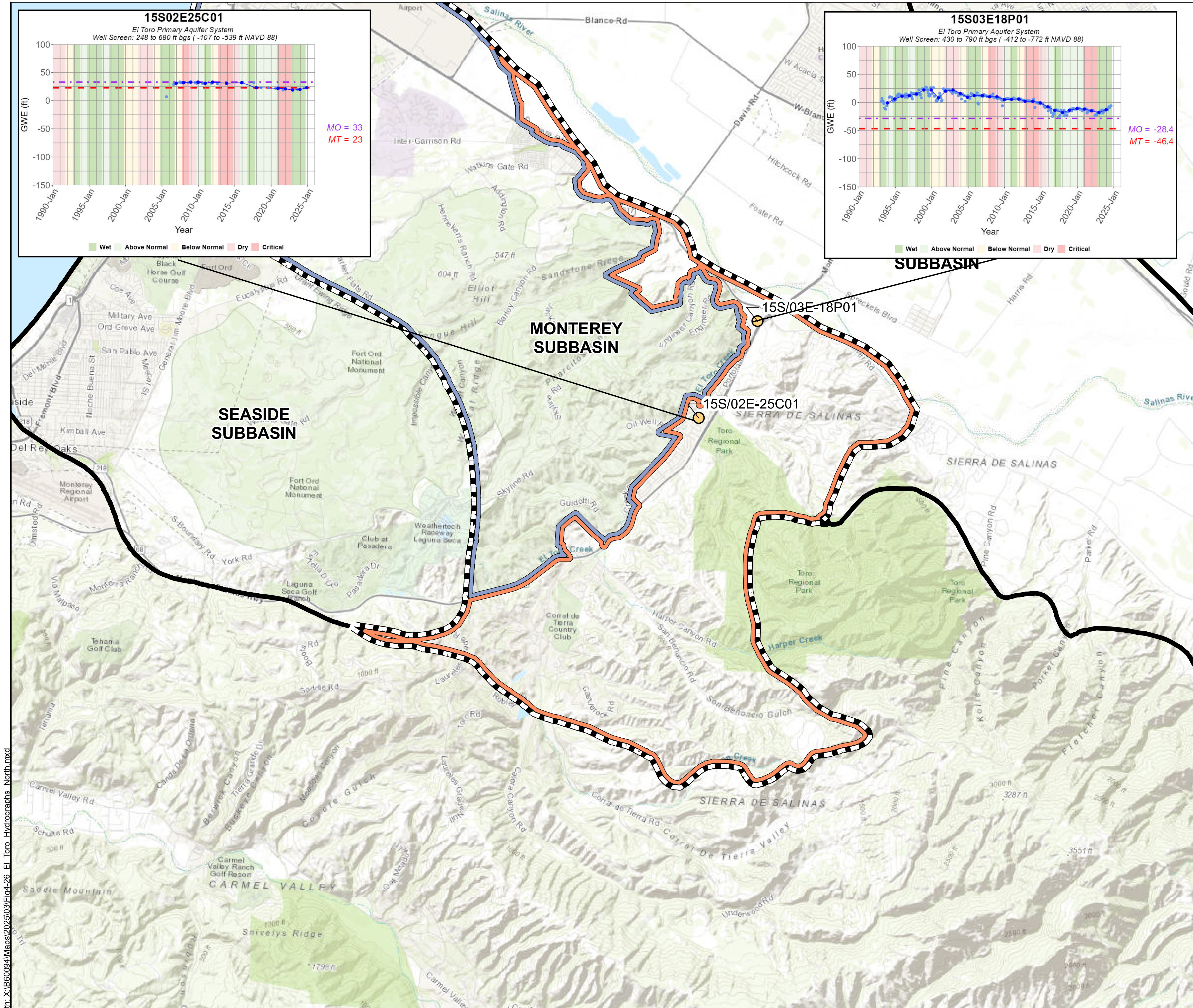
Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 10 April 2025.
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 2024 Annual Report
March 2025
Figure 4-25



Legend

- Representative Monitoring Sites for Groundwater Elevations
- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

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 10 April 2025.
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 2024 Annual Report
March 2025

Figure 4-26

Path: X:\B60094\Maps\2025\03\Fig4-26_El_Toro_Hydrographs_North.mxd

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.

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 and 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 3,347 acre-feet during WY 2024.

Table 4-1. Groundwater Extraction by Sector in WY 2024 in the Marina-Ord Area

Year	Water Use Sector	Groundwater Extraction (AF)	Method of Measurement	Accuracy of Measurement
WY 2024	Urban	3,347	Direct/Meter	Estimated to be +/- 5%.

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). Based on MCWRA Ordinance 5426 adopted in 2024, future annual reports will include groundwater extraction data for all areas within the SVBGSA subbasins inclusive of non-de minimis wells, as reported to MCWRA. 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). Pumping data from SWRCB for 2024 is not available yet so 2023 data is provided as an estimate. Table 4-2 shows the groundwater extraction for the Corral de Tierra Area. The urban and total groundwater extraction estimates are likely less than actually occurred, since not all public drinking water systems reported pumping to the SWRCB. Both agricultural and urban pumping is reported by MCWRA from October 1 through September 30, starting in WY 2024 based on MCWRA Ordinance 5426. Pumping reported to SWRCB is reported on a calendar year basis.

The rural domestic pumping estimate for the Corral de Tierra Area was updated to maintain consistency with the other subbasins. Rural domestic pumping is estimated using the number of drinking water connections based on data compiled for water systems and 2024 County of Monterey parcel data. To estimate water use, the number of connections first were estimated and then that number was multiplied by a constant pumping rate of 0.35 AFY per connection across all subbasins[4]. This constant was verified using reported urban pumping to assess the accuracy of the connections and water use estimates.

Table 4-2. Groundwater Extraction by Sector in WY 2024 in the Corral de Tierra Area

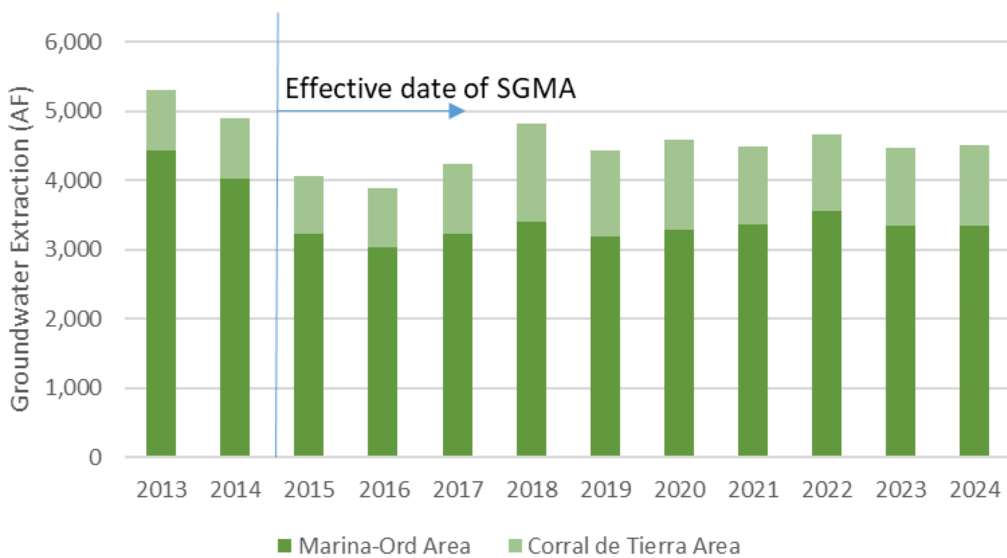
Water Use Sector	Groundwater Extraction (AF)	Method of Measurement	Accuracy of Measurement
Rural Domestic (b)	133	Estimated	N/A
Urban (c)	721	Direct, Estimated	Estimated to be +/- 5%.
Agricultural (c)	310	Direct	Estimated to be +/- 5%.
Total	**1,164**	--	

Notes:

(a) N/A = Not Applicable.
(b) Estimated using number of drinking water connections based on data compiled for water systems and 2024 County of Monterey parcel data and a constant pumping rate of 0.35 AFY/yr per connection.
(c) Urban pumping is comprised of 2024 pumping data from MCWRA and 2023 pumping data from SWRCB until 2024 data is available.

Figure 4-27 shows historic groundwater extraction in Monterey Subbasin over the past ten years. As shown on Figure 4-27, groundwater extraction in the Monterey Subbasin declined between 2014 and 2016 due to urban water conservation during the historic drought, rebounded between 2016 to 2018, and remained stable at approximately 4,500 AFY since 2018.

Figure 4-27. Historic Groundwater Extraction in the Monterey Subbasin



[4] The 0.35 AF/yr per connection estimate was determined by comparing pumping data reported to the state for several public water systems in the Corral de Tierra Area to the number of residential connections in those systems. This constant closely approximates reported pumping for residential water systems based on data reported to the state.

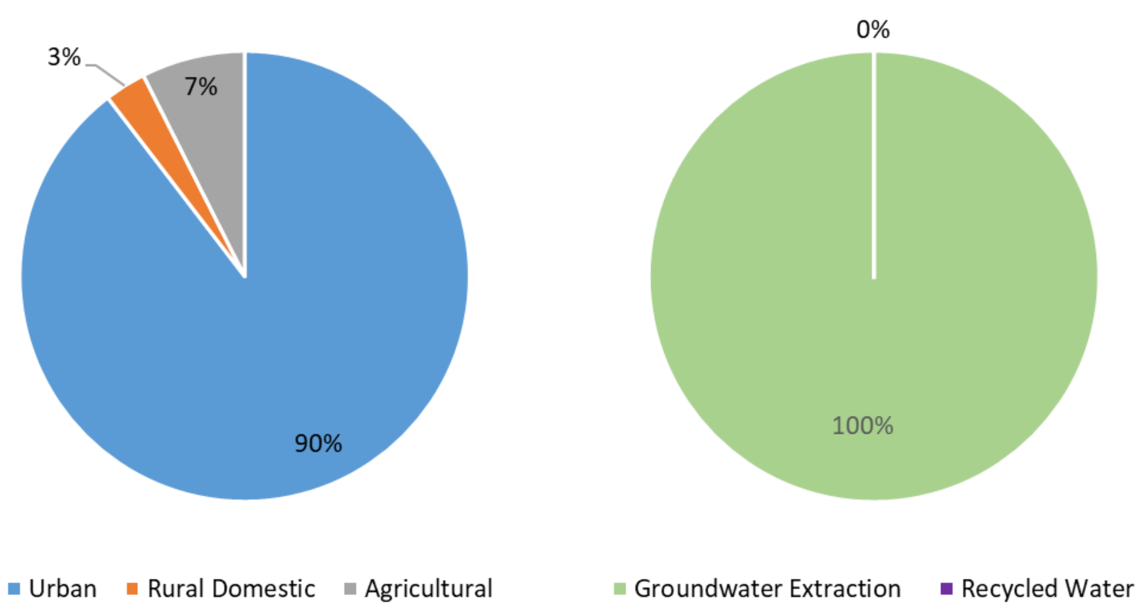
4.2.2 Total Water Use

Total water use for WY 2024 is summarized in Table 4-3 and illustrated by sector and by source on Figure 4-28. As shown on Figure 4-28, urban water use was the predominant water use sector and accounted for 90% of the water use in the basin. Domestic and agricultural uses accounted for 3% and 7% of the Subbasin's total water use respectively. No recycled water use occurred in the subbasin during WY 2024.

Table 4-3. Total Water Use in WY 2024 in the Monterey Subbasin

Management Area	Water Use Sector	Groundwater Extraction (AF)	Recycled Water (AF)	Total Use by Sector (AF)
Marina-Ord Area	Urban	3,347	0	3,347
Corral de Tierra Area	Rural Domestic	133	0	133
Corral de Tierra Area	Urban	721	0	721
Corral de Tierra Area	Agricultural	310	0	310
	Total	**4,510**	**0**	**4, 510**

Figure 4-28. Total Water Use in WY 2024 by Sector and Source



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[5].

4.3.1 Marina-Ord Area WBZ

The groundwater storage change in the Marina-Ord Area WBZ during WY 2024 was estimated by (a) comparing the estimated water level surface in Fall 2023 with the estimated water level surface in Fall 2024 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 5.1.3 below, available data shows no advancement of the seawater intrusion extent during WY 2024. Therefore, the change in groundwater storage estimated herein is based on the estimated change in storage due to groundwater elevation changes.

As discussed in Section 4.1 above, 2024 water level contours for the 400-Foot and Deep Aquifers were updated in this annual report to reflect the updated HCM and findings of the Deep Aquifers Study. However, finalization of this updated HCM within the Marina-Ord Area will be performed once data from additional 400-Foot Aquifer and Deep Aquifer monitoring wells are installed in this management area. These wells will provide crucial data in areas where data gaps exist that will further inform the updated HCM and will ultimately be incorporated into the groundwater flow model. These wells are scheduled to be installed in WY 2025. As such, the estimated change in groundwater storage within the Marina-Ord Area WBZ, has been conducted based on the HCM presented in the GSP and reflected in the MBGWFM. This HCM and numerical model has been utilized to estimate the water budget for the Marina-Ord Area WBZ and provide storage coefficients to facilitate the calculation of the change in storage of this WBZ for Monterey Subbasin WY 2022 and WY 2023 Annual reports. As such, Fall 2024 water level contours were drawn utilizing the originally established HCM presented in the GSP and utilized to estimate the change in storage between Fall 2023 and Fall 2024 for the Marina-Ord Area WBZ. These water level contours are shown on Figure 4-29 and Figure 4-30. Specifically, geospatial (raster) surfaces of groundwater elevations were created from Fall 2024 water level contours and Fall 2023 contours and associated with the MBGWFM grid. Average water levels within each MBGWFM 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 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

[5] 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.

each principal aquifer in Fall 2023 and Fall 2024. Total storage volumes were then compared to calculate the change in groundwater storage within each principal aquifer between Fall 2023 and Fall 2024. The calculation was only performed for cells outside the seawater intruded area.

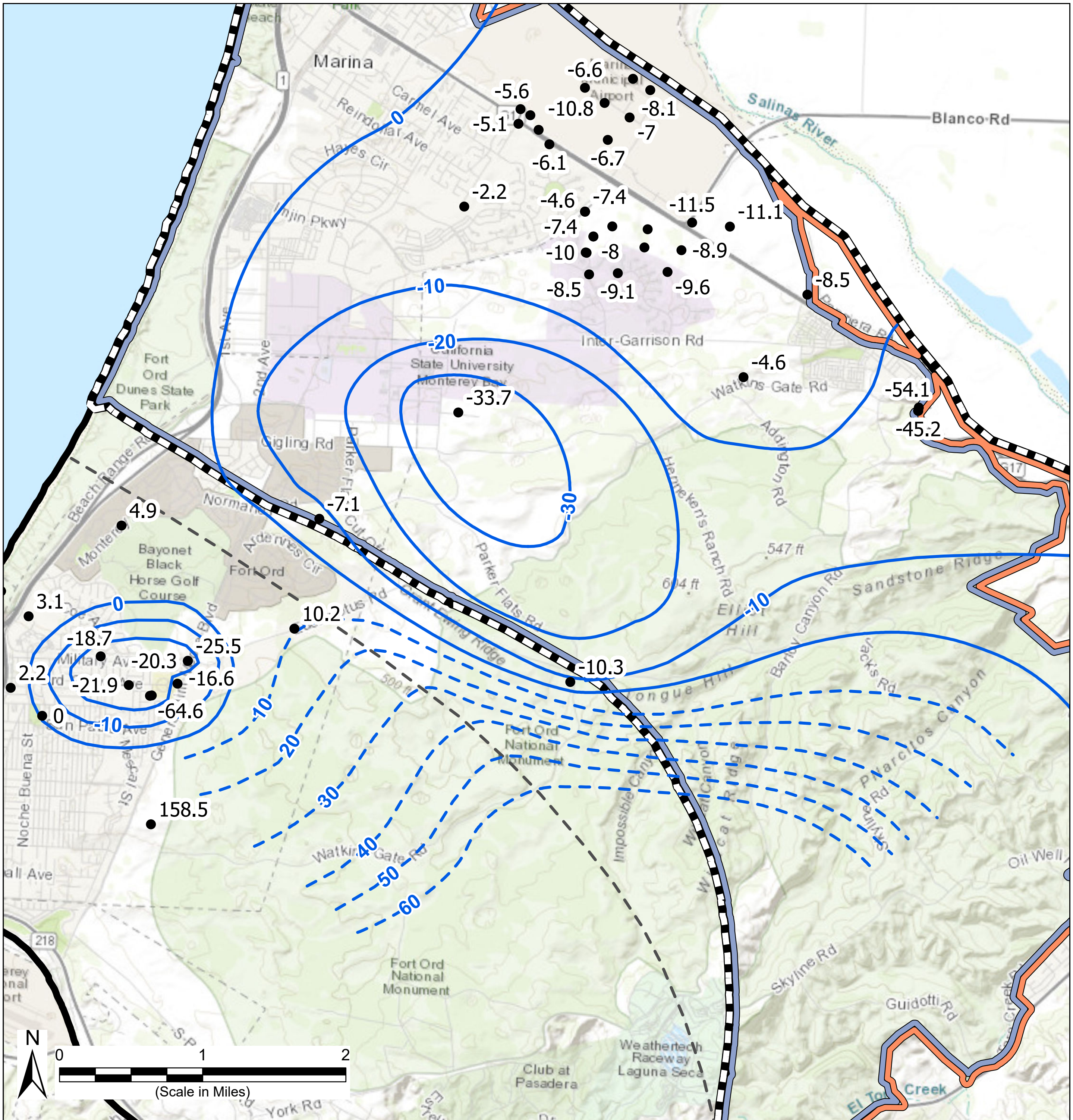
The estimated change in groundwater storage for each principal aquifer in the Marina-Ord Area WBZ is shown in Table 4-4 and Figure 4-31. Estimated groundwater elevation changes in the Marina-Ord Area between Fall 2023 and Fall 2024 are shown on Figure 4-32.

- Between Fall 2023 and Fall 2024, there were observed decreases in storage in the Dune Sand and 180-Foot Aquifers. These decreases likely reflect the natural decline in water levels that occurs in shallow aquifers after a very wet year such as WY 2023. There was also an observed increase of 75 AF in the 400-Foot Aquifer. These fluctuations fall within the historical range of changes and correlate with groundwater elevation trends, reflecting hydrologic conditions in WY 2024 (see Section 4.1.2).
- A decrease of -242 AFY was observed between Fall 2023 and Fall 2024 in the Deep Aquifers. This decrease in storage in the Deep Aquifers reflects the continuing decline in groundwater levels within selected upper Deep Aquifer zone wells during WY 2024. These fluctuations fall within the historical range of changes in storage observed in this principal aquifer.

Due to limited availability of reliable water level data from deep aquifer production wells in Fall 2024 there is a higher level of uncertainty in the estimated change in storage in the Deep Aquifers compared to other principal aquifers. MCWDGSA is working on expanding its Deep Aquifers monitoring network with the construction of new monitoring wells, as outlined in Section 5.2.4. In addition, it is anticipated that aquifer specific water budgets and storage change estimates will be revisited utilizing the update HCM as part of the 2027 GSP Periodic evaluation.

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

Aquifer	Change in Groundwater Storage, Fall 2023 to Fall 2024 (AF)
Dune Sand Aquifer	-356
180-Foot Aquifer	-64
400-Foot Aquifer	75
Deep Aquifers	-242
Total Marina-Ord Area WBZ	**-586**



Legend

- Fall 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

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

Abbreviations

ft = foot

NAVD 88 = North American Vertical Datum of 1988

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2025.

Notes

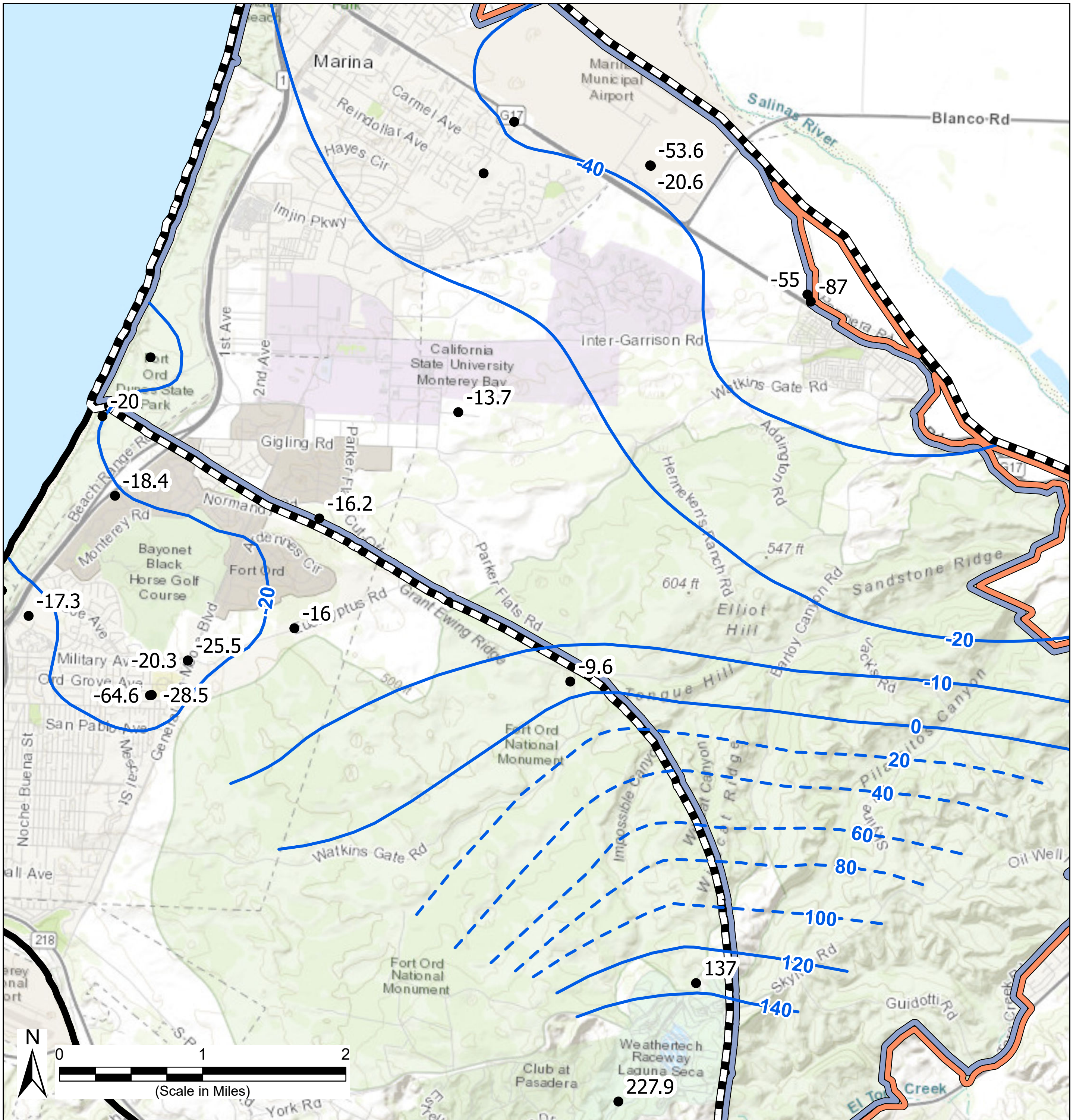
1. All locations are approximate.
2. Groundwater contours are in ft NAVD 88.
3. These contours are prepared for storage calculation purposes and does not reflect the updated HCM. Groundwater elevations in the 400-Foot Aquifers have been plotted with those within the Paso Robles Aquifer in the Seaside Subbasin.

Groundwater Elevation Contours for Storage Calculation in the 400-Foot Aquifer – Fall 2024

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-29

Path: X:\B60094\Maps\2025\03\Contours_fall_v3.aprx



Legend

- Fall 2024 Groundwater Contours
- GWE Measurement Locations
- Monterey Subbasin

Management Areas

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

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. These contours are prepared for storage calculation purposes and does not reflect the updated HCM. Groundwater elevations in the Deep Aquifers have been plotted with those within the Santa Margarita Aquifer in the Seaside Subbasin.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2025.

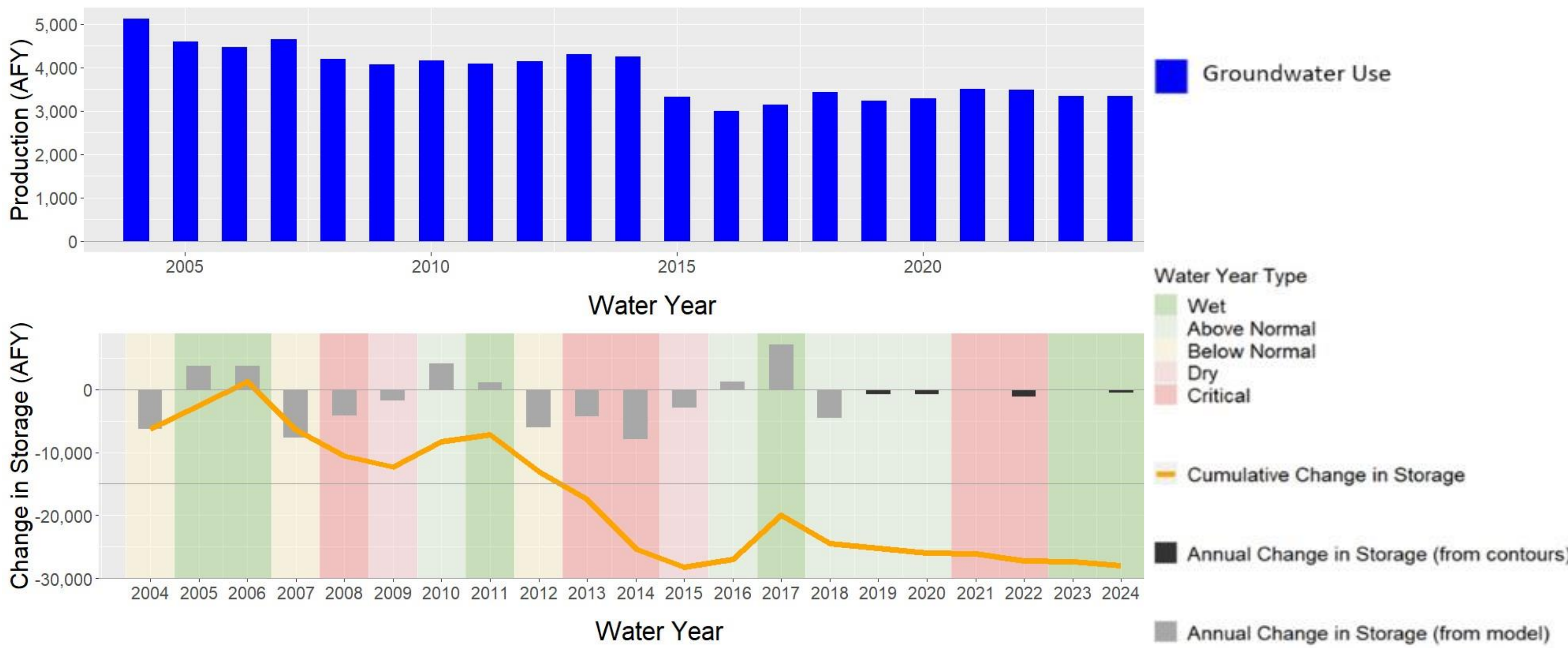
Groundwater Elevation Contours for Storage Calculation in the Deep Aquifers – Fall 2024

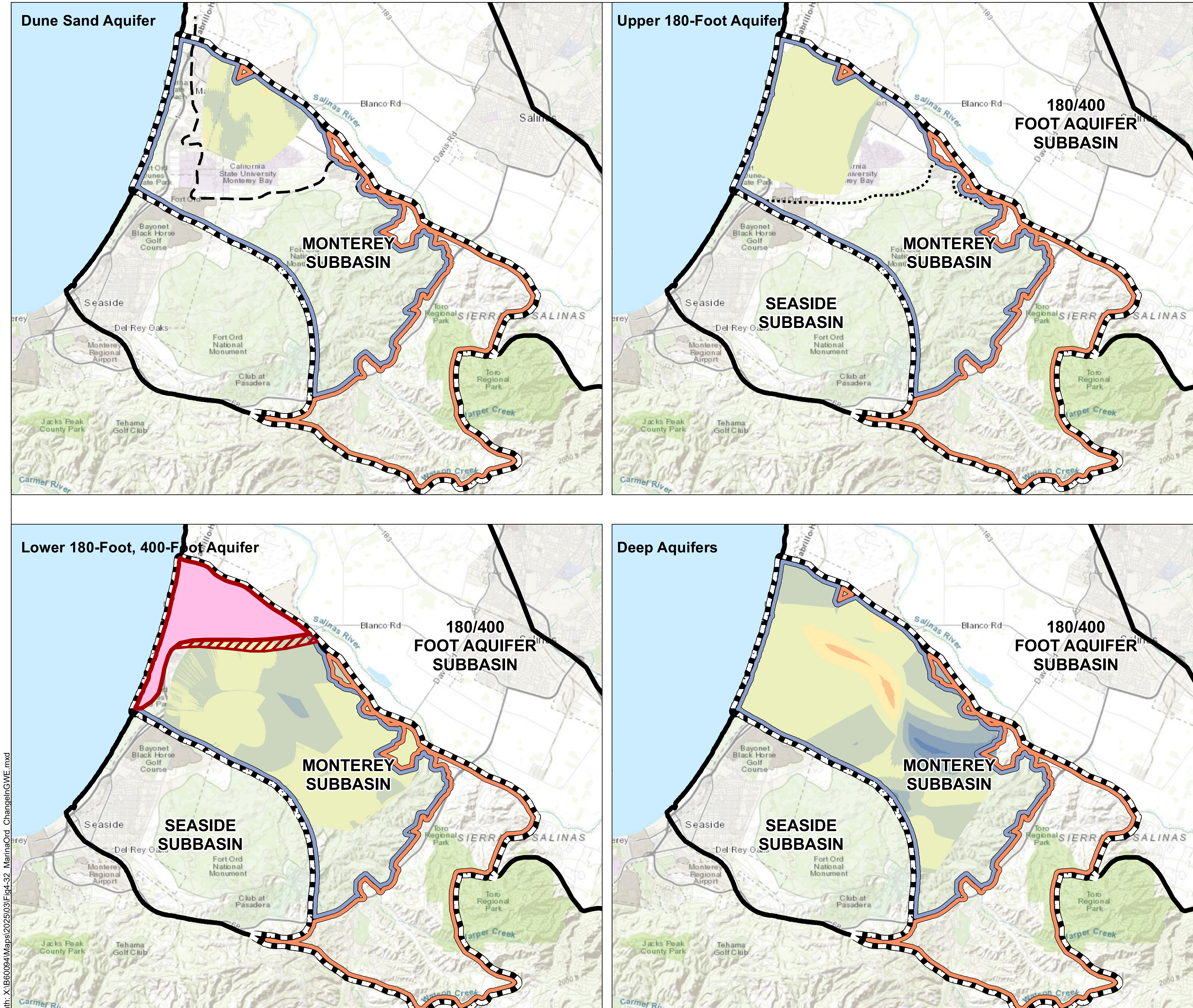
Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-30

Path: X:\B60094\Maps\2025\03\Contours_fall_v3.aprx

Figure 4-31. Cumulative and Annual Change in Storage in the Marina-Ord Area





Legend

- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin
- Southern Extent of FO-SVA (Harding ESE, 2001)
- Southern Extent of Valley Fill Deposits (Harding ESE, 2001)

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Estimated Seawater Intrusion in Monterey Subbasin

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

Change in Groundwater Elevations (ft)

- -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. The change in groundwater elevation reflects the changes from Fall 2021 to Fall 2022.
3. The areas of known seawater intrusion and potential seawater intrusion are discussed in Section 5.3.3 of the Monterey GSP. Area of potential seawater intrusion is located between the seawater intruded wells and the non-seawater intruded wells and lacks of sufficient data.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2025.

N
0 2.5 5
(Scale in Miles)

Change in Groundwater Elevations in the Marina-Ord Area, Fall 2023 to Fall 2024

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-32

Path: X:\B60094\Maps\2025\03\Fig4-32_MarinaOrd_ChangeInGWE.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 2023 to Fall 2024. 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 WBZ are shown on Figure 4-34. 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. The storage change was not calculated in the areas that were not contoured and not covered by the RMS network. Updated groundwater level contours were developed for Fall 2023 (Figure 4-16) based upon the updated HCM for the Corral de Tierra WBZ to facilitate calculation of the storage change.

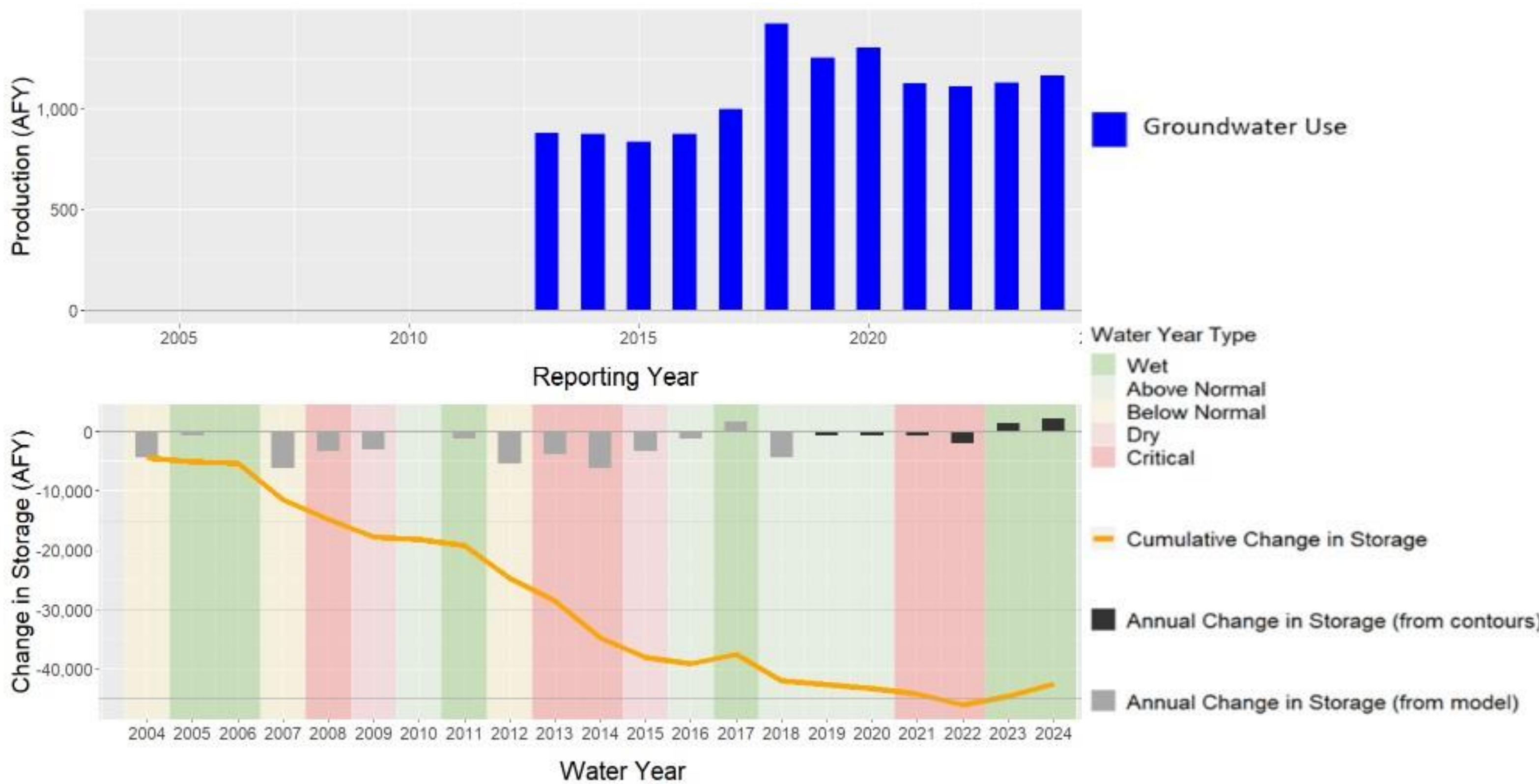
A summary of components used for estimating the change in groundwater storage due to groundwater elevation changes in the Corral de Tierra Area is shown in Table 4-5 and Figure 4-33. The estimated groundwater elevation changes in the Corral de Tierra Area are shown on Figure 4-34. Annual groundwater storage changes due to changes in groundwater elevation from Fall 2023 to Fall 2024 increased by 2,100 AF in the Corral de Tierra Area. The increase during this wet year does not change the overall trend of decreasing groundwater in storage, as shown by the orange cumulative change in groundwater storage line on Figure 4-33.

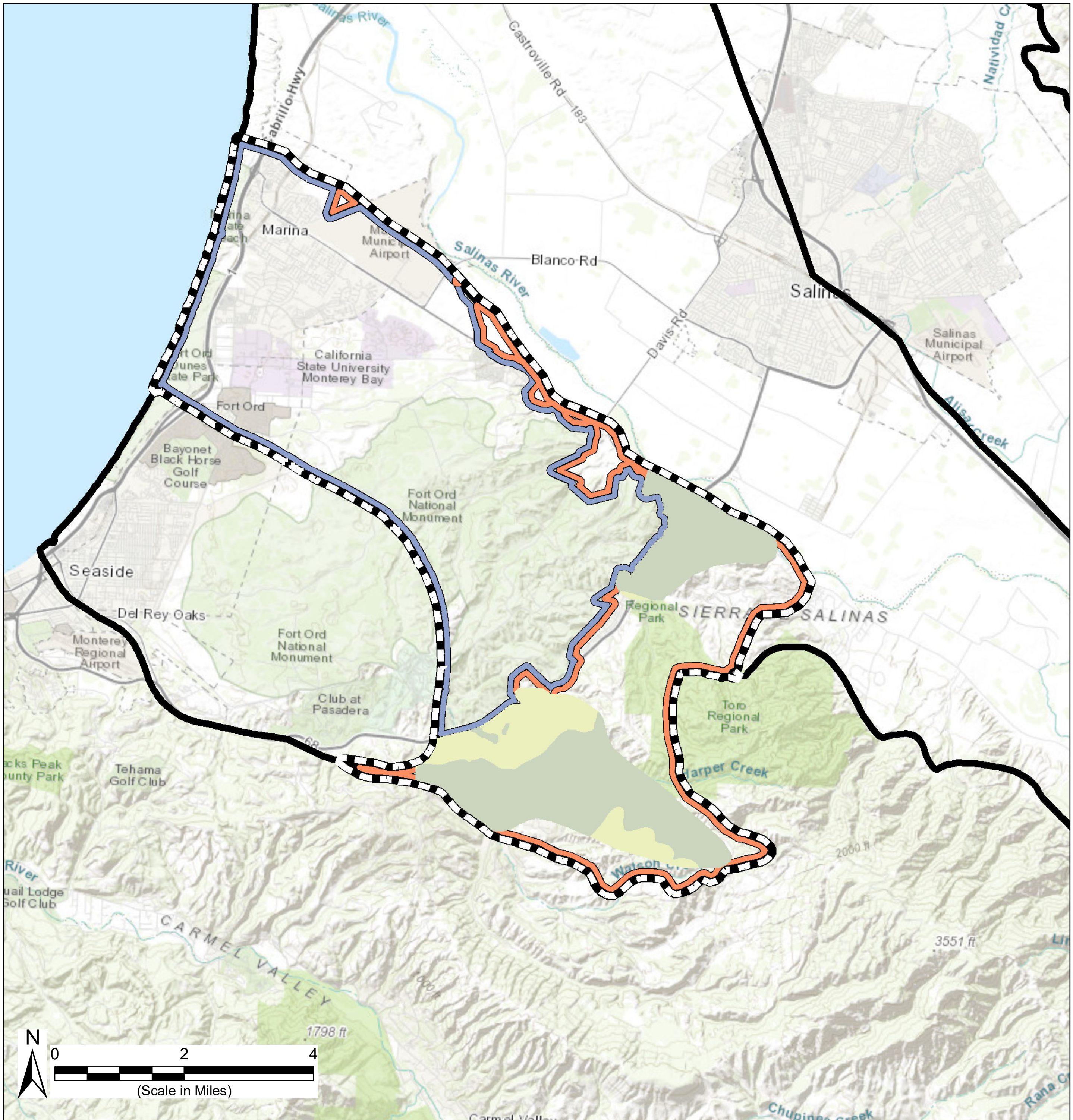
Table 4-5. Estimated Change in Groundwater Storage in the Corral de Tierra Area

Component	Fall 2023 to Fall 2024	
	Hwy 68 East bowl	El Toro bowl
Area of contoured portion of Subbasin (acres)	1,400	4,300
Storage coefficient	0.1	0.1
Average change in groundwater elevation (feet)	7.87	2.44
Annual change in groundwater storage (AF/year)	1,100	1,000
Total annual change in groundwater storage (AF/year)	**2,100**	

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

Figure 4-33. Cumulative and Annual Change in Storage in the Corral de Tierra Area





Path: X:\B60094\Maps\2025\03\Fig4-34-Coral_ChangeInGWE.mxd

Legend

Monterey Subbasin

Other Groundwater Subbasins within Salinas Valley Basin

Change in Groundwater Elevation in the El Toro Aquifer System (ft)

-4.9 - 0

0.1 - 5

Management Areas

Marina-Ord Area

Corral de Tierra Area

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 2023 to Fall 2024

Abbreviations

ft = feet

NAVD 88 = North American Vertical Datum of 1988

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 22 March 2025.

Change in Groundwater Elevations in the El Toro Primary Aquifer System, Fall 2023 to Fall 2024

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-34

4.4 Seawater Intrusion

Seawater intrusion is being monitored in the coastal Marina-Ord Area of the Subbasin. This section discusses seawater intrusion monitoring data collected in WY 2024, including measurements of geochemical concentrations from groundwater wells as well as induction logging performed in deep monitoring wells as a qualitative assessment of seawater intrusion.

4.4.1 Salinity Concentrations

Within the Monterey Subbasin, the sustainability indicator of seawater intrusion is evaluated using the location of the 500 milligrams per liter (mg/L) chloride isoconcentration contour, equivalent total dissolved solids (TDS) concentrations, and/or specific conductivity measurements. As discussed in Section 5.3.2 of the GSP, TDS has identified as an effective surrogate for chloride in the Marina-Ord Area, as groundwater in the Marina-Ord aquifers has low natural TDS, and the primary source of salinity in this area is seawater intrusion. Based on water quality data collected in the lower 180-Foot and 400-Foot Aquifers, a strong correlation can be developed between these parameters, as shown below. Based on this relationship, a 500 mg/L chloride concentration is approximately equivalent to 1,250 mg/L of TDS. An empirical relationship is also developed between TDS and conductivity. 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.

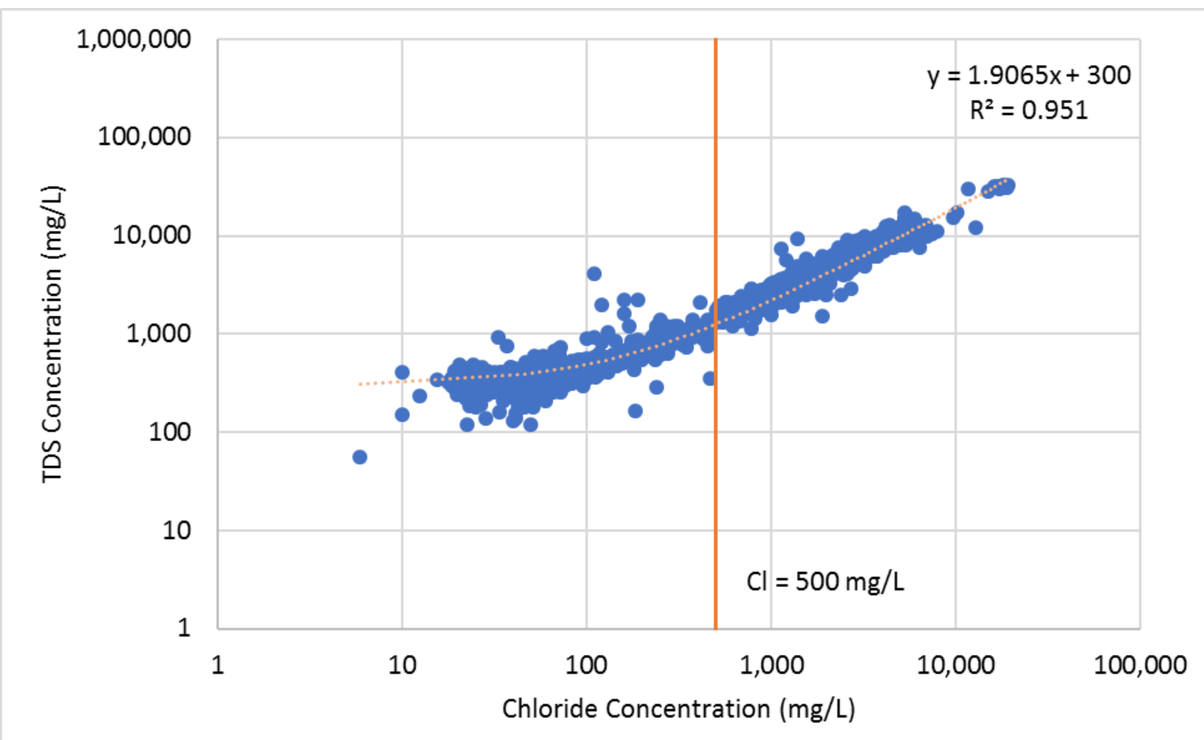


Figure 4-35. Relationship Between TDS and Chloride Concentrations, Marina-Ord Area

As discussed in Section 5.2.3.2, MCWDGSA has been working to establish its seawater intrusion monitoring program over the past two years. The program now consists of (1) direct water quality sampling of chloride and TDS from wells within the RMS network and (2) additional sampling and collection of specific conductivity measurements in non-RMS wells. In Deep Aquifer monitoring wells where groundwater sampling is currently not feasible due to the depth to water and/or size of the wells, conductivity measurements are taken with a Temperature, Level and Conductivity (TLC) meter at screen depth elevations up to 1,000 ft below ground surface (bgs). In WY 2024, MCWDGSA collected chloride, TDS, and/or conductivity measurements from over 100 wells in the Marina-Ord Area.

This section presents salinity concentration maps from WY 2024 and long-term concentration trends for selected wells in the Subbasin's monitoring network.

4.4.1.1 Salinity Concentration Maps

Figure 4-36 and Figure 4-37 show Fall 2024 chloride and TDS concentrations, respectively, in each of the coastal aquifers. As discussed above, conductivity measurements have been converted to TDS concentrations and incorporated into the data shown on Figure 4-37. The figures identify the seawater intrusion minimum threshold chloride isocontour of 500 mg/L. These figures show that

- Limited seawater intrusion exists in the Dune Sand and Upper 180-Foot Aquifers and no seawater intrusion exists in the Deep Aquifers. Although elevated TDS concentrations of 1,360 mg/L were detected in Upper 180-Foot Aquifer well MP-BW-33-272, which is located inland near Reservation Road, in November 2024, chloride concentrations were only 147 mg/L. Given that chloride concentrations are well below 500 mg/L, it is concluded that elevated TDS concentrations in this well are not related to seawater intrusion, but likely the result of historical chemical releases at former Fort Ord.
- In the Lower 180/400-Foot Aquifer, chloride concentrations in wells inland of the seawater intrusion minimum threshold isocontour line remain below 500 mg/L. However, chloride concentrations in groundwater samples collected from MP-BW-42-345 increased to 479 mg/L in November 2024. This well is located less than 500 feet beyond (i.e., southeast) of the seawater intrusion minimum threshold line. TDS concentrations in groundwater samples collected from this well in November 2024 were 1,420 mg/L. This concentration exceeds the TDS concentration of 1,250 which generally correlates to a chloride concentration of 500 ug/L. As discussed in Section 4.4.1.2, wells near the MP-BW-42 cluster have shown recent increases in chloride and TDS concentrations, which indicates a slow advancement of seawater intrusion in this area since 2015.

4.4.1.2 Long-Term Salinity Concentration Trends

Temporal trends in chloride and TDS concentrations can be assessed with chemographs that plot changes in concentrations of these over time. Chemographs for seawater intrusion RMS wells are included in Appendix D. Graphs for RMS wells screened in the Lower 180/400-Foot Aquifer are shown on Figure 4-38.

As shown on graphs in Appendix D, long-term chloride and TDS concentrations in the Dune Sand, upper 180-Foot, and Deep Aquifers RMSs remain stable and below the seawater intrusion threshold of 500 mg/L for chloride or the correlated TDS concentration of 1,250 mg/L. In the lower 180-Foot/400-Foot Aquifer, recent increases in chloride and TDS concentrations are observed in the MP-BW-42 well cluster and at well MW-OU2-66-180. These wells are located less than 1000 feet beyond the seawater intrusion minimum threshold line, which corresponds to the estimated location of the seawater intrusion front in the lower 180-/400 -Foot aquifers in 2015.

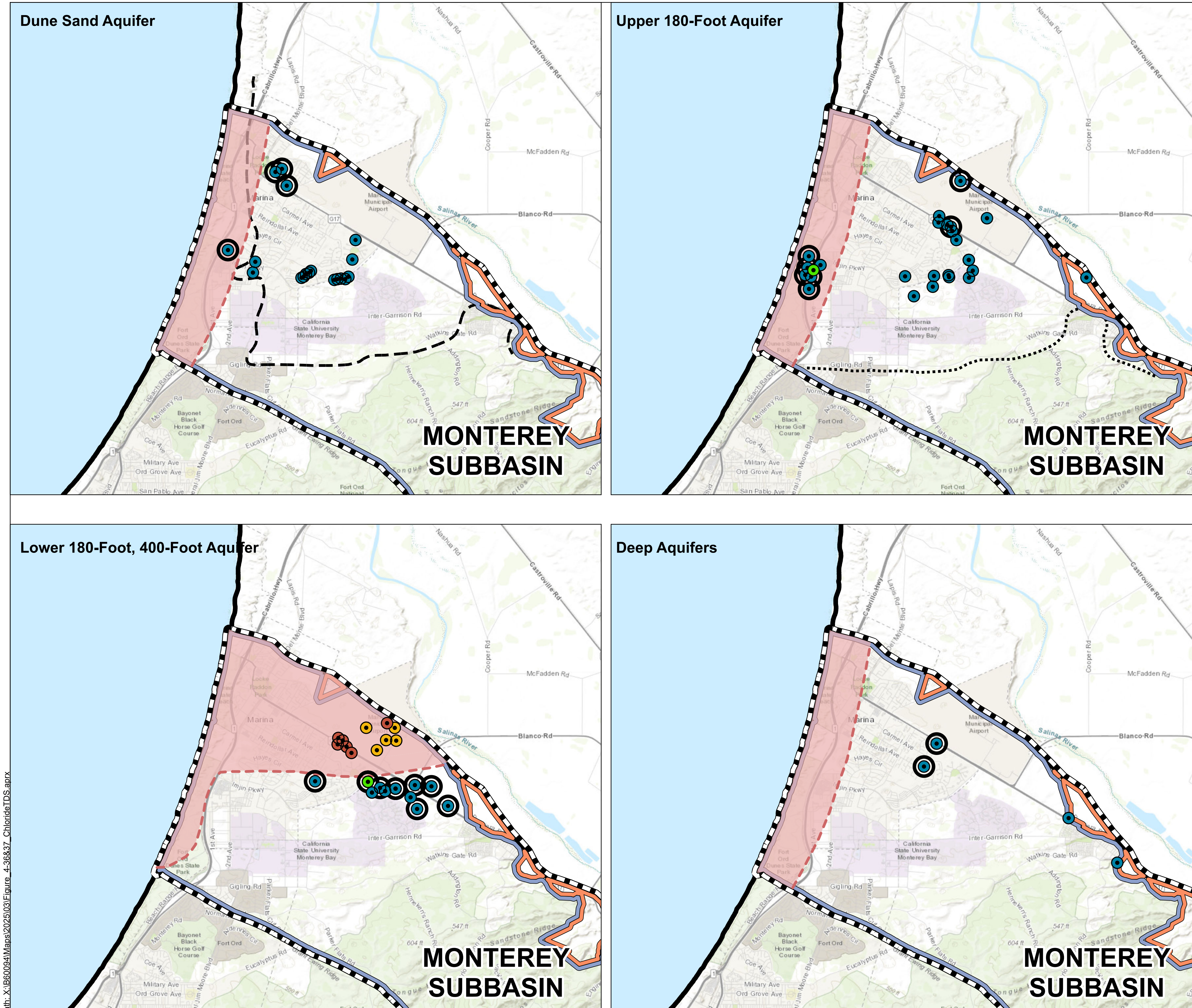
4.4.2 Induction Logs

Induction logging measures the fluid conductivity within the adjacent formation throughout the depth of the well. Although this method does not provide exact measurements of water quality, it can be used to monitor changes in conductivity (i.e., groundwater salinity) over time. In addition, because induction logging provides a continuous vertical profile, it is an effective way to identify signs of vertical migration of seawater intrusion from shallower to deeper aquifers. This section describes current induction logging programs in the Subbasin and data collected in WY 2024. The monitoring wells mentioned herein are a subset of the 400-Foot and Deep Aquifer RMS wells shown on Figure 4-23 and Figure 4-24.

The Seaside Basin Watermaster constructed and maintains four Sentinel Wells along the coast in the Monterey and Seaside Subbasins to detect potential increases in seawater intrusion. The northern-most well, SBWM-1, is located within the Monterey Subbasin (Figure 4-24). SBWM-2 is located immediately south of Monterey/Seaside basin boundary. The Watermaster conducts semi-annual induction logging within these wells. During baseline monitoring of SBWM-1 in 2007, it was documented that very high conductivities indicative of saline groundwater were observed at depths from 125 feet to approximately 350-400 feet below ground surface (Feeney, 2007). These depths correspond to depths of the 180- and 400-foot aquifers in the Monterey Subbasin and this well is located within the existing seawater intrusion front identified for these aquifers. Recent induction logs show small increases in conductivity in SBWM-1 at similar depths and at SBWM-2 and 4 within the Paso Robles Formation of the Seaside Basin. As discussed in the Seaside Basin's WY 2024 Seawater Intrusion Analysis Report (Montgomery & Associates, 2024)

> *SBWM-2 has had the greatest increase since 2019, approximately 2,500 µmhos/cm at an approximate depth of 350 feet bgs (-276 feet amsl). SBWM-1 has had a modest increase in conductivity since 2019, approximately 400 µmhos/cm at an approximate depth of 530 feet bgs (-433 feet amsl).*

In November 2022, MCWRA performed induction logging at the USGS deep monitoring well (014S001E24L002M) and the Airport deep monitoring well (14S02E33E02). These induction logs provide a baseline for comparison with future induction logs to qualitatively evaluate groundwater salinity changes near these wells. No new induction logging was performed in these wells during WY 2024.



Legend

- Monterey Subbasin
- Marina-Ord Area
- Corral de Tierra Area
- Other Groundwater Subbasins within Salinas Valley Basin
- Southern Extent of FO-SVA (Harding ESE, 2001)
- Southern Extent of Valley Fill Deposits (Harding ESE, 2001)
- RMW-SWI
- Location of the Seawater Intrusion MT
- Area Between the Ocean and SWI MT

Chloride Concentration

- ≤ 250 mg/L
- 251 - 500 mg/L
- 501 - 1,500 mg/L
- 1,501 - 5,000 mg/L
- > 5,000 mg/L

Abbreviations

mg/L = miligram per liter
MT = Minimum Threshold
RMW = Representative Monitoring Well
SWI = Seawater Intrusion

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 23 March 2025.
2. Chloride data sources inlcude:
   (1) Chloride data collected from Fort Ord wells from MCWD's sampling event during November2024;
   (2) Chloride data from MCWD production wells collected during Fall 2024, obtained from California's Drinking Water Watch;
   (3) Chloride data from MPWMD's Fall 2024 sampling event.

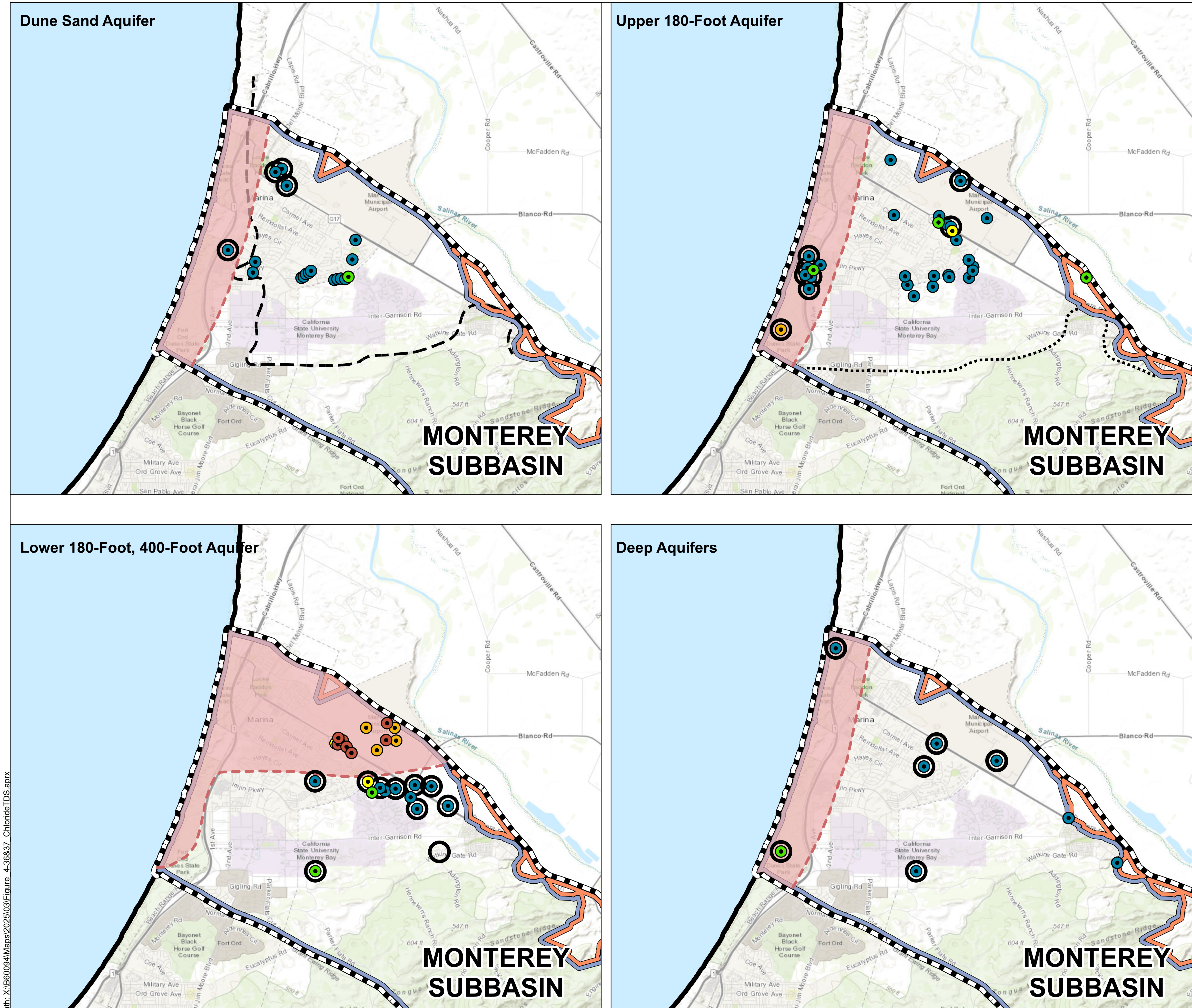
N

0 2 4
(Scale in Miles)

Fall 2024 Chloride Concentrations

Monterey Subbasin
WY 2024 Annual Report
March 2025
Figure 4-36

Path: X:\B60094\Maps\2025\03\Figure_4-36&37_ChlorideTDS.aprx



Legend

- Monterey Subbasin
- Marina-Ord Area
- Corral de Tierra Area
- Other Groundwater Subbasins within Salinas Valley Basin
- Southern Extent of FO-SVA (Harding ESE, 2001)
- Southern Extent of Valley Fill Deposits (Harding ESE, 2001)
- RMW-SWI
- Location of the Seawater Intrusion MT
- Area Between the Ocean and SWI MT

TDS Concentration Equivalent

- ≤ 780 mg/L
- 781 - 1,250 mg/L (500 mg/L Chloride)
- 1,251 - 3,000 mg/L
- 3,001 - 10,000 mg/L
- > 10,000 mg/L

Abbreviations

mg/L = miligram per liter
MT = Minimum Threshold
RMW = Representative Monitoring Well
SWI = Seawater Intrusion
TDS = Total Dissolved Solids

Notes

1. All locations are approximate.
2. Specific conductance to TDS conversion is based on a derived slope of 0.7025 mg/L per uS /cm from a linear regression model with existing data from the Monterey Subbasin.
3. Measurements from Source 3 for the Deep Aquifers wells were taken within the well casing up to approximately 1,100 ft deep. The conductivity meter cannot reach the well screen interval of deep wells over 1,100 ft due to the limited length of the meter.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 23 March 2025.
2. TDS and conductivity data sources inlcude:
   (1) Specific conductance and TDS data collected from Fort Ord wells from MCWD's sampling event during November2024;
   (2) Specific conductance from Fort Ord's quarterly sampling event in November 2024;
   (3) Specific conductance collected by MCWD staff in Fall 2024;
   (4) TDS from MCWD production wells collected during Fall 2024, obtained from California's Drinking Water Watch;
   (5) TDS data from MPWMD's Fall 2024 sampling event.

N

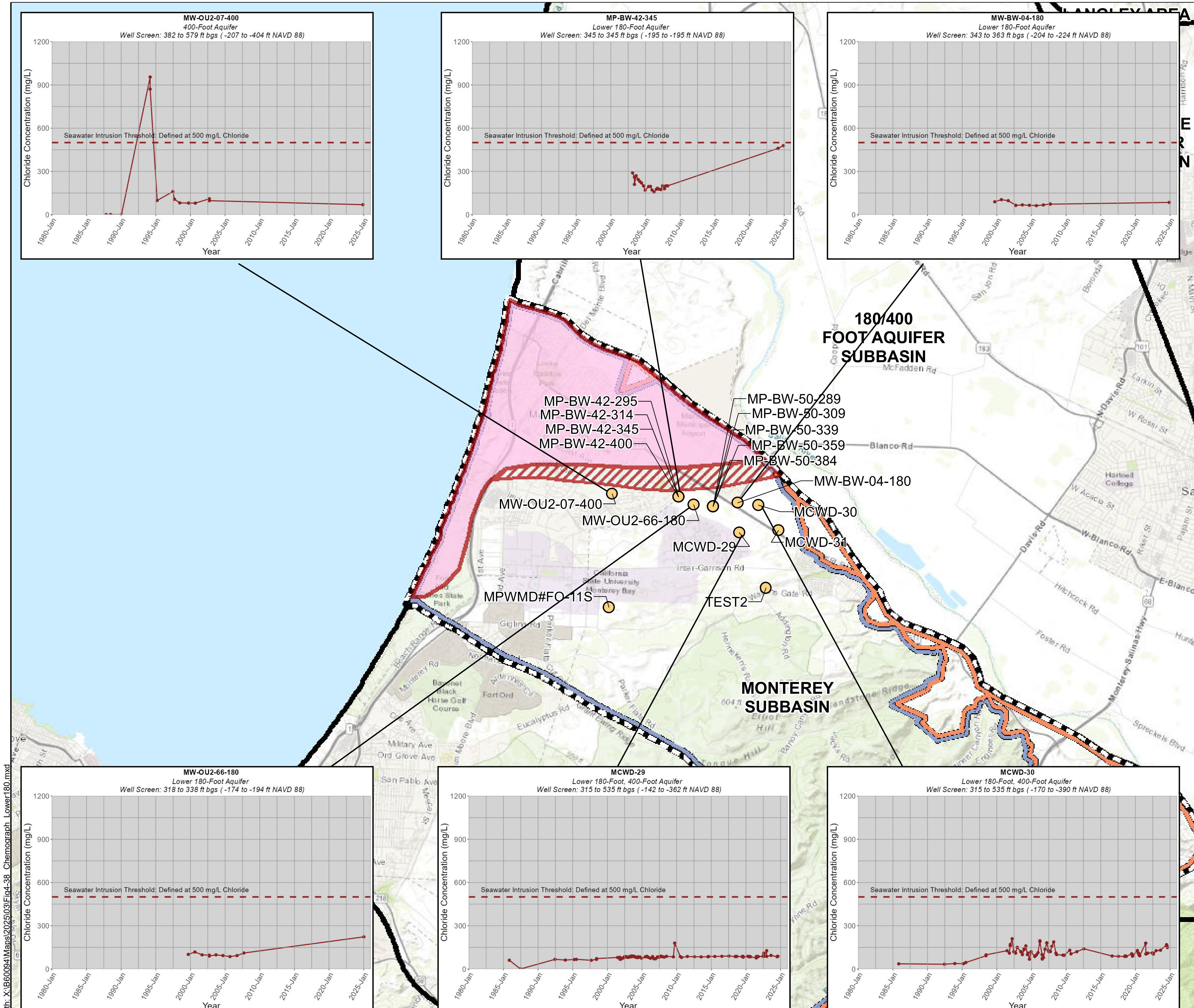
0 2 4
(Scale in Miles)

Fall 2024 TDS Concentrations

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-37

Path: X:\B60094\Maps\2025\03\Figure_4-36&37_ChlorideTDS.aprx



Legend

- Seawater Intrusion RMS
- Monterey Subbasin
- Other Groundwater Subbasins within Salinas Valley Basin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Estimated Seawater Intrusion in Monterey Subbasin

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

Representative Monitoring Sites

- Chloride Concentrations
- Seawater Intrusion MT at 500 mg/L Chloride

Abbreviations

DWR	= California Department of Water Resources
ft	= foot
RMS	= Representative Monitoring Site

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 10 April 2025.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Long-term Chloride Concentration in Seawater Intrusion RMS Lower 180-Foot/400-Foot Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-38

Path: X:\B60094\Maps\2025\03\Fig4-38_Chemograph_Lower180.mxd

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.

Groundwater quality in public water system supply wells is evaluated using data collected by the State Water Resources Control Board's Division of Drinking Water. The Central Coast Regional Water Quality Control Board (CCRWQCB) oversees groundwater quality monitoring for on-farm domestic wells and irrigation wells through the Irrigated Lands Regulatory Program (ILRP). Water quality data for both programs can be found on SWRCB's Groundwater Ambient Monitoring and Assessment (GAMA) Program Groundwater Information System (SWRCB, 2024). However, through collaboration with the CCRWQCB and Central Coast Water Quality Preservation, Inc., after the submittal of the WY 2023 Annual Report, it was determined that the GAMA system is missing ILRP data. Therefore, in this annual report and future reports produced by MCWDGSA and SVBGSA , water quality in ILRP wells will be evaluated using data directly from the CCRWQCB.

Table 4-6 shows the number of wells in the identified water quality monitoring network that were sampled and those wells that had concentrations above regulatory standards (i.e., Maximum Contaminant Levels [MCLs] and Secondary Maximum Contaminant Levels [SMCLs], and Agricultural Water Quality Objectives) and in WY 2024. As shown on this table, in WY 2024, 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, and manganese. Ten wells in the Corral de Tierra Area had higher concentrations than the regulatory drinking water standard for arsenic. Four and five wells had higher concentrations than the regulatory drinking water standards for iron and manganese, respectively.

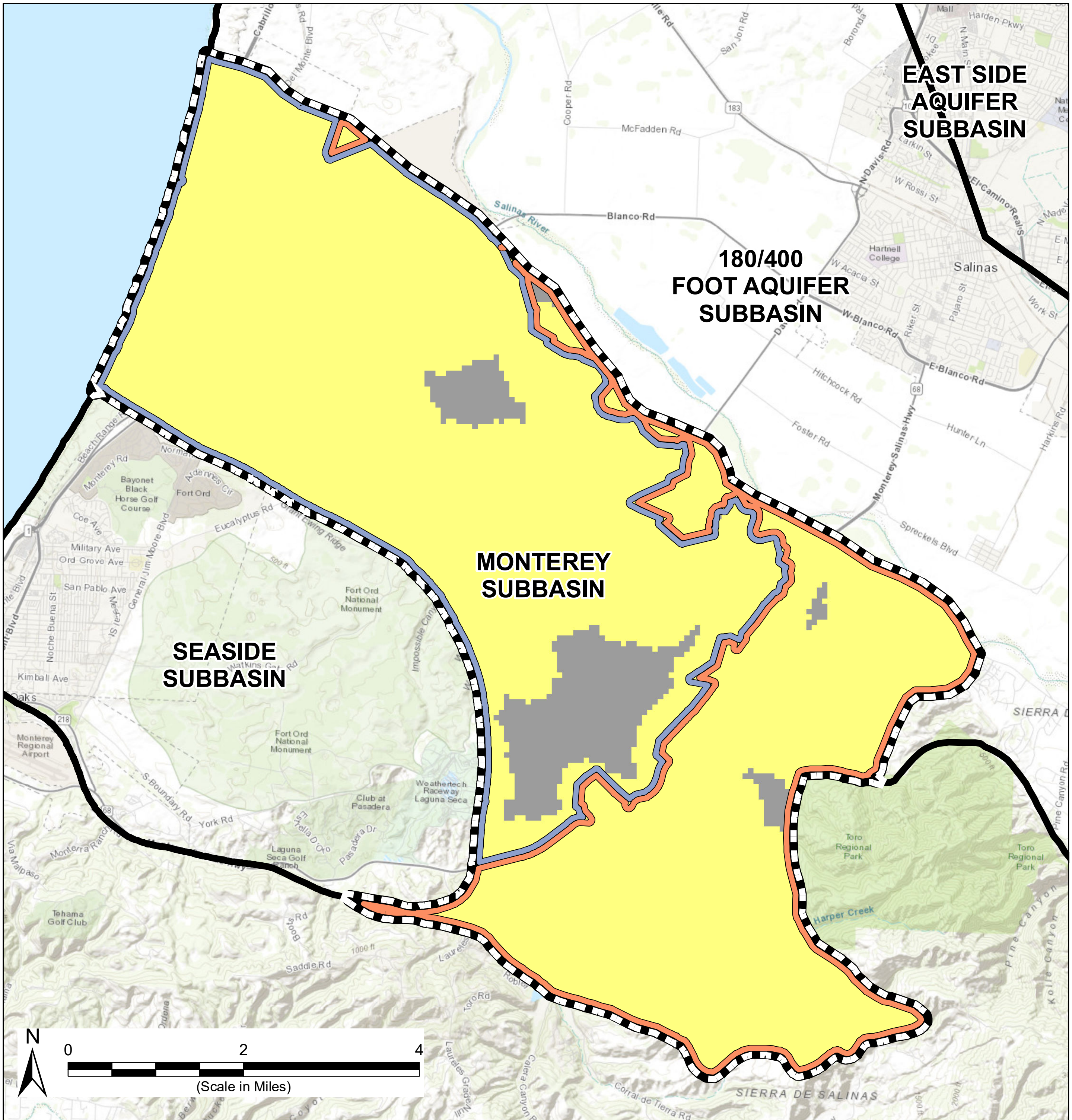
Table 4-6. Water Quality in WY 2024

Constituent of Concern (COC)	Regulatory Standard	Standard Units	Number of Wells Sampled for COC in WY 2024	Number of Wells Sampled in WY 2024 with COC Concentrations Above the Regulatory Standard
Marina-Ord Area				
DDW Wells				
Carbon Tetrachloride	0.5	µg/L	7	0
Trichloroethene (TCE)	5	µg/L	7	0
Corral de Tierra Area				
DDW Wells				
Aluminum	1000 (MCL) 200 (SMCL)	µg/L	3	0
Arsenic	10	µg/L	15	10
Chromium	50	µg/L	4	0
Foaming Agents (MBAS)	0	mg/L	2	0
Iron	300	µg/L	9	4
Manganese	50	µg/L	8	5
Radium 226 + Radium 228	5	pCi/L	3	0
Specific Conductance	1600	µmhos/cm	2	0
Total Dissolved Solids	1000	mg/L	3	0
Zinc	5	mg/L	3	0
ILRP On-Farm Domestic Wells				
Specific Conductance	1600	µmhos/cm	4	0
Total Dissolved Solids	1000	mg/L	0	0

Abbreviations:
mg/L = milligram per liter
µg/L = microgram per liter
µmhos/cm = micromhos per centimeter

4.6 Land Subsidence

Land subsidence is measured using InSAR data. This data is provided by DWR on the SGMA data viewer portal (DWR, 2023b). Figure 4-39 shows the annual subsidence for the Subbasin from October 2023 to October 2024. Data continue to show negligible subsidence. All land movement was within the estimated measurement error 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

No Data

Abbreviations

ft/yr = foot per year

Notes

1. All locations are approximate.
2. This figure shows the annual land subsidence rate between October of 2023 and October of 2024.

Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 23 March 2025.
2. InSAR subsidence data, "SAR\Vertical_Displacement_TRE_ALTAMIRA_Annual_Rate_20231001_20241001 (ImageServer)." Created by DWR and obtained from ArcGIS REST Services Directory.

Estimated InSAR Subsidence WY 2024

Monterey Subbasin
WY 2024 Annual Report
March 2025

Figure 4-39

Path: X:\B60094\Maps\2025\03\Fig4-39_InSARSubsidence.mxd

4.7 Interconnected Surface Water

4.7.1 Marina-Ord Area

As described in the Monterey GSP, the MT for the depletion of ISW due to pumping is set to the minimum shallow groundwater elevations historically observed between 1995 and 2015 near locations of ISW. As shown in Table 4-7, the groundwater elevation at the RMS during Fall 2024 and Spring 2024 remained higher than its representative MT and MO.

Table 4-7. Marina-Ord Area Interconnected Surface Water Representative Monitoring Sites

Site Name	Aquifer	Collection Agency	Fall 2024	Spring 2024	MT	MO
Marina-Ord Area						
MW-BW-82-A	Dune Sand Aquifer	U.S. Army	12.1	11.3	7.9	7.9

4.7.2 Corral de Tierra Area

During WY 2024, SVBGSA installed one new shallow well along El Toro Creek off Portola Road. The well was screened to capture groundwater levels high enough to be potentially interconnected with surface water. Groundwater elevation measurements were attempted during well development but the well was dry, indicating lack of connection between surface water and groundwater at this time. Monitoring will continue in this well.[6] Once a water level transducer is installed, it will be monitored by MCWRA. A groundwater elevation measurement record is necessary to establish SMC appropriately; therefore, SMC has not been set for this well.

[6] Per Title 23 CCR § 351[o], "Interconnected surface water refers to surface water that is hydrologically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted." The absence of groundwater within the dry well indicates that currently there is not a continuous saturated zone that hydrologically connects the overlying surface water to groundwater in the underlying aquifer. The well will continue to be monitored to see if a continuous saturated zone develops during other seasons or wetter years.

5 ANNUAL PROGRESS TOWARDS IMPLEMENTATION OF THE MONTEREY GSP

5.1 Sustainable Management Criteria

The Monterey GSP includes descriptions of significant and unreasonable conditions, MTs, IMs, MOs, and URs for DWR's six sustainability indicators. The MCWDGSA and SVBGSA determined locally defined significant and unreasonable conditions based on public meetings and staff discussions. The quantitative SMCs were developed to reflect the significant and unreasonable conditions and the Subbasin's sustainability goal. The SMCs are individual criterion that will need to be met simultaneously for all Sustainability Indicators. 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 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 GSA'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.

5.1.1 Chronic Lowering of Groundwater Levels

Table 5-1 compares Fall 2024 groundwater elevations to MTs, MOs, and interim milestone in 5 years after GSP implementation (IM5s) 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.

Since completion of the WY 2023 annual report, the following changes were made to the groundwater elevation RMS network:

- MPWMD#FO-10S and MPWMD#FO-10D have been removed as recent hydraulic testing found that the screens of these nested wells are hydraulically connected across the well bore and, as such, groundwater levels from these wells do not reflect the water level of the screened aquifer.

Additionally, the following changes were made since the completion of the Monterey GSP:

- MW-02-13-180M, MW-12-07-180, MP-BW-42-295, MP-BW-50-289 have been replaced by other existing U.S. Army wells, EW-12-04-180M, MW-02-06-180, MP-BW-42-345, and MP-BW-50-339, respectively, because the wells are either decommissioned by the U.S. Army or no longer on the Army's monitoring program.
- MW-12-12-180L was decommissioned by the U.S. Army and removed from the monitoring network. No other U.S. Army wells exist in its vicinity.
- 16S/02E-03H02 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.
- 15S/03E-20R50 has been removed because it is outside of the Monterey Subbasin.

The groundwater elevation monitoring network currently consists of 32 RMSs in the Marina-Ord Area and 11 RMSs in the Corral de Tierra Area.

Fall groundwater elevation data are color-coded on Table 5-1: 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 2024	MT	MO	IM5
Marina-Ord Area						
MW-BW-28-A	Dune Sand Aquifer	U.S. Army	64.5	63.7	70.3	70.3
MW-BW-49-A	Dune Sand Aquifer	U.S. Army	12.5	8.9	11.3	11.3
MW-BW-81-A	Dune Sand Aquifer	U.S. Army	13.2	8.2	10	10
MW-BW-82-A	Dune Sand Aquifer	U.S. Army	12.1	7.9	9.5	9.5
MW-OU2-13-A	Dune Sand Aquifer	U.S. Army	88.3	89.6	94.4	94.4
MW-OU2-32-A	Dune Sand Aquifer	U.S. Army	8.4	7.2	8.1	8.1
MW-OU2-34-A	Dune Sand Aquifer	U.S. Army	7.8	4.7	6.6	6.6
CDM MW-1 Beach	Upper 180-Foot Aquifer (a)	Seaside Basin Water Master	4.2	3.3	3.3	3.3
MW-02-05-180	Upper 180-Foot Aquifer (a)	U.S. Army	7.3	6.5	8.4	8.4
MW-02-10-180	Upper 180-Foot Aquifer (a)	U.S. Army	7.3	6.5	7.3	7.3
EW-12-04-180M	Upper 180-Foot Aquifer (a)	U.S. Army	6.7	6	6.5	6.5
MW-02-13-180U	Upper 180-Foot Aquifer (a)	U.S. Army	7.4	6.8	7.3	7.3
MW-02-06-180	Upper 180-Foot Aquifer (a)	U.S. Army	6.8	6.1	7.3	7.3
MW-B-05-180	Upper 180-Foot Aquifer (a)	U.S. Army	-1.8	-8	-3.4	-3.4
MW-BW-55-180	Upper 180-Foot Aquifer (a)	U.S. Army	-3.2	-6.4	-5.7	-5.7
MW-OU2-29-180	Upper 180-Foot Aquifer (a)	U.S. Army	-4.7	-9	-7.2	-7.2
MP-BW-42-345	Lower 180-Foot Aquifer (a)	U.S. Army	-4.6	-10.4	-7.9	-7.9
MW-BW-04-180	Lower 180-Foot Aquifer (a)	U.S. Army	-11.5	-11	-11	-11.0
MW-OU2-66-180	Lower 180-Foot Aquifer (a)	U.S. Army	-5.5	-10	-9.2	-9.2
TEST2	Lower 180-Foot Aquifer (a)	U.S. Army	-4.6	-11.9	-10.6	-10.6
MP-BW-50-339	Lower 180-Foot, 400-Foot Aquifer (a)	U.S. Army	-6.1	-8.5	-7.1	-7.1
MPWMD#FO-11S	400-Foot Aquifer	Seaside Basin Water Master	-33.7	-25.9	-6.4	-44.4
MW-OU2-07-400	400-Foot Aquifer	Fort Ord	-2.2	-6.6	-4.2	-4.2
014S001E24L002M	Deep Aquifers	USGS	-28.0	-29.6	-20.8	-34.9
014S001E24L003M	Deep Aquifers	USGS	-11.3	-6.8	3.5	-18.9
014S001E24L004M	Deep Aquifers	USGS	-28.9	-34.7	-21.1	-41.6
014S001E24L005M	Deep Aquifers	USGS	-25.1	-26.6	-6	-39.7
14S02E33E01	Deep Aquifers	MCWRA	-53.6	-43.8	-29.3	-69.9
14S02E33E02	Deep Aquifers	MCWRA	-20.7	-21.1	-13.9	-22.6
PZ-FO-32-910	Deep Aquifers	MCWRA	-55.0	-44.1	-19.7	-65.6

Site Name	Aquifer	Collection Agency	Fall 2024	MT	MO	IM5
MPWMD#FO-11D	Deep Aquifers	Seaside Basin Water Master	-13.7	-4.8	3.3	-15.7
Sentinel MW #1	Deep Aquifers	Seaside Basin Water Master	-25.9	-25.4	-18.8	-37.8
Corral de Tierra Area						
15S/02E-25C01	El Toro Primary Aquifer System	MCWRA	23.0	23	33	21
15S/03E-18P01	El Toro Primary Aquifer System	MCWRA	(c)	-46.4	-28.4	-53
16S/02E-01M01	El Toro Primary Aquifer System	MCWRA	315.4	291.5	301.5	295.3
16S/02E-02G01	El Toro Primary Aquifer System	MCWRA	298.1	294.9	304.9	299.2
16S/02E-02H01	El Toro Primary Aquifer System	MCWRA	304.2	278.9	288.9	282
16S/02E-03A01	El Toro Primary Aquifer System	MCWRA	207.9	227	232	188
16S/02E-03F50	El Toro Primary Aquifer System	MCWRA	226.1	220.7	225.7	211
16S/02E-03H01	El Toro Primary Aquifer System	MCWRA	175.7	210.1	220.1	213.6
16S/02E-03J50	El Toro Primary Aquifer System	MCWRA	217.2	193.3	210.1	210.1
Robley Deep (South)	El Toro Primary Aquifer System	MCWRA	168.5	169.8	183.5	160.5
Robley Shallow (North)	El Toro Primary Aquifer System	MCWRA	245.1	245.2	255.2	230.7

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) 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.

(c) 15S/03E-18P01 is not sampled for Fall 2024 water level.

5.1.1.1 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 2024, one well in the Dune Sand Aquifer, two wells in the lower 180-Foot and 400-Foot Aquifers, five wells in the Deep Aquifers, and four wells in the El Toro Primary Aquifer System exceeded their MTs, as indicated by the orange cells.

5.1.1.2 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. Five RMS wells in the Dune Sand Aquifer, seven in the upper 180-Foot Aquifer, four in the lower 180-Foot and one in 400-Foot Aquifer, and four in the El Toro Primary Aquifer System had groundwater elevations higher than their MO in WY 2024, 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 MCWDGSA and SVBGSA set IMs at 5-year intervals. The 2027 IM (IM5) for groundwater elevations are also shown in Table 5-1. The WY 2024 groundwater elevations in 28 wells are higher than the 2027 IMs[7].

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.

5.1.1.3 <u>Undesirable Result</u>

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
c) the Deep Aquifers, or
d) the El Toro Primary Aquifer System.

<u>Marina-Ord Area</u>

Dune Sand Aquifer and Upper 180-Foot Aquifer

- One RMS well in the Dune Sand Aquifer, out of 16 RMS wells that screened the Dune Sand and upper 180-Foot Aquifers, exceeded its MT, which represents 6% of the total RMS wells in the Dune Sand and upper 180-Foot Aquifers.

[7] 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.

Lower 180-Foot and 400-Foot Aquifer

- Two out of seven RMS wells, that screen the lower 180-Foot and 400-Foot Aquifers exceeded their MTs, which represents 28% of the total RMS wells in the lower 180- and 400-Foot aquifers.

Deep Aquifers

- Five out of nine RMS wells that screen the Deep Aquifers exceeded their MTs, which represents 56% of the total RMS wells in the Deep Aquifers.

Corral de Tierra Area

- Four out of 11 RMS wells, or 36%, that screen the El Toro Primary Aquifer exceeded their MTs.

The WY 2024 conditions in the lower 180-Foot and 400-Foot Aquifer, Deep Aquifers, and 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.

5.1.2 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 2024, and therefore, by definition, it constitutes an UR for reduction in groundwater storage.

5.1.3 Seawater Intrusion

Section 4.4 above discusses WY 2024 seawater intrusion monitoring in RMS and non-RMS wells of the seawater intrusion monitoring network. The seawater intrusion MT and MO chloride isocontour line in the Monterey Subbasin is defined as

- *Approximately 3,500 feet from the coast in the Dune Sand Aquifer, upper 180-Foot Aquifer and Deep Aquifers. This distance is generally consistent with the location of Highway 1 in the Monterey Subbasin and seaward of groundwater extraction in the Subbasin; and*

- *The approximate location in 2015 of the 500 mg/L chloride concentration isocontour in the lower 180-Foot and 400-Foot Aquifers.*

As shown in Section 4.4, as of WY 2024, no wells inland of the seawater intrusion minimum threshold isocontour line in each aquifer exceeded the threshold defined in the Monterey GSP at 500 mg/L of chloride or, if chloride data is unavailable, 1,250 mg/L of TDS, which is used as a surrogate where chloride data are unavailable. The most recent Fall 2024 chloride concentrations at MP-BW-42-345 in the Lower 180-Foot/400-Foot Aquifer were close to but below the 500 mg/L threshold. As such, it does not currently constitute an exceedance of the MT.

The seawater intrusion UR in the Subbasin is defined as any exceedance of the minimum threshold. The WY 2024 conditions as described above do not constitute a seawater intrusion UR per the Monterey GSP.

5.1.4 Water Quality

The water quality MTs are set at no additional wells with COC concentrations above the regulatory standard for each constituent, above those that existed in 2019. The MT for each COC is provided in Table 5-2. Based on the additional ILRP data provided by CCRWQCB, the ILRP COCs were reevaluated. No MTs for the ILRP wells need to be revised. Table 5-2 also shows (1) the wells sampled in WY 2024 that had higher concentrations than the regulatory standard and (2) the total number of wells that have had higher concentrations than the regulatory standard in its most recent sample, and (3) the number of wells that exceeded the MT based on most recent results.

The water quality MTs represent conditions that 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) 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 2024, there were three 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 that the number of wells with COC concentrations above the regulatory limit is now lower than the number the wells with COC concentrations above the regulatory limit in 2019.

Table 5-2. Water Quality Exceedances in WY 2024

Constituent of Concern (COC)	Minimum Threshold/ Measurable Objective (Baseline number of wells with COC concentrations above the regulatory standard in 2019) (b)	Number of Wells Sampled in WY 2024 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				
Aluminum	0	0	0	0
Arsenic	10	10	12	2
Chromium	1	0	0	-1
Foaming Agents (MBAS)	3	0	0	-3
Iron	10	4	11	1
Manganese	11	5	11	0
Radium 226 + Radium 228	0	0	1	1
Specific Conductivity	1	0	1	0
Total Dissolved Solids	1	0	0	-1
Zinc	1	0	0	-1
ILRP On-Farm Domestic Wells				
Specific Conductance	0	0	0	0
Total Dissolved Solids	1	0	1	0

Notes:

(a) highlighted cells indicate the exceedance of MT.

(b) 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.

5.1.5 Land Subsidence

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 measurement 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 2023 to October 2024 demonstrated land subsidence of less than 0.1 feet/year, as shown on Figure 4-39.. Therefore, the land subsidence IM and MO are being met, and the Subbasin has not experienced a land subsidence UR.

5.1.6 Interconnected Surface Water

Groundwater elevation is used as a proxy in ISW RMS wells to monitor the potential depletion of ISW due to pumping and the health of GDEs located near the City of Marina. As shown in Section 4.7, groundwater elevation in Fall 2024 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.

5.2 GSP Implementation Activities

Groundwater management activities that occurred in WY 2024 associated with GSP implementation are detailed in this section. These include the activities of MCWDGSA and SVBGSA, and partners that promote groundwater sustainability and are important for reaching the sustainability goal defined in the Monterey GSP. MCWDGSA and SVBGSA continued to strengthen their collaboration throughout WY 2023 with regular meetings on planning and implementing the Monterey GSP.

This section reports on activities conducted throughout WY 2024 to the end of calendar year 2024 (i.e., October 2022 to December 2024) with the entire period referred to as 2024. Sections are included for each of the following four categories of activities:

- General Administration
- Interested Parties Coordination and Outreach
- Data Expansion and SGMA Compliance
- Projects and Management Actions

In addition, plan implementation activities for the upcoming water year are discussed with their specific work streams within each category. Progress on individual tasks and planned activities within each category are summarized in Table 5-3 through Table 5-7. The tasks carried out by SVBGSA align with the tasks identified in the SVBGSA Work Plan.

In addition, the Subbasin GSAs' progress towards addressing DWR Recommended Corrective Actions on the Monterey Subbasin GSP is described in the Data Expansion and SGMA Compliance section (Section 5.2.3). Progress on DWR's Recommended Corrective Actions is summarized in Table 5-6.

5.2.1 General Administration

Progress on general administration tasks and planned activities are described below and summarized in Table 5-3.

5.2.1.1 MCWDGSA and SVBGSA Common Activities

MCWD, acting as the grantee, entered into agreement for the Sustainable Groundwater Management Round 2 Implementation Grant for GSP implementation activities in the Monterey Subbasin on January 25, 2024. MCWD and SVBGSA entered into a sub-agreement for SVBGSA implementation of the Grant. The award included funding for

- **Data expansion and SGMA compliance**: installation of monitoring wells and data collection to address data gaps identified in the Monterey GSP; update of the HCM with the data collected in preparation of the 5-year GSP periodic evaluation; and refining representation of the Subbasin in the regional SVIHM and Seawater Intrusion Model.
- **Project Update Report**: development of Deep Aquifers management options building upon findings of the Deep Aquifers Study; further assessment of multi-regional project scenarios and impacts on the Monterey Subbasin, building upon the feasibility studies described in Section 5.2.4.
- **Corral de Tierra engagement of interested parties and domestic well owners**: interested party engagement and outreach to underrepresented communities and domestic well owners in the Corral de Tierra Area; and coordination with the Water Quality Coordination Group, Land Use Jurisdiction Coordination Program, and other partner agencies.

During the reporting period, MCWDGSA and SVBGSA carried out implementation activities pursuant to the agreement and conducted grant administrative activities.

5.2.1.2 MCWDGSA Administration

The MCWDGSA continued general administrative tasks associated with the Board, the MCWDGSA/SVBGSA steering committee (described further in Section 5.2.2.1), communications, and collaboration with partner GSAs.

During the reporting period, MCWD recruited two new staff to support water management responsibilities of the District and the GSA to a total of three staff under the supervision of the Water Resources Manager. The positions include

- Water Resources Technician - supports the District's water conservation and resource management efforts, including conducting water audits, analyzing water use data, and providing customer consultations on conservation methods, preparing reports, and supporting grant applications.
- Water Resources Assistant Engineer - The Assistant Water Resources Engineer assists in planning, designing, and analyzing water resource projects, including groundwater management, stormwater systems, and water conservation programs.

The continued addition of staff supports MCWD's water resources planning and MCWDGSA's groundwater management efforts and meets the needs of the expanding SGMA monitoring program as described in Section 5.2.3.2.

In April 2024, the District completed a Water, Wastewater, and Recycled Water Rate Study to evaluate its operational and facility requirements for the next five years. As part of this study, the District accounted for operations of the MCWDGSA and incorporated its financial needs into the rate structure. During the reporting period, MCWDGSA also assessed its groundwater monitoring infrastructure and developed a Capital Improvement Project to expand its monitoring network.

MCWDGSA is in the process of expanding its regulatory mechanisms in complying with SGMA, focusing on developing a series of GSA ordinances to support effective groundwater management.

5.2.1.3 SVBGSA Administration

SVBGSA carried out general administrative activities in support of SGMA compliance, data expansion communications and outreach, and assessment of projects and management actions. SVBGSA has a contract with Regional Government Services (RGS), which provides administrative and financial staffing services. In addition to managing a range of governance, financial, and communication activities, a special effort was put into administrative process improvements and board development.

From October 2023 to December 2024, in alignment with the SVBGSA work plan, 13 Board of Directors (BOD) meetings and multiple Board committee meetings, including 5 Executive Committee and 8 Budget Finance Committee meetings, were conducted to ensure effective decision-making and oversight.

Grant administration remained a key focus, with management of the SGM Round 2 Implementation Grant for the Salinas Valley underway. A Groundwater Sustainability Fee 5-year evaluation by Hansford Economic Consulting was initiated, including stakeholder input through Advisory Committee (AC) and Board meetings. The work commenced in April 2024 and concluded in Fall 2024, with potential recommendations for fee changes implemented in fiscal year (FY) 2026.

Financial oversight and budget preparation were enhanced through a revised format for budget and financial reports, introduced in October 2023. The FY 2025 work plan, approved in March 2024, comprised greater detail and included projections for FY 2026-FY 2027. Additionally, the Board approved three new financial policies, revisions to one existing policy, and a comprehensive Bylaws amendment that included an addition of a Code of Conduct.

The Subbasin Implementation Committees Membership Program was developed, establishing guidelines for selecting and appointing members to the SVBGSA Subbasin Implementation Committees, followed by a successful solicitation of committee members for the next 2-year term.

Multiple administrative improvements were actively pursued, including an assessment of clerical tasks and staffing support. A Board ad-hoc committee was formed to evaluate services provided by RGS and conduct a performance review of General Manager in August and September 2024.

Board development initiatives included a governance training session in June 2024 and the establishment of an online resource library for board members.

Overall, these accomplishments reflect a commitment to strong governance, financial responsibility, and transparent communication in support of the agency's strategic goals.

Progress according to individual General Administrative tasks within the work plan are summarized in Table 5-3 through Table 5-7.

Table 5-3. Progress on General Administrative Tasks as of December 2024

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments
MCWDGSA and SVBGSA Common Activities						
Grant Administration	SGM Round 2 Implementation Grant Administration			x		MCWDGSA grant administration as the grantee with SVBGSA support
Board and Committee Activities	MCWDGSA/SVBGSA Technical and Steering Committee			x		Regularly occurring Technical Committee and quarterly Steering Committee meetings; the Steering Committee met 3 times during the reporting period
MCWDGSA Administrative Activities						
Board and Committee Activities	Board of Directors			x		Ongoing; the MCWDGSA Board of Directors meets monthly
Staff Expansion	Hiring of two additional water resources staff				x	Water Resources Technician and Water Resources Engineer
Grant Administration	SGM Round 2 Implementation Grant Administration			x		Serving as the grantee for the Monterey Subbasin in addition to administering grant-related work efforts in the Marina-Ord Area
Rate Study	Include MCWDGSA operations in the District’s 2024 comprehensive rate study				x	

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments
Infrastructure Assessment	Assess facilities and develop Capital Improvement Projects for the GSA				x	
Policy Development	Develop GSA ordinances to expand regulatory mechanisms			x		
SVBGSA Administrative Activities						
Organize and Conduct Agency Board and Committee Activities	Manage Board of Directors (BOD, or Board), Executive Committee, Budget and Finance Committee activities			x		Ongoing; the Board of Directors meets monthly; the Board met 13 times, Executive Committee met 5 times, and the Budget and Finance Committee met 8 times.
Prepare Regulatory Fee Study Update	Develop scope of work. timeline and process				x	Joint Advisory Committee and Board meeting to provide input for scope held in October, survey conducted and shared with AC in December, Board made a final decision in January 2024. Agreement with HEC executed in March 2024.
	Conduct Sustainable Groundwater Fee 5-Yr Evaluation and prepare memorandum. Manage the process, outreach and implementation			x		Technical Memorandum by HEC accepted by the Board in Nov 2024. Advisory Committee developed a recommendation for the Board in regard to implementing the Fee changes in FY 2026. Decision on which recommendations to implement anticipated to be made in Spring 2025.

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments
Manage Budget Preparation and Financial Reporting	Improve the format and process for financial reports			x		New budget and financial report format developed in October. Bi-monthly financial reports produced going forward. Continuing to assess and include enhancements for greater transparency
	Prepare work plan and annual draft budget		x			FY 2026 work plan to be prepared for Board review in Feb/Mar 2025.

5.2.2 Coordination and Engagement

The Subbasin GSAs coordinated regularly through staff and consultant meetings during the reporting period. Additionally, they coordinated and engaged with stakeholders and agencies in their respective Management Areas described below. Progress on individual Interested Parties and Outreach tasks and planned activities are summarized in Table 5-4.

5.2.2.1 MCWDGSA and SVBGSA Coordination

The Subbasin GSAs' staff and consultants continued to meet regularly during 2024 through the Technical Committee to coordinate implementation activities including data management, monitoring, model development, funding and grant applications, and P&MA development. The MCWDGSA/SVBGSA Technical Committee was established in the 2018 Framework Agreement and includes staff and technical consultants from the two agencies.

The MCWDGSA/SVBGSA Steering Committee continued to meet on a quarterly schedule during 2024. The MCWDGSA/SVBGSA Steering Committee was established in the 2018 Framework Agreement between the two agencies and consists of the General Managers and one board member from each agency. The Steering Committee met four times during 2024.

5.2.2.2 MCWDGSA Activities

The MCWDGSA practices stakeholder engagement through its GSA website (http://mcwd.org/) and public meetings. During the reporting period, MCWDGSA held Board of Director public meetings coincidentally with MCWD Board meetings on the third Monday of every month. The GSA will continue to meet regularly in WY 2024.

MCWDGSA participates in regular intra- and inter-basin coordination by being a member of the SVBGSA Advisory Committee, Monterey Subbasin Implementation Committee, Seaside Watermaster Technical Advisory Committee (TAC), Pure Water Monterey Coordination and Management Committee, MCWRA Basin Management Advisory Committee, and MCWRA Reservoir Operations Advisory Committee. Its consultant, EKI Environment & Water, serves on the SVBGSA Groundwater Technical Advisory Committee.

Additionally, MCWDGSA held as-needed meetings with individual stakeholders and agencies to coordinate.

- During 2024, MCWDGSA aimed to establish regular point of contacts with the Seaside Watermaster, Monterey Peninsula Water Management District (MPWMD), MCWRA, and the U.S. Army regarding data sharing, access to monitoring wells, and coordinated monitoring within the Monterey Subbasin and adjacent Subbasins.
- Because the Marina Ord Area's monitoring network consists largely of wells not owned by MCWD, the District has been gaining permission from these agencies to initiate its own groundwater elevation monitoring program.

5.2.2.3 SVBGSA Activities

During 2024, SVBGSA continued to coordinate with partner agencies, conduct extensive engagement of stakeholders, and outreach on groundwater and SGMA activities. The Monterey Subbasin Implementation Committee met 5 times during the year.

Staff of SVBGSA had frequent discussions with MCWDGSA and MCWRA counterparts ensuring the alignment between these organizations. SVBGSA and MCWRA continued to strengthen collaboration further, particularly with monitoring and data activities and the tasks under the Round 1 and Round 2 SGM Implementation Grants. SVBGSA also held other ongoing meetings with Monterey County Environmental Health Bureau, land use jurisdictions, and Preservation, Inc., who assists growers with Irrigated Lands Regulatory Program compliance.

Conducting periodic outreach with small water systems, domestic well owners, Disadvantaged Communities (DACs), growers not currently involved, and other stakeholders on topics such as groundwater, SGMA, and SVBGSA remains a challenge, given such a diverse audience and the complexity of the issues. SVBGSA worked with Miller Maxfield, a local communications firm, to develop a communication strategy to expand the reach and enhance the narrative. Miller Maxfield assisted with improving the website, preparing outreach materials, and utilizing social media to effectively engage more people. SVBGSA actively participated in the Water Awareness Committee to disseminate information and resources about SVBGSA, groundwater management, and domestic water use efficiencies. This included, among other things, having a booth at the Monterey County Fair with other WAC member agencies.

As part of SVBGSA efforts on advancing the demand management dialogue, 5 workshops titled "Our Water Future in the Salinas Valley" were held in Spring 2024 at different locations in the Salinas Valley. These workshops, jointly planned and executed by Dave Ceppos, Miller Maxfield, and Montgomery & Associates, were widely advertised and geared toward the general public. Along with presentations by guest speakers and having lively discussions with them, participants engaged in a water management exercise to illustrate key concepts. For these events, the Marcom Awards honored Miller Maxfield and SVBGSA with Gold in Public Relations: Special Event 2024 recognition.

Progress on individual Interested Parties and Outreach tasks within the work plan are summarized in Table 5-4.

Table 5-4. Progress on Interested Parties Coordination and Outreach as of December 2024

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments (includes meetings from October 2023 to December 2024)
MCWDGSA and SVBGSA Coordination Activities						
Inter-basin Coordination	Technical Committee			x		Regularly occurring Technical Committee meetings between staff and consultants and as-needed communications
	Steering Committee			x		Quarterly Steering Committee meetings; the Steering Committee met 4 times
MCWDGSA Coordination and Outreach Activities						
Agency Committees and Meetings	Seaside Watermaster Technical Advisory Committee			x		Participates in the Seaside Watermaster TAC and TAC meetings
	SVBGSA Advisory Committee			x		Participates in the SVBGSA AC and AC meetings
	Subbasin Implementation Committees: Monterey (Corral de Tierra Management Area)			x		District staff currently serves as the chair of the committee and participates in committee meetings
	MCWRA Basin Management Advisory Committee and Reservoir Operation Advisory Committee			x		District staff participate in MCWRA committee meetings

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments (includes meetings from October 2023 to December 2024)
	Pure Water Monterey Coordination and Management Committee					District staff participates in committee meetings and activities to coordinate advanced treated water planning and delivery
	Groundwater Technical Advisory Committee			x		Consultant participates in GTAC meetings to review and provide input on Deep Aquifer management, Seawater Intrusion Model, and regional projects planning
Individual Stakeholder Coordination	Seaside Watermaster, MPWMD, MCWRA, M1W, and the U.S. Army			x		Staff and consultants held as-needed meetings with individual stakeholders and agencies to coordinate specific work efforts
SVBGSA Coordination and Outreach Activities						
Utilize SVBGSA Committees and Partnerships for informing constituents	Host Advisory Committee			x		AC meets bi-monthly or as needed to provide community input to the BOD; held 7 AC meetings
	Host Subbasin Implementation Committees			x		Held 7 Monterey Subbasin Committee meetings
	Host Groundwater Technical Advisory Committee			x		Meets as needed; held 5 GTAC meetings
	Coordinate meetings with partner agencies: MCWRA, M1W, MCWD GSA, ASGSA, MCEHB, Water Quality Coordination Group, Land Use Coordination Group			x		Regularly met with partner agencies regularly for general coordination and on specific work streams.
	Develop scientific communication materials and outreach materials for events			x		In partnership with Miller Maxfield, developed materials for County Fair and North Monterey County Community Resource Festival

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments (includes meetings from October 2023 to December 2024)
Engage with Underrepresented and Disadvantaged Communities	Review 2020 DAC engagement strategy and develop implementation plan through 2027		x			Developing implementation plan in support of SGM Round 2 grant scope. Initiated planning for Water Leadership Institute with EDF and RCDMC
	Form AC DAC Working Group		x			Developing implementation plan in support of SGM Round 2 grant scope.
	Translation of SVBGSA website and key information			x		Activated translation feature on svbgsa.org
Enhance Partnerships with Domestic Well Owners	Support Dry Well Notification Program			x		Information about the Dry Well Notification Program distributed to interested parties and shared via social media channels
	Water Awareness Committee/ Conservation Communication			x		Staff participates and contributes to the WAC. Held booth at Monterey County Fair WAC Water Showcase on August 31, 2024.
	Domestic Well Owner Outreach/ Water Use Efficiency Resources		x			Planning for development of Rural Residents Water Efficiency Pilot Program

5.2.3 Data Expansion and SGMA Compliance

During 2024, the Subbasin GSAs continued their momentum in filling data gaps, expanding the monitoring networks, and groundwater modeling. The GSAs completed or are concluding multi-year efforts such as the Deep Aquifer Study, HCM update, refinement of the Seawater Intrusion Model (SWI Model), and providing a solid basis for planning projects and management actions. Progress on individual Data Expansion and SGMA Compliance tasks and planned activities are summarized in Table 5-5.

5.2.3.1 MCWDGSA and SVBGSA Common Activities

The Subbasin GSAs and partner agencies carried out data expansion and groundwater modeling tasks identified in the Monterey Subbasin GSP and the SGM Round 2 Implementation Grant. Monterey Subbasin GSP Implementation Actions are noted with "I#" action numbers below.

- I1 – Support 180/400-Foot Aquifer Subbasin GSP Implementation: MCWDGSA continues the support of SGMA implementation in the adjacent 180/400 Subbasin and Seaside Subbasin Actions. During the reporting period, SVBGSA developed the 180/400 Subbasin GSP 2025 Periodic Evaluation and submitted it to DWR on January 21, 2025. The collaborative data expansion and groundwater modeling efforts described herein were incorporated into the 180/400 Subbasin GSP 2025 Periodic Evaluation. MCWDGSA and its technical consultants also provided direct input through the MCWDGSA/SVBGSA Technical Committee.
- I2 – Deep Aquifers Investigation: The Salinas Valley Deep Aquifers 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.

  After conducting the Groundwater Technical Advisory Committee review process, Montgomery & Associates finalized the Salinas Valley Deep Aquifers Study in April 2024. MCWDGSA supported the Deep Aquifers Study by being a funding partner and collaborating on technical input. The MCWD Board and SVBGSA Board received the final Deep Aquifers Study in May 2024.
- I5 – Groundwater Technical Advisory Committee, formerly the Seawater Intrusion Working Group (SWIG): The GTAC was formed in late 2022 by the SVBGSA and is an ad hoc committee comprised of third-party experts that represent stakeholders within the Salinas Valley Groundwater Basin. These experts have expertise in hydrology, hydrogeology, hydrological modeling, civil engineering, or related fields. The GTAC continues the responsibilities of the former SWIG TAC and is convened to provide technical input on multi-subbasin groundwater management strategies including

management of seawater intrusion and the Deep Aquifers. SVBGSA held 5 GTAC meetings between October 2023 and December 2024. Through GTAC activities, the Subbasin GSAs continued to work through technical review and feedback on (1) Deep Aquifer Study administrative draft report; (2) the SWI Model development and calibration; (3) regional projects feasibility studies and modeling of the regional projects (as discussed in Section 5.2.4); and (4) Salinas Valley HCM updates as discussed below.

- I6 – Future Modeling of Seawater Intrusion and Projects: In 2024, MCWDGSA and SVBGSA began performing a coordinated round of updates to the SWI Model in attempts to improve its representation of local hydrogeology and calibration to historical water level and chloride conditions within the Monterey Subbasin. These modifications are being conjunctively completed by MCWDGSA and SVBGSA's technical consultants, and include the following specific efforts:
    - Revising SWI Model layering within the coastal Monterey, Seaside and 180/400 Subbasins to better reflect the geometry and thickness of principal aquifer and aquitard units based on recent geophysical surveys completed by DWR, MCWD, and SVBGSA and the results of the Deep Aquifer Study (SVBGSA, 2024);
    - Revising SWI Model recharge rates within the Dune Sands surficial soils complex to better reflect estimated recharge rates from prior studies and included in the Monterey Subbasin GSP and accompanying Monterey Subbasin Groundwater Flow Model (MBGWFM);
    - Revising SWI Model parameterization of aquifer properties to improve model calibration to historical water level and chloride concentrations observed throughout the Monterey, Seaside and 180/400 Subbasins; and
    - Improving the representation of the ocean boundary;
    - Revising SWI Model assumptions and inputs for the Baseline future (50-year) predictive model scenario for which various regional SGMA implementation alternatives will be evaluated.

These updates are still ongoing. Specifically, as part of WY 2025 SGMA implementation efforts, both MCWDGSA and SVBGSA are undergoing a subsequent round of revisions to both the SWI Model and the USGS Salinas Valley Integrated Hydrologic Model (SVIHM) to further improve their consistency and performance in specific subareas and aquifers, including (1) within the coastal Dune Sands and 180-Foot Aquifers of the Monterey Subbasin; (2) within the Corral de Tierra area of the Monterey Subbasin; and (3) within the entirety of the Deep Aquifers across Salinas Valley Basin.

The SWI Model is a publicly available tool to estimate the effects of projects and management actions on seawater intrusion, and the version as of fall 2024 was used for the 180/400 Subbasin feasibility studies. It is anticipated that the SVIHM will ultimately be used to estimate water budgets and cross-boundary flows between basins within the greater Salinas Valley Basin. However, the SVIHM is poorly calibrated in the Monterey Subbasin and is yet to be publicly released by the USGS. The public release of the Valley-wide model is now anticipated in early 2025, after which it will be recalibrated in the Monterey Subbasin.

- Salinas Valley HCM Update**:** In preparation for the GSP 2027 Evaluation and groundwater flow model updates, MCWDGSA and SVBGSA updated the Monterey Subbasin HCM. Based on new information that has become available since the development of the GSP, such as the AEM data, priorities were identified to adjust the conceptualization according to the new data and, if needed, new analyses, such as refining the aquifer and aquitard extents, as described in Section 3.1 above. The data, methods, and key findings are summarized in Appendix A, and they were used to adjust groundwater flow model layering in the SWI Model.

The Subbasin GSAs conducted SGMA compliance activities including preparation of annual reports and addressing the recommended corrective actions of the 2022 Monterey Subbasin GSP. The Work Plan and progress towards addressing the RCAs is summarized in Table 5-6, and was detailed in the WY 2023 Annual Report.

- Groundwater Dependent Ecosystem Workgroup: The GDE Working Group continued providing input to SVBGSA and the Central Coast Wetlands Group (CCWG) about the methodology to identify GDEs and an approach to monitor and assess impacts to GDE health. CCWG completed a GDE identification and GDE Monitoring Standard Operating Procedure. MCWDGSA is actively participating in the GDE workgroup and the collaborative efforts related to GDE monitoring. This engagement allows MCWDGSA to align GDE monitoring methodologies with SVBGSA and other subbasins in the Salinas Valley.

5.2.3.2 MCWDGSA Activities

In addition to actively supporting the collaborative activities described above, MCWDGSA continued improving its monitoring network, addressing data gaps, and expanding data collection during WY 2024.

- Monitoring Network Expansion: During WY 2024, MCWDGSA completed the design of the new monitoring wells in the 400-Foot and Deep Aquifers in the Marina-Ord Area. One cluster of three monitoring wells is planned for the 4th Avenue location; another nested monitoring well with two screens is planned within the Ord area near the District's C2 Tank. During the reporting period, the District also worked on obtaining a use easement for construction of the C2 Tank wells and prepared technical specifications for bid solicitation in early 2025.

  The District identified inactive production wells and monitoring wells in the Marina-Ord Area. The District conducted condition assessments of old production wells (Well 1, Well 3, Well 4, and Well 8a) to assess whether any of them are suitable for rehabilitation into monitoring wells or are compromised and need to be destroyed. The District restarted collecting data from inactive monitoring wells on a regular basis as part of this monitoring plan.

- Groundwater Elevation Monitoring Program: MCWDGSA expanded its groundwater elevation program by establishing a schedule to collect groundwater elevation measurements from its inactive monitoring wells.

  MCWDGSA plans to install pressure transducers to a selected subset of monitoring wells and collect a higher resolution of groundwater data. In 2024, the GSA purchased transducers and installed them in the District's Watkin's Gate monitoring wells near MCWD-34, MCWD-1, MCWD-8a, and the Airport monitoring wells. MCWDGSA is also in conversations with local water management agencies regarding access and equipment installation in RMS wells owned by these agencies.

- Seawater Intrusion Monitoring Program**:** Building upon the collaborative workflow established in 2022 and 2023, MCWDGSA conducted two rounds of TDS sampling in the Ord area in 2024 (February and November 2024). In addition, the District continued conductivity profiling in deep wells and key monitoring wells and have started installing Aqua Troll 200 transducers that are placed in the screens of RMS wells for better tracking of seawater intrusion.

- Condition Assessment and Hydraulic Testing in FO-10 and FO-11**:** Groundwater elevations in monitoring well clusters MPWMD#FO-10 and MPWMD#FO-11, located in the southern Marina-Ord Area, have been declining consistently since the 2000s, even though there is no known groundwater extraction in the immediate vicinity of these wells. The Monterey GSP identified the cause of this groundwater depression as well as the connectivity between the 400-Foot and Deep Aquifers in the vicinity of these wells as a critical data gap. Questions have been raised by the Seaside Watermaster regarding the integrity of the FO-10 nested well cluster. A review of induction logging results from 2021 as well as original well construction field notes indicates that approximately 1,300 feet of 2-inch steel tremie pipe was abandoned in the annular space of the well during construction.

  To better assess the integrity of the wells, MCWDGSA obtained DWR technical support services (TSS) to video log the MPWMD#FO-10 and MPWMD#FO-11 clusters in October 2024. The video logs found that the FO-10D well is blocked at 285 ft, consistent with the finding of the steel tremie pipe in the well. Following the video assessment, the District conducted slug testing of the FO-10 wells screens to provide a semi-quantitative assessment of the well integrity, as described in Appendix E . The slug test indicated that there is direct hydraulic interconnection between the three screened zones, indicating that the annular seal is compromised. The well will be destroyed to prevent potential impairments to water quality; data from the well will be removed from evaluation of groundwater conditions; a new monitoring well cluster will be constructed to replace this RMS in a location that benefits both Monterey and Seaside Subbasins.

- Installation of Weather Stations**:** MCWDGSA installed and is operating three weather stations in the Marina-Ord area (near MCWD-12, MCWD-30, and the District's 4th Avenue Office) during the reporting period. Given that the Dune Sand Aquifer receives direct surficial recharge, it is important to quantify precipitation and understand the relationship between precipitation and recharge. These new weather stations will provide data to support groundwater recharge estimates through a soil-moisture balance method used in the Monterey Subbasin GSP water budget.
- Data Integration Platform Development: As the GSA's activities expand, new data is available from by various local water management agencies or vendor platforms that needs to be centralized. Additionally, the District requires the capability to run real-time analytics, generate operational and management reports, and communicate information to the public using interactive maps and visuals to enhance transparency and engagement. To navigate these complexities, the District identified the need to upgrade its existing data management system (DMS) into a data integration platform to address the District's evolving water management needs. In November 2024, the District initiated efforts to develop a customized Platform to better support ongoing, data-driven decision-making. The first phase, to be completed by mid-2025, includes establishing a functional prototype that documents system capabilities and serves as a foundation for further analytical and reporting needs.

Additional MCWDGSA SGMA compliance activities during 2024 included updating the Agency's Data Management System and submitting monitoring data to DWR.

5.2.3.3 SVBGSA Activities

Along with annual SGMA compliance tasks, SVBGSA and partner agencies focused heavily on filling data gaps and groundwater modeling this year to establish a solid basis for planning projects and management actions. Main workstreams included the following:

- Groundwater Monitoring Program (GMP) with Well Registration and GEMS Expansion**:** SVBGSA collaborated with MCWRA on the development of a Groundwater Monitoring Program. MCWRA adopted Ordinance 5246 in October 2024. The Ordinance updates the previous GEMS program, expands extraction reporting to the SVBGSA geographic boundaries, expands well registration to all wells, and shifts the extraction reporting timeline earlier to make data available for SGMA annual reports. MCWRA furthered the existing well registration program with desktop data collection to summarize the locations and depths of all wells with existing information from public records. The data will be used for outreach to well owners to register their wells. WY 24 extraction data was provided by MCWRA in time to be included in the WY 24 Annual Report.
- GDE Verification**:** The Groundwater Dependent Ecosystem Working Group continued providing input to SVBGSA and the Central Coast Wetlands Group about the methodology to identify GDEs and an approach to monitor and assess impacts to GDE health. CCWG

completed a GDE identification and GDE Monitoring Standard Operating Procedure. SVBGSA plans to conduct field reconnaissance to verify presence of GDEs in 2025.

- Monitoring Networks**:** During WY 2024, SVBGSA completed the design and installation of four new monitoring wells in the Corral de Tierra Management Area, funded by the SGM Round 2 Implementation Grant. These additional wells help fill the groundwater level and interconnected surface water monitoring network data gaps in the 2022 GSP.

Additional SGMA compliance activities during 2024 included updating SVBGSA's Data Management System and web map, submitting monitoring data to DWR, and completing annual reports.

Progress on individual Data Expansion and SGMA Compliance tasks within the work plan is summarized in Table 5-5, and progress on RCAs is summarized in Table 5-6.

Table 5-5. Progress on Data Expansion and SGMA Compliance as of December 2024

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments
MCWDGSA and SVBGSA Common Activities						
I2 - Conduct Deep Aquifer Study	Develop hydrogeologic conceptual model				x	GTAC provided input for HCM that is incorporated into Deep Aquifer Study made public in May 2024.
	Develop water budget				x	GTAC provided input for water budget that is incorporated into Deep Aquifer Study made public in May 2024.
	Develop management guidance				x	GTAC provided input for management guidance that is incorporated into Deep Aquifer Study made public in May 2024.
	Review by GTAC, finalize and present study				x	Administrative draft of the study completed in December 2023. Study completed in May 2024 and presented to agency boards in Summer/Fall 2024.
I6 - Assess and Refine Seawater Intrusion Model	Develop SWI Model and make initial GTAC recommended model refinements				x	SWI Model completed and revised in response to GTAC comments
	Additional SWI Model Updates			x		Model updates for feasibility study analyses completed. Additional model revisions in Monterey Subbasin to be coordinated with MCWDGSA in 2025.

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments
	Conduct model runs of multi-project scenarios in Monterey Subbasin	x				
Maintain, Enhance and Update Groundwater Models (Salinas Valley Integrated Hydrologic Model)	Provide USGS model oversight			x		Anticipate completion of Model in early 2025.
	Manage USGS Tech Services Agreement			x		SVBGSA fiscal contribution.
	Plan and implement groundwater model updates		x			Upon completion of the model updates, new versions will be used to evaluate P&MAs. To be led by SVBGSA and coordinated with MCWDGSA.
	Review/update completed model and prepare a summary report	x				
Prepare Hydrogeologic Conceptual Model for GSP 5-year Evaluation	Refine and incorporate new data into HCM for Monterey Subbasin				x	Refined HCM has been finished, presented to Monterey Committee. Documentation included as attachment to this annual report.
	Prepare valley-wide HCM			x		Refined HCMs will be incorporated into a valley-wide HCM.
Verify Groundwater Dependent Ecosystems	Develop methodology with CCWG				x	GDE Working Group convened seven times to provide CCWG and SVBGSA input. Additional subject matter experts were consulted for their input on the methodology. Methodology was presented at the June Advisory Committee meeting and summarized in the 180/400 GSP 2025 Evaluation.

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments
	Conduct field reconnaissance to verify presence in the Monterey Subbasin		x			Field reconnaissance planned for 2025.
Prepare Annual Reports	Gather input from Monterey Subbasin Implementation Committee			x		Input requested from implementation committee for WY 2024 conditions and narrative.
	Prepare, submit and present annual reports			x		EKI and M&A are working on preparing WY 2024 Annual Reports due to DWR by April 1.
	Provide options and recommendations for Annual Report process to SVBGSA BOD				x	SVBGSA informed BOD on the role of subbasin implementation committees in the preparation of annual reports
Semi-Annual Data Upload	Semi-annual groundwater elevation submittals to DWR pursuant to 23 CCR § 354.34(c)(1)(B) and § 354.40			x		
Address RCAs and Prepare 2025 Periodic Evaluation	Review RCAs and develop strategies for addressing them			x		RCAs and proposed strategies for addressing them were presented to the subbasin implementation committees for their review and input. Respective activities will be included in the Work Plans for FY 2025 and beyond.

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments
MCWDGSA Data Expansion and SGMA Compliance Activities						
Monitoring Network Expansion	New Monitoring Wells			x		See M4 under P&MAs
	Repurposing of Inactive Monitoring Wells			x		Established regular monitoring schedule for 10 previously inactive wells and conducted condition assessment for 4 wells
Groundwater Elevation Monitoring Program	Groundwater elevation monitoring in MCWD wells			x		Ongoing monthly measurements.
	Install pressure transducers			x		Installing transducers in a subset of monitoring wells. Ten transducers at five locations were installed in WY 2024. Data is available for six transducers for WY 2024.
Seawater Intrusion Monitoring Program	Salinity sampling from deep wells			x		Conducted two rounds of measurements within WY 2024.
	Coordinate sampling from Fort Ord wells			x		Conducted two rounds of sampling in WY 2024.
	Induction logging		x			MCWDGSA is reviewing past induction logging data to plan for induction logging from Deep Aquifer wells in WY 2025.
Condition Assessments	Video logging and hydraulic testing of FO-10 and FO-11				x	Results indicate that there is a cross-connection between FO-10's screens. The well cluster is recommended to be destroyed and removed from the RMS network.

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments
Weather Stations	Installation of weather stations				x	Deployed three weather stations to collect data and validate groundwater recharge estimates.
Data Management and Data Integration	Manage and update DMS concurrent with annual report preparation			x		Facilitate data transfers from partner agencies: Seaside Watermaster, MPWMD, MCWRA, and the U.S. Army. Upload of new water year data into DMS in progress.
	Develop Data Integration Platform		x			Develop a platform to centralize and analyze MCWD's datasets. Initiated Phase 1 to develop functional prototype by mid-2025.
SVBGSA Data Expansion and SGMA Compliance Activities						
Develop Well Registration Program	Conduct desktop data collection			x		MCWRA completed the desktop analysis for existing well records in 180/400 and is in progress for the remaining subbasins.
	Develop well registration program, policies and procedures			x		MCWRA ordinance (No. 5426) was passed for the Groundwater Monitoring Program which includes GEMS expansion and well registration. MCWRA has also developed a Program Manual. Service agreement, along with annual task orders (between MCWRA and SVBGSA) is being prepared to formalize the partnership
	Develop well registration program report (implementation plan)		x			Preparing a summary report of well registration data and data gaps

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments
	Conduct outreach and data solicitation			x		MCWRA and SVBGSA developing outreach strategy and schedule to inform various interest groups and general public. General outreach about the GMP has begun, specific activities to individual target groups are being planned.
	Conduct data management options evaluation		x			MCWRA is scoping and planning well registration data management systems options.
Expand and Enhance Groundwater Extraction Monitoring	Development and adoption of regulatory framework in collaboration with MCWRA				x	MCWRA ordinance (No. 5426) was passed for the Groundwater Monitoring Program which includes GEMS expansion and well registration. MCWRA has also developed a Program Manual
	Conduct feasibility study for extraction data collection			x		Five growers participated in a feasibility study for using satellite data to estimate net groundwater extraction. Cal Poly collected and processed data and produced a report. "Well bubblers" are used to measure groundwater elevation and might be helpful to pair with extraction data. 1 domestic well owner and 3 agricultural well owners have agreed to test the tool.
	Develop GEMS expansion and enhancement implementation report			x		Preparing a summary report of GEMS expansion and data gaps

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments
	Develop GEMS policies and/or procedures			x		Service agreement, along with annual task orders (between MCWRA and SVBGSA) are being prepared to formalize the partnership.
	Conduct GEMS field work and data collection		x			Service agreement, along with annual task orders (between MCWRA and SVBGSA) are being prepared to formalize the partnership
Expand Groundwater Level Monitoring Network	Well design, bid assist, construction management, & monitoring activities			x		M&A developed technical specifications for 4 monitoring wells in the Corral de Tierra Area and is provided technical oversight for well drilling.
	Well construction			x		Constructed 4 monitoring wells.
Test Aquifer Properties	Fill aquifer properties data gap(s) in Corral de Tierra Area		x			Reviewed Monterey County permit files for existing reports. Working with landowners to plan tests.
Host and Manage Data Management System	Manage and update DMS concurrent with annual report preparation			x		Upload of new water year data into DMS in progress
Review Well Permits (as needed)	Review Well Permits (as needed)			x		Executive Order (EO) N-7-23 no longer in place.
	Prepare Water Quality Coordination Update Report		x			Coordination initiated with County through Basin Investigation.

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments
Carry out Other GSP Implementation Actions	Prepare Land Use Update Report		x			

Table 5-6. Status of Addressing Monterey Subbasin RCAs

No.	RCA	Action to Address	Status
1	Investigate the connectivity of the upper saturated zone to the principal aquifer to determine if a continuous upper saturated zone connects to the principal aquifer.	Corral de Tierra Management Area: • SVBGSA will use the shallow wells installed for ISW and GDEs to assess connections between shallow groundwater and primary aquifers.	Corral de Tierra Management Area: • To be completed by 2027 Periodic Evaluation.
		Marina-Ord Management Area: • Groundwater elevation near the vernal ponds GDEs aligns with those in the Dune Sand Aquifer, which is defined as a principal aquifer in the Marina-Ord Area	Marina-Ord Management Area: • No further action
2	Conduct necessary field reconnaissance for GDE identification. Update future iterations of the GSP with the results of the field studies to identify GDEs in the Subbasin.	Corral de Tierra Management Area: • SVBGSA will work with Central Coast Wetlands Group to map potential GDEs and conduct field reconnaissance in the Corral de Tierra Management Area.	Corral de Tierra Management Area: • SVBGSA is developing an approach and methods in other subbasins, and will expand this work to the Corral de Tierra Management Area with SGM Round 2 Implementation Grant.
		Marina-Ord Management Area: • Field studies of the Marina vernal pond GDEs were completed in 2020 and summarized in the GSP; MCWDGSA staff is participating in the GDE Workgroup.	Marina-Ord Management Area: • MCWDGSA will assess whether further field reconnaissance is needed in the Marina-Ord Area through the approach developed by the GDE Workgroup.
3	Provide more information about how the proposed minimum thresholds for the chronic lowering groundwater levels may impact beneficial uses and users. Specifically, work to obtain additional well	Corral de Tierra Management Area: • SVBGSA will provide more information to beneficial uses and users, with an initial	Corral de Tierra Management Area: • Underway and will increase with SGM Round 2 Implementation Grant.

No.	RCA	Action to Address	Status
	information and perform further analysis to identify and analyze the impact of the selected minimum threshold levels on supply wells. The analysis should identify the degree/extent of potential impact including the percentage, number and location of potentially impacted wells at the proposed minimum thresholds for chronic lowering of groundwater levels.	focus on outreach to domestic well owners. • SVBGSA is developing a Valley-wide well registration database that will include the Monterey Subbasin. • SVBGSA will re-assess impacts in the Corral de Tierra after the database is complete.	• Underway with MCWRA. • To be completed when well registration database complete, no later than 2027.
		Marina-Ord Management Area: • Construction of domestic wells is prohibited in the urban areas of the Marina-Ord Area; the only supply wells in the Marina-Ord Area are MCWD production wells.	Marina-Ord Management Area: • MCWD production wells to be included in the Valley-wide analysis above.
4	Revise the definition of undesirable results so that exceedances of minimum thresholds caused by groundwater extraction, whether the GSA has implemented pumping regulations or not, are considered in the assessment of undesirable results in the Subbasin.	• SVBGSA will review conditions in the Corral de Tierra Management Area and provide explanations of when exceedances occur. • MCWDGSA and SVBGSA will revise the Water Quality undesirable result in next amendment to include pumping impacts regardless of GSA action. • MCWDGSA and SVBGSA will provide a more thorough analysis in 2027 Periodic Evaluation.	• Underway with this Annual Report. • Planned for 2027 Periodic Evaluation. • Planned for 2027 Periodic Evaluation.
5	Provide the rationale for using 2019 concentration data instead of 2015 concentration data as the baseline for setting minimum thresholds for degraded water quality.	• MCWDGSA and SVBGSA will evaluate if using 2015 leads to a different SMC, and based on results the GSAs may reconsider SMC if needed or provide rationale.	• Planned for Fall 2025.
6	Department staff understand that estimating the	• MCWDGSA and SVBGSA will review	• Awaiting DWR guidance on ISW.

No.	RCA	Action to Address	Status
	location, quantity, and timing of stream depletion due to ongoing, Subbasin-wide pumping is a complex task and that developing suitable tools may take additional time; however, it is critical for the Department's ongoing and future evaluations of whether GSP implementation is on track to achieve sustainable groundwater management. The Department plans to provide guidance on methods and approaches to evaluate the rate, timing, and volume of depletions of interconnected surface water and support for establishing specific sustainable management criteria in the near future. This guidance is intended to assist GSAs to sustainably manage depletions of interconnected surface water. In addition, the GSA should work to address the following items by the first periodic update: a. Consider utilizing the interconnected surface water guidance, as appropriate, when issued by the Department to establish quantifiable minimum thresholds, measurable objectives, and management actions. b. Continue to fill data gaps, collect additional monitoring data, and implement the current strategy to manage depletions of interconnected surface water and define segments of interconnectivity and timing. c. Prioritize collaborating and coordinating with local, state, and federal regulatory agencies as well as interested parties to better understand the full suite of beneficial uses and users that may be impacted by pumping-induced surface water depletion within the	forthcoming DWR guidance and refine SMC based on it, as appropriate for the Subbasin.	

No.	RCA	Action to Address	Status
	GSA's jurisdictional area.		
7	Establish a sufficient monitoring network capable of collecting the required information to quantify depletions of interconnected surface water.	Corral de Tierra Management Area: • SVBGSA will install 1 shallow well along El Toro Creek to monitor ISW. • SVBGSA will reassess locations of ISW as part of the HCM update and may consider additional wells if findings warrant it.	Corral de Tierra Management Area: • Planned for 2024 with SGM Round 2 Implementation Grant.
		Marina-Ord Management Area: • One shallow monitoring well is included in the ISW monitoring network near the Marina vernal ponds. No additional data gaps were identified.	Marina-Ord Management Area: • No further action

5.2.4 Projects and Management Actions

Section 9 of the Monterey GSP identified 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 are being further developed and prioritized during the first years of GSP implementation.

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, MCWDGSA and SVBGSA are advancing workstreams to reach sustainability, which include Marina-Ord Area local P&MAs, Corral de Tierra Area local P&MAs, as well as multi-subbasin P&MAs.

The following is a brief overview of the progress made towards implementing the P&MAs during 2024. The SVBGSA led regional project planning efforts with the SGM Round 1 Implementation Grant for the 180/400 Subbasin and engaged the Monterey Subbasin Implementation Committee in a series of planning discussions for the Corral de Tierra Area and proceeded of monitoring wells. Within the Marina-Ord Area, the MCWDGSA proceeded with monitoring well planning and design with anticipated construction in WY 2024. The SGM Round 2 Implementation Grant funding helped both agencies get additional workstreams underway. Progress towards implementing the P&MAs during 2024 and planned activities are also summarized in Table 5-7.

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 indirect potable reuse (IPR) within MCWD's service area. MCWD is expanding its recycled water distribution system for landscape irrigation. Expansion efforts are ongoing in the California State University Monterey Bay subarea and completed in the Dunes Development Area. In 2025, a total of 150 AFY of advanced treated water delivery is anticipated in these areas within the Monterey Subbasin.

The MCWDGSA included the recommended IPR project of its 2022 IPR Feasibility Study in its Round 2 Implementation Grant work plan; however, the project was not included in the funding award. The MCWDGSA continued to develop a funding plan for the project and explored state and federal funding opportunities in WY 2024. In October 2024, MCWDGSA applied to the U.S. Bureau of Reclamation WaterSMART Drought Resiliency Grant for a first phase of the project. The IPR project is currently scheduled on the MCWDGSA's capital improvement program as a grant-funded project but may be financed through GSA funds if grant funding is unavailable. It is estimated that completion of the project is anticipated in the next 3.5 to 5 years, depending on funding and financing.

- M4 – Drill and Construct Monitoring Wells in the Marina-Ord Area: This project consists of constructing new monitoring wells and expanding the groundwater elevation and seawater intrusion monitoring networks in the Marina-Ord Area. Particularly, the Monterey Subbasin GSP identified data gaps near the central coastline and the Fort Ord hills area in the 400-Foot and Deep Aquifers. The MCWDGSA included planning and construction of monitoring wells in the Round 2 Implementation Grant work plan. The grant application was successful, and funding was awarded for this project. At the end of 2024, the District completed well design and bid preparation. Bid solicitation was carried out in January and February 2025 for construction in the second quarter of 2025.
- C1 - Reducing Demand (Pumping Allocations and Controls in GSP): Building on the Situation Assessment completed the prior year, SVBGSA worked with Dave Ceppos from California State University Sacramento Consensus and Collaboration Program (CCP), Montgomery & Associates, and Miller Maxfield to hold 5 workshops titled "Planning for Uncertainty" across the Valley. The workshops were aimed at engaging the public in understanding and visioning a wide variety of actions that can help plan for uncertainty. These workshops shared a wide variety of conservation and demand management actions, which prefaced subbasin-specific dialogues. SVBGSA is being followed by subbasin-specific dialogues to identify what types of demand management actions are appropriate for each subbasin, which was initiated in the Monterey Subbasin in December 2024. SVBGSA is also supporting existing agricultural extension efforts for efficient agricultural irrigation as a way to support and develop a broader program to incentivize voluntary actions that will result in reduced demand. It partnered with the University of California Cooperative Extension (UCCE) to develop a website on water-efficient agricultural practices appropriate for the Central Coast.
- Corral de Tierra – Reducing Demand through Water Efficiency Pilot Program (New): Most water use in the Corral de Tierra is for rural residential users, many of whom have not benefitted from conservation programs and rebates that many larger water systems have. To reduce demand and increase awareness of the groundwater conditions, SVBGSA initiated a new effort this year to support residential water efficiency in the Corral de Tierra Area and other subbasins. This pilot program consists of a water use survey, targeted water use efficiency webpage, and free house calls to assess how to improve water efficiency.
- Corral de Tierra – Drill and Construct Monitoring Wells: For the Corral de Tierra Area, the Monterey Subbasin GSP identified several groundwater level monitoring data gaps. With SGM Round 2 Implementation Grant funding, SVBGSA reevaluated those data gaps and identified well locations and conducted well design. In WY 2024, 4 wells were completed, 3 of which are groundwater level monitoring wells and 1 of which is an interconnected surface water monitoring well.

Regional Projections and Management Actions

The Monterey GSP identified 3 multi-subbasin projects that address groundwater conditions in the Monterey Subbasin and adjacent subbasins. SVBGSA initiated development of feasibility studies for 3 approaches to mitigate seawater intrusion: an extraction barrier coupled with a desalting plant to provide a new regional water supply, seasonal reservoir releases with aquifer storage and recovery (ASR), and demand management. These feasibility studies will inform how the Agency proceeds with the selection of projects to address seawater intrusion. The feasibility studies will culminate in a Project Update Report that will enable the Agency to compare study results and options, solicit feedback from interested parties, and consider project combinations.

- R1 – Seasonal Reservoir Releases with Aquifer Storage and Recovery: SVBGSA continued to look at the possibility of addressing seawater intrusion through ASR and capturing additional wet winter flows. This study assesses the concept of diverting surface water at the Salinas River Diversion Facility (SRDF), treating it, and injecting water into the 180-Foot and 400-Foot Aquifers, aiming to raise groundwater levels to address seawater intrusion while still meeting Castroville Seawater Intrusion Project (CSIP) irrigation demands. During the reporting period, SVBGSA and Montgomery & Associates worked with MCWRA and M1W to assess operations and constraints related to how the project would work with reservoir operations, water rights, and permits associated with the SRDF. A new alternative project concept was identified to capture excess watershed flows with a new diversion facility, while maintaining current reservoir and CSIP operations. In addition, this year the feasibility steps completed included: conducting a review of existing water quality and potential treatment requirements, refining the project concepts and scenarios, and modeling the effectiveness of the project concepts on seawater intrusion and groundwater levels.
- R2 – Brackish Groundwater Restoration (BGR) Project (new name for the Seawater Intrusion Extraction Barrier/Regional Water Supply Project): Carollo Engineers continued to prepare this feasibility study during this reporting period. In coordination with Montgomery & Associates, the initial scenarios modeled with the SWI Model and preliminary engineering analysis were used to define small, medium, and large scenarios that varied in their magnitude, cost, and groundwater impact. Carollo identified treatment requirements for groundwater desalting, refined potential facility locations and developed facility descriptions, and estimated capital and operating costs. Montgomery & Associates modeled the final 3 scenarios with the updated SWI Model. These scenarios were presented to various committees in fall 2024.
- R3 – Multi-benefit Stream Channel Improvements: SVBGSA continued to partner with the Resource Conservation District of Monterey County (RCDMC), who continued to work with project partners to maintain the river corridor, map and remove Arundo donax, and estimation of associated water savings. SVBGSA continued to support FlowWest to assess groundwater benefits of vegetation removal and sediment management under the

Salinas River Stream Maintenance Program. This modeling work will help quantify the groundwater recharge benefits.

- Deep Aquifers Management Options (Deep Aquifers Working Group): After the Deep Aquifers Study was made public in April 2024, MCWDGSA and SVBGSA began to work with partner agencies through the newly developed Deep Aquifers Agency Working Group to discuss the Study’s findings and implementation of the guidance.

Table 5-7. Progress on Projects and Management Actions as of December 2023

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments
Monterey Subbasin Projects and Management Actions						
M3 – IPR with Injection of Recycled Water	Develop funding plan			x		Continued to develop a funding plan and applied for state and federal funding opportunities.
M4 – New Monitoring Wells in the Marina-Ord Area	Well design, bid assist, construction management, equip & monitor			x		Included in SGM Round 2 Implementation Grant for Monterey Subbasin; identified candidate well sites and screened aquifers; proceeding with well design
	Well construction			x		Included in SGM Round 2 Implementation Grant for Monterey Subbasin; planned for WY 2024
C1 – Assess and Develop Demand Management	Conduct DM dialogue process			x		Subbasin focused work started in 180/400, Eastside and Monterey. Contracted with ERA Economics to include economic analysis.
	Conduct legal analysis of DM			x		Staff is working with special counsel to prepare a legal white paper that has been routed for peer review. Final draft anticipated to be available in March 2025.
	Plan for DM in overdrafted subbasins			x		Initial meeting held with Monterey Subbasin in December 2024.

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments
	Assess inter-subbasin impacts of DM		x			Planning for multi-basin scenario modeling.
New Monitoring Wells in the Corral de Tierra Area	Well construction			x		Included in SGM Round 2 Implementation Grant for Monterey Subbasin. 4 wells were completed in WY 2024.
Regional Projects and Management Actions						
R3 – Assess Groundwater Benefits of Salinas River Stream Maintenance Programs	Model the program impact to recharge and conduct stakeholder outreach			x		Executed agreement with FlowWest and initated coordination meetings with RCDMC, MCWRA and M&A which continue as HEC-RAS model is updated and various flow scenarios are investigated.
Refine Sustainability Strategies	Assist with implementation of sustainability strategies and projects/management actions			x		Sustainability strategy and P&MAs under review and discussion by subbasin committees.
	Provide technical support services			x		M&A to support staff as needed.
Assess Deep Aquifer Study Management Options (Deep Aquifers Working Group)	Evaluate policy approaches and determine management options			x		Study released May 2024. Agencies' (County, MCWDGSA, MCWRA, SVBGSA) Working Group developing recommendations for monitoring and management actions. GTAC discussed monitoring recommendations in December.

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments
R1 – Conduct Aquifer Storage and Recovery Feasibility Study	Collect info, gather input, assess water rights			x		Held meetings with MCWRA, M1W, GTAC to gather information and assess project concepts to include in technical memorandum.
	Develop scope of work				x	
	Conduct phase 1 of the study			x		Prepared administrative draft technical memoranda and coordinated review and input from MCWRA.
R2 – Conduct Brackish Groundwater Restoration Project (prev. Seawater Extraction Barrier/Regional Water Supply) Feasibility Study	Coordinate project management and meetings			x		Ongoing coordination with M&A and partner agencies
	Prepare presentations to board and commitees			x		Periodic updates presented at various committee meetings.
	Conduct effectiveness evaluation				x	Updated modeling of alternatives completed using revised SWI model.
	Prepare alternatives analysis				x	Small, medium and large alternative project configurations identified.
	Assess siting and implementation				x	Identified potential facility locations and sites based on alternatives.

Activities	Tasks	Not yet started	Scoping/ Planning	In progress	Complete	Comments
	Prepare final phase 1 feasibility study report			x		Draft Summary Report published in December. U.S. Bureau of Reclamation (USBR) feasibility study administrative draft underway.
	Complete USBR feasibility study			x		Underway.
	Conduct phase 1(a) feasibility study: end users and distribution system	x				
	Conduct California Environmental Quality Act (CEQA) study	x				
Prepare Projects Update Report	Prepare projects update report for Monterey Subbasin	x				

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APPENDIX A

Technical Memorandum: Monterey Subbasin HCM Update: Data, Methods, and Findings

MONTGOMERY
& ASSOCIATES
Water Resource Consultants

Groundwater experts since 1984

TECHNICAL MEMORANDUM

DATE: March 26, 2025 **PROJECT #:** 9100.8802

TO: Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA)

FROM: Victoria Hermosilla, P.G., and Tina Wang, P.E.

REVIEWED BY: Amy Woodrow, MCWRA; Joe Oliver, P.G.; Abby Ostovar, Ph.D.; Tiffani Cañez; Derrik Williams, P.G., C.Hg.; and Vera Nelson, P.E.

PROJECT: Salinas Valley Hydrogeological Conceptual Model (HCM) Update

SUBJECT: Monterey Subbasin HCM Update: Data, Methods and Findings

INTRODUCTION

The Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA), Marina Coast Water District Groundwater Sustainability Agency (MCWDGSA), and other partner agencies have analyzed new information and filled data gaps identified in the Monterey Subbasin (Subbasin) Groundwater Sustainability Plan (GSP) (MCWDGSA and SVBGSA, 2022). Montgomery & Associates (M&A) and EKI Environment & Water (EKI) used this new information to update the Subbasin's Hydrogeologic Conceptual Model (HCM) to better inform management decisions and prepare for the upcoming 5-year Periodic Evaluation. EKI's efforts primarily focused on the Marina-Ord Area, which corresponds to MCWDGSA's primary management area. To acquire and analyze data, M&A and EKI worked with partner agencies such as Monterey County Water Resources Agency (MCWRA) and California American Water. The updated HCM strengthens and refines the geologic model that forms the basis for the groundwater flow modeling.

The HCM update focused on key areas where new data indicated that an updated understanding was needed. The primary updates to the HCM included the following:

- Updating the location and character of the bedrock surface including offshore geology, and subsequently revising the primary aquifers above the bedrock as needed
- Incorporating the results of the *Deep Aquifers Study* (Study) (M&A, 2024) by refining the extent and depth of the Aquitard that separates the 400-Foot Aquifer from the Deep Aquifers (400/Deep Aquitard)

- Incorporating previous studies with new data to modify the coastal aquitards to refine known extents, gaps, and thin spots
- Based on the updated aquifers and aquitards, refining the relationships with the Seaside Basin and the 180/400-Foot Aquifer Subbasin (180/400 Subbasin) and refining the connection between the Coastal and Corral areas of the Monterey Subbasin

For the purposes of the HCM update, the Coastal Area of the Monterey Subbasin refers to the areas on the northwestern arm of the Laguna Seca Anticline, and the Corral Area refers to the areas on the southeastern arm of the Laguna Seca Anticline. Although these are geologic designations to focus on the hydrogeologic setting, they generally coincide with the Management Area designations defined in the GSP (Figure 1). Therefore, the terms "Coastal Area" and "Marina-Ord Area" are also used interchangeably in this document. This memo summarizes the data used, the analyses and methods employed, and the findings for the updated Monterey Subbasin HCM.

MONTGOMERY & ASSOCIATES

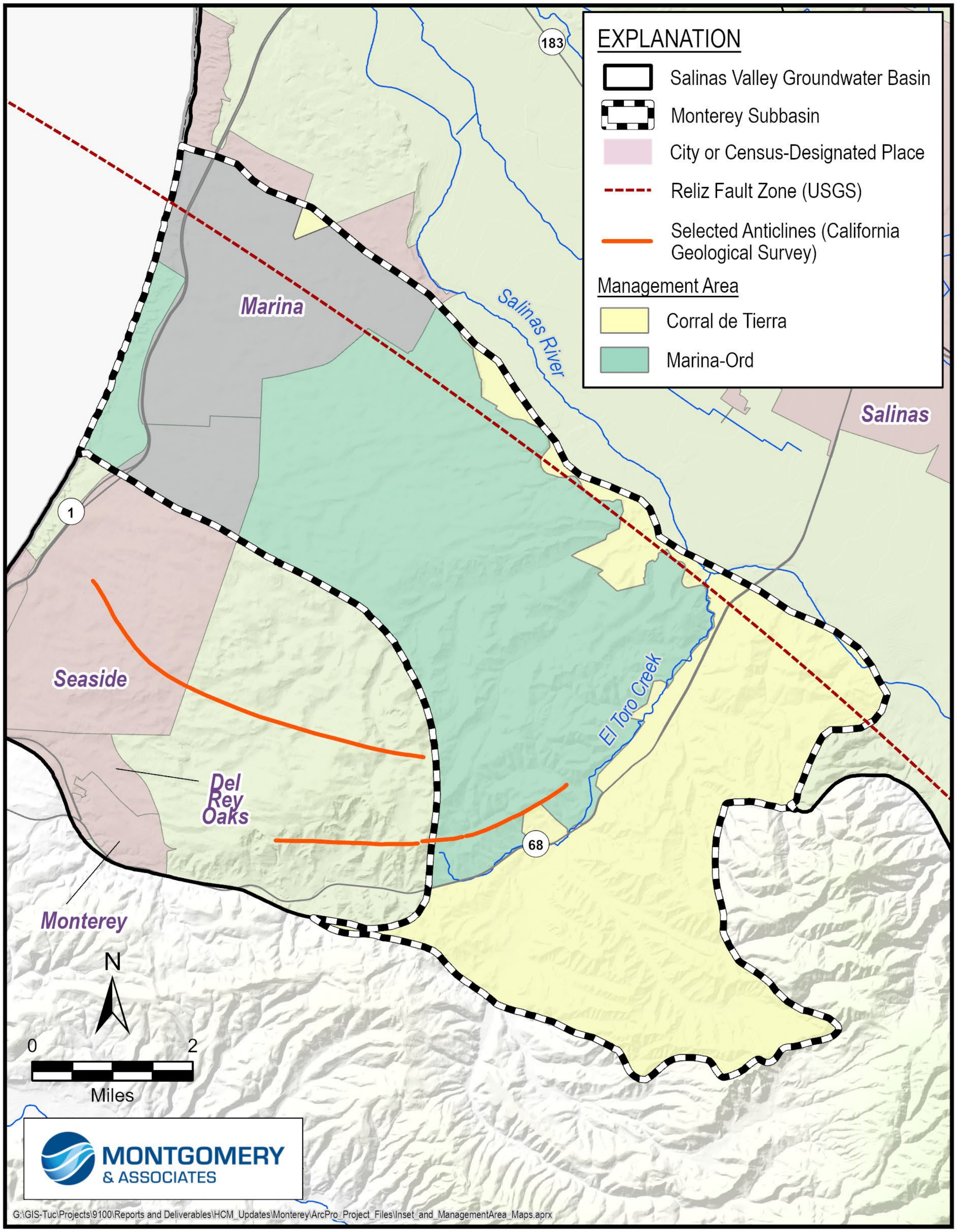

Figure 1. Monterey Subbasin Management Areas and Mapped Anticlines

DATA

The data used to update the HCM include published cross sections and reports, well completion reports (WCRs), numerical groundwater flow model layers, geophysical data, and geologic maps, as detailed in the following subsections.

Published Cross Sections and Reports

The 2022 GSP summarized published cross sections and reports. For this HCM update, the following reports and cross sections were re-reviewed, compared with new data and information, and incorporated into the revised HCM. These included:

- *Hydrogeologic Investigation of Salinas Valley Basin in the Vicinity of Fort Ord and Marina Salinas Valley, California - Final Report* (Harding ESE, 2001)
- *El Toro Groundwater Study Monterey County, California* (GeoSyntec, 2007)
- *Accompanying Documentation Geologic Map and Cross-Sections from El Toro to Salinas Valley* (GeoSyntec, 2010)
- *Deep Aquifer Investigation - Hydrogeologic Data Inventory, Review, Interpretation and Implications* (Feeney and Rosenberg, 2003)
- *Final Report, Hydrostratigraphic Analysis of the Northern Salinas Valley* (Kennedy/Jenks, 2004)
- *Hydrogeologic Report on the Deep Aquifer, Salinas Valley, Monterey County, California* (Thorup, 1976 and 1983)
- *Map Series — Monterey Canyon and Vicinity, California: U.S. Geological Survey Open-File Report 2016–1072* (Dartnell et al, 2016)
- *Deep Aquifers Study* (M&A, 2024a)

Well Completion Reports (WCRs)

WCRs helped refine geologic interpretations and included important information such as driller-observed lithology, screen intervals, and dates of well installation. Some WCRs were more detailed than others with more frequent lithologic descriptions, electric logs (e-logs), and other construction or water level details.

M&A obtained WCRs through the California Department of Water Resources (DWR) Online System for Well Completion Reports (OSWCR) database, the County of Monterey Health Department (MCHD), MCWRA, MCWD, the U.S. Army, other collaborating partner agencies, and private entities. The combination of WCR data helped refine the extents, gaps, and thin spots of the shallower aquitards in the coastal areas of the Monterey Subbasin.

Numerical Groundwater Flow Model Layers

Previous and current groundwater flow models reflect various conceptual understandings of the Subbasin. Models reviewed for the HCM update included:

- The Salinas Valley Geologic Model (Sweetkind, 2023). This document defines the spatial extent, depth, and distribution of geologic materials and textures for the provisional Salinas Valley Integrated Hydrologic Model (SVIHM). It was developed by the USGS, which covers the entire Salinas Valley and includes a geological framework with documentation.
- The Monterey Subbasin Groundwater Flow Model (MBGWFM) (EKI, 2022). This model was developed for MCWD and informed the 2022 Monterey Subbasin GSP. It covers the Monterey Subbasin and an adjacent part of the 180/400 Subbasin southwest of the Salinas River.
- The Seaside Basin Model (HydroMetrics Water Resources, 2009). This model was developed for the Seaside Basin Watermaster and covers the Seaside Basin and adjacent parts of the Monterey Subbasin.
- The Salinas Valley Seawater Intrusion Model (SWI Model) (M&A, 2023; 2024b). This model was developed by M&A for SVBGSA and the County of Monterey in 2023 and covers the coastal area of the Salinas Valley north of Chualar. It was updated based in part on the HCM updates included in this memo in 2024.

These models were primarily used to compare and refine the depths and thicknesses of the hydrostratigraphic layers within the Salinas Valley Groundwater Basin.

Geophysical Data

The following 3 primary types of geophysical data were used in this HCM update:

- Airborne Electromagnetic (AEM) resistivity data. These data were collected by the California Department of Water Resources (DWR) and SVBGSA between 2020 and 2023, and by MCWD in 2017 and 2019. The AEM data provide a broad coverage of general lithologic trends.
- Borehole resistivity data. These geophysical data are collected in boreholes prior to well installation and provided detailed interpretation of localized lithology.

- Seismic data. Seismic data used in this HCM update were from the USGS (Dartnell *et al.*, 2016) and provided stratigraphic information about offshore geology.

The first 2 types of data are electrical resistivity data, which are collected by sending electrical pulses into the subsurface and receiving signals back. The third type of geophysical data, seismic data, is collected from measuring the reflected, refracted, and direct waves from an active wave source, such as an explosion or hammer impact.

AEM Data

AEM surveys measure the resistivity of both solid and liquid materials in the subsurface over large areas. Lower resistivity materials are clays, silts, and/or higher total dissolved solids (TDS) water. Higher resistivity materials are sands and gravels, some types of bedrock, and/or lower TDS water. AEM data are useful for filling gaps between known data points such as wells. This effort focused on reviewing and analyzing the lower resistivities at various target depths where aquitards are expected.

This effort primarily used 3 sets of AEM surveys to fill data gaps, confirm other data, and refine the primary aquifers and aquitards. These data came from the following sources:

- DWR Survey Area 1, 2020 (DWR, 2020)
- DWR Survey Area 8, 2022 (DWR, 2022)
- Deep Aquifers Survey, 2023 (M&A, 2024)

The MCWD 2017 and 2019 AEM surveys of the coastal Salinas Valley area were also used to verify aquitard extents in the Marina-Ord Area where few other data were available (Stanford/Aqua Geo Frameworks, 2017; Aqua Geo Frameworks, 2019).

E-logs/Borehole geophysical logs

Borehole geophysical logs measure the resistivity of materials in the subsurface adjacent to a borehole. Like AEM data, borehole geophysics can help qualitatively differentiate between clays, silts, sands and gravels, high TDS water, and low TDS water. Borehole geophysics data show much more detail than AEM data, but only reflect conditions immediately adjacent to a borehole. Borehole geophysical logs were sourced from other studies or included with WCRs.

Seismic Data

Seismic data are collected from measuring the reflected, refracted, and direct waves from an active wave source such as an explosion or hammer impact. The seismic waves travel through the subsurface, reflect off various lithologic surfaces, and return to the ground surface. Based on the timing of the waves, investigators can determine the locations and general rock types of the subsurface lithology up to a few kilometers below land surface. Seismic survey data from the *Seismic Study in Monterey Bay* (Dartnell *et al.*, 2016) were used to refine the offshore portion of the HCM.

Geologic Maps

Geologic maps provide a visual representation of the rocks, formations, and structures encountered at land surface. The 3 primary maps used for this HCM update were the Rosenberg 2001 Monterey County digital geologic map, the Clark *et al.*, 2002 surface geologic map of the Spreckels quadrangle, and the subsequently revised version of the onshore and offshore geology derived from the Dartnell *et al.*, 2016 Seismic Study in Monterey Bay. These geologic maps supplemented other data during the HCM update by verifying surface expressions of the various lithologic units.

Groundwater Elevations

While groundwater elevation data are not a form of geologic information, they are valuable in identifying where aquitards effectively separate aquifers and where discontinuities may create hydraulic connections, particularly in areas where geologic data are sparse or inconclusive. When aquitards are laterally extensive and effectively confining, significant differences in groundwater elevations can be expected between adjacent aquifers. Conversely, where aquifers are absent or discontinuous, groundwater elevations may equalize, indicating hydraulic connectivity between the aquifers.

In urban areas near the City of Marina, where high-coverage AEM data could not be collected due to infrastructure interference, groundwater elevation data were used in conjunction with WCRs to further support the presence or absence of the aquitards.

Empirical Observation

On April 8, 2024, M&A staff accompanied former Monterey Peninsula Water Management District Water Resources Manager Joe Oliver on a field trip to observe local geologic features in the Subbasin. The field trip went from the Monterey Regional Airport to Laureles Grade Road, down Robley Road to Corral de Tierra Road, to a parking area below Cypress Community Church, north along State Route 68, and then west along Reservation Road. Mr. Oliver spoke at length about the local geology encountered in this Subbasin.

Mr. Oliver pointed out surficial outcrops of the geologic formations that define the bedrock and aquifers in the Subbasin. Field trip stops included discussions of generalities and variance within the formations. The M&A team was able to make hands-on observations of these rocks, which provided critical insight into the Subbasin's subsurface character.

METHODS

The Subbasin hydrostratigraphy was updated through the following steps:

1. Integrating and reviewing the data using Leapfrog Geo visualization software
2. Prioritizing data based on reliability and availability
3. Selecting the best data to define the new hydrostratigraphic layers
4. Contouring the data to create new hydrostratigraphic layers within Leapfrog Geo software

Geologic Visualization Software

Leapfrog Geo software, developed by Seequent, was the primary 3D visualization software used to relate and analyze the different types of data described above. All data were imported into the software and methodically reviewed and compared to each other.

Data Prioritization

Various data have differing levels of confidence. The list below demonstrates the general hierarchy of confidence in the various data types used in this analysis, starting from highest (1) to lowest (7) confidence.

1. Geologic maps
2. Empirical Observations
3. Published cross sections and reports, unless more recent data were available
4. Borehole logs (well completion reports and e-logs)
5. AEM and seismic data
6. Groundwater Elevations
7. Numerical groundwater flow models

Concurrently using multiple data sources can improve confidence in geologic interpretations. For example, confidence in AEM data can be significantly improved when it is combined and coordinated with geologic maps or borehole logs.

Data are not uniformly distributed throughout the Monterey Subbasin. Wells and associated WCRs are more concentrated in areas with more infrastructure, whereas AEM flightlines generally cover areas with less or no infrastructure. Therefore, hydrogeologic interpretations are more strongly influenced by availability of data in different areas.

Hydrogeologic interpretations initially focused on areas with a higher density of multiple data types to cross validate these data. Developing confidence in any data type allowed analyses using those data to expand horizontally and vertically, and revise the HCM as needed.

The decision-making procedures for updating the HCM generally used the following guidelines. These guidelines do not represent a decision-making hierarchy, rather they are a group of guidelines that interact in various ways based on circumstances in each particular area of focus.

- Newer geologic maps were prioritized over older geologic maps.
- Newer published cross sections were prioritized over older published cross sections, unless there was higher confidence in older cross sections based on the author and how the sections correlated with other data.
- Geologic maps provided anchor locations for the geologic surface contacts, including bedrock contacts, where available.
- Empirical observations provided refined details, insights, and contextualized the geologic formations within the hydrostratigraphic framework.
- The hydrostratigraphy was refined by jointly using AEM data, WCRs, and published cross sections in places where the various data types overlapped. This strengthened confidence in AEM data interpretation.
- Groundwater elevation data supplemented AEM data, WCRs, and published cross sections in determining where aquitards may be present or discontinuous.
- Where AEM data and cross sections did not align, well logs used to develop the cross section were reviewed and used in conjunction with the AEM data.
- AEM data were the primary data source for hydrostratigraphic interpretation in areas with limited borehole data.
- E-logs and published cross sections were used where AEM data were not available and were correlated with the nearest AEM data.
- WCRs were used as verification and interpolation points for key priority areas.
- Areas with no other nearby data relied on the SVIHM geologic model or other groundwater flow model layers to interpolate the hydrostratigraphic layers.

Figure 2 shows an example analysis that encompasses many types of data and shows how they are correlated to provide a more cohesive understanding of the Subbasin's hydrostratigraphy. The cross section on Figure 2 was exported from the Leapfrog software and spans the 180/400 Subbasin, the Monterey Subbasin, and the Seaside Basin. Hydrostratigraphy in the north (left on Figure 2) is based primarily on WCRs, with finer sediments highlighted in blue.

Hydrostratigraphy in the center of Figure 2 is based on AEM data, with finer sediments highlighted in blue. A map of the top of the Monterey Formation (HydroMetrics, 2009) provided structural data in the south, and geologic maps provided locations of surface outcrops of the Monterey Formation, which are highlighted with yellow disks. Published cross sections, e-logs, and surface geology maps are not shown on the figure; however, they were also reviewed for confirmation of other data. Through careful analysis and integration of all data types, a new bedrock surface was developed, shown with a pink mesh and green contour lines on Figure 2. This figure illustrates the data synthesis methodology applied in the Subbasin.

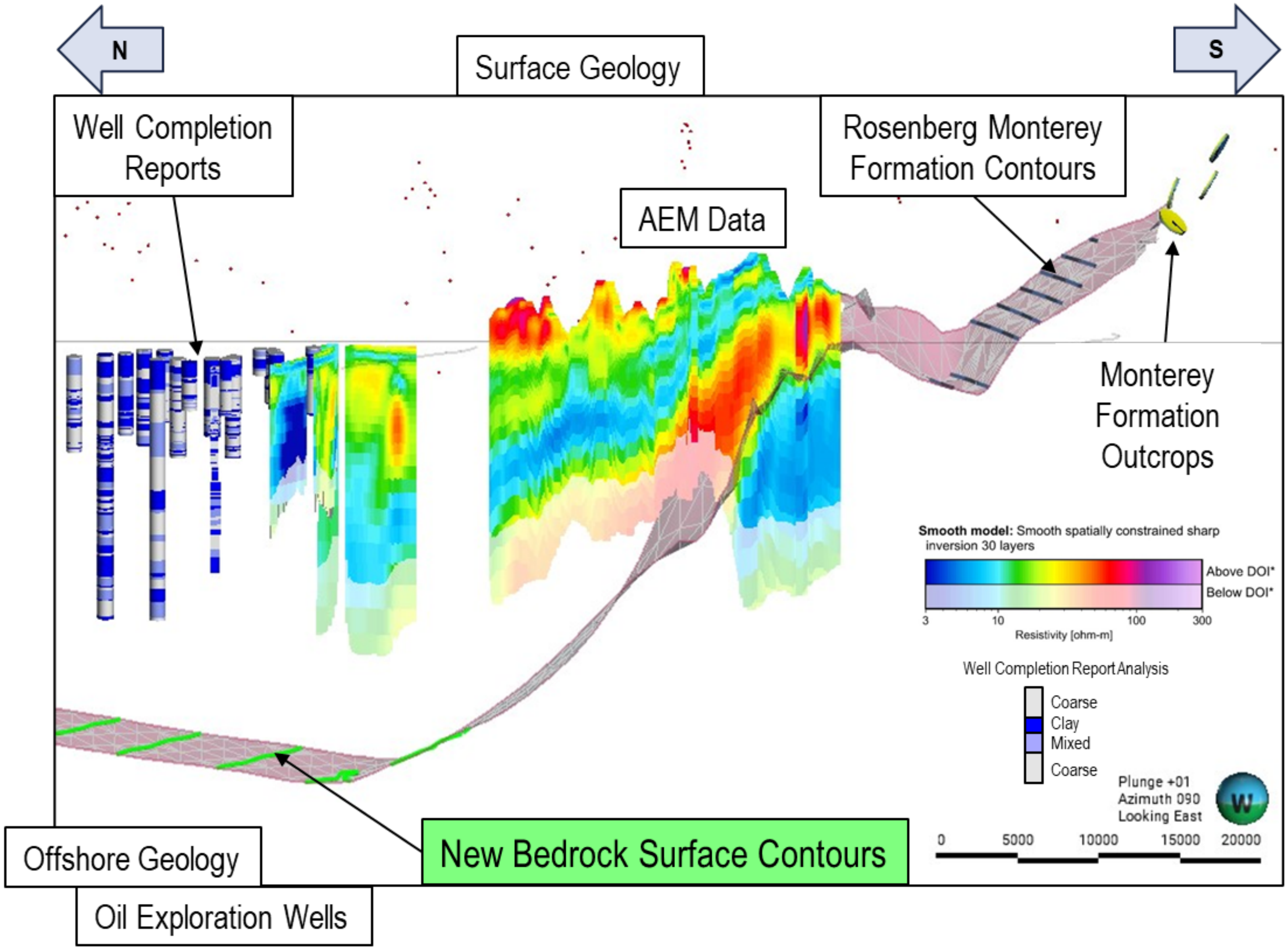

Figure 2. Example of Different Types of Data Juxtaposted in Leapfrog Geo Software

Hydrostratigraphic decision-making was prioritized from deepest to shallowest layers. The bedrock surface was the first priority and was modified using AEM data, oil exploration wells, surface geology maps, the Monterey Shale contours, and the Salinas Valley Geological Framework. After revising the bedrock surface, the Toro Primary Aquifer was assumed to exist above the bedrock in the Corral Area; the location and depth of the aquitard between the 400-Foot Aquifer and Deep Aquifers was revised based on the Deep Aquifers Study in the Marina-Ord Area (M&A, 2024). Following that, the aquitards between the 400-Foot Aquifer and 180-Foot Aquifer and shallow sediments were revised based on additional WCRs, published cross sections, and the AEM data. The respective aquifers were assumed to exist between the aquitards and the bedrock.

RESULTS/FINDINGS

Results of the Subbasin's HCM updates are detailed below.

Bedrock Surface and Offshore Geology

<u>Principal Data Used</u>: Oil exploration wells, AEM data, SVIHM geologic model, seismic data, surface geology maps, and bathymetry

The Monterey Formation and granitic rocks constitute the Subbasin's primary bedrock units. These units define the bottom of what is considered usable aquifer materials. The previous conceptualization of the top of bedrock surface was based on the 1978 Durbin model (Durbin *et al.*, 1978), which relied on geophysical gravity studies. This surface conforms to a traditional bathtub shape for the greater Salinas Basin, generally dipping down toward the Sierra de Salinas and tilting up toward the coast. The Salinas Valley Geological Framework (Sweetkind, 2023) generally follows this same conceptualization.

Coastal Area Onshore Bedrock

This HCM update concluded that the coastal onshore portion of the Monterey Subbasin is consistent with the previous conceptualization, with only minor adjustments along the coastline based on lithology from several deep oil exploration wells.

Coastal Area and Offshore Bedrock and Geology

This HCM update concluded that the top of bedrock elevations deviate from the SVIHM elevations for the offshore area adjacent to the Monterey Subbasin. The revisions are based on oil exploration wells previously mentioned, mapped outcrops of bedrock in Monterey Bay (Dartnell *et al.*, 2016, and Wagner *et al.* 2002), and seismic reflection cross sections (Dartnell *et al.*, 2016). The combination of these data and lack of known significant faulting offsets indicates the top of bedrock surface extends offshore with the same, gently sloping upward trend observed onshore. The top of the bedrock slope flattens farther from the coastline. This interpretation follows the same slightly upward slope shown on the B – B' geologic cross section in the *Deep Aquifer Investigation - Hydrogeologic Data Inventory, Review, Interpretation and Implications* report (Feeney and Rosenberg, 2003).

M&A updated the offshore hydrostratigraphy above bedrock based on more recent offshore geologic maps and the most recent bathymetry (seafloor topography) data. These updates provide a refined conceptualization of how the aquifers interact with the ocean in Monterey Bay. The primary modifications to the offshore hydrostratigraphy consisted of connecting geologic units to outcrops from the most recent offshore geologic maps, smoothing and revising the offshore hydrostratigraphy, and updating it based on recent bathymetry data (NOAA, 2024). Units that have not been mapped as outcropping offshore were assumed to pinch out between the coastline and Monterey Canyon. This is consistent with similar pinch outs in the SVIHM.

Figure 3 shows a cross section of the revised hydrostratigraphic interpretation that extends offshore. The updated bedrock surface, shown in grey, is a relatively flat-lying layer with no substantial discontinuities between the coastline and Monterey Canyon. Figure 3 also shows the revised hydrostratigraphy above the Monterey Formation, and how only the Purisima and Santa Margarita Formations outcrop along the wall of Monterey Canyon. Included on Figure 3 are drillholes with bedrock contact and the AEM survey flightlines, which were used in the analysis.

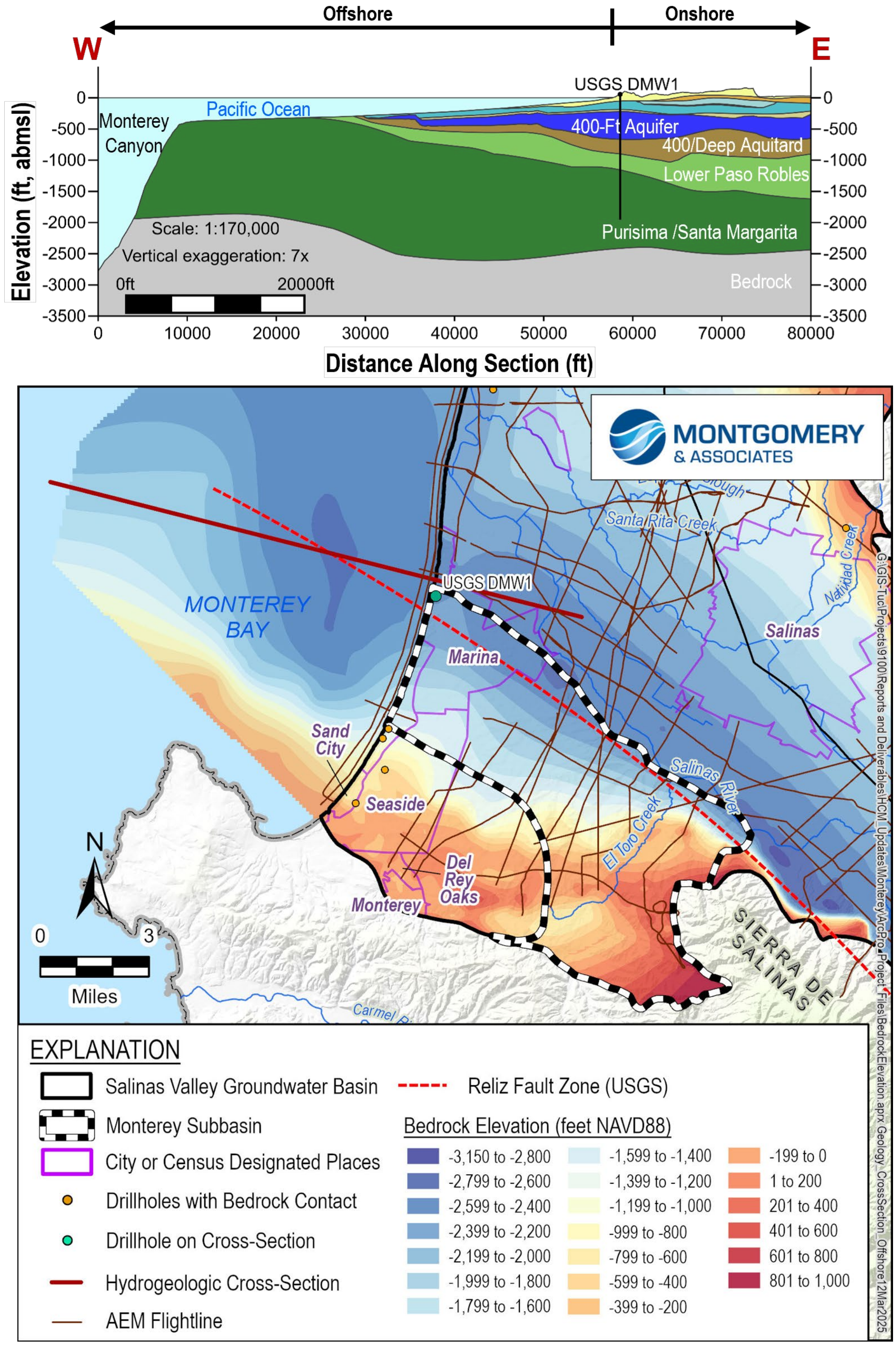

Figure 3. Revised Conceptual Understanding of Offshore Bedrock and Hydrostratigraphy

Corral Area

Previous geologic conceptualizations of the Corral Area identified the Cretaceous granitic and metamorphic rocks as the bedrock units, with the Monterey Shale included as water bearing because some domestic wells completed in the Monterey Shale draw small amounts of water from fractures (GeoSyntec, 2007). The GSP, however, identified the primary water-bearing units as those above the Monterey Shale because the Monterey Shale is generally considered not water-bearing throughout the rest of the Salinas Basin. The best estimate of the top of the Monterey Shale surface came from a 2009 set of contours developed by L. Rosenberg, and was first published by HydroMetrics in their 2009 Seaside Basin Groundwater Model report. These contours show the bedrock dipping from the southeast to the syncline that coincides with Highway 68, rising with the Laguna Seca Anticline and then dipping steeply again to the north, stopping at the Reliz Fault.

This HCM update builds on the interpretation that the Monterey Shale, granitic rocks, and metamorphic rocks all constitute the bedrock, and incorporate additional data to refine the Monterey Shale and the crystalline rock surfaces. The HCM update relied on surface geology maps and AEM data.

Surface geology maps aided in anchoring bedrock outcrops near Highway 68 where there is a surficial outcrop of Monterey Shale. This outcrop indicates a very shallow bedrock in Toro Canyon, and corresponds to mapped shallow groundwater levels near Toro Creek. These data suggest the shallow groundwater near this outcrop is less likely the result of significant stream leakage and more likely the result of the shallow bedrock surface forcing groundwater up.

AEM data provided a strong basis for revising the bedrock surface along the Laguna Seca anticline, as well as north toward the coastal areas. The bedrock surface was revised to be shallower and more undulating than previously understood. The revised bedrock surface also shows distinct bowl-like structures in the Corral de Tierra area. These El Toro Primary Aquifer bowls are shallow, with the main El Toro bowl largely disconnected from the greater Salinas Valley Basin. The secondary bowl is the Highway 68 East bowl, which is shallower but shows some potential hydraulic connectivity with the greater Basin near the boundary with the 180/400-Foot Aquifer Subbasin. A cross section running semi-parallel to El Toro Creek is shown on Figure 4. This cross section shows the 2 bowl structures from the revised bedrock interpretation.

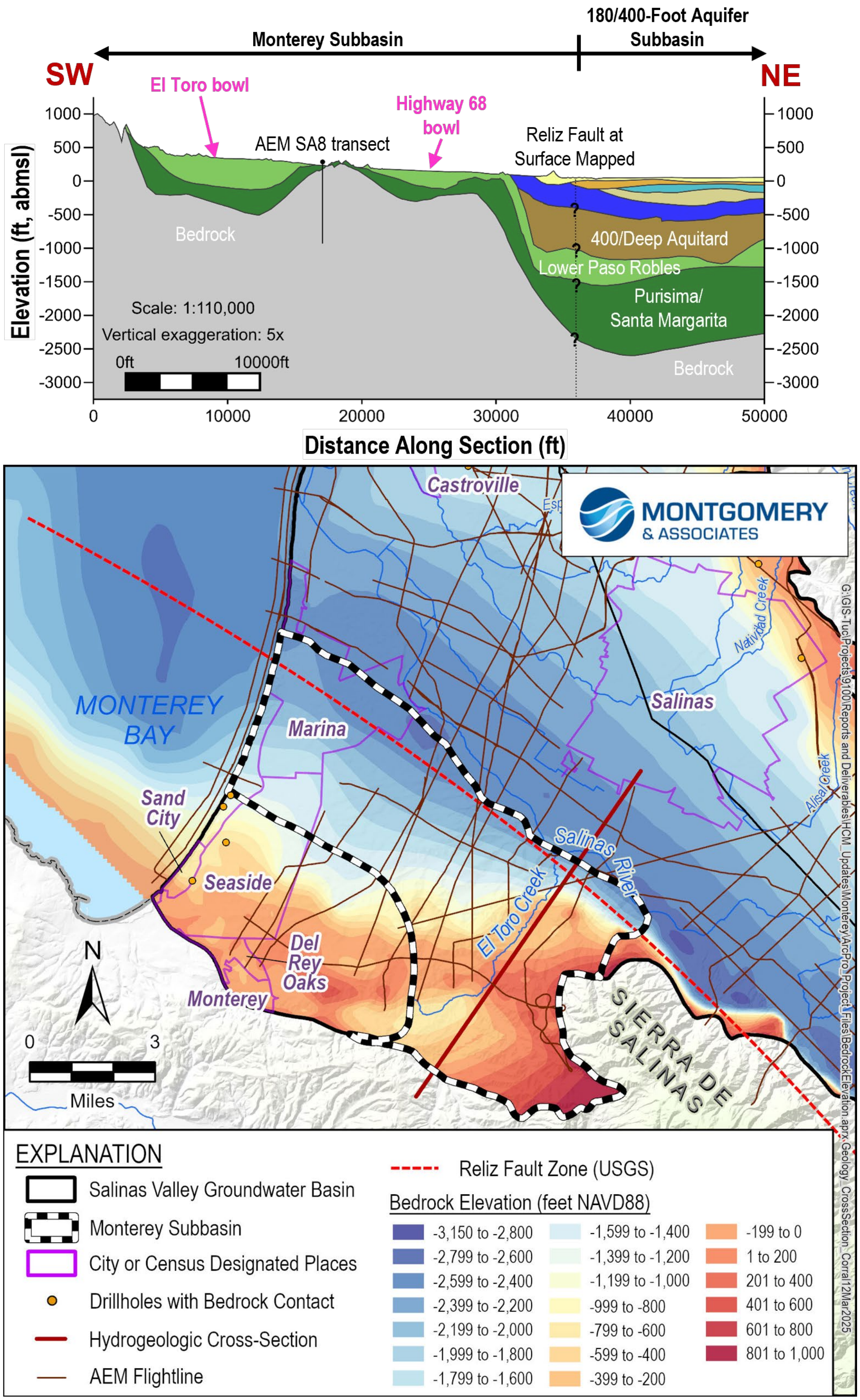

Figure 4. Revised Conceptual Understanding of Bedrock along Highway 68

Coastal 400/Deep Aquitard and Deep Aquifers' Extent

Principal Data Used: Previously published studies, AEM data, WCRs

The Deep Aquifers' extent was revised by incorporating results and data from the *Deep Aquifers Study* (Study) (M&A, 2024). Attachment A to the Study details the data, methods, and extent findings, which are summarized here.

Although the Deep Aquifers were identified as a principal aquifer in the 180/400 and Monterey Subbasins, no cohesive valley-wide description of the Deep Aquifers' depth and extent existed prior to the Study. The previous understanding of the Deep Aquifers focused on the coastal areas of the 180/400 and Monterey Subbasins, where the majority of the deep wells were installed. The *Deep Aquifer Investigation - Hydrogeologic Data Inventory, Review, Interpretation and Implications* (Feeney and Rosenberg, 2003) detailed the geology that constitutes the Deep Aquifers and summarized the known Deep Aquifers wells' screened intervals, extraction, and locations.

The *Hydrogeologic Report on the Deep Aquifer, Salinas Valley, Monterey County, California* (Thorup, 1976) defined the Deep Aquifers as the entirety of the Paso Robles Formation within the Salinas Valley Basin and developed recharge and storage estimates assuming the whole formation was the Deep Aquifers. Other subsequent studies and analyses generally defined the Deep Aquifers based on the presence of the overlying 400-Foot Aquifer or MCWRA-designated Deep Aquifers wells, but notably there was no defined extent.

The updated understanding of the Deep Aquifers presented in the Study focused on the presence of the 400/Deep Aquitard to delineate the Deep Aquifers from the shallower principal aquifers. Accordingly, the Deep Aquifers incorporate all the productive zones below the 400/Deep Aquitard, including the previously named 800-Foot, 900-Foot, 1,100-Foot, and 1,500-Foot Aquifers; and comprise portions of the Paso Robles Formation, Purisima Formation, and Santa Margarita Sandstone. This definition is consistent with the Monterey Subbasin GSP. Although distinct water levels have been measured at different depths of the Deep Aquifers within the Monterey Subbasin, insufficient data exist to subdivide the Deep Aquifers into distinct component horizons.

The Study delineated the lateral extent of the Deep Aquifers throughout the majority of the 180/400 Subbasin and into adjacent and nearby subbasins by tracing the continuous presence of the 400/Deep Aquitard. The extent of the Deep Aquifers into the Monterey Subbasin is shown on Figure 5. This figure includes areas marked as the uncertain extent, where current data are not sufficient to conclusively determine if the Deep Aquifers are present or absent.

The 400/Deep Aquitard was identified and traceable in AEM data and well completion reports from the coastal areas, southward to major geologic structures including the Laguna Seca Anticline. This confirms that the Deep Aquifers exist throughout the coastal Marina-Ord area of the Monterey Subbasin up to the Laguna Seca Anticline, and that the Deep Aquifers are in hydraulic communication with both the Seaside and 180/400-Foot Aquifer Subbasins. The depth of the 400/Deep Aquitard and the Deep Aquifers are refined with AEM data and well completion reports.

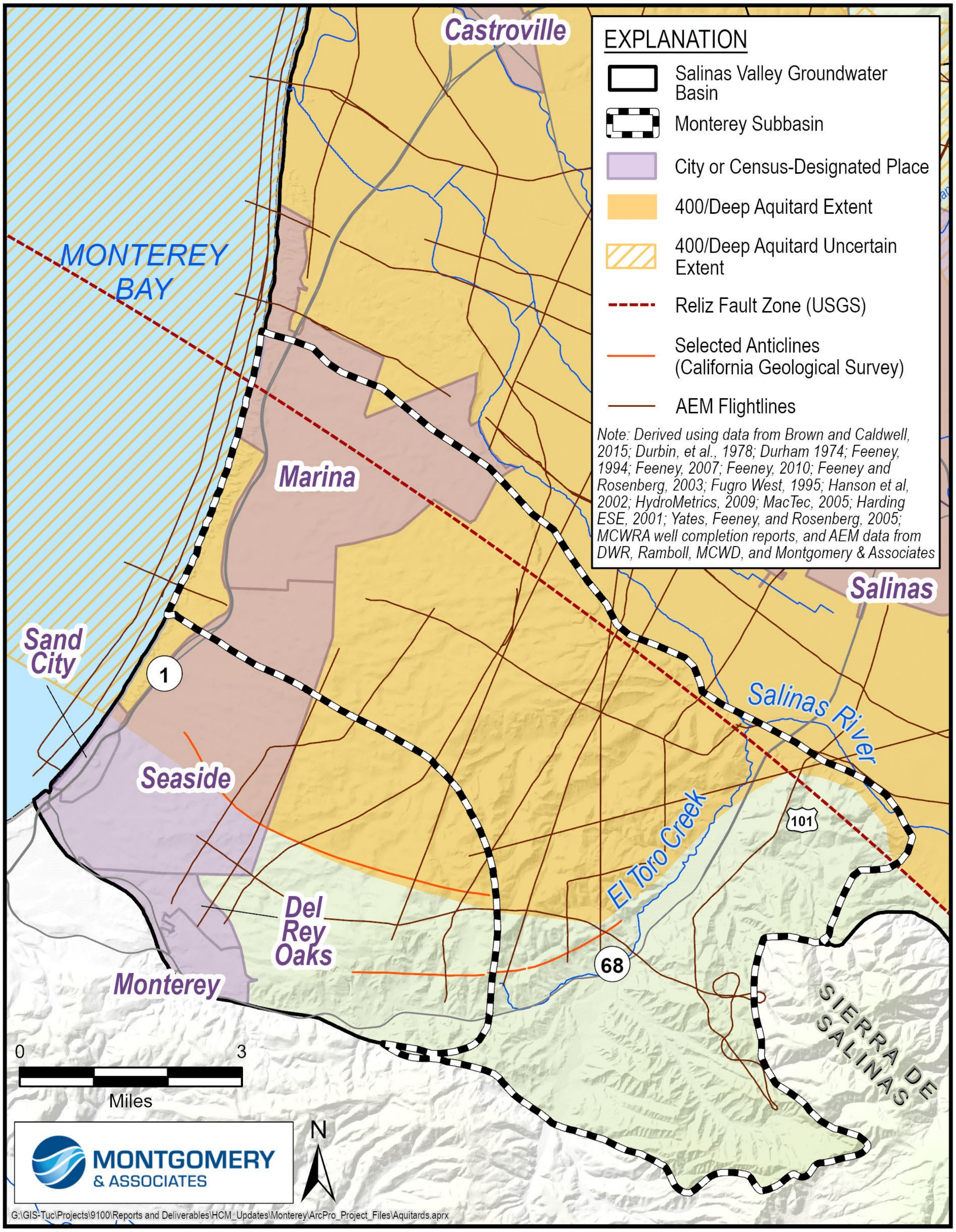

Figure 5. Updated Deep Aquifers Extents, as Determined by the Deep Aquifers Study (M&A, 2024)

Extents and Thicknesses of Coastal Shallow Aquitards

Principal Data Used: WCRs, published cross sections, groundwater elevation data, AEM data, Salinas Valley Geological Framework, MBGWFM

M&A and EKI updated the extents and thicknesses of the coastal aquitards in the Marina-Ord Area. These edits were relatively minor and do not constitute major updates to the Monterey Subbasin HCM.

The MBGWFM provided a starting point for the extents, depths, and thicknesses of aquitards. Where data indicated the aquitards should be refined, more in-depth mapping was completed, such as through analyses of driller-observed lithology supplemented by groundwater elevation data. This effort focused on 3 aquitards: the Salinas Valley Aquitard (SVA), the Intermediate Aquitard between the Upper 180-Foot Aquifer and the Lower 180-Foot Aquifer, and the 180/400-Foot Aquitard.

SVA

The SVA separates shallow sediments and the dune sands from the 180-Foot Aquifer. The lateral extent and thickness of the SVA was refined based on WCRs, AEM data from DWR Survey Area 1 (DWR, 2020), Survey Area 8 (DWR, 2022), the Deep Aquifers Survey (M&A, 2024), published cross sections, and information in the SVIHM and MBGWFM. The revised extent of the SVA is shown on Figure 6.

Consistent with the Monterey Subbasin GSP, the SVA exists near the Fort Ord area. Its extent is primarily based on the extent delineated in the *Final Report, Hydrogeologic Investigation of the Salinas Valley Basin in the Vicinity of Fort Ord and Marina* (Harding ESE, 2001). The extent of the SVA near the coast toward the 180/400 Subbasin was refined using WCRs, and the SVA was defined as pinching out toward the coast near Highway 1.

Figure 7 reproduces a cross section from the *Hydrogeologic Investigation of Salinas Valley Basin in the Vicinity of Fort Ord and Marina Salinas Valley, California* (Harding ESE, 2001) that shows the coastal aquitards in the Subbasin. Although the SVA is not specifically highlighted on this figure, the cross section shows the relatively continuous clay rich horizon that separates the dune sands and A-Aquifer from the 180-Foot Aquifer. Near the Salinas River on the right of the cross section, the SVA is a single, thick layer of clay that overlies the 180-Foot Aquifer. Moving south into the Monterey Subbasin, or to the left on the cross section, the SVA transitions to comprise several layers of clay that together create the hydraulic barrier between the Dune Sands and the 180-Foot Aquifer.

Intermediate Aquitard

Near the coast, the 180-Foot Aquifer in the Monterey Subbasin is separated into the Upper and Lower 180-Foot Aquifer with the Intermediate Aquitard in between. Figure 7 highlights the intermediate aquitard in blue. This figure shows how the Intermediate Aquitard separates the Upper 180-Foot Aquifer from the Lower 180-Foot Aquifer in the Monterey Subbasin. The extent and depth of the Intermediate Aquitard was refined in collaboration with EKI and using AEM data, WCRs, and published cross sections.

180/400 Aquitard

The extent and thickness of the 180/400 Aquitard was refined using data from previous studies including the *Hydrogeologic Investigation of Salinas Valley Basin in the Vicinity of Fort Ord and Marina Salinas Valley, California* (Harding ESE, 2001), the *Final Report, Hydrostratigraphic Analysis of the Northern Salinas Valley* (Kennedy/Jenks, 2004), and *Recommendations to Address the Expansion of Seawater Intrusion in the Salinas Valley Groundwater Basin* (MCWRA, 2017). Additionally, data from WCRs, AEM transects, and groundwater data were used to define the aquitard’s gaps and thin spots. The refined extent of the aquitard is shown on Figure 8, with the full extent of the aquitard in green, and the locations of intermittent or aquitard gaps are displayed in light green.

The revised interpretation shows this aquitard as uneven in thickness and intermittently present, especially in the coastal areas of the Monterey and 180/400 Subbasins. Within the Marina-Ord Area, there are notable thin or intermittent zones, which results in hydrologic connections between the 180-Foot and 400-Foot Aquifer. This interpretation was further refined by examining where groundwater elevations in the 180- and 400-Foot Aquifers are similar, as illustrated on Figure 9. Thin or intermittent aquitard locations were furthermore confirmed using AEM data, where applicable. AEM data also demonstrated that the 180/400 Aquitard is more laterally extensive in the southern portion of the Marina-Ord area than previously believed.

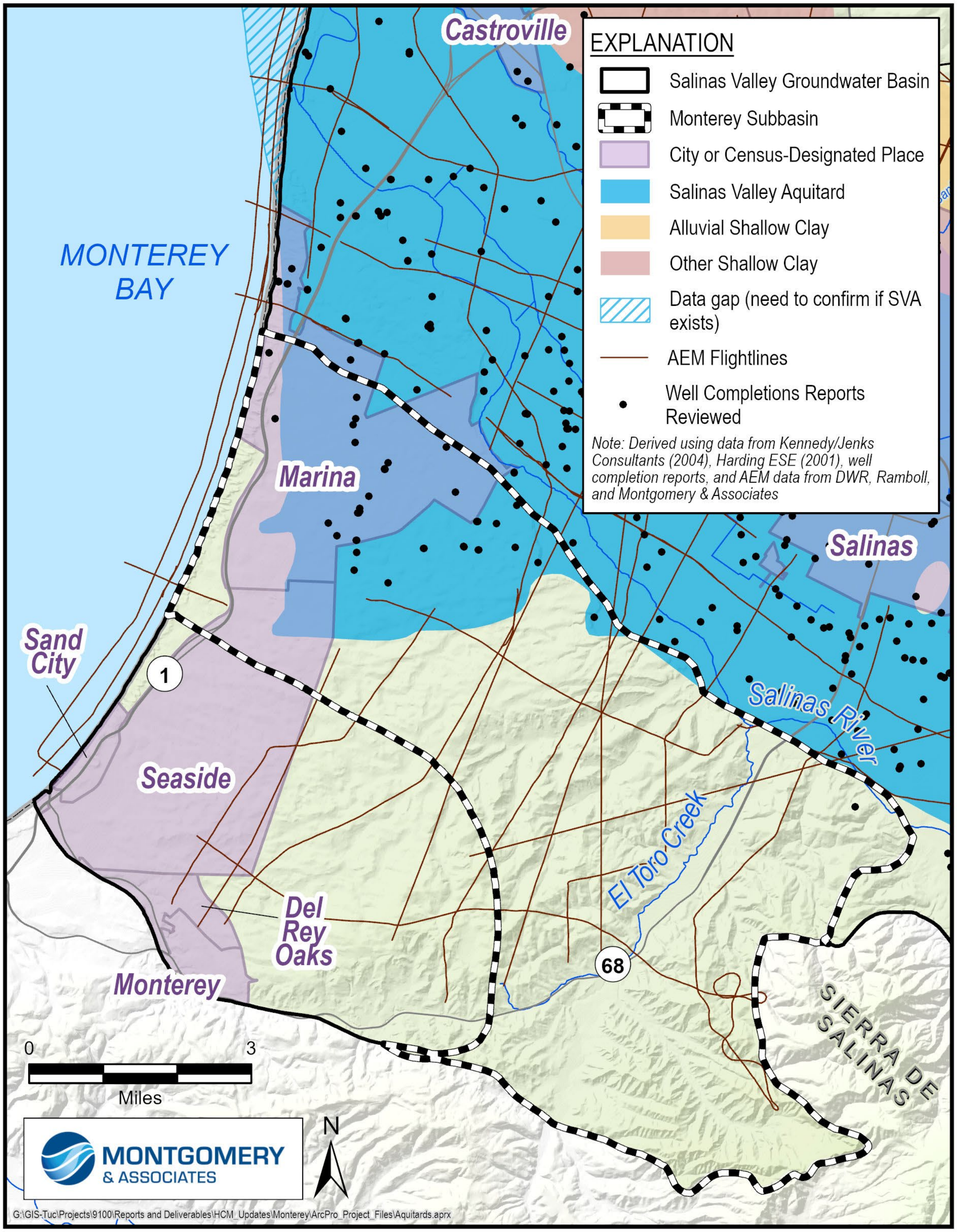

Figure 6. Updated Understanding of the SVA and Shallow Clays with Key Data Sources

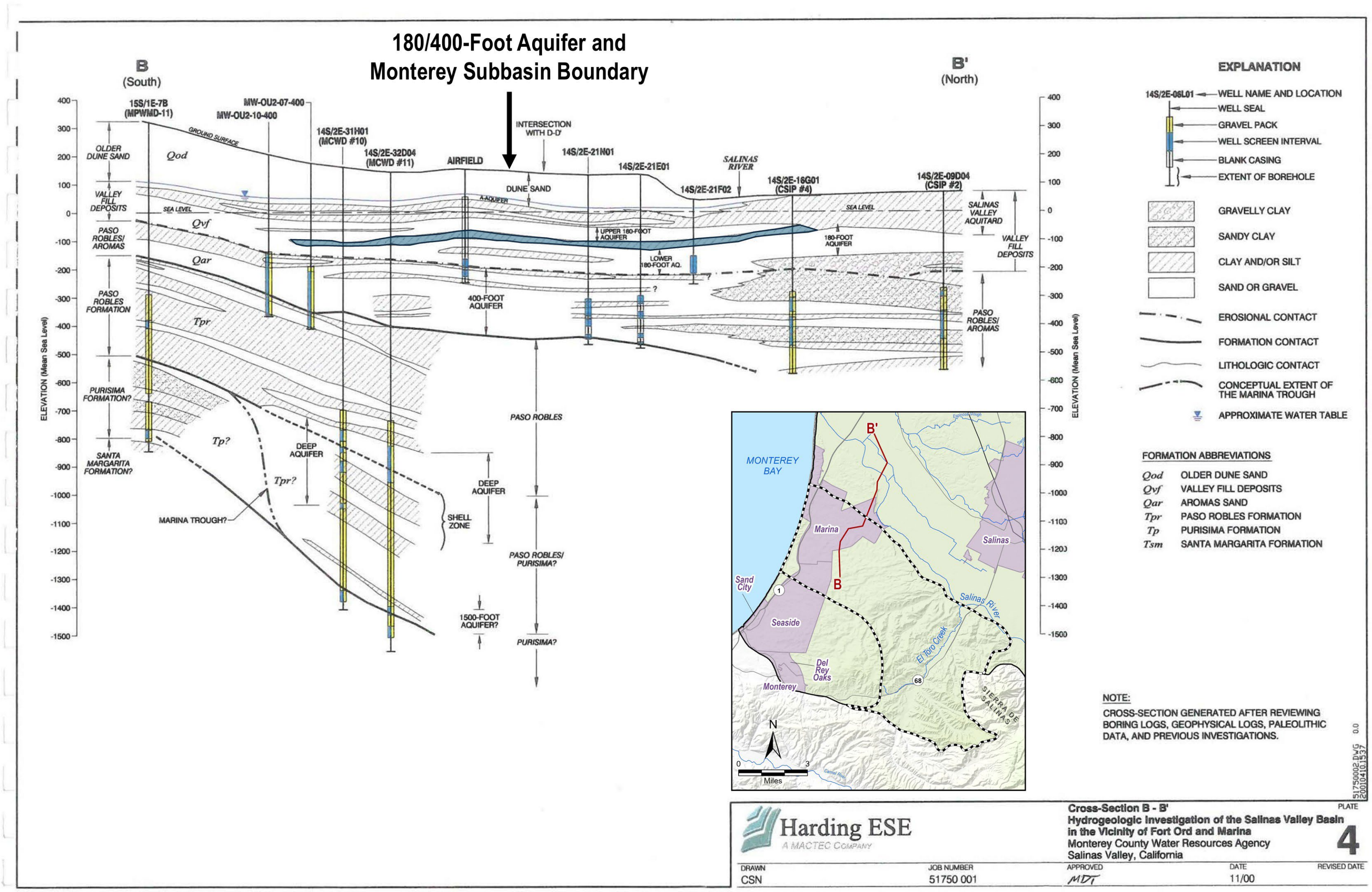

Figure 7. Cross Section of SVA and Intermediate Aquitard (adapted from Harding ESE, 2001)

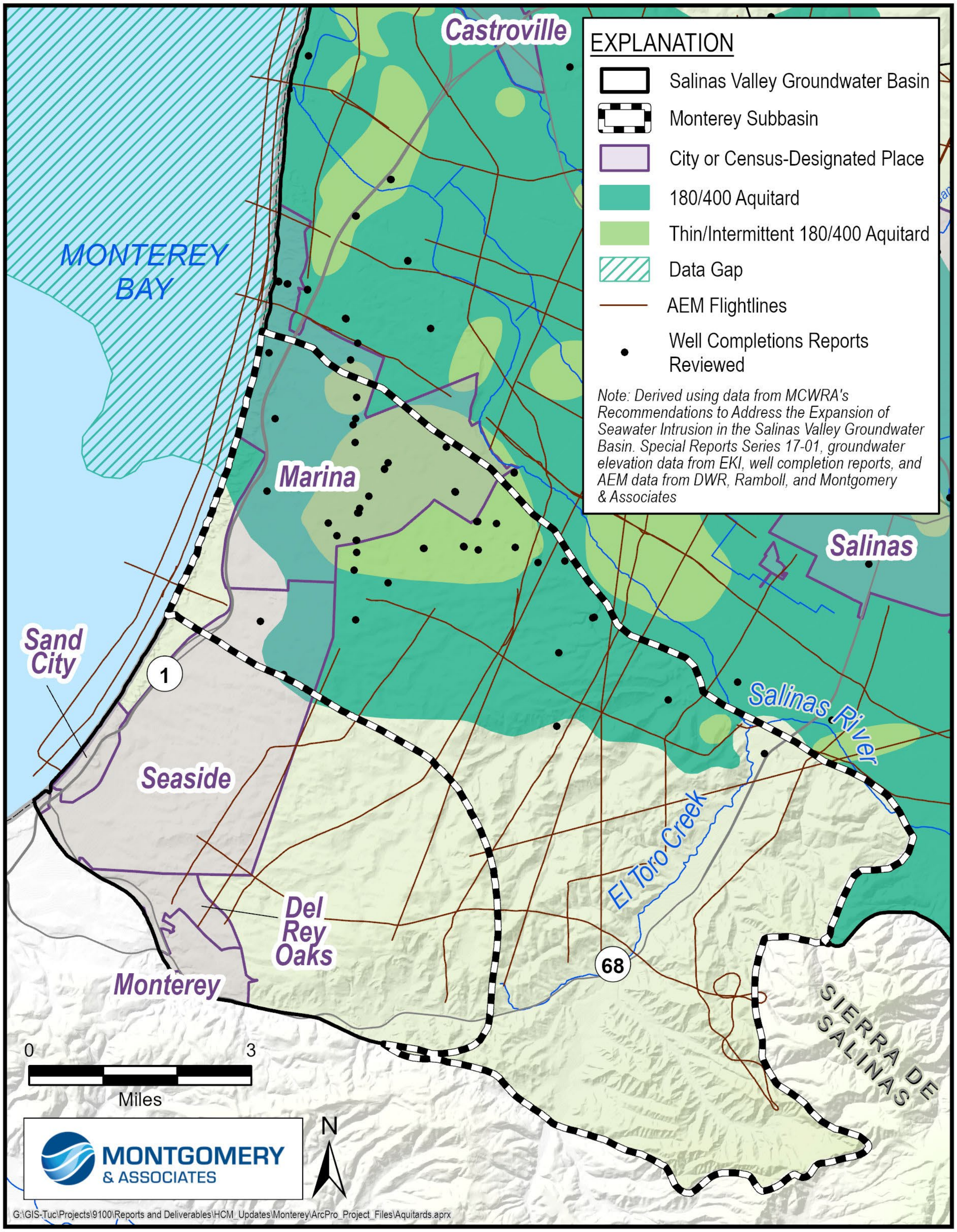

Figure 8. Updated Understanding of the 180/400 Aquitard with noted Thin or Intermittent Zones

Figure 9. Hydrographs with Similar Groundwater Elevation in the 180- and 400-Foot Aquifers in the Marina-Ord Area

Relationships with other Managed Groundwater Areas

Interaction between the Monterey Marina-Ord and Corral Areas

Principal Data Used: AEM data, WCRs, published cross sections, surface geology maps

The relationship between the Corral de Tierra's El Toro Primary Aquifer System and the coastal Marina-Ord aquifers of the Monterey Subbasin has been poorly defined due to a lack of data through the middle of the Subbasin. Previous conceptualizations of the connectivity presumed the El Toro Primary Aquifers System followed the bedrock surface and connected to the principal aquifers in the Marina-Ord Area because of their shared geology. This previous concept supported modeling that simulated strong hydraulic connectivity between the Corral de Tierra and Marina-Ord areas. However, no wells between the Corral de Tierra and Marina-Ord areas provide a basis for this connectivity.

The updated conceptualization, which is primarily founded on the updated, shallower bedrock in the Corral de Tierra area, shows a clearer geologic separation of the 2 regions within the Monterey Subbasin. The Laguna Seca Anticline is well defined by the AEM data. A cross section showing the axis and the arms of the Anticline is shown on Figure 10. The Laguna Seca Anticline forms the north-northwestern rim of the El Toro and Highway 68 East bowls that contain the El Toro Primary Aquifer System discussed in the sections above. This cross section shows how the Paso Robles Formation in the El Toro bowl is hydrogeologically isolated from the same formation in the Marina-Ord area. The hydraulic connectivity between the El Toro bowl and Marina-Ord Area is reduced not only by pinched hydrostratigraphy across the anticline axis, but also by the presence of Toro Canyon, which interrupts potential groundwater flow from higher elevations. When groundwater wells and water table contours are added to the conceptualization, it becomes apparent that the Corral de Tierra and Marina-Ord areas are distinctly separate. However, in the northern portion of the Corral Area, the anticline is not observed, which increases the potential for hydraulic connectivity between the Highway 68 East bowl and the Marina-Ord Area.

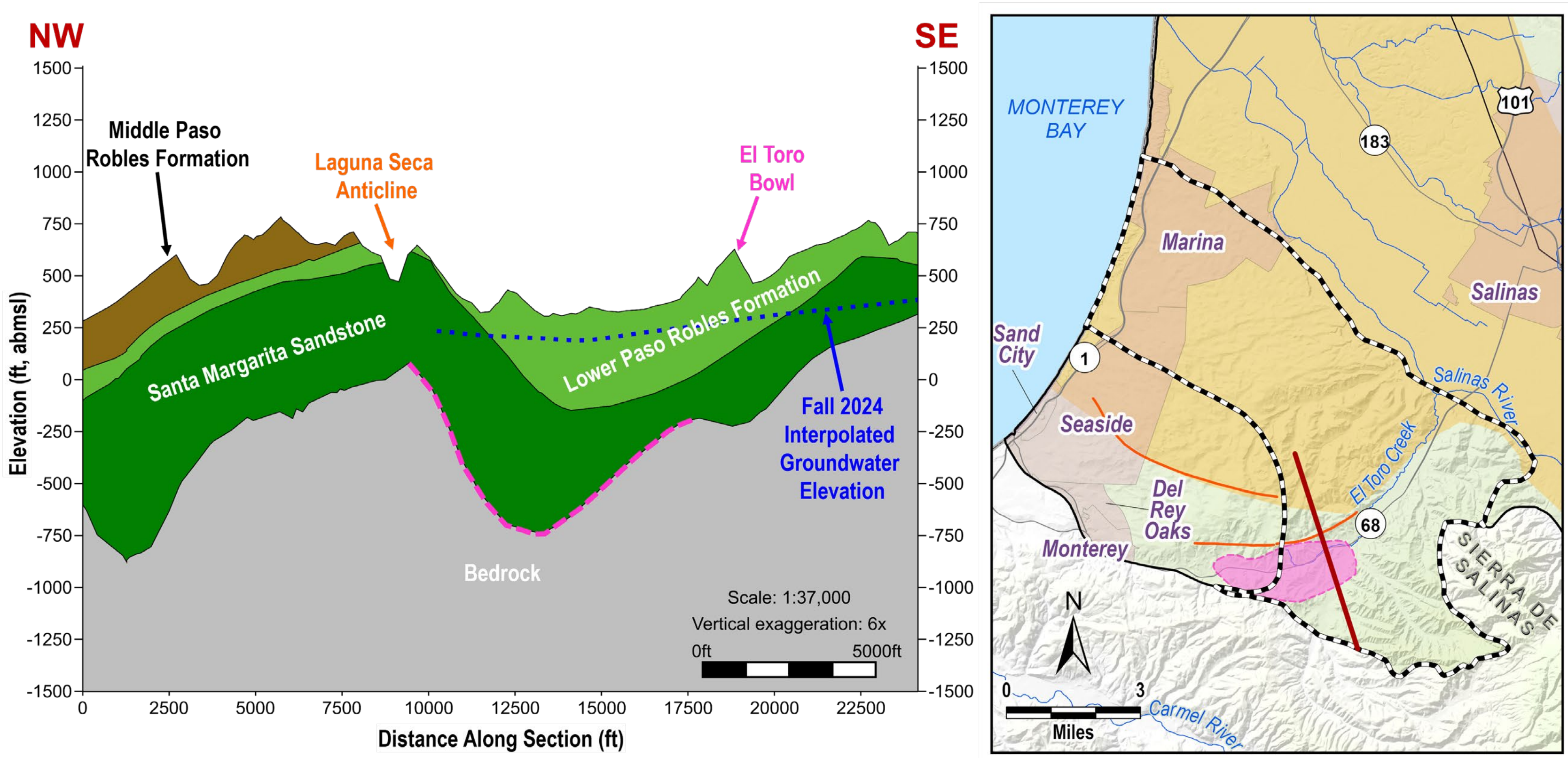

Figure 10. Bedrock Surface Demonstrating Revised Relationship between Corral and Coastal Monterey Subbasin Areas

180/400 Subbasin Boundary

Coastal Area and the 180/400 Subbasin

The relationship between the Coastal area and the 180/400 Subbasin generally remained the same as previous interpretations, with minor modifications from the aquitards' revisions described above.

Corral Area and the 180/400 Subbasin

Principal Data Used: AEM data, published cross sections, surface geology maps

The relationship between the Corral de Tierra El Toro Primary Aquifer System and the 180/400 Subbasin was previously poorly defined due to a lack of data across the subbasins' boundary. Previous conceptualizations of the connectivity presumed the Toro Primary Aquifer System followed the bedrock surface and connected to the principal aquifers in the 180/400 Subbasin because of their shared geology. It was generally thought that water flowed from the El Toro area into the 180/400 Subbasin with little influence from Reliz Fault, similar to what is observed in the coastal areas of the Subbasin. Cross section X_1-Z in the *Geologic Map and Cross-Sections from El Toro to Salinas Valley* (Geosyntec, 2010), as shown in the Monterey Subbasin GSP (MCWDGSA and SVBGSA, 2022), shows uplift of the bedrock that defined the overlying permeable materials connection to the 180/400 Subbasin.

The conceptualization of the boundary between the Corral area and the 180/400 Subbasin was revised to reveal a much more limited hydraulic connection between the 2 areas. AEM data in combination with the geologic map in the Corral de Tierra Area reveal that the bedrock reaches the surface and then dives steeply as it approaches the mapped Reliz Fault as shown on Figure 4, which also shows the bedrock bowls. These data suggest that groundwater flow between the Corral de Tierra area and the 180/400 Subbasin may be somewhat limited. This boundary remains an area of uncertainty due to the geologic complexity, and this conceptual understanding may be updated in the future with more refined data. In addition, results of numerical modeling will be used to verify that measured water level data can be simulated using this updated hydrogeologic conceptual model.

Seaside Basin Boundary

Coastal Monterey and Seaside Basin

The primary aquifers in the Seaside Basin are defined by their geological formations and include the Paso Robles Aquifer, often denoted as "shallow," and the Santa Margarita Aquifer, often denoted as "deep." Historically, it was believed that the 400-Foot Aquifer and the Deep Aquifers in the Monterey Subbasin were generally connected to the Paso Robles and Santa Margarita Aquifers, respectively (MCWDGSA and SVBGSA, 2022).

The revised bedrock surface analysis and the *Deep Aquifers Study* have confirmed the direct hydrostratigraphic connection between the Marina-Ord Area with the Seaside Basin, with no apparent geologic barrier to groundwater flow. The study extended of the Deep Aquifers into the Seaside Basin based on the presence of the continuous 400/Deep Aquitard, which terminates at the axis of the Laguan Seca Anticline. The reassessment of the depth of the 400/Deep Aquitard indicates that many wells screened in the Paso Robles Formation in the southern Marina-Ord Area and Seaside Basin, historically associated with the 400-Foot Aquifer, are screened below the continuous 400/Deep aquitard. This places these wells in the Deep Aquifers, which may affect the assessment of groundwater gradients, aquifer-specific water budgets, and changes in storage. A cross section illustrating how both the 400-Foot and the Deep Aquifers extend from the Monterey Subbasin into the Seaside Basin is shown on Figure 11.

Corral de Tierra Area and Laguna Seca Area

Principal Data Used: AEM data, surface geology maps

The relationship between the Corral de Tierra Area of the Monterey Subbasin and the Laguna Seca area of the Seaside Basin has been poorly understood. There has been historical concern over the groundwater relationships between these areas, and how pumping in one area might impact the adjoining area. No physical boundary to groundwater flow has ever been postulated; this boundary is only one of convenience between the Seaside Basin and the Monterey Subbasin.

The updated conceptualization of this boundary relationship focuses on the geologic setting with the revised bedrock contours providing the basis for the refinement. The revised bedrock surface establishes the isolated El Toro bowl, which is bisected by the jurisdictional boundary between the Seaside Basin and Monterey Subbasin as shown on Figure 12 and Figure 4. The revised bedrock surface establishes the hydrologic connection between these areas and supports the observed related groundwater levels and groundwater pumping. Further, the isolated nature of the El Toro bowl indicates that these 2 hydrologically connected areas might be somewhat separated from other portions of both the Seaside and Monterey Subbasins as discussed above.

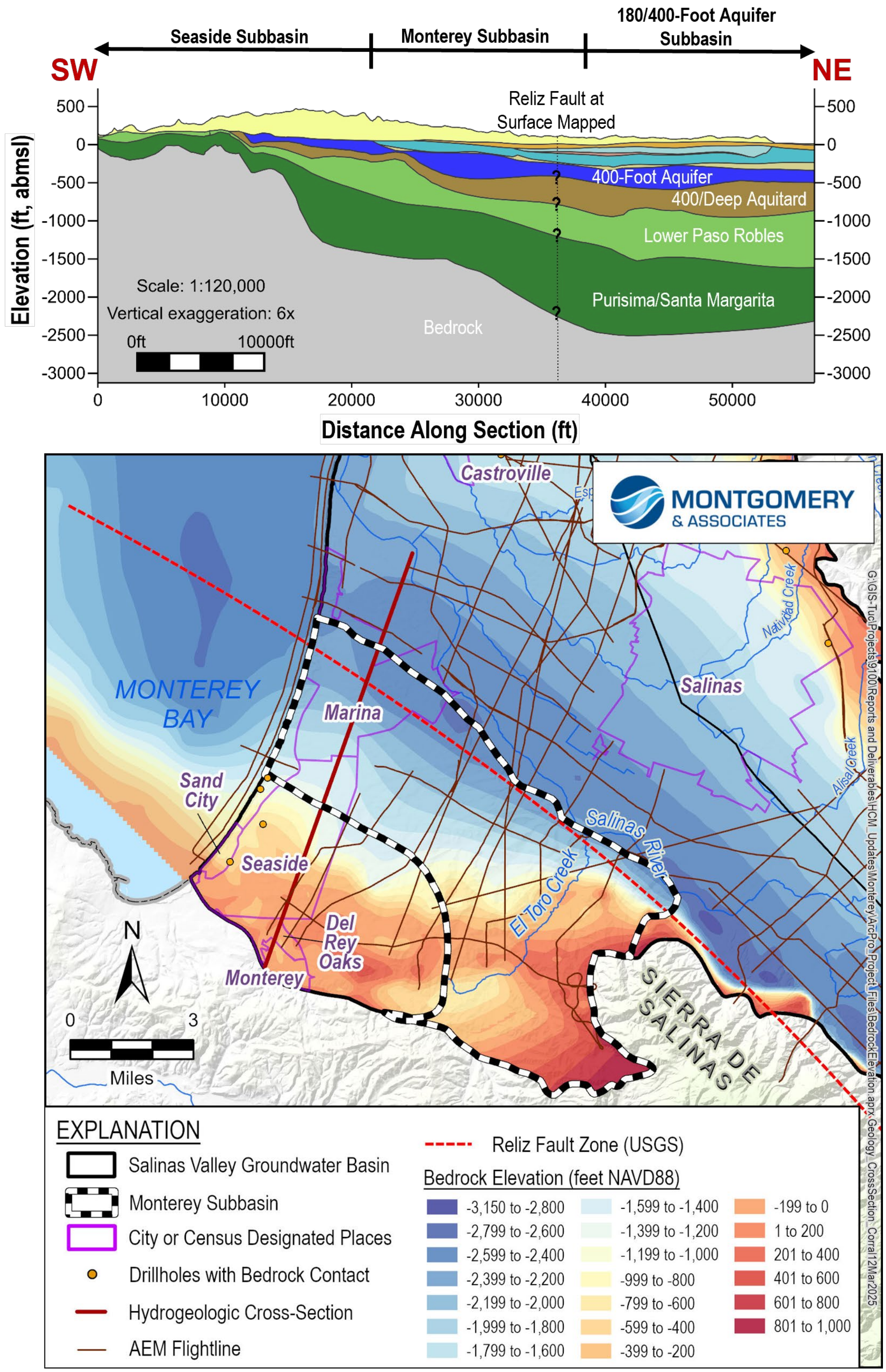

Figure 11. Revised Layers Across the Subbasin Boundary

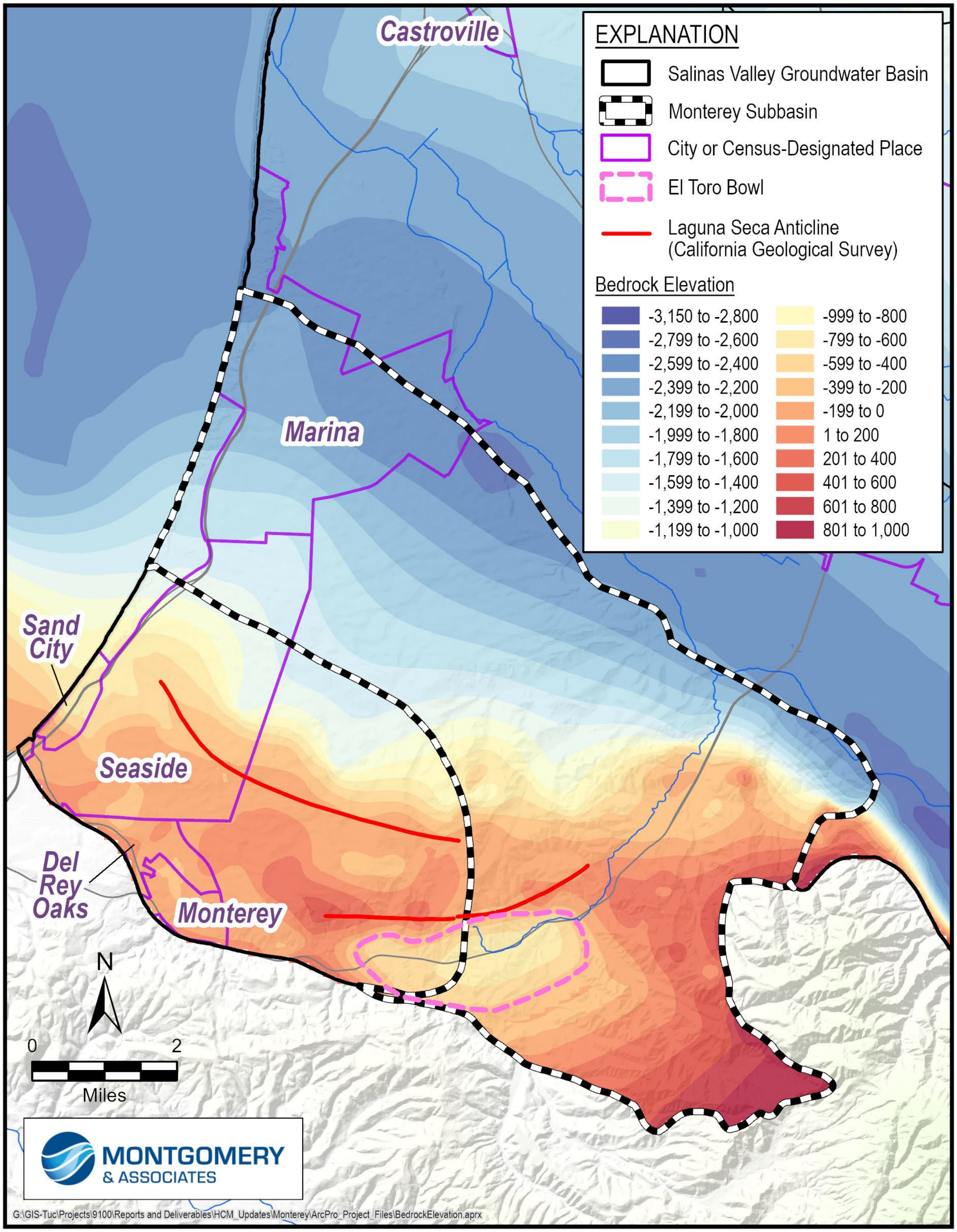

Figure 12. El Toro Bowl and Jurisdictional Boundary with Seaside Basin

CONCLUSIONS

The Monterey Subbasin HCM presented in the GSP was developed using the best available data and information at the time. The SVBGSA, in collaboration with the MCWDGSA, has collected and analyzed significant amounts of new data to refine and update the conceptual model, providing clear HCM refinements for the Monterey Subbasin. These refinements focus on both the Coastal and Corral areas, separated by the axis of the Laguna Seca anticline.

The following bullets summarize the principal updates to the Monterey Subbasin HCM:

- The bedrock surface that delineates the bottom of the productive aquifers has been updated using multiple datasets for a more complete view of the depth and shape of the groundwater basin. In the Coastal Area, the bedrock surface extends to Monterey Canyon where the respective geologic formations crop out. In the Corral Area, the updated bedrock surface indicates the Corral de Tierra Area groundwater occurs primarily in the isolated El Toro bowl and the Highway 68 East bowl.
- The Deep Aquifers are confirmed in the Marina-Ord Area and are defined by the presence of the continuous 400/Deep Aquitard, which extends south terminating at the axis of the Laguna Seca Anticline (M&A, 2024). The depth and extent of the 400/Deep Aquitard was refined by tracing its respective AEM resistivity profile.
- The extents of the coastal aquitards were refined based on additional WCR, cross sectional, AEM, groundwater elevation, and other mapped data without significant changes from the Monterey Subbasin GSP and MBGWFM. Notable thin or intermittent zones were further refined and incorporated into the geologic model.
- The hydrogeologic relationships between the Marina-Ord and Corral areas of the Monterey Subbasin, the Monterey and the 180/400-Foot Aquifer Subbasins, and the Monterey and Seaside Subbasins have been updated based on the revised bedrock surface updates and the results of the *Deep Aquifers Study*.
    - Within the Monterey Subbasin, hydrogeologic connectivity appears to be limited between the El Toro bowl and the coastal Marina-Ord Area, while some degree of potential connectivity between the Highway 68 East bowl and the Marina-Ord Area.
    - Between the Monterey and the 180/400 Subbasins, the Coastal connection in the GSP is confirmed, and there appears to be potential hydrogeologic connectivity between the Corral de Tierra area and the 180/400-Foot Aquifer Subbasin starting at the Highway 68 East bowl.

- o Between the Monterey and the Seaside Basins, there is shared hydrogeologic connectivity with the Coastal area. The 400/Deep Aquitard extends into both Subbasins in the coastal areas, demonstrating that the 400-Foot Aquifer and Deep Aquifers exist in both subbasins. There is hydrogeologic connectivity between the Corral area and Laguna Seca area in the El Toro bowl, as defined by the revised bedrock surface.

MONTGOMERY & ASSOCIATES

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APPENDIX B

WY 2024 Hydrologic Condition and Water Management in the Salina Valley Basin

WATER YEAR CONTEXT FOR WATER USE AND GROUNDWATER MANAGEMENT

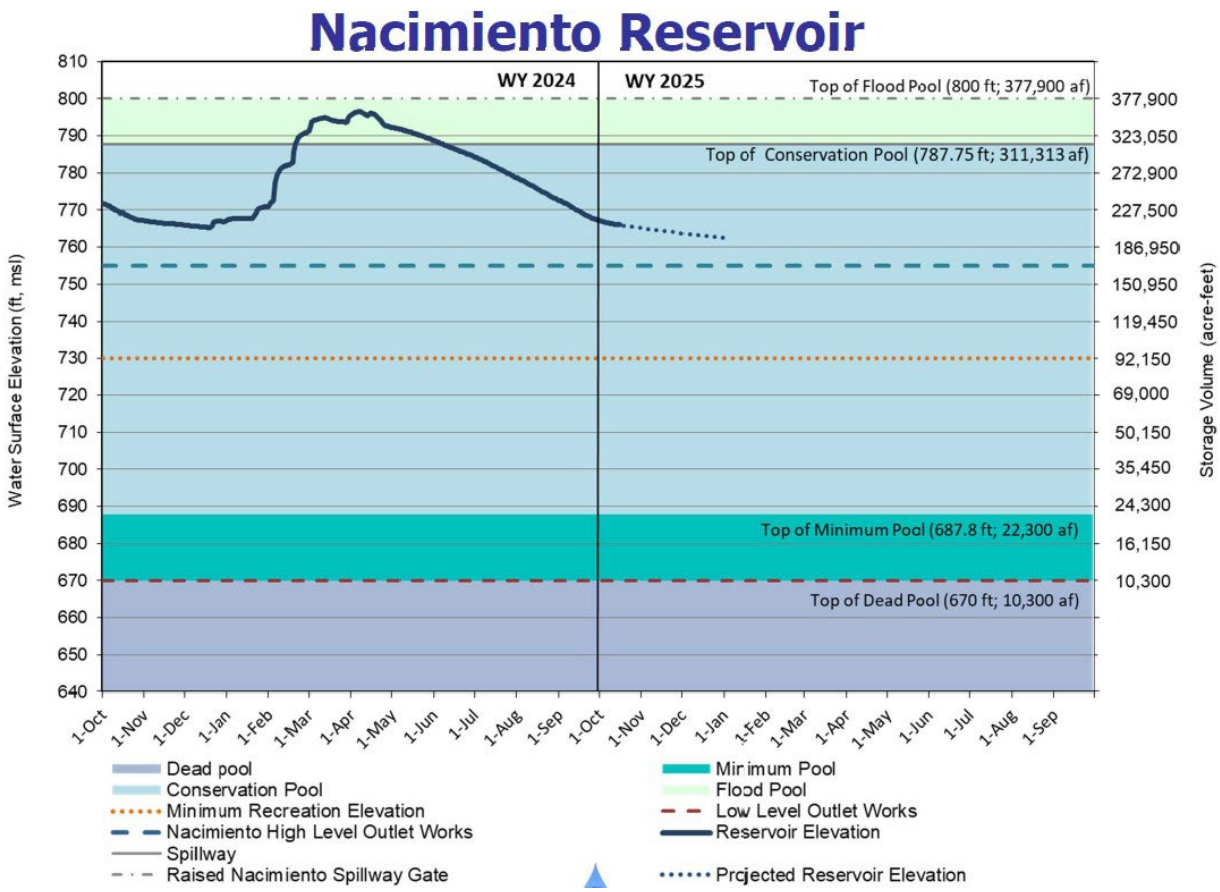
Many factors affect groundwater use and management. In the Salinas Valley, MCWRA operates the Nacimiento and San Antonio Reservoirs for multiple purposes, including groundwater recharge, and re-diversion of stored reservoir water for delivery to the Castroville Seawater Intrusion Project (CSIP) as an in-lieu irrigation supply in the seawater intruded area, and flood control. Reservoir operation, the amount of surface water diverted to CSIP at the Salinas River Diversion Facility (SRDF), and CSIP deliveries from recycled water provide meaningful context for water use and management in the Salinas Valley. In, stakeholders offered commentary through the subbasin implementation committees on how their operations and water use were affected by factors such as flooding, temperature, pests, and market conditions. While the experiences of subbasin committee members are not necessarily representative of all groundwater users, they provide important context for interpreting water use fluctuations and trends.

A.1. Reservoir Operations and Streamflow

Reservoir elevations and storage are critical factors MCWRA considers in determining releases from Nacimiento and San Antonio Reservoirs. Figure 1 and Figure 3 show reservoir elevations and storage from WY 2024 to the beginning of WY 2025 for the Nacimiento and San Antonio Reservoirs, respectively. With the above-normal precipitation that occurred during WY 2024, the storage increased during the wet season and in February the reservoir elevation in Nacimiento rose into the flood pool. Then, during the conservation release season, storage decreased, and at the end of the water year was about the same as at the beginning.

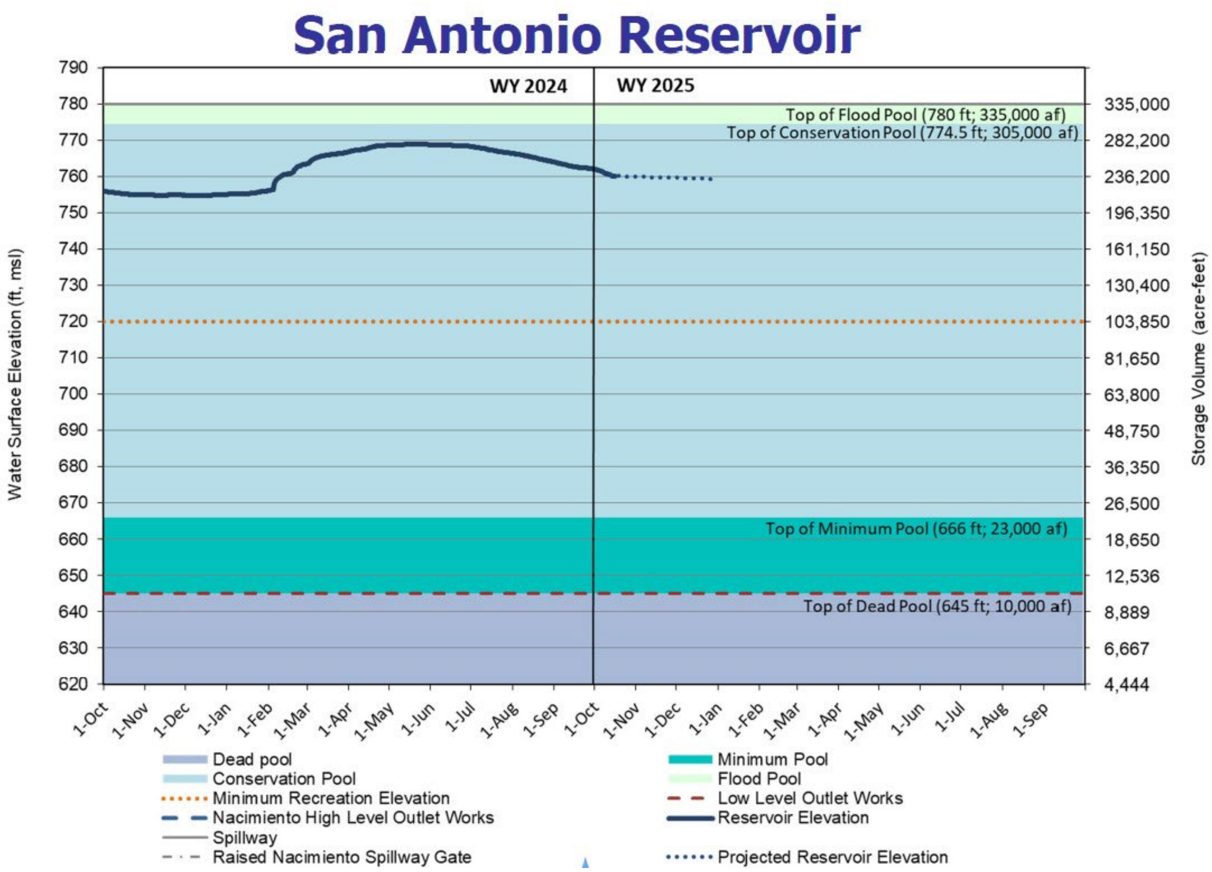
Figure 2-3 shows that from the beginning to the end of WY 2024, Nacimiento Reservoir storage decreased from 64% to 57% of capacity, ending at 215,590 AF of water in storage. Figure 2-4 shows that San Antonio Reservoir storage increased from 66% to 73% of capacity, ending at 244,900 AF of water in storage.

During WY 2024, releases were made from Nacimiento and San Antonio Reservoirs for water conservation to provide stored reservoir water for groundwater recharge to the Salinas Valley Groundwater Basin and operation of the SRDF. Operation of the SRDF began May 10, 2024, and continued through the remainder of WY 2024. Releases during WY 2024 were made in accordance with existing regulations and agreements to provide for fish and wildlife habitat. The timing and quantity of reservoir releases accounted for natural flows in the Salinas River in addition to considerations for minimizing impacts on reservoir levels during peak recreational periods, to the extent possible.



(MCWRA, 2024)

Figure 1. Nacimiento Reservoir Water Surface Elevation and Storage Volume in WY 2024



(MCWRA, 2024)

Figure 2. San Antonio Reservoir Water Surface Elevation and Storage Volume in WY 2024

A.2. Water Use and Management

In 2024, the Governor's State of Emergency that was in place for drought conditions was lifted for Monterey County. Therefore, SVBGSA is no longer required to review well permits under Executive Order N-7-22. The County of Monterey's well permit application and review process otherwise remains the same.

Subbasin implementation committees noted that during WY 2024, several factors affected water use and management, in particular the following:

- **State urban mandates** affect water use within drinking water systems subject to the following mandates (State Water Resources Control Board [SWRCB], 2024a):

  1.1. For urban water suppliers, statewide Level 2 demand reduction actions not required: The requirement for urban water suppliers to implement demand-reduction actions that correspond to at least Level 2 of their water shortage contingency plans has not been in effect during WY 2024.

1.2. **For commercial, institutional, and Home Owner Association (HOA) common areas, the decorative grass watering emergency ban has expired:** The Emergency Regulation to Ban Decorative Grass Watering (non-functional turf irrigation) in commercial, industrial, and institutional areas, including HOA common areas expired by operation of law on June 5, 2024. In October 2023, however, the California State Legislature passed Assembly Bill 1572, which phases in a permanent ban on decorative grass watering in commercial, industrial, and institutional areas.

1.3. **Emergency prohibition on wasteful water uses has expired:** The Emergency Regulation to Prohibit Wasteful Water Uses (such as refilling fountains without recirculating pumps, overwatering landscapes, watering grass within 48 hours of rainfall, etc.) expired on December 21, 2023.

A.3. CSIP Operations

The CSIP delivers a combination of recycled water, stored reservoir surface water, and groundwater as an irrigation supply to growers in part of the seawater intruded area. While CSIP is only located in the 180/400 Subbasin, it affects MCWRA operation of the reservoirs, which affects recharge along the Salinas River. Storage in Nacimiento and San Antonio Reservoirs allowed MCWRA to make summer conservation releases and divert surface water at the SRDF to CSIP. Recycled and surface water provided the majority of water to CSIP during WY 2024, reducing groundwater pumping when compared to previous years. Figure 3 shows monthly CSIP water deliveries by water type since January 2020. In summer 2024, surface (river) water and recycled water made up the majority of CSIP supply, similar to summer 2023.

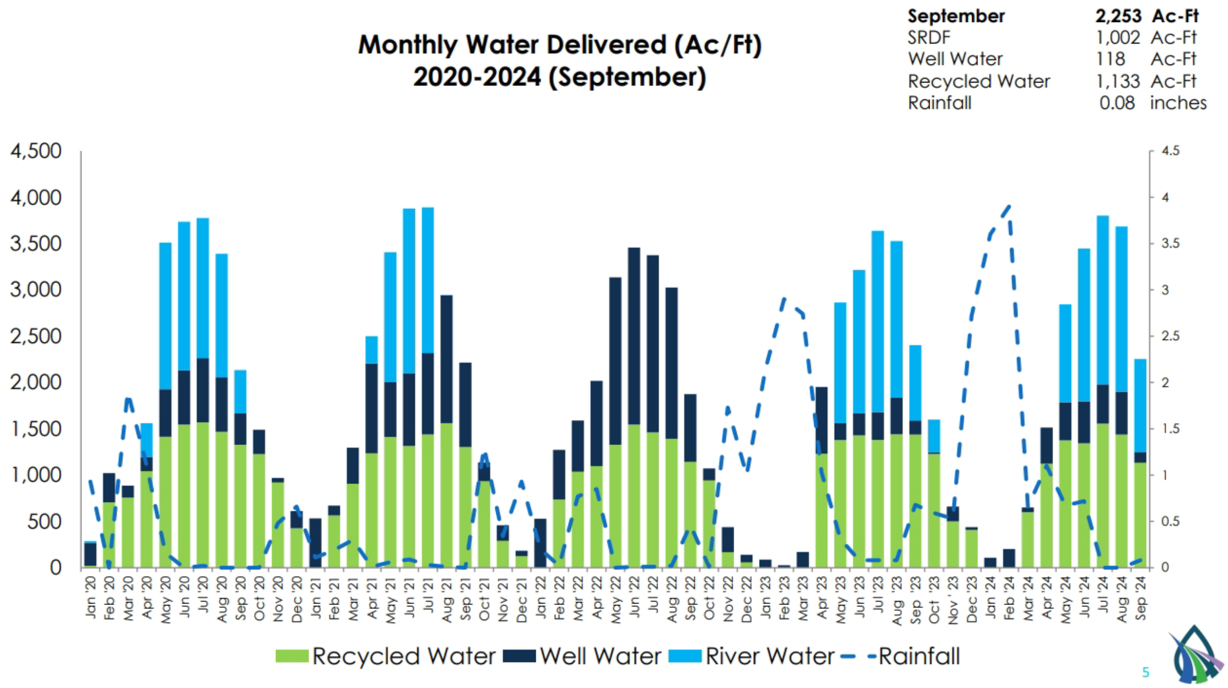


Figure 3. WY 2024 Monthly Water Delivered (AF/yr) to CSIP (M1W, 2024)

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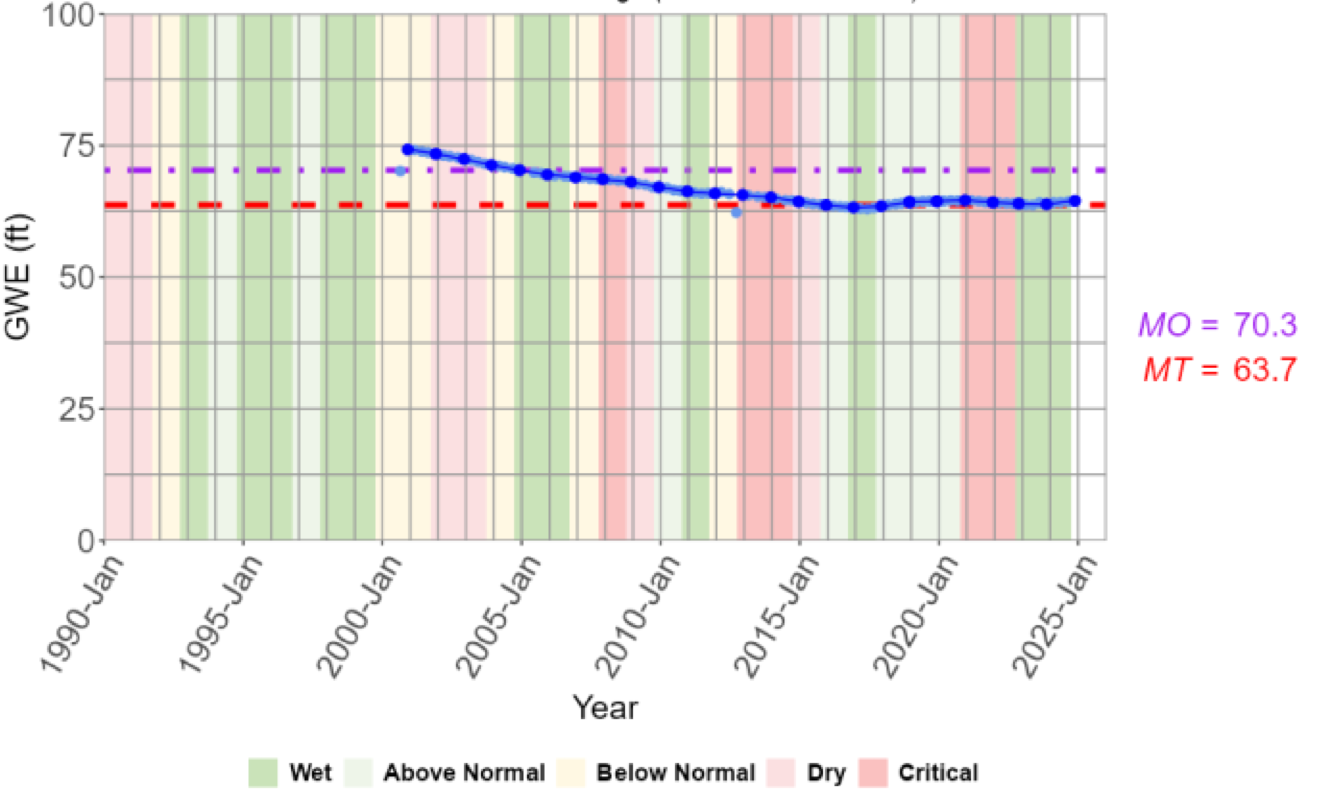
APPENDIX C

Long-term Groundwater Elevations in

Groundwater Level RMS Wells

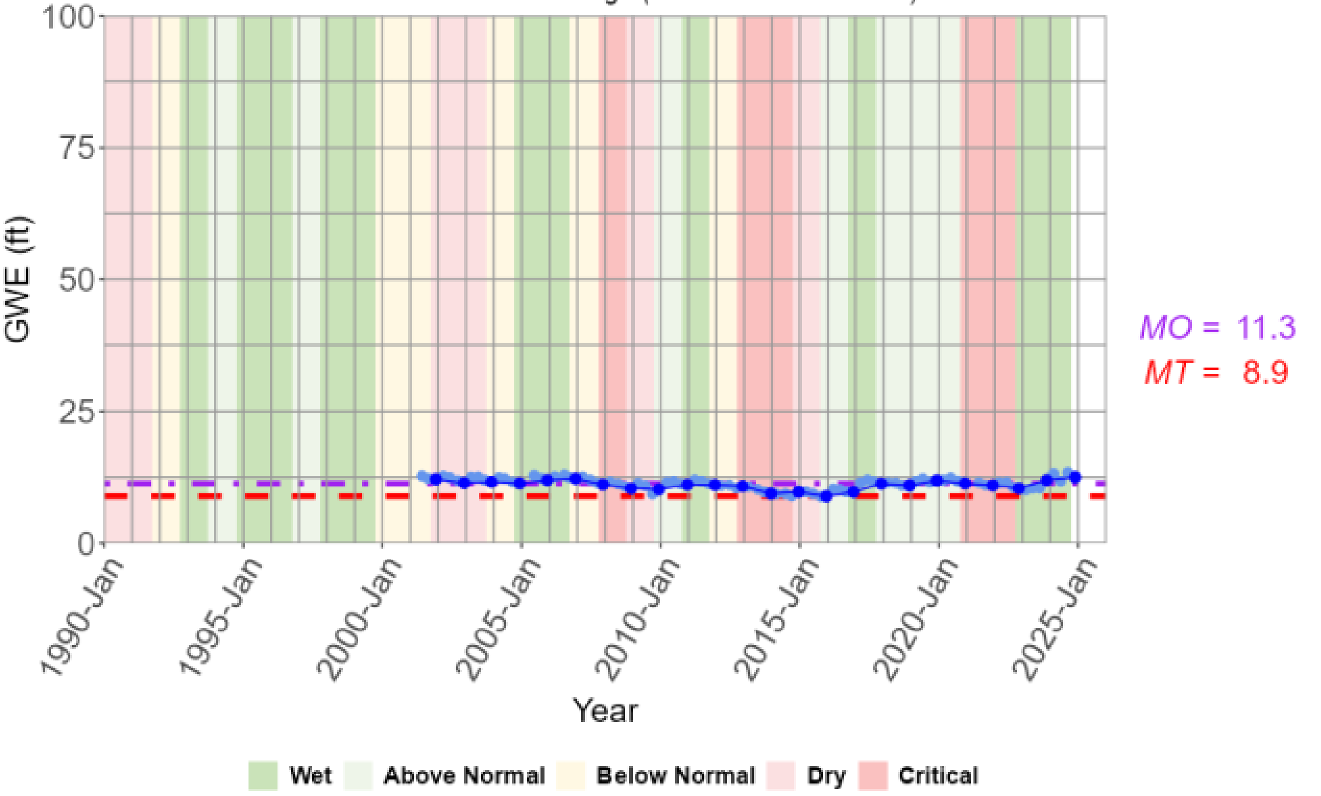
MW-BW-28-A

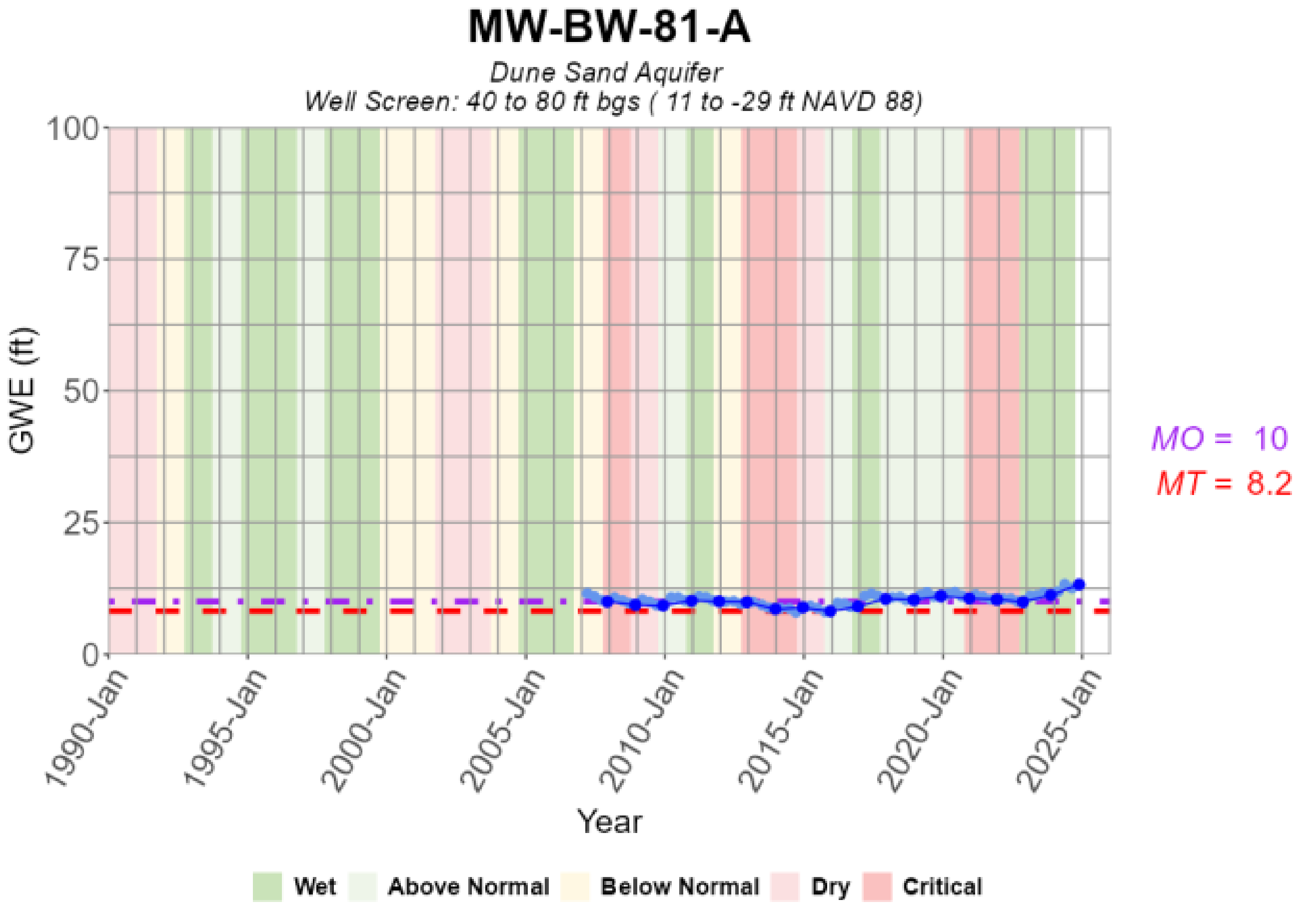
Dune Sand Aquifer
Well Screen: 83 to 113 ft bgs (58 to 28 ft NAVD 88)

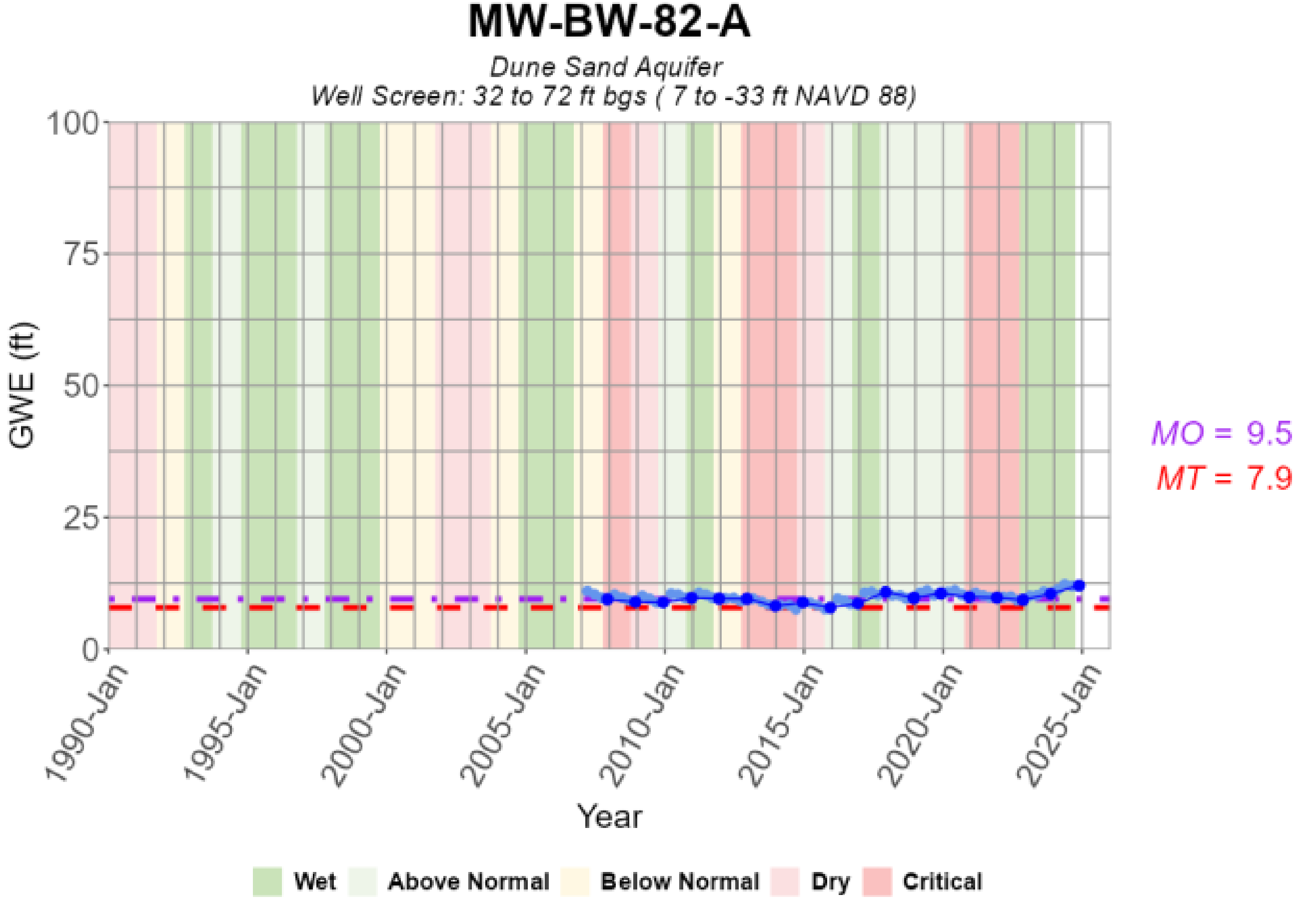


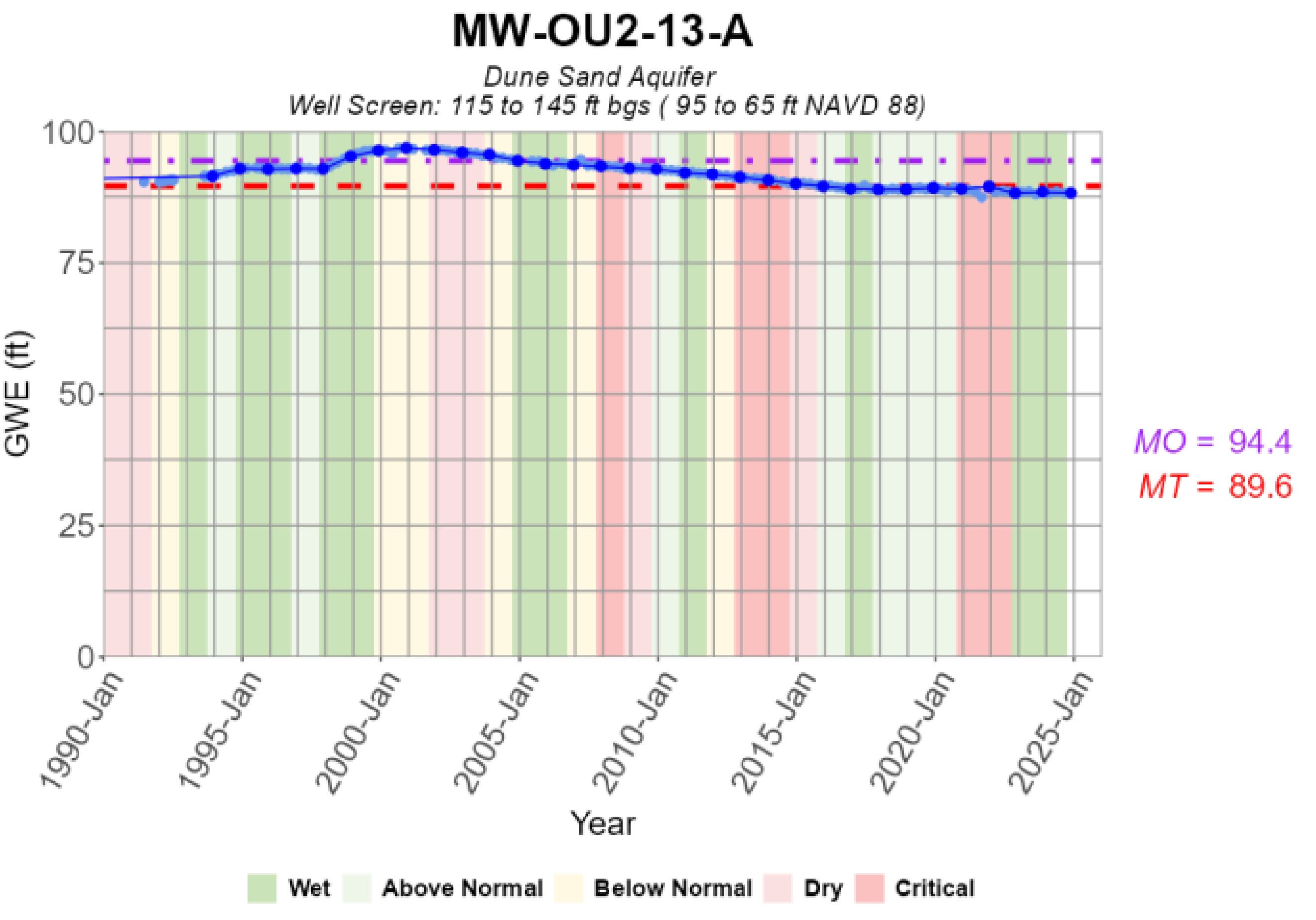
MW-BW-49-A

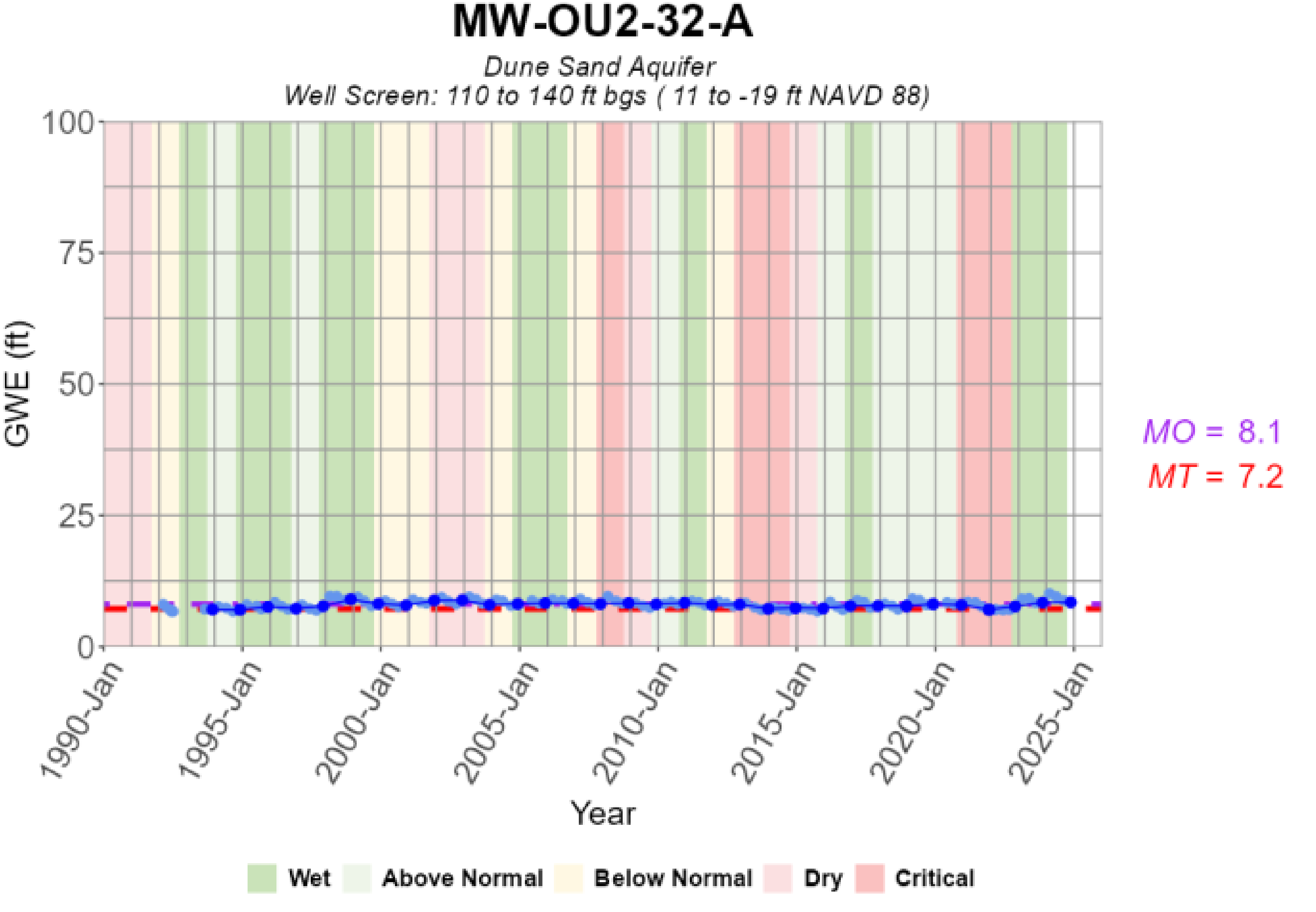
Dune Sand Aquifer
Well Screen: 32 to 62 ft bgs (13 to -17 ft NAVD 88)

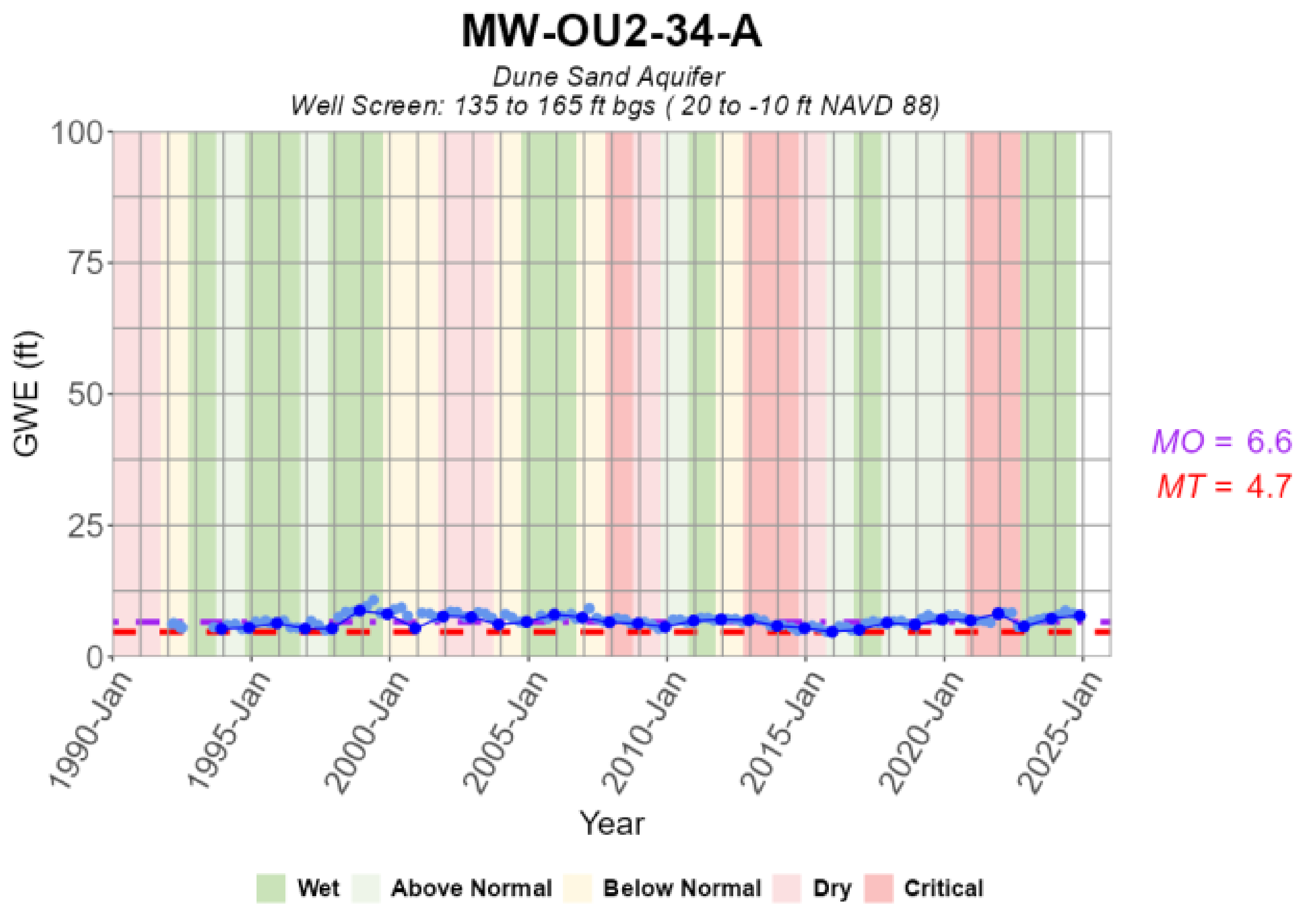


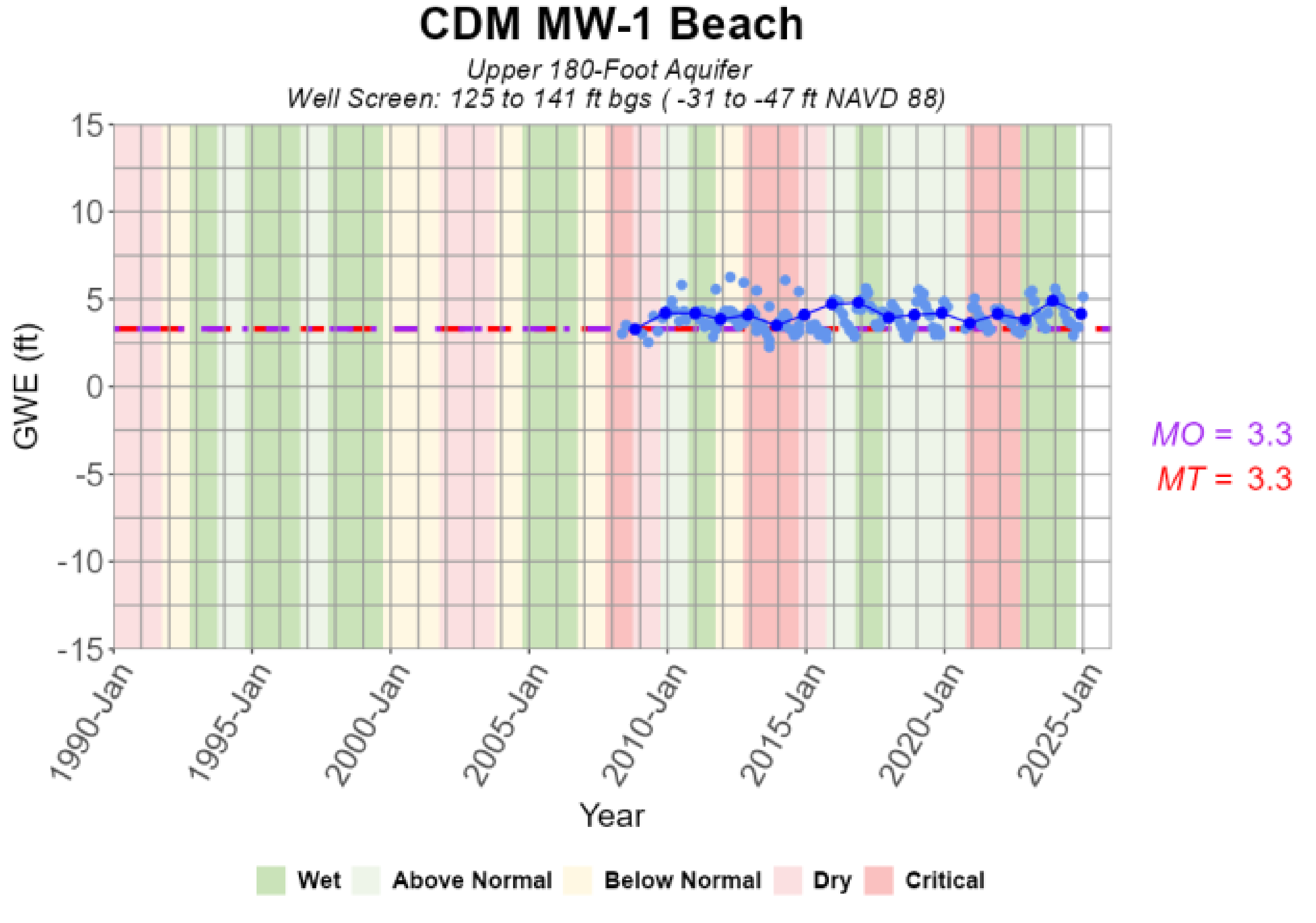

MW-BW-81-A
Dune Sand Aquifer
Well Screen: 40 to 80 ft bgs (11 to -29 ft NAVD 88)
GWE (ft)
Year
MO = 10
MT = 8.2
Wet
Above Normal
Below Normal
Dry
Critical

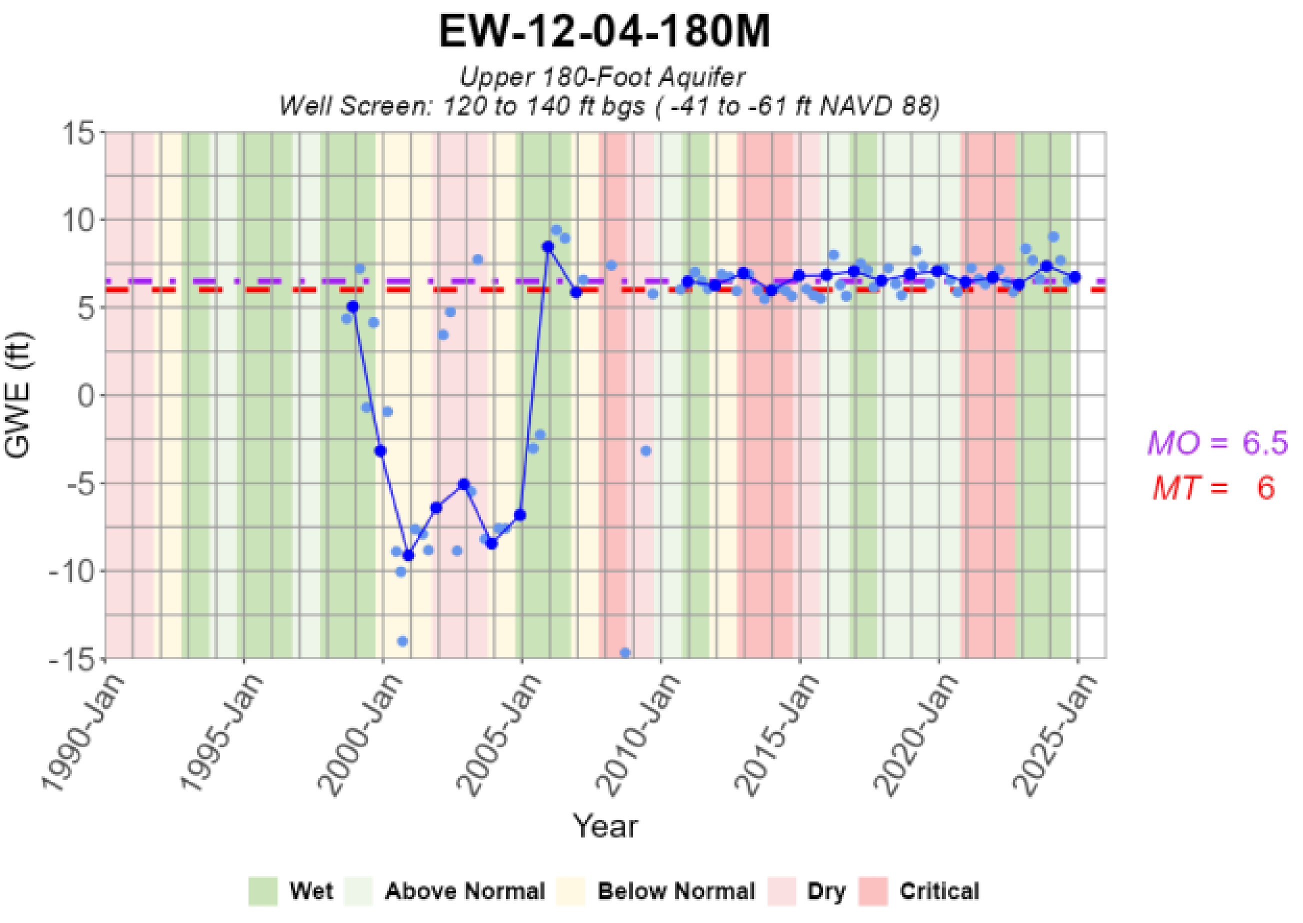

MW-BW-82-A
Dune Sand Aquifer
Well Screen: 32 to 72 ft bgs (7 to -33 ft NAVD 88)
GWE (ft)
Year
MO = 9.5
MT = 7.9
Wet
Above Normal
Below Normal
Dry
Critical

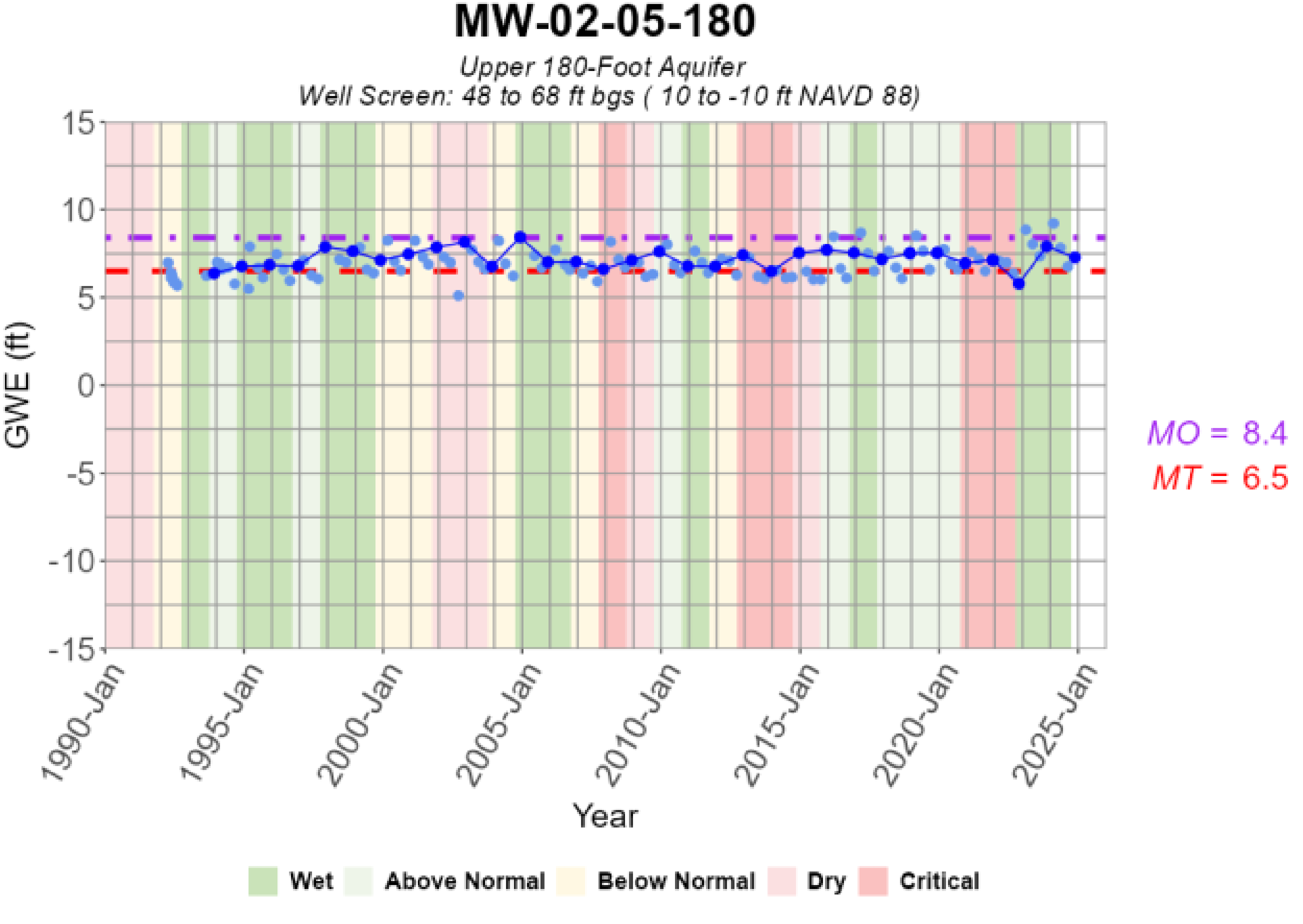

MW-OU2-13-A
Dune Sand Aquifer
Well Screen: 115 to 145 ft bgs (95 to 65 ft NAVD 88)
GWE (ft)
Year
MO = 94.4
MT = 89.6
Wet
Above Normal
Below Normal
Dry
Critical

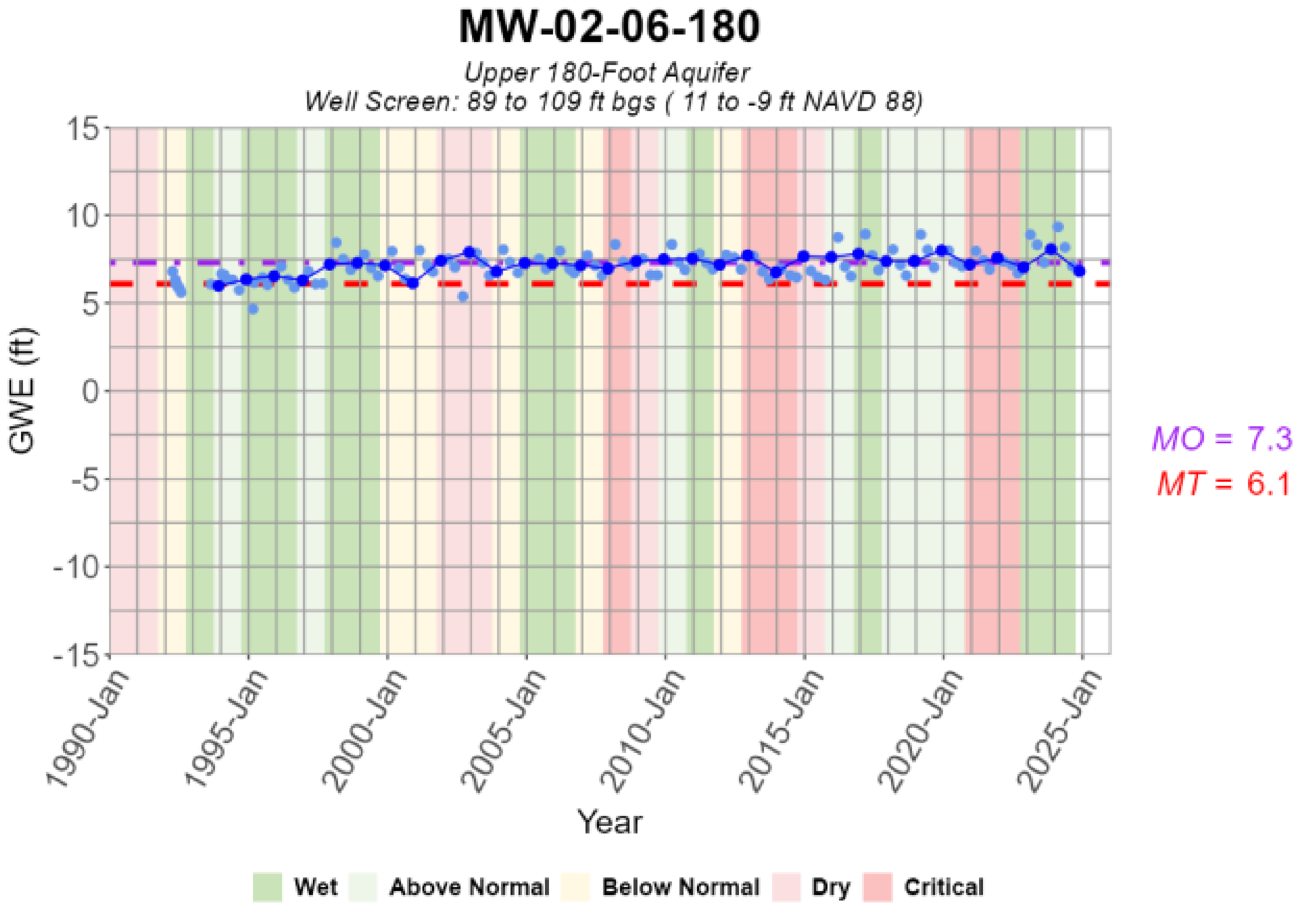

MW-OU2-32-A
Dune Sand Aquifer
Well Screen: 110 to 140 ft bgs (11 to -19 ft NAVD 88)
GWE (ft)
Year
MO = 8.1
MT = 7.2
Wet
Above Normal
Below Normal
Dry
Critical

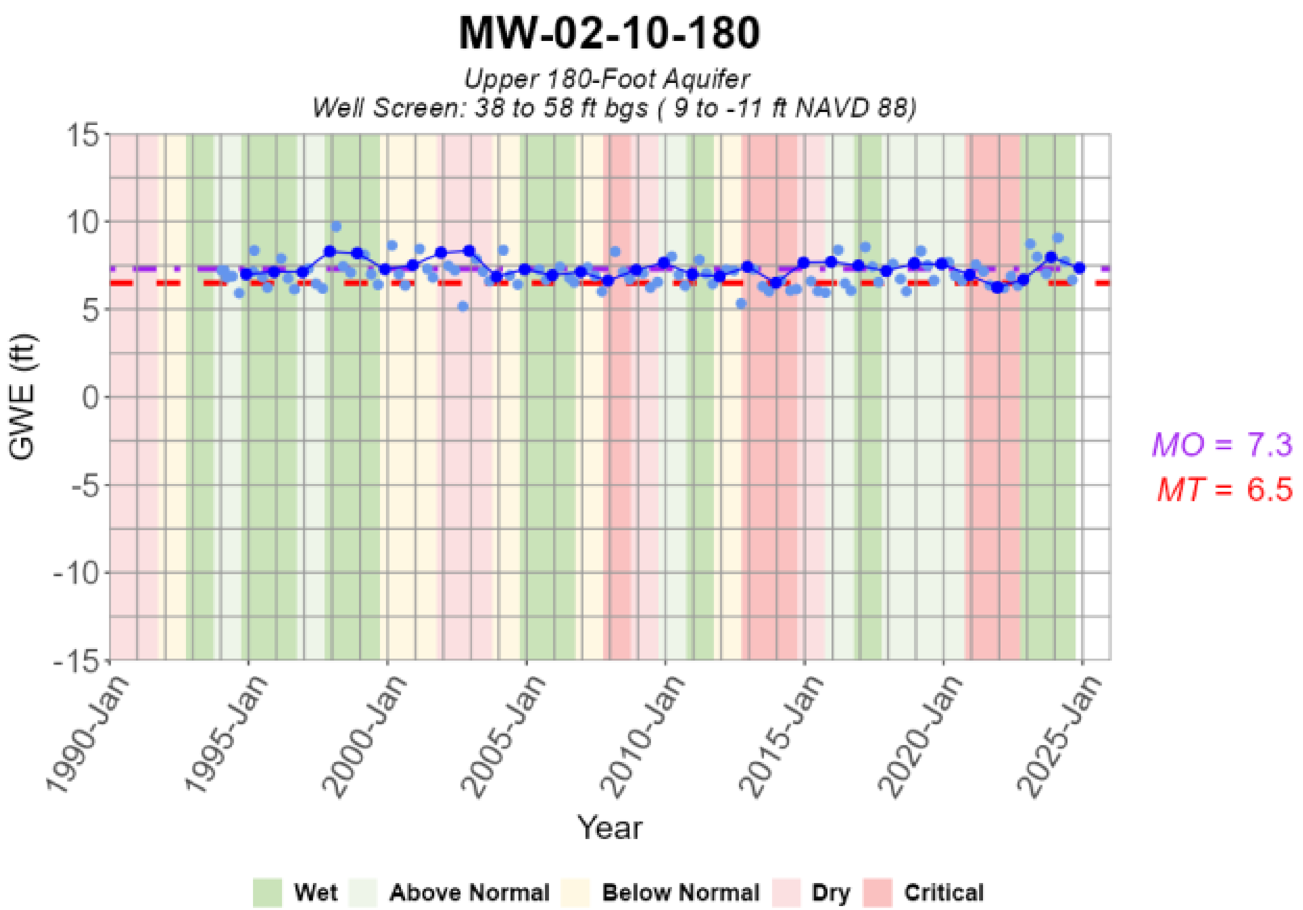

MW-OU2-34-A
Dune Sand Aquifer
Well Screen: 135 to 165 ft bgs (20 to -10 ft NAVD 88)
GWE (ft)
100
75
50
25
0
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = 6.6
MT = 4.7
Wet
Above Normal
Below Normal
Dry
Critical

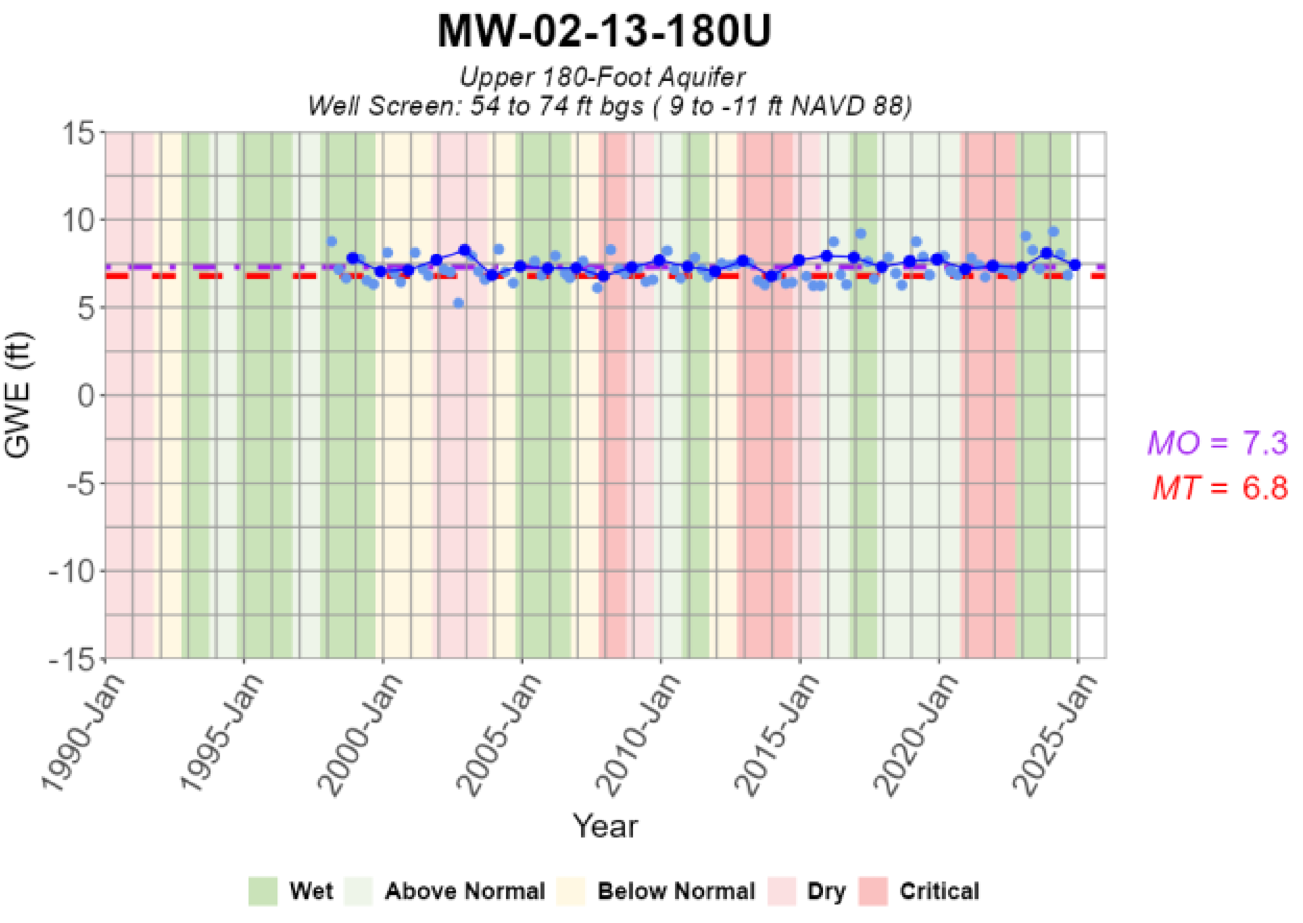

CDM MW-1 Beach
Upper 180-Foot Aquifer
Well Screen: 125 to 141 ft bgs (-31 to -47 ft NAVD 88)
GWE (ft)
15
10
5
0
-5
-10
-15
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = 3.3
MT = 3.3
Wet
Above Normal
Below Normal
Dry
Critical

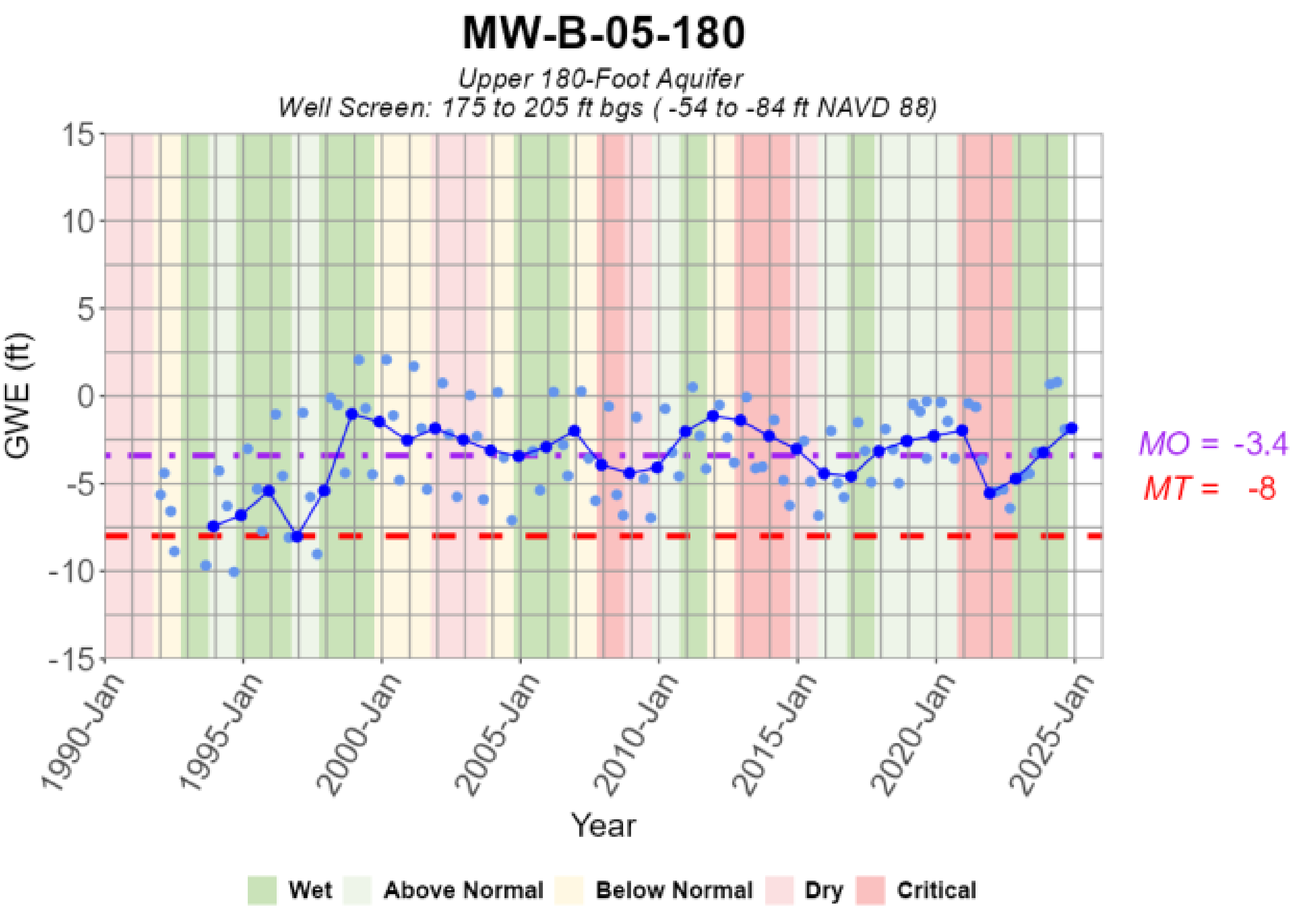

EW-12-04-180M
Upper 180-Foot Aquifer
Well Screen: 120 to 140 ft bgs (-41 to -61 ft NAVD 88)
GWE (ft)
Year
MO = 6.5
MT = 6
Wet
Above Normal
Below Normal
Dry
Critical

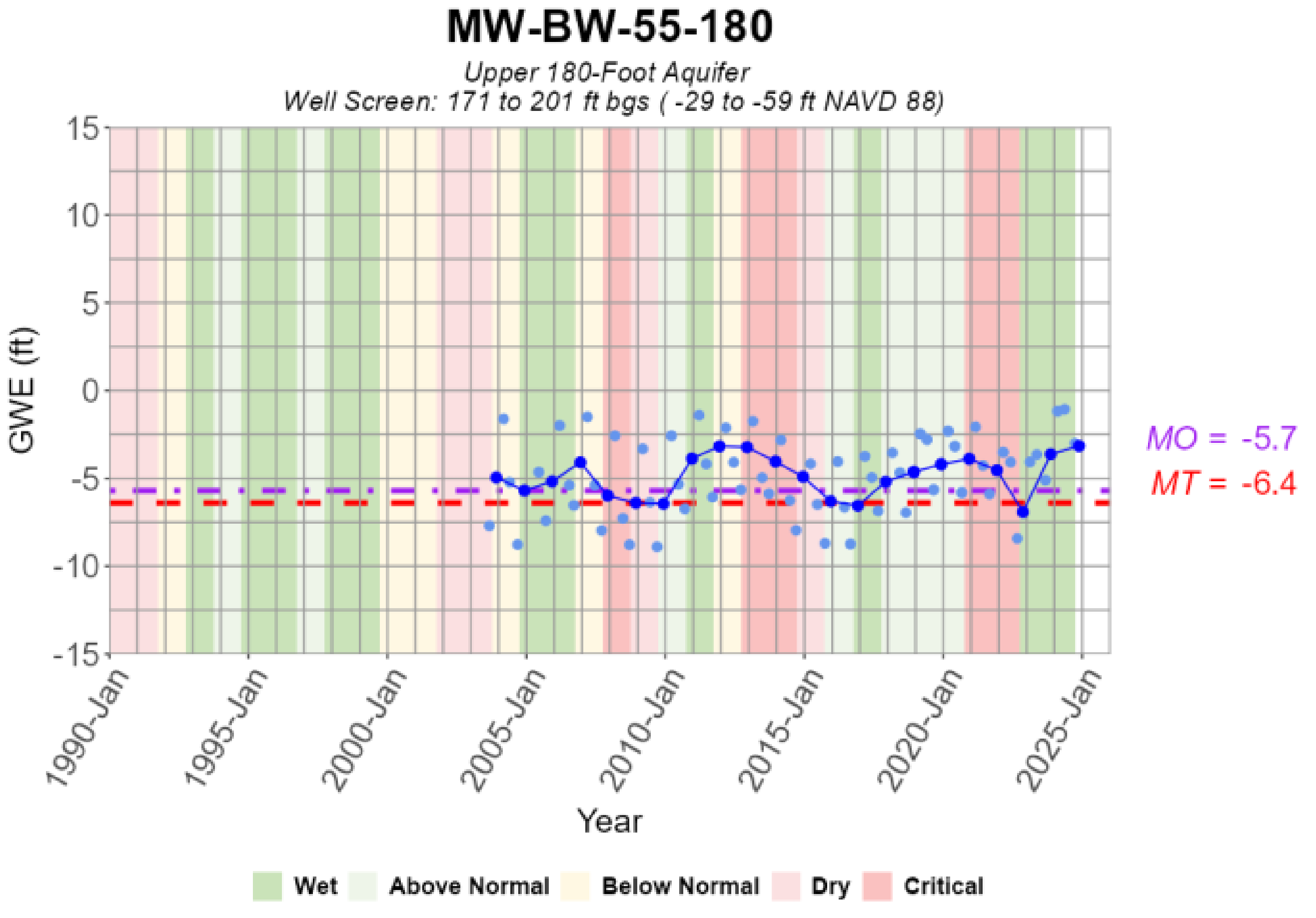

MW-02-05-180
Upper 180-Foot Aquifer
Well Screen: 48 to 68 ft bgs (10 to -10 ft NAVD 88)
GWE (ft)
Year
MO = 8.4
MT = 6.5
Wet
Above Normal
Below Normal
Dry
Critical

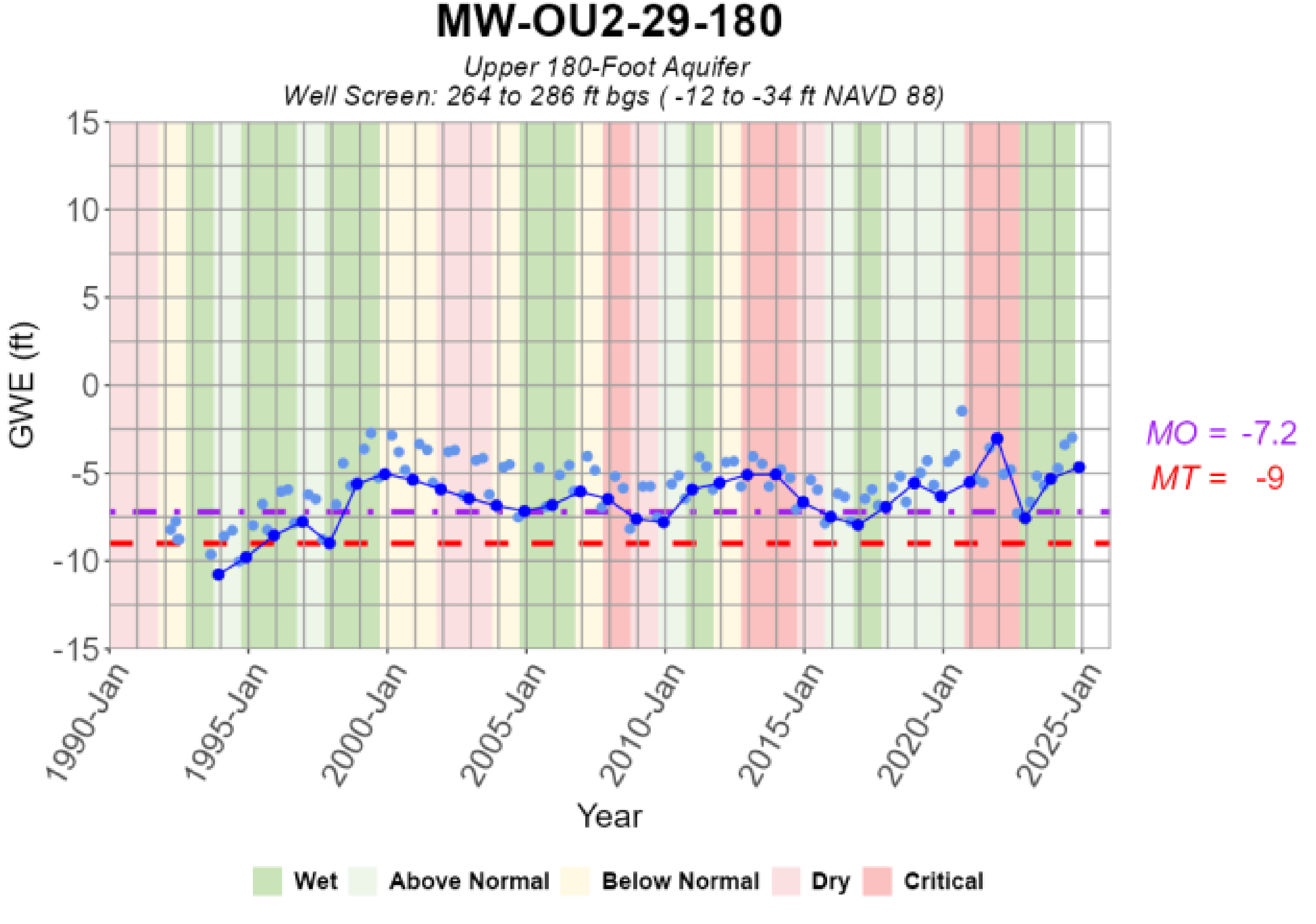

MW-02-06-180
Upper 180-Foot Aquifer
Well Screen: 89 to 109 ft bgs (11 to -9 ft NAVD 88)
GWE (ft)
15
10
5
0
-5
-10
-15
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical
MO = 7.3
MT = 6.1

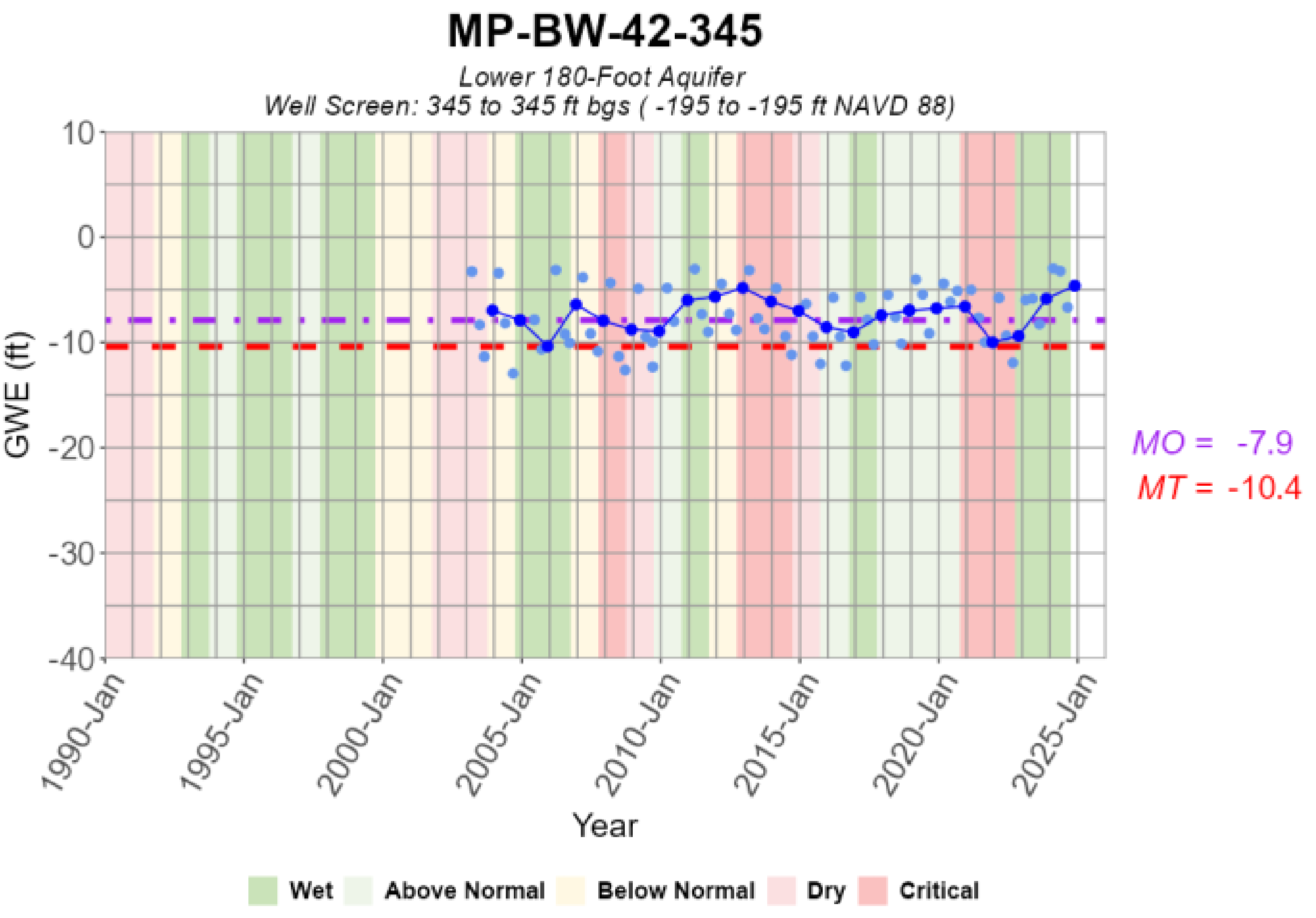

MW-02-10-180
Upper 180-Foot Aquifer
Well Screen: 38 to 58 ft bgs (9 to -11 ft NAVD 88)
GWE (ft)
15
10
5
0
-5
-10
-15
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical
MO = 7.3
MT = 6.5

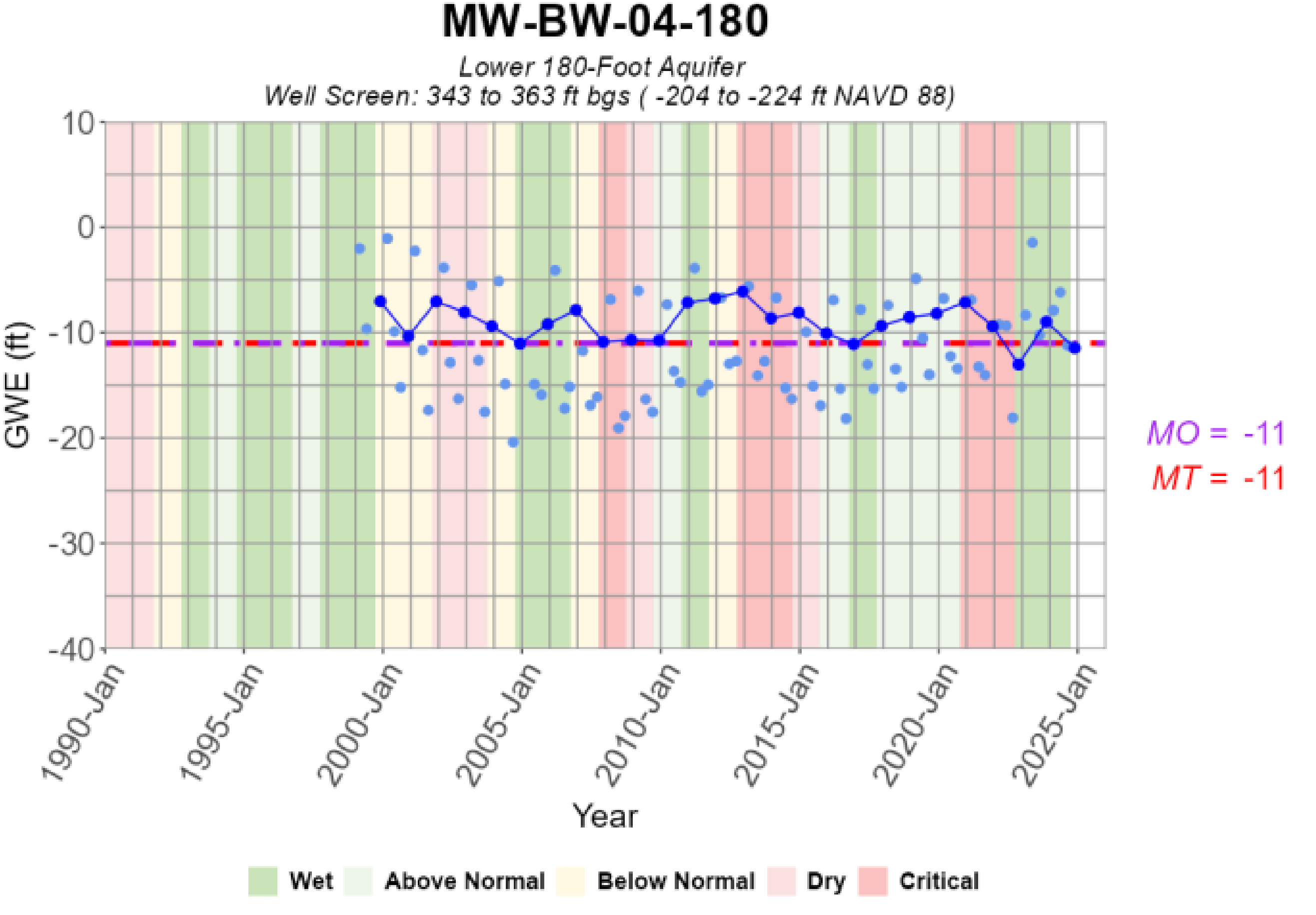

MW-02-13-180U
Upper 180-Foot Aquifer
Well Screen: 54 to 74 ft bgs (9 to -11 ft NAVD 88)
GWE (ft)
Year
MO = 7.3
MT = 6.8
Wet
Above Normal
Below Normal
Dry
Critical

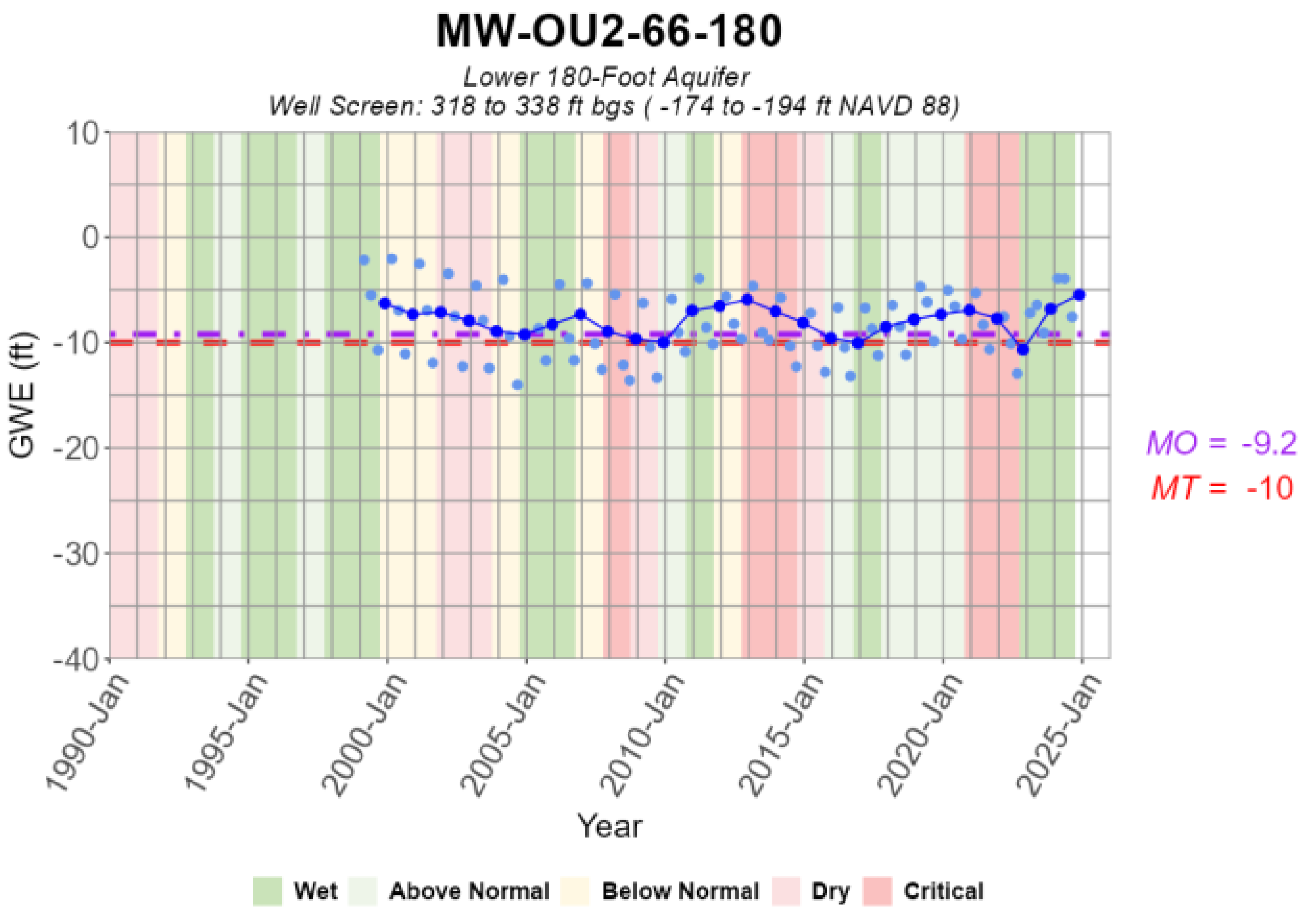

MW-B-05-180
Upper 180-Foot Aquifer
Well Screen: 175 to 205 ft bgs (-54 to -84 ft NAVD 88)
GWE (ft)
Year
MO = -3.4
MT = -8
Wet
Above Normal
Below Normal
Dry
Critical

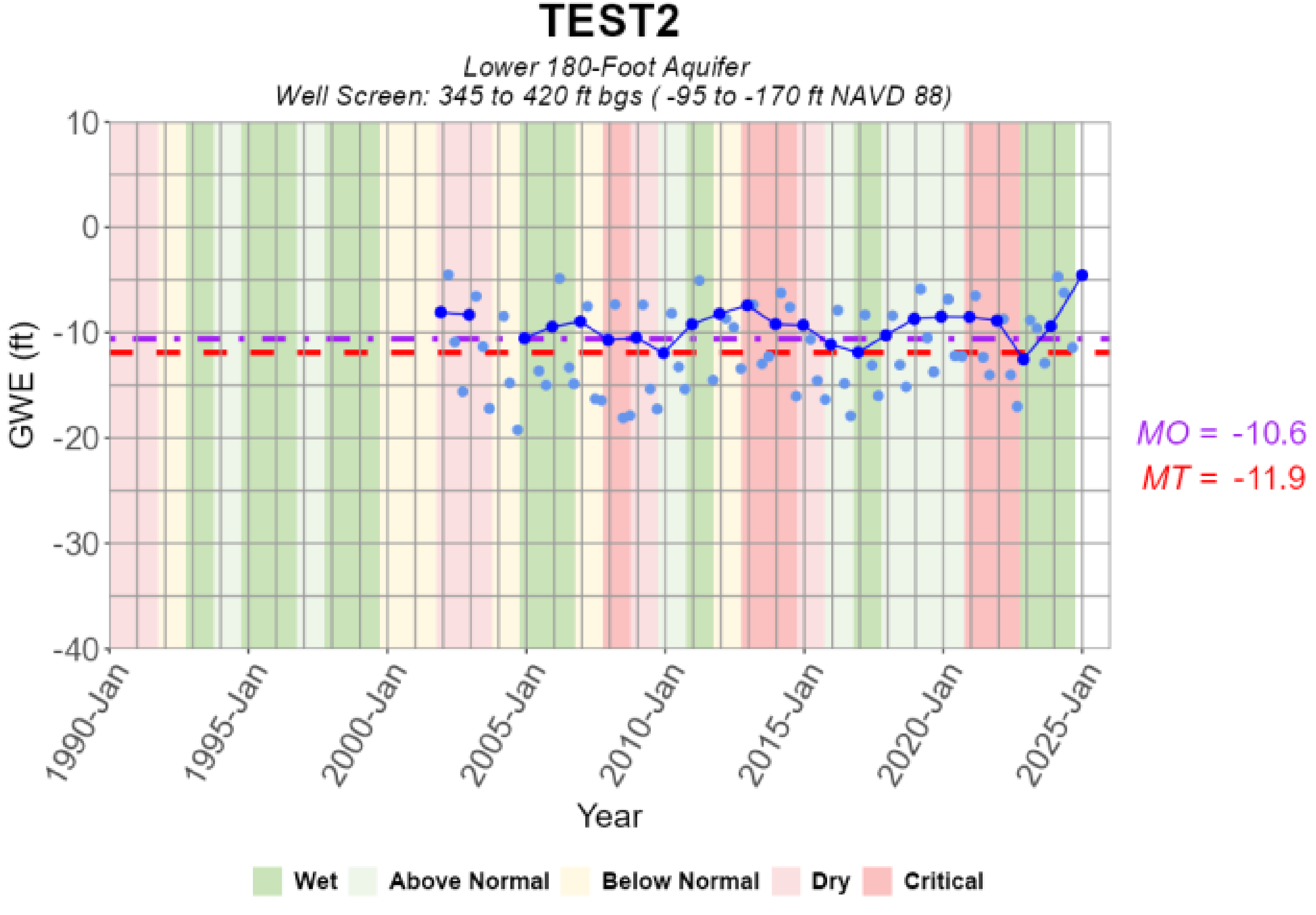

MW-BW-55-180
Upper 180-Foot Aquifer
Well Screen: 171 to 201 ft bgs (-29 to -59 ft NAVD 88)
GWE (ft)
15
10
5
0
-5
-10
-15
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = -5.7
MT = -6.4
Wet
Above Normal
Below Normal
Dry
Critical

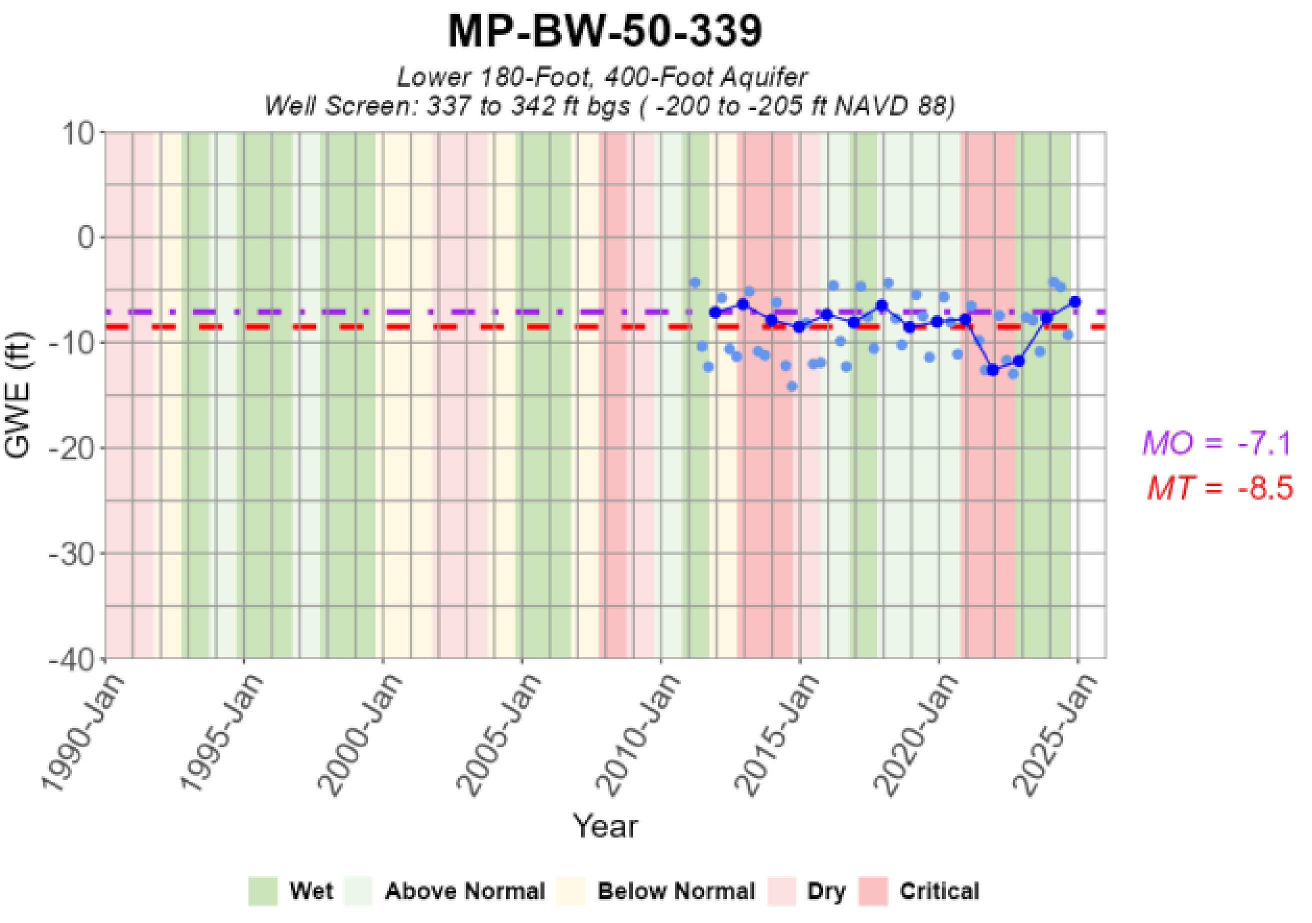

MW-OU2-29-180
Upper 180-Foot Aquifer
Well Screen: 264 to 286 ft bgs (-12 to -34 ft NAVD 88)
GWE (ft)
15
10
5
0
-5
-10
-15
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = -7.2
MT = -9
Wet
Above Normal
Below Normal
Dry
Critical

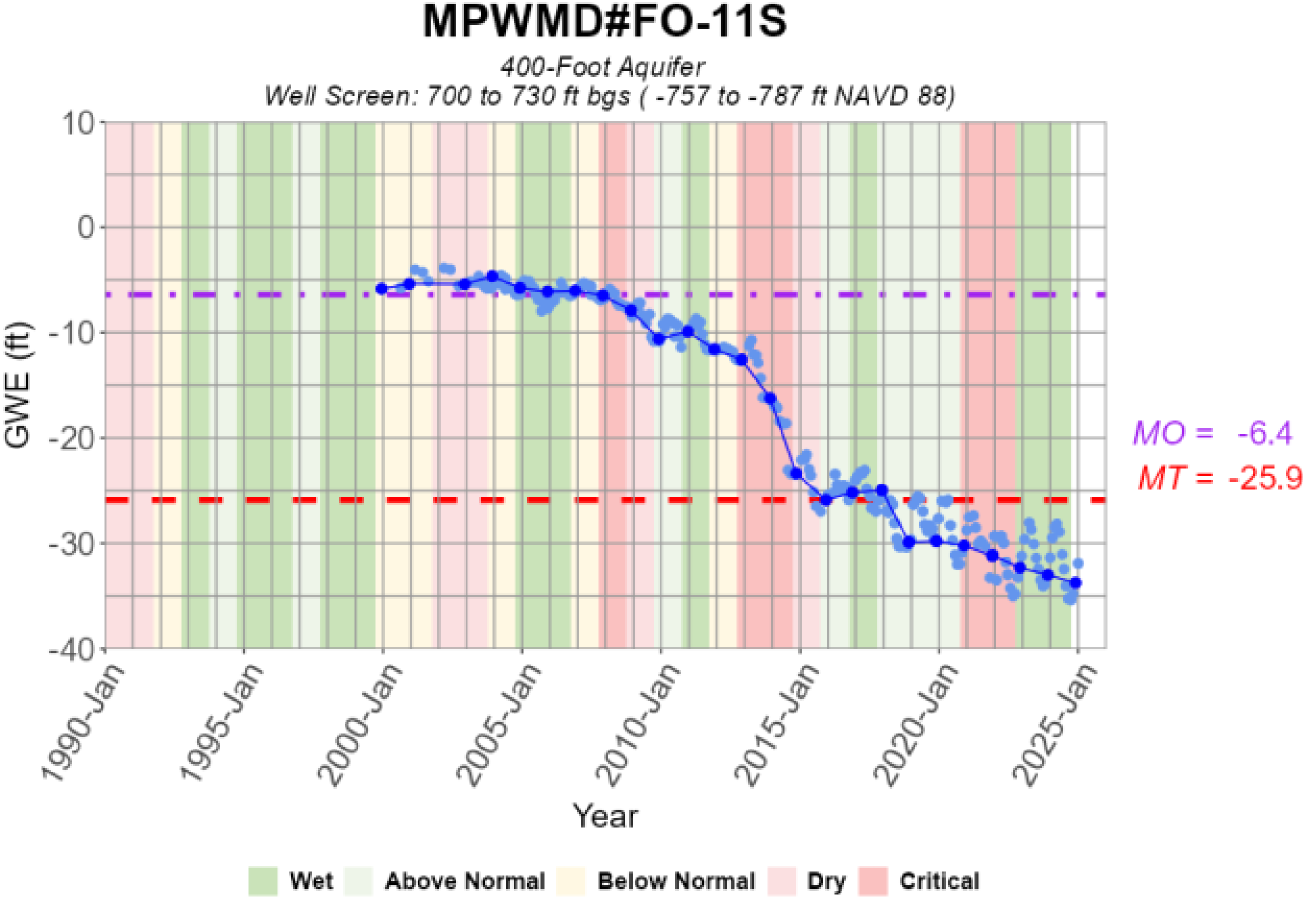

MP-BW-42-345
Lower 180-Foot Aquifer
Well Screen: 345 to 345 ft bgs (-195 to -195 ft NAVD 88)
GWE (ft)
10
0
-10
-20
-30
-40
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = -7.9
MT = -10.4
Wet
Above Normal
Below Normal
Dry
Critical

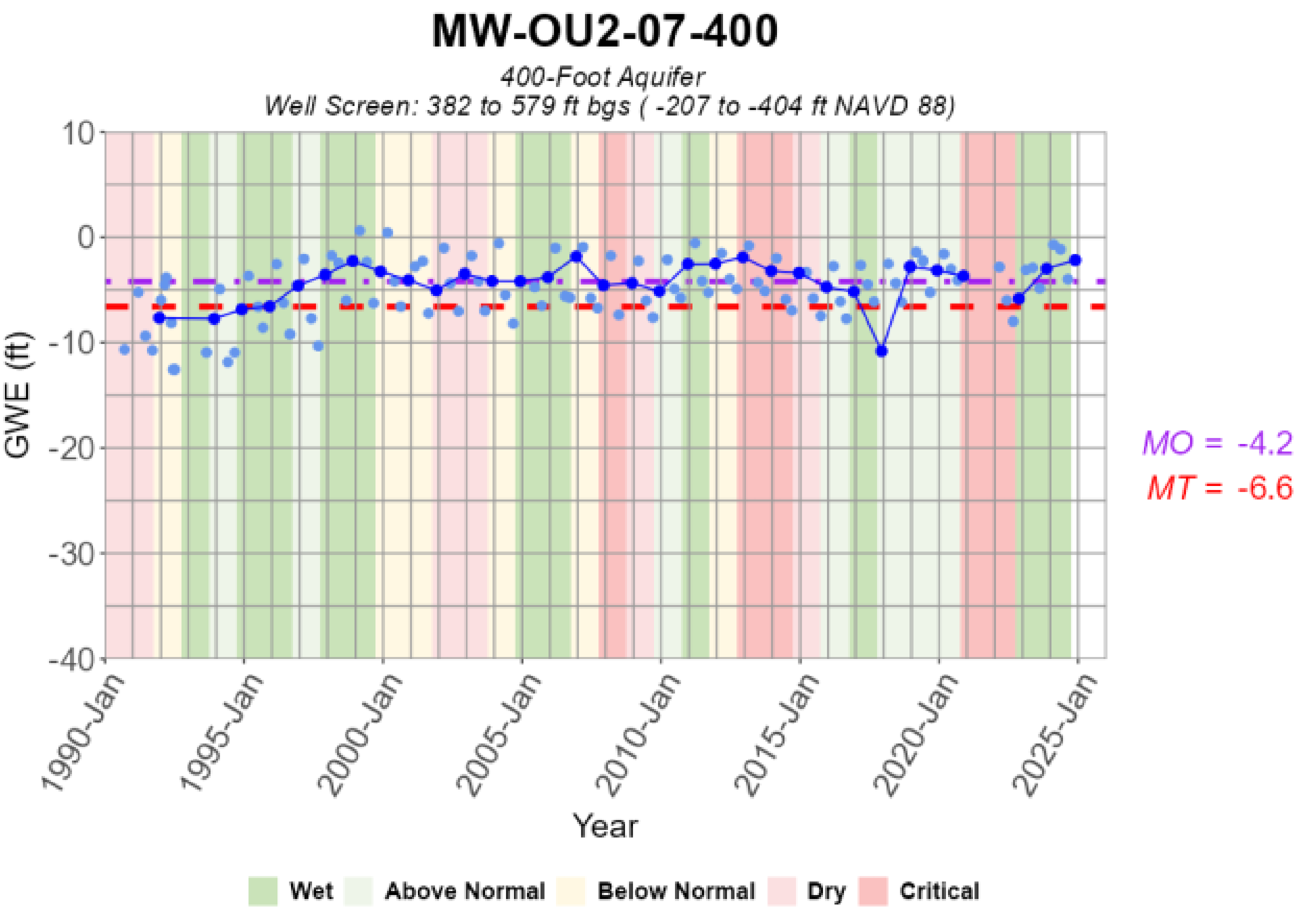

MW-BW-04-180
Lower 180-Foot Aquifer
Well Screen: 343 to 363 ft bgs (-204 to -224 ft NAVD 88)
GWE (ft)
10
0
-10
-20
-30
-40
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = -11
MT = -11
Wet
Above Normal
Below Normal
Dry
Critical

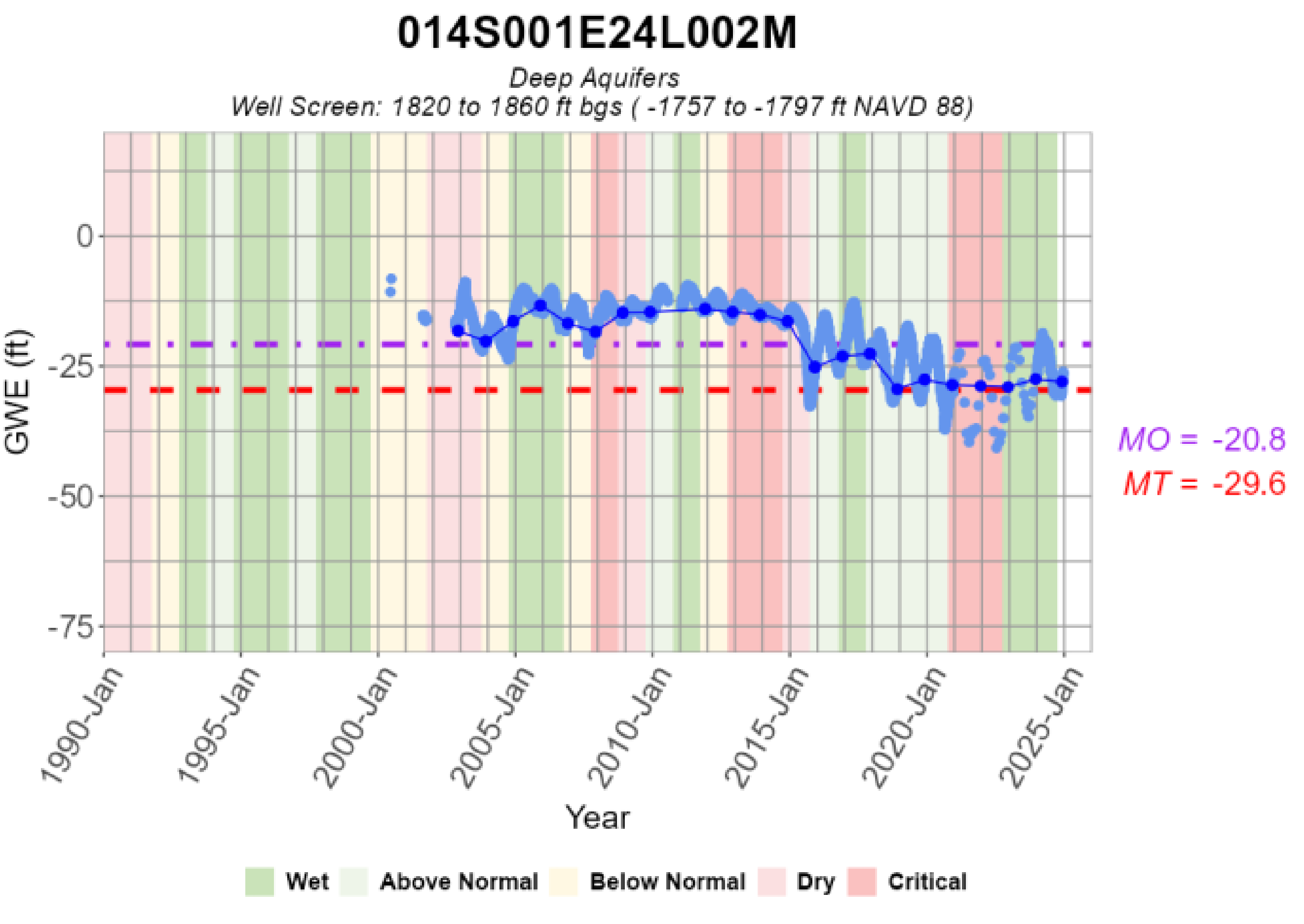

MW-OU2-66-180
Lower 180-Foot Aquifer
Well Screen: 318 to 338 ft bgs (-174 to -194 ft NAVD 88)
GWE (ft)
Year
MO = -9.2
MT = -10
Wet
Above Normal
Below Normal
Dry
Critical


TEST2
Lower 180-Foot Aquifer
Well Screen: 345 to 420 ft bgs (-95 to -170 ft NAVD 88)
GWE (ft)
Year
MO = -10.6
MT = -11.9
Wet
Above Normal
Below Normal
Dry
Critical


MP-BW-50-339
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 337 to 342 ft bgs (-200 to -205 ft NAVD 88)
GWE (ft)
10
0
-10
-20
-30
-40
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = -7.1
MT = -8.5
Wet
Above Normal
Below Normal
Dry
Critical


MPWMD#FO-11S
400-Foot Aquifer
Well Screen: 700 to 730 ft bgs (-757 to -787 ft NAVD 88)
GWE (ft)
10
0
-10
-20
-30
-40
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = -6.4
MT = -25.9
Wet
Above Normal
Below Normal
Dry
Critical

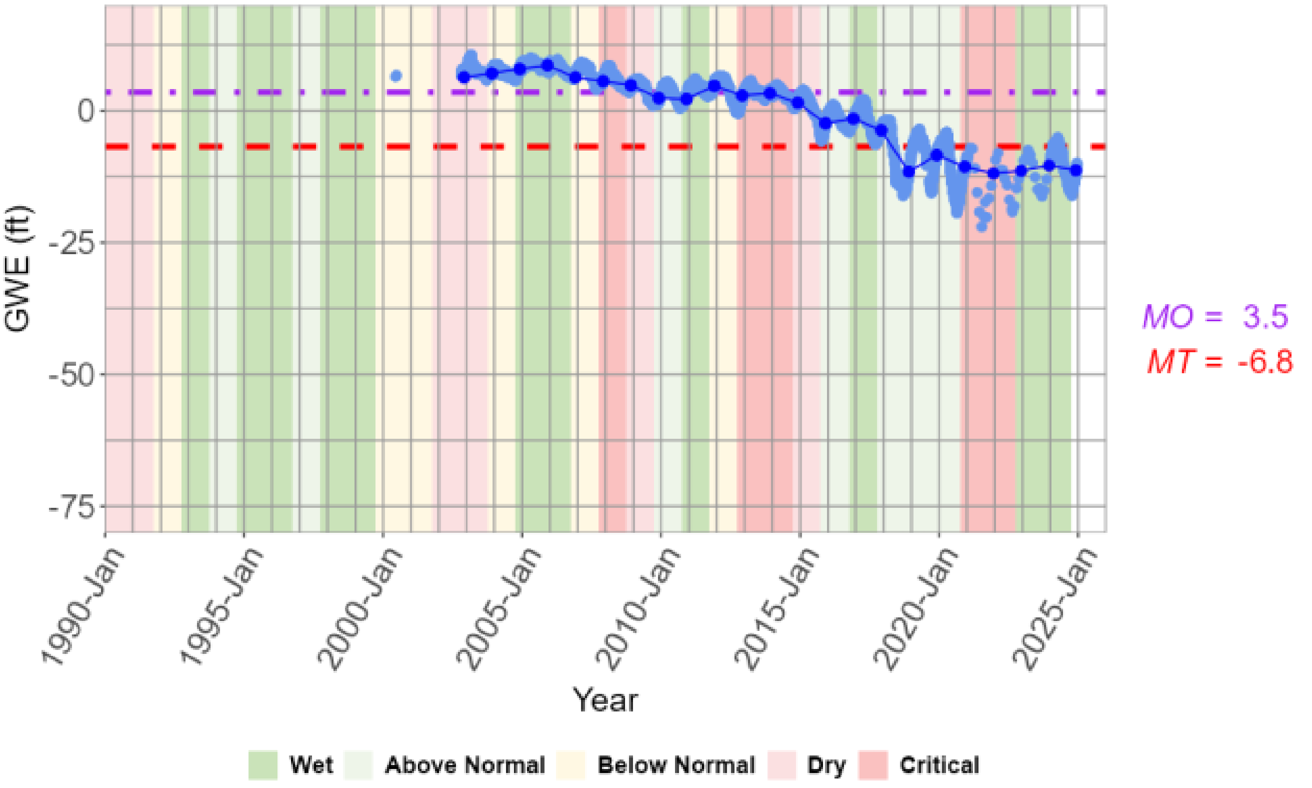

MW-OU2-07-400
400-Foot Aquifer
Well Screen: 382 to 579 ft bgs (-207 to -404 ft NAVD 88)
10
0
-10
-20
-30
-40
GWE (ft)
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = -4.2
MT = -6.6
Wet
Above Normal
Below Normal
Dry
Critical


014S001E24L002M
Deep Aquifers
Well Screen: 1820 to 1860 ft bgs (-1757 to -1797 ft NAVD 88)
0
-25
-50
-75
GWE (ft)
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = -20.8
MT = -29.6
Wet
Above Normal
Below Normal
Dry
Critical

014S001E24L003M

Deep Aquifers

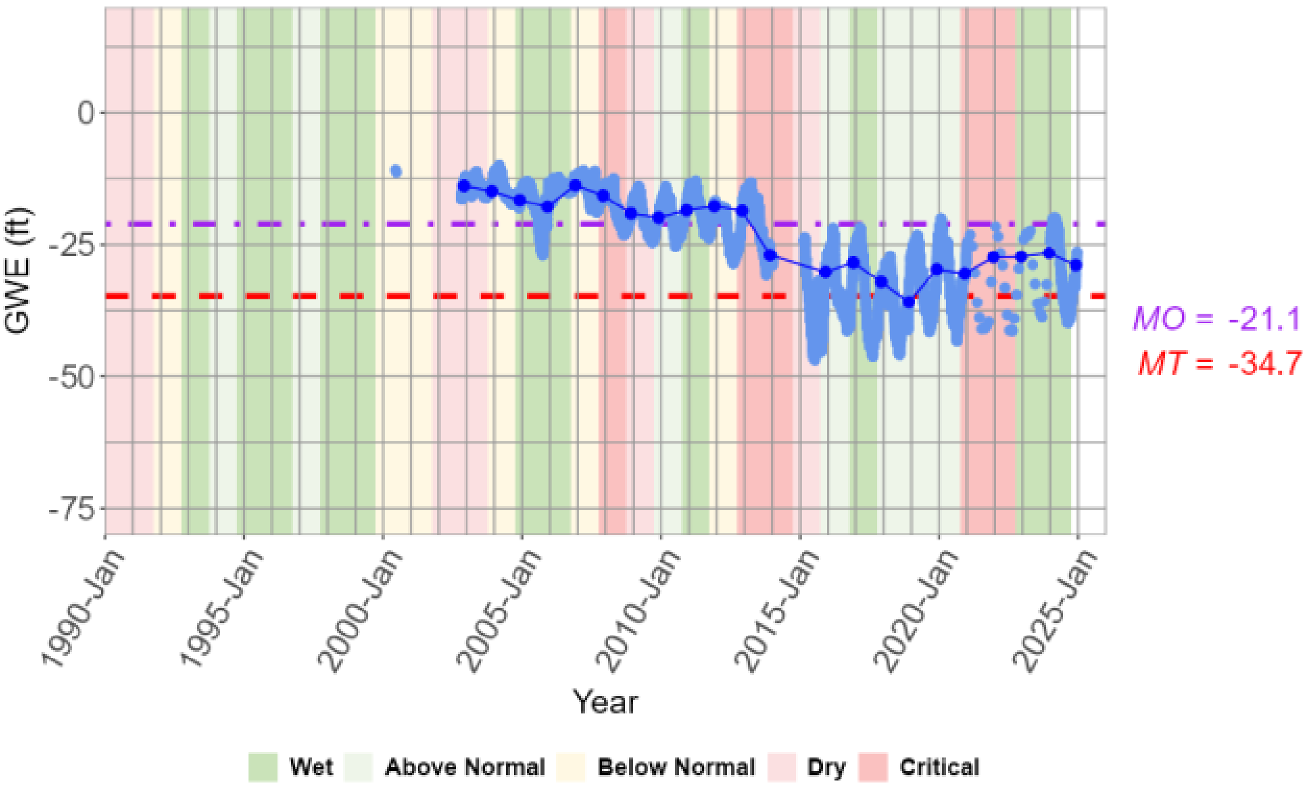
Well Screen: 1410 to 1430 ft bgs (-1347 to -1367 ft NAVD 88)



014S001E24L004M

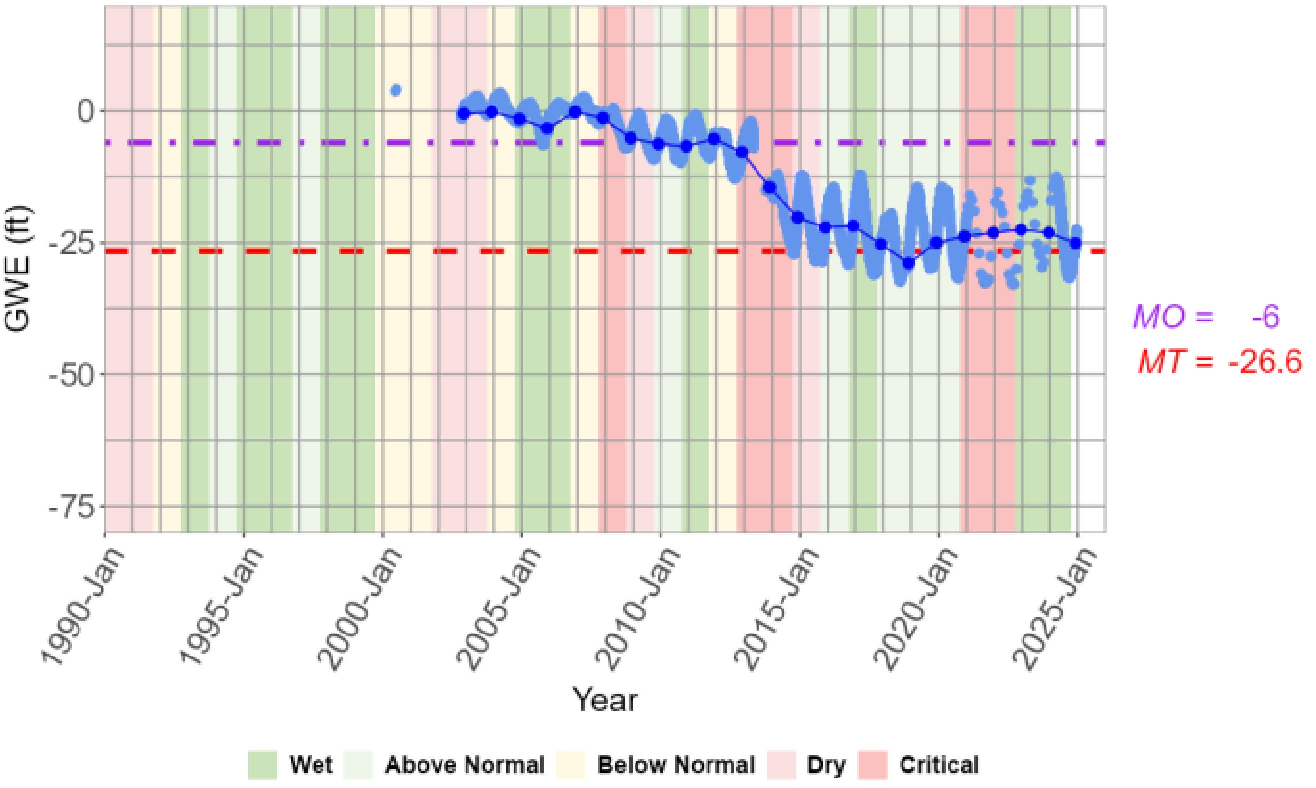
Deep Aquifers

Well Screen: 1040 to 1060 ft bgs (-977 to -997 ft NAVD 88)



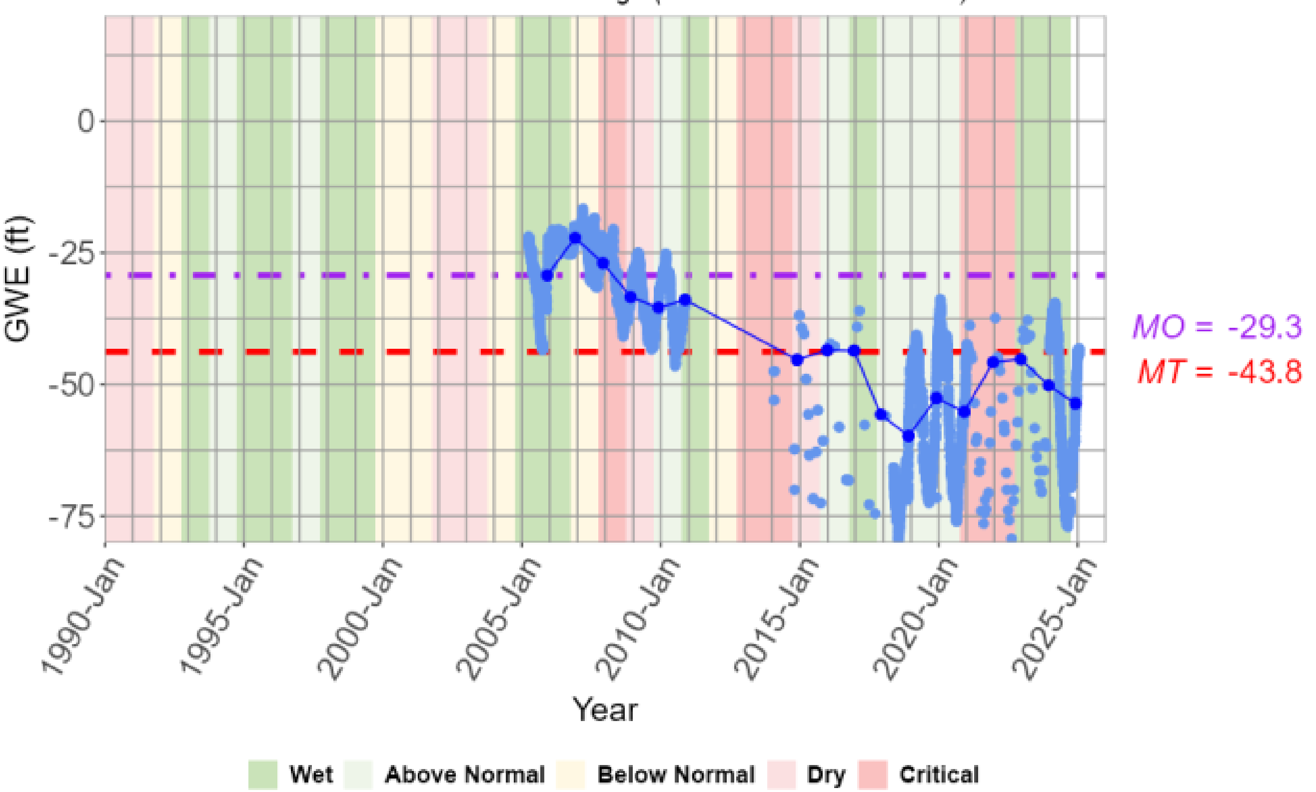
014S001E24L005M

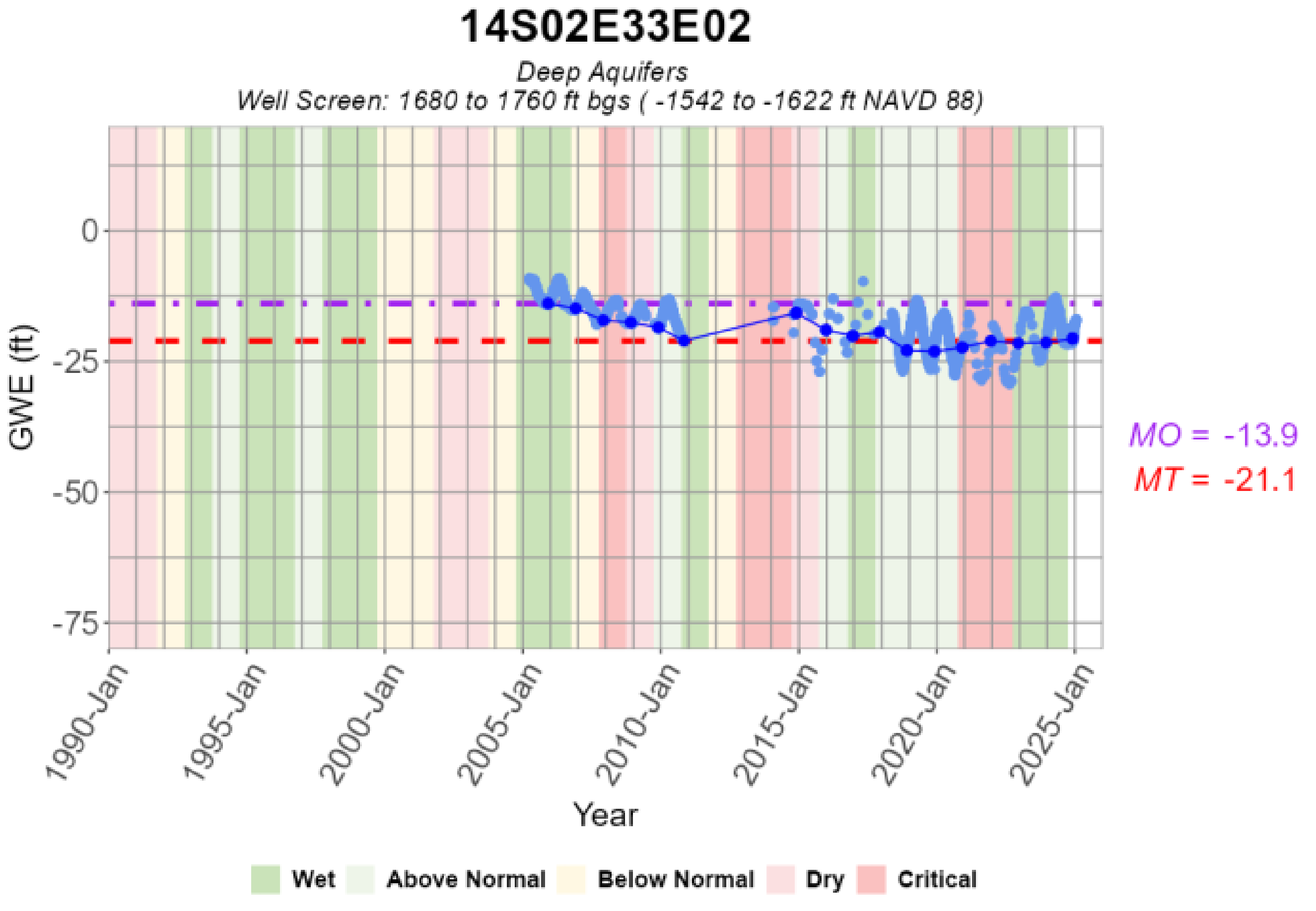
Deep Aquifers
Well Screen: 930 to 950 ft bgs (-867 to -887 ft NAVD 88)

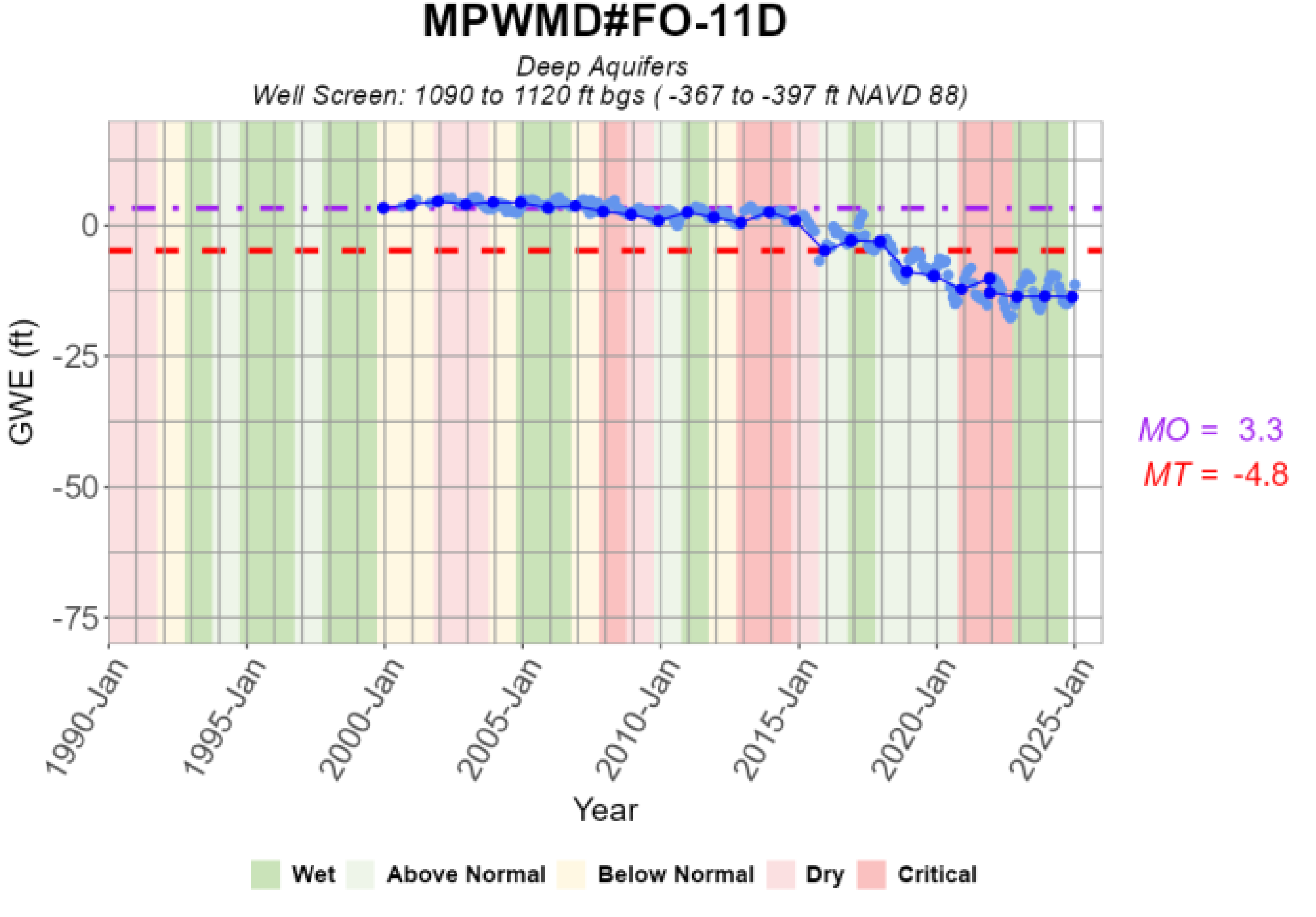


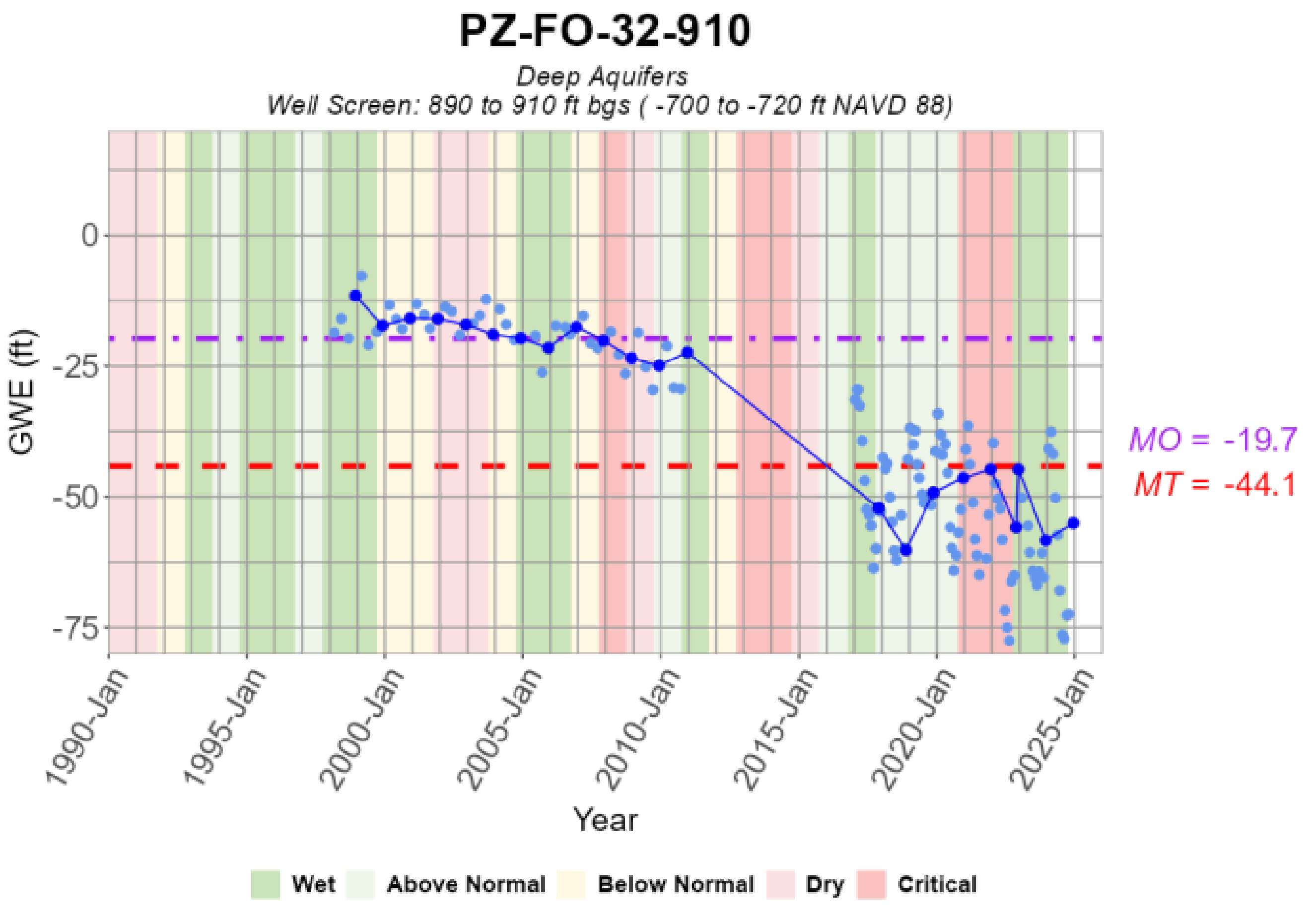
14S02E33E01

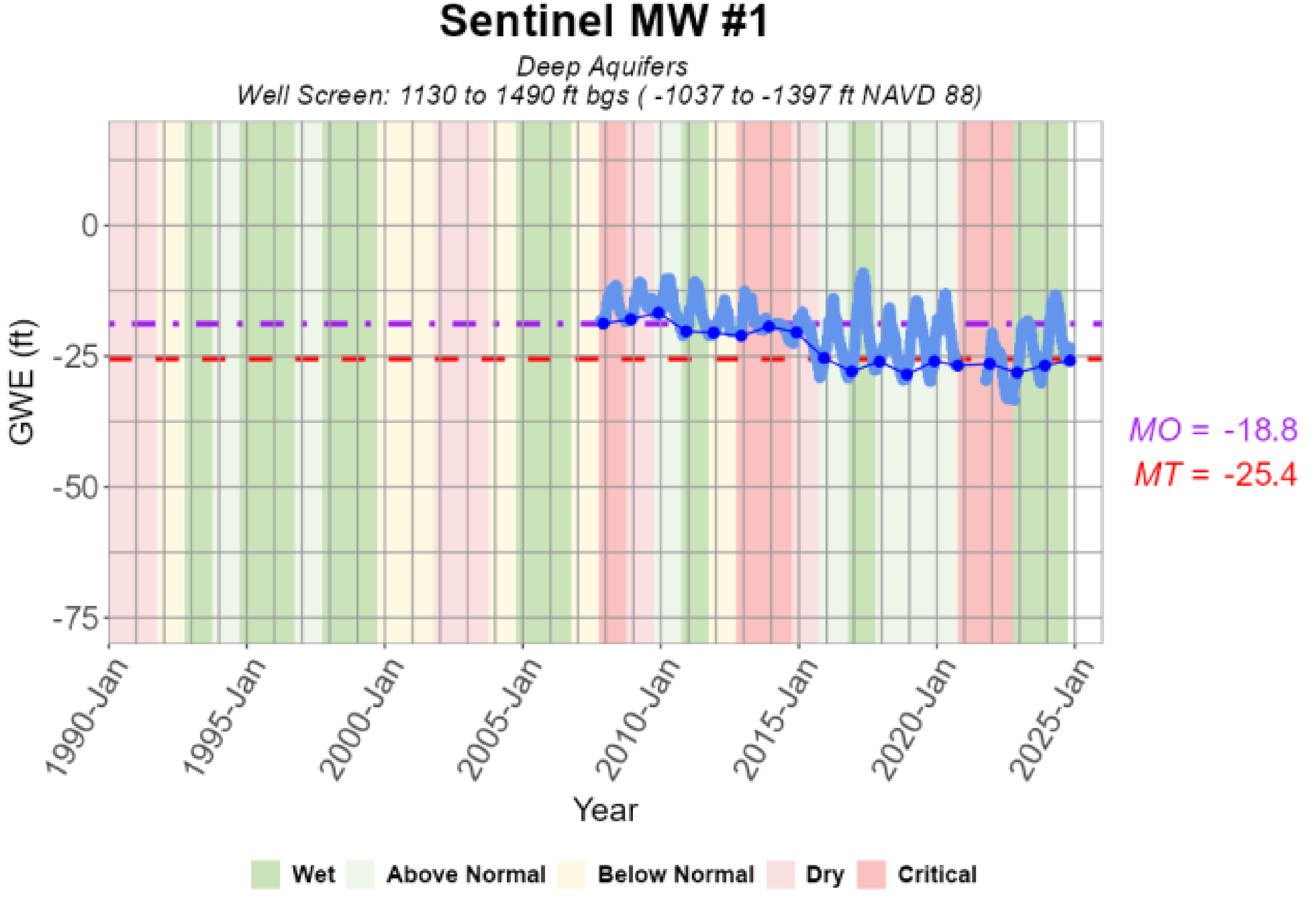
Deep Aquifers
Well Screen: 1045 to 1095 ft bgs (-906 to -956 ft NAVD 88)

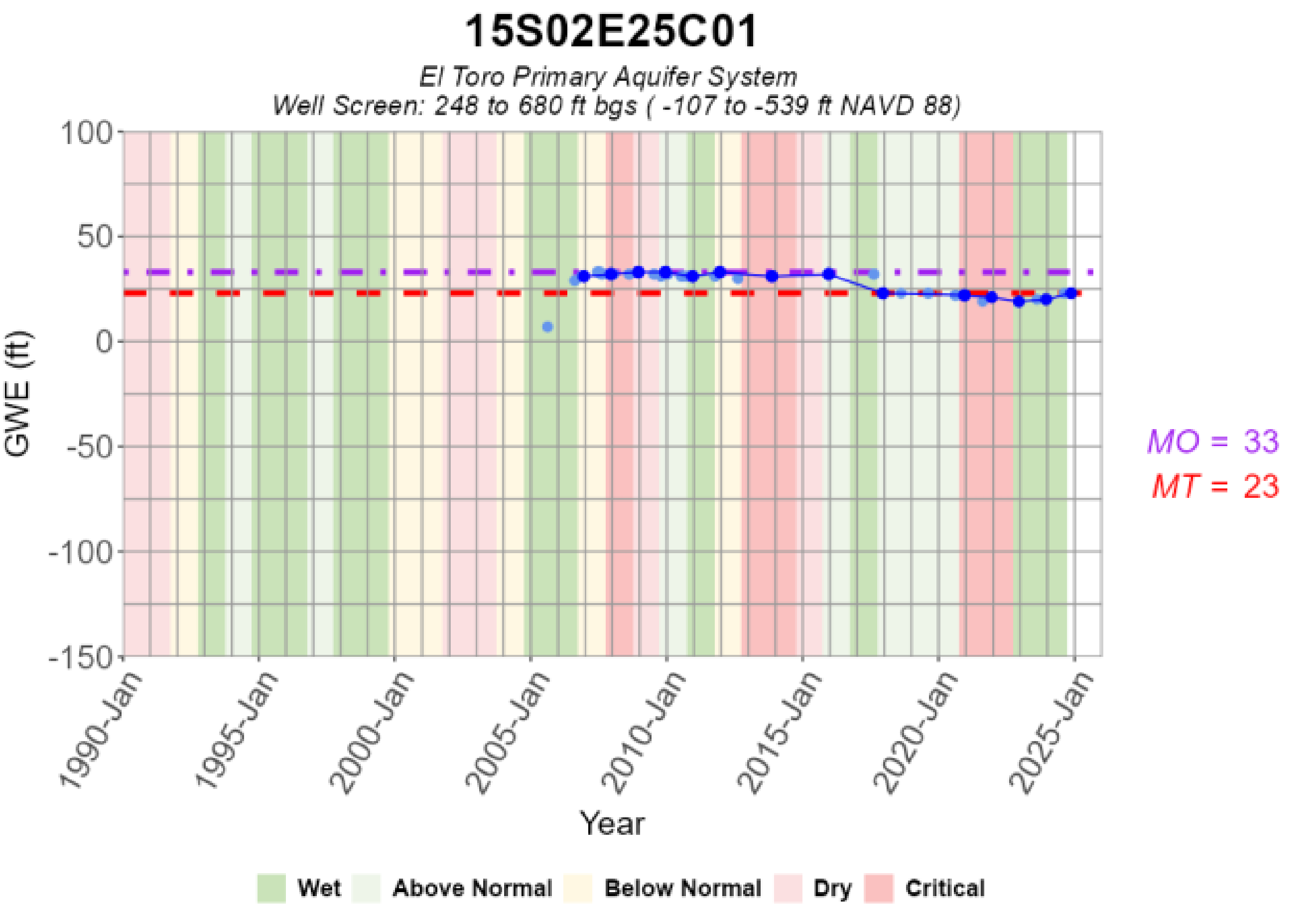



14S02E33E02
Deep Aquifers
Well Screen: 1680 to 1760 ft bgs (-1542 to -1622 ft NAVD 88)
GWE (ft)
0
-25
-50
-75
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = -13.9
MT = -21.1
Wet
Above Normal
Below Normal
Dry
Critical

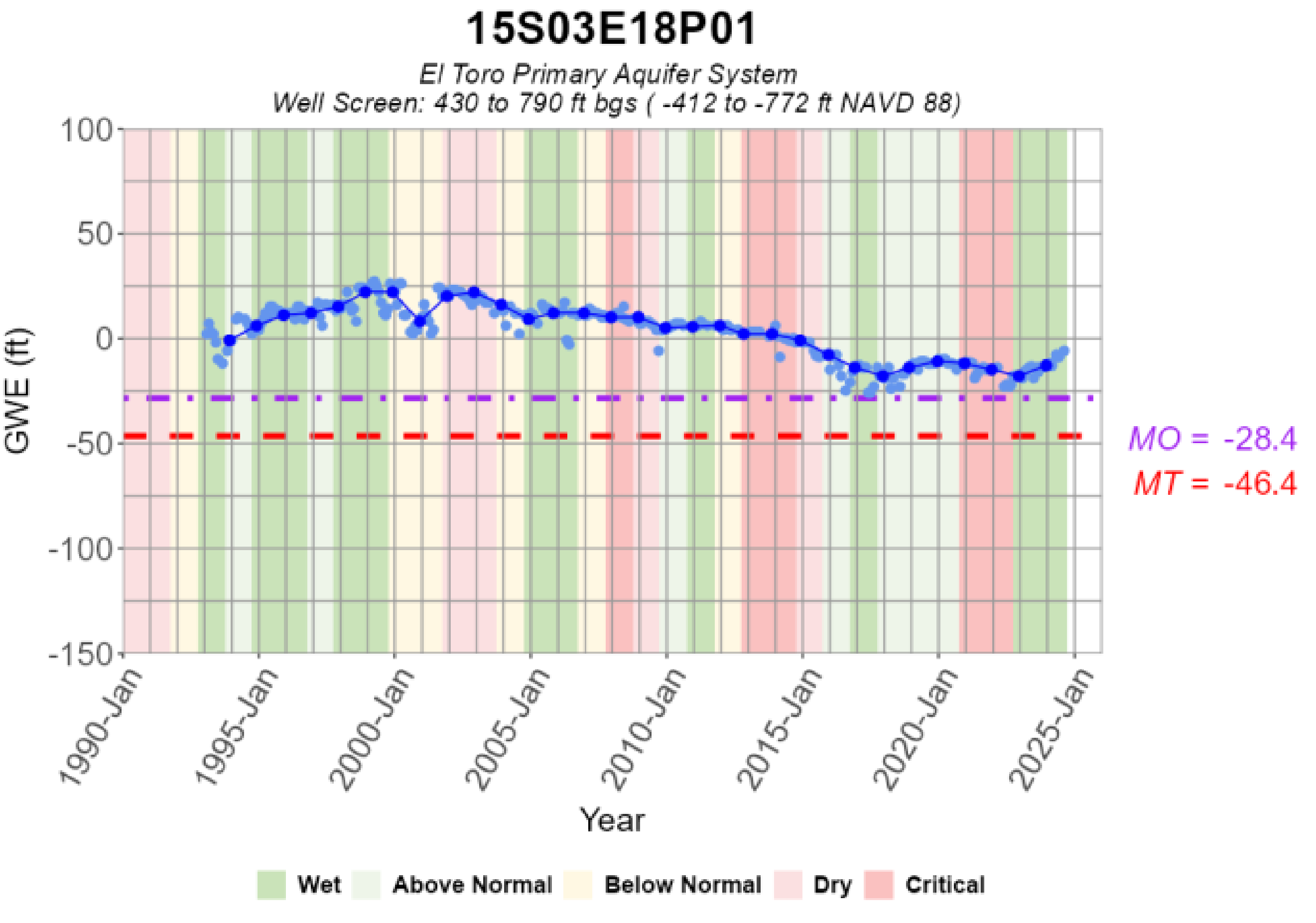

MPWMD#FO-11D
Deep Aquifers
Well Screen: 1090 to 1120 ft bgs (-367 to -397 ft NAVD 88)
GWE (ft)
0
-25
-50
-75
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = 3.3
MT = -4.8
Wet
Above Normal
Below Normal
Dry
Critical


PZ-FO-32-910
Deep Aquifers
Well Screen: 890 to 910 ft bgs (-700 to -720 ft NAVD 88)
GWE (ft)
0
-25
-50
-75
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = -19.7
MT = -44.1
Wet
Above Normal
Below Normal
Dry
Critical


Sentinel MW #1
Deep Aquifers
Well Screen: 1130 to 1490 ft bgs (-1037 to -1397 ft NAVD 88)
GWE (ft)
0
-25
-50
-75
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = -18.8
MT = -25.4
Wet
Above Normal
Below Normal
Dry
Critical



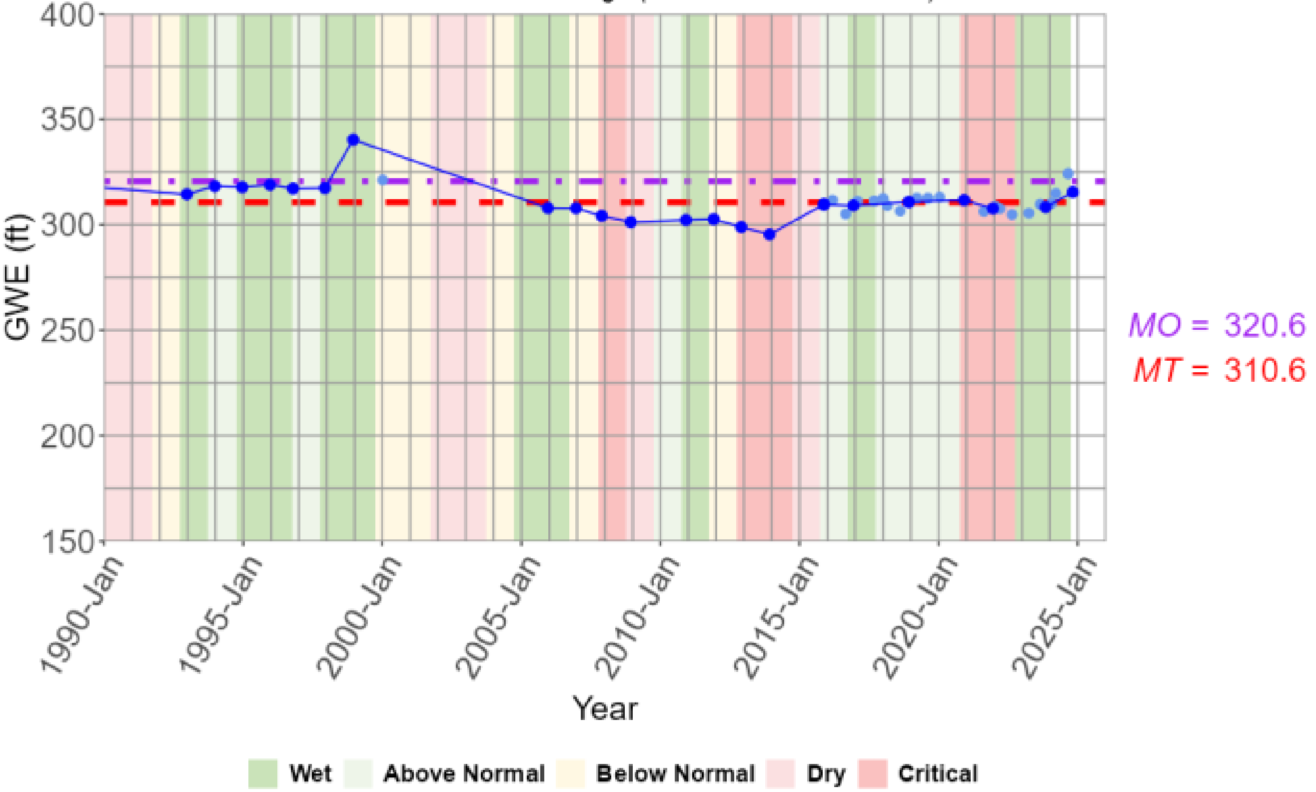
15S02E25C01
El Toro Primary Aquifer System
Well Screen: 248 to 680 ft bgs (-107 to -539 ft NAVD 88)
GWE (ft)
100
50
0
-50
-100
-150
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = 33
MT = 23
Wet
Above Normal
Below Normal
Dry
Critical



15S03E18P01
El Toro Primary Aquifer System
Well Screen: 430 to 790 ft bgs (-412 to -772 ft NAVD 88)
GWE (ft)
100
50
0
-50
-100
-150
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = -28.4
MT = -46.4
Wet
Above Normal
Below Normal
Dry
Critical

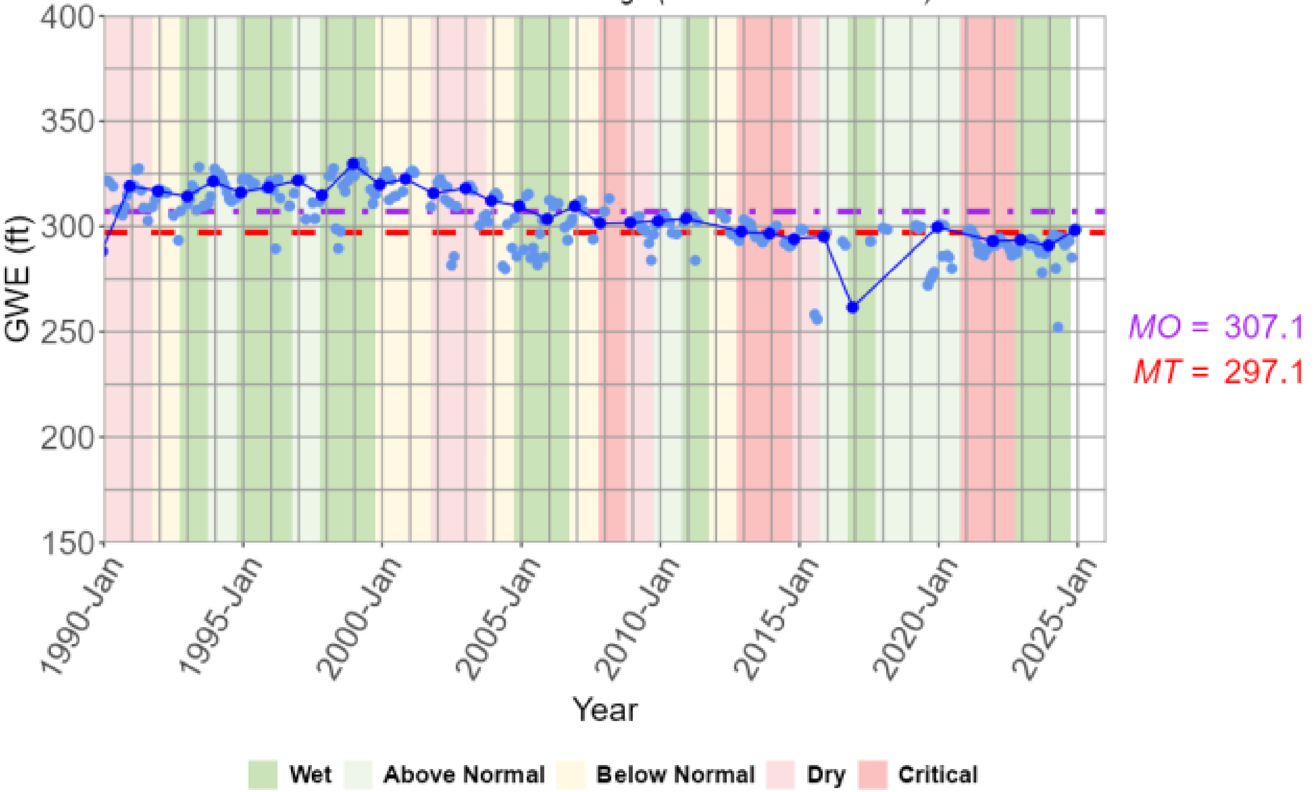
16S02E01M01

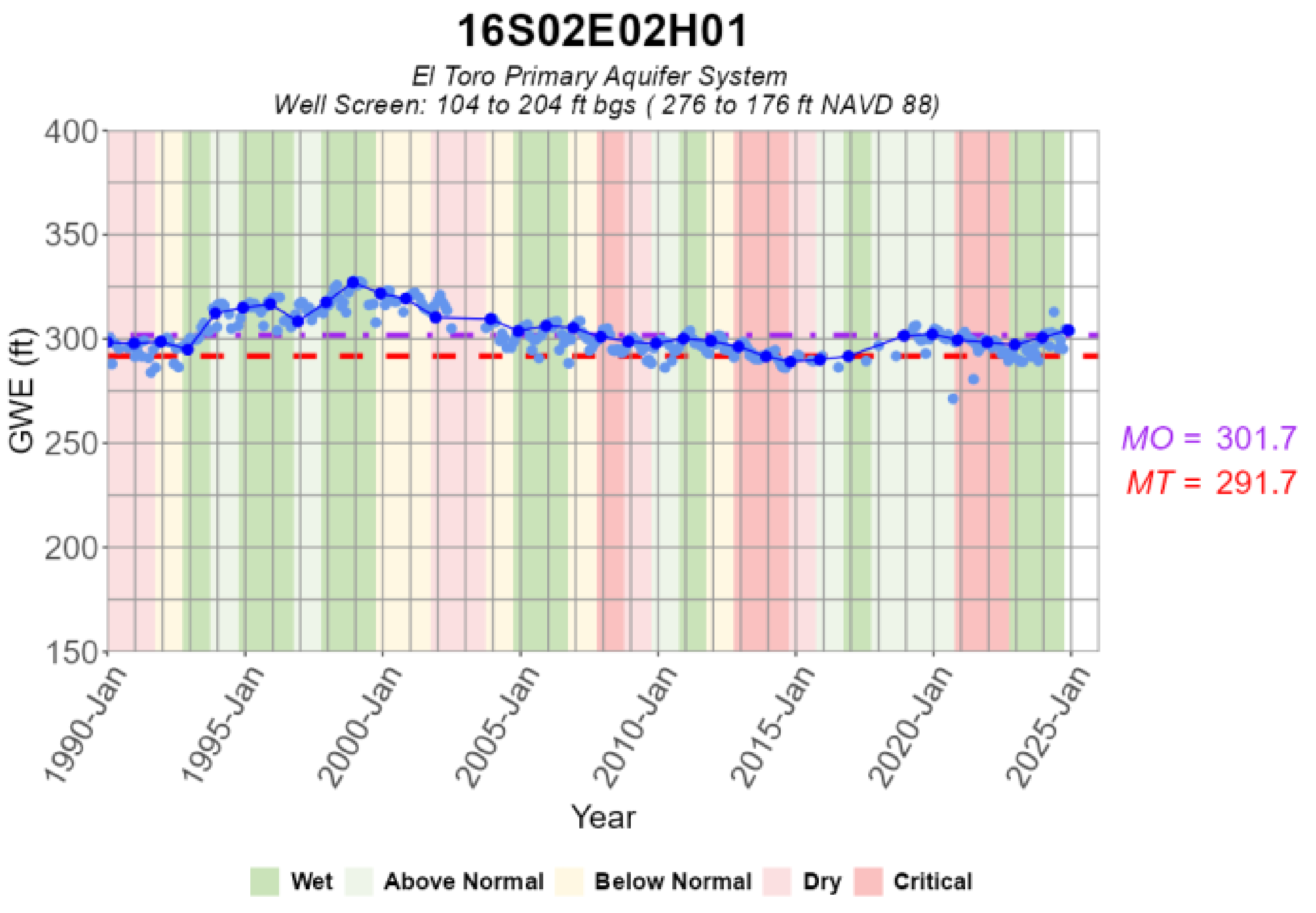
El Toro Primary Aquifer System
Well Screen: 80 to 180 ft bgs (326 to 226 ft NAVD 88)

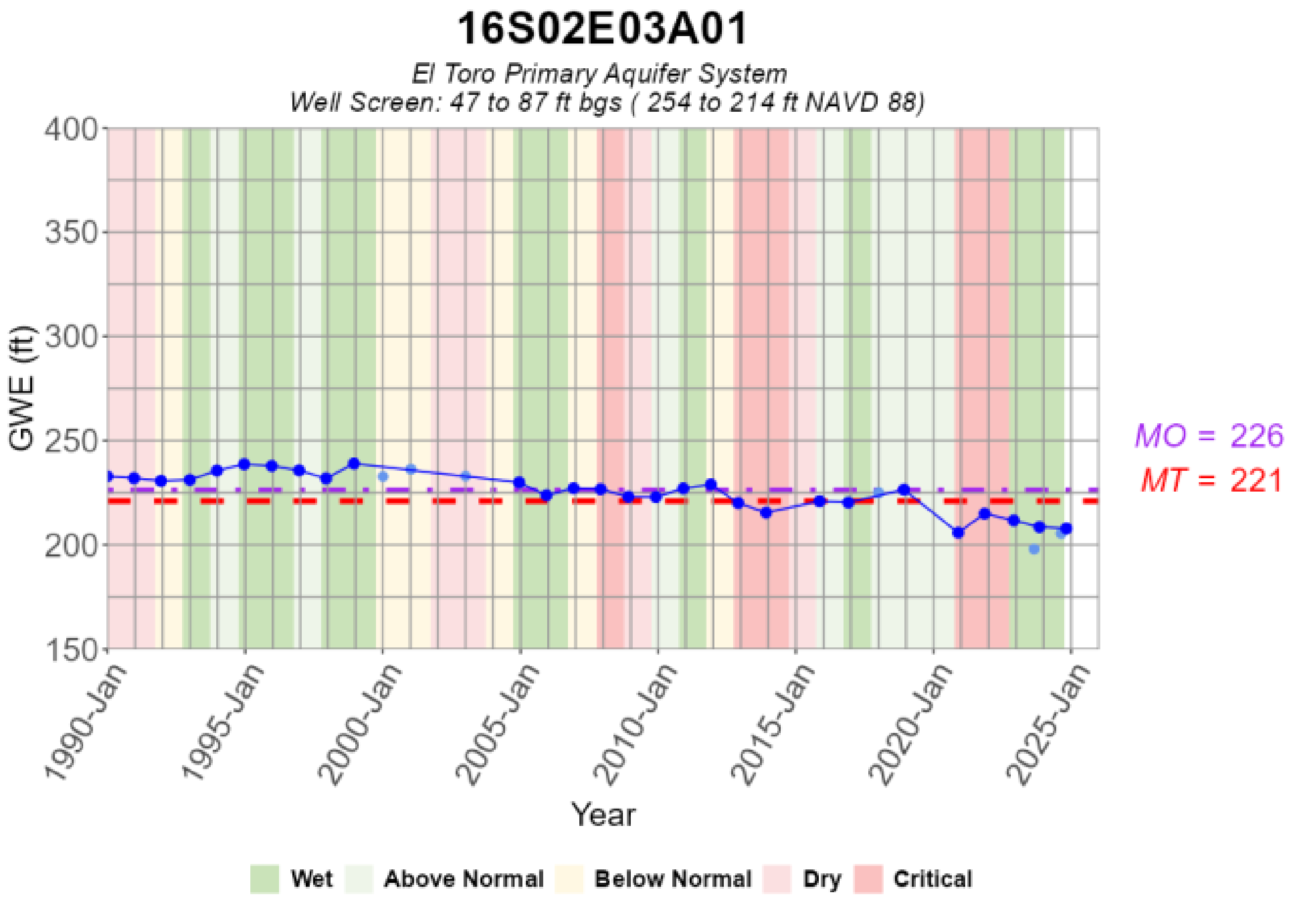


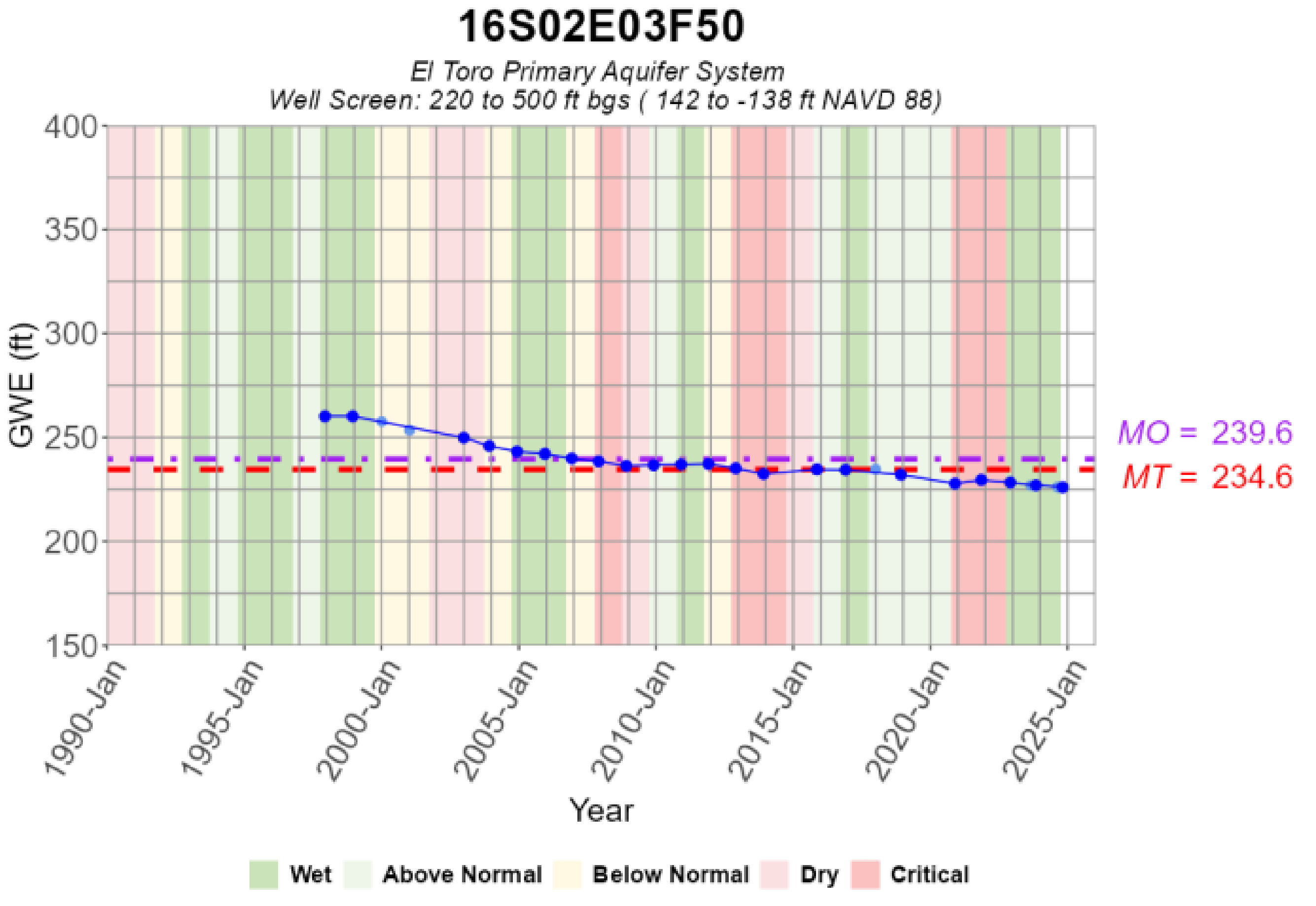
16S02E02G01

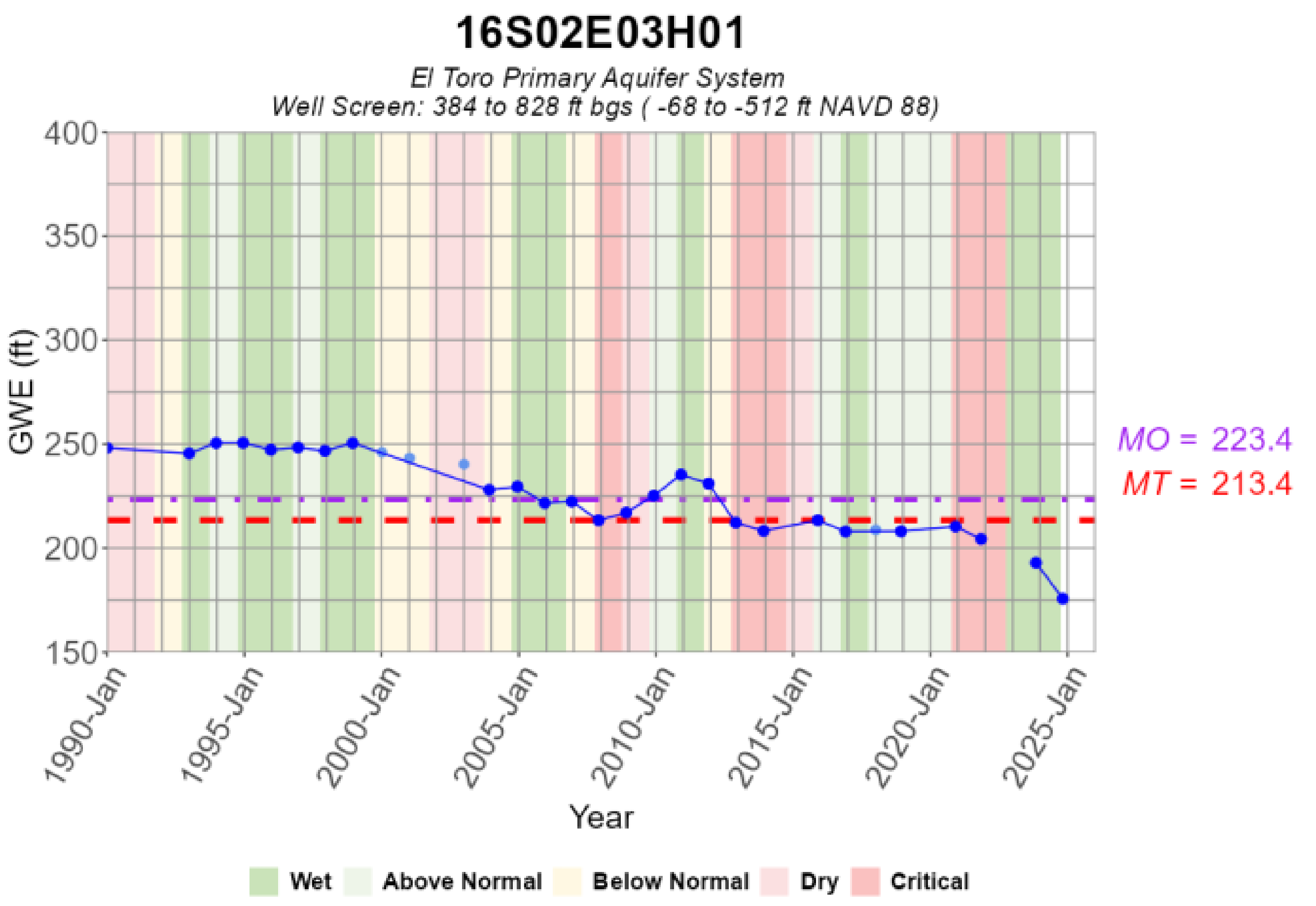
El Toro Primary Aquifer System
Well Screen: 320 to 440 ft bgs (51 to -69 ft NAVD 88)




16S02E02H01
El Toro Primary Aquifer System
Well Screen: 104 to 204 ft bgs (276 to 176 ft NAVD 88)
GWE (ft)
400
350
300
250
200
150
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = 301.7
MT = 291.7
Wet
Above Normal
Below Normal
Dry
Critical

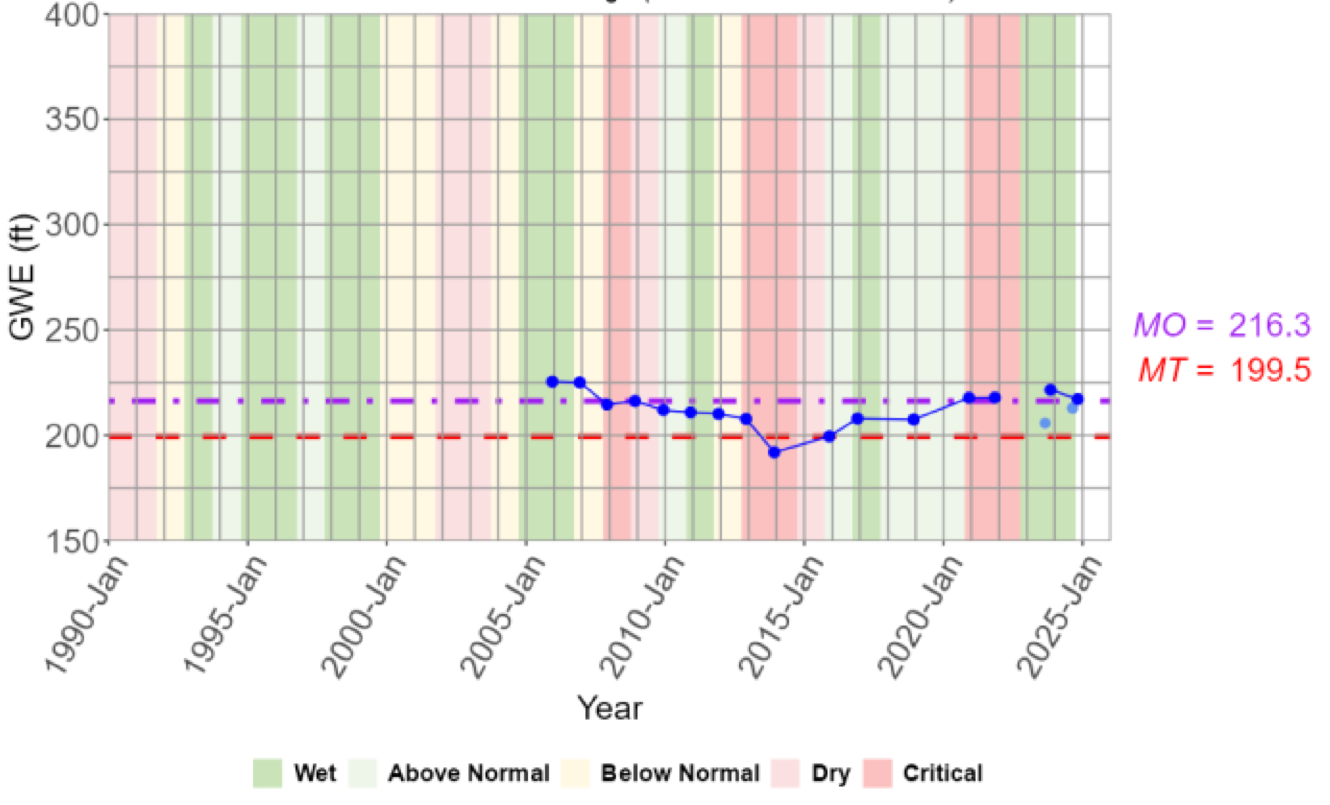

16S02E03A01
El Toro Primary Aquifer System
Well Screen: 47 to 87 ft bgs (254 to 214 ft NAVD 88)
GWE (ft)
400
350
300
250
200
150
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = 226
MT = 221
Wet
Above Normal
Below Normal
Dry
Critical


16S02E03F50
El Toro Primary Aquifer System
Well Screen: 220 to 500 ft bgs (142 to -138 ft NAVD 88)
GWE (ft)
400
350
300
250
200
150
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = 239.6
MT = 234.6
Wet
Above Normal
Below Normal
Dry
Critical


16S02E03H01
El Toro Primary Aquifer System
Well Screen: 384 to 828 ft bgs (-68 to -512 ft NAVD 88)
GWE (ft)
400
350
300
250
200
150
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = 223.4
MT = 213.4
Wet
Above Normal
Below Normal
Dry
Critical

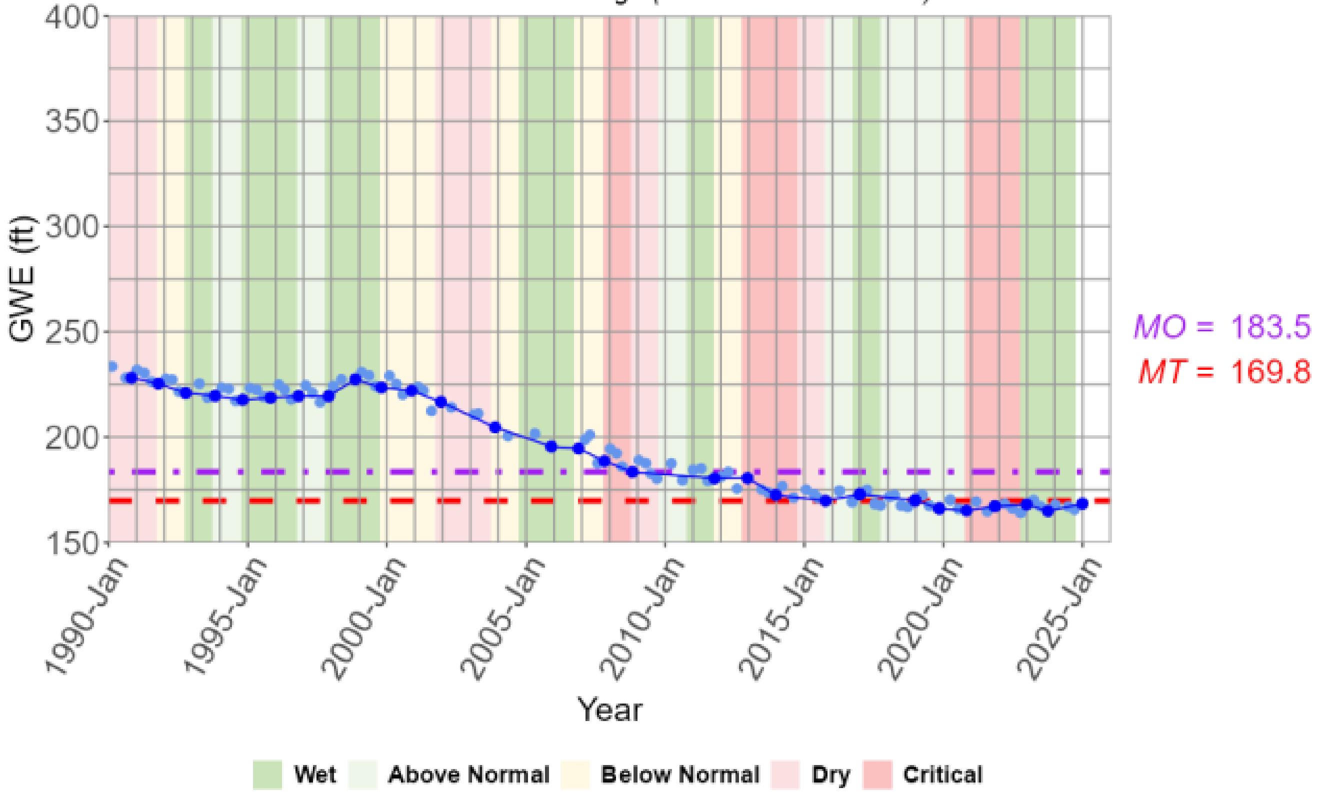
16S02E03J50

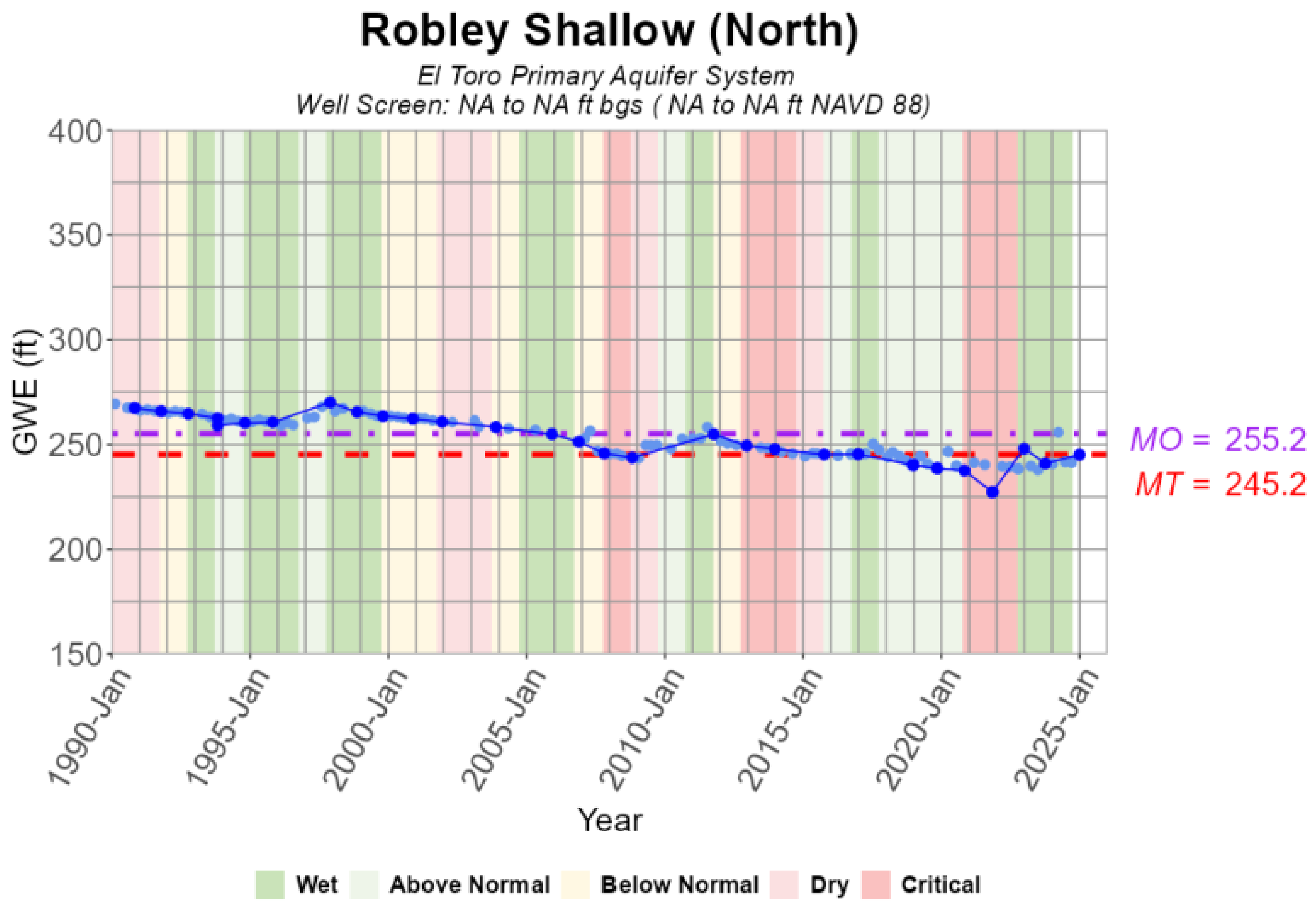
El Toro Primary Aquifer System
Well Screen: 528 to 810 ft bgs (-203 to -485 ft NAVD 88)



Robley Deep (South)

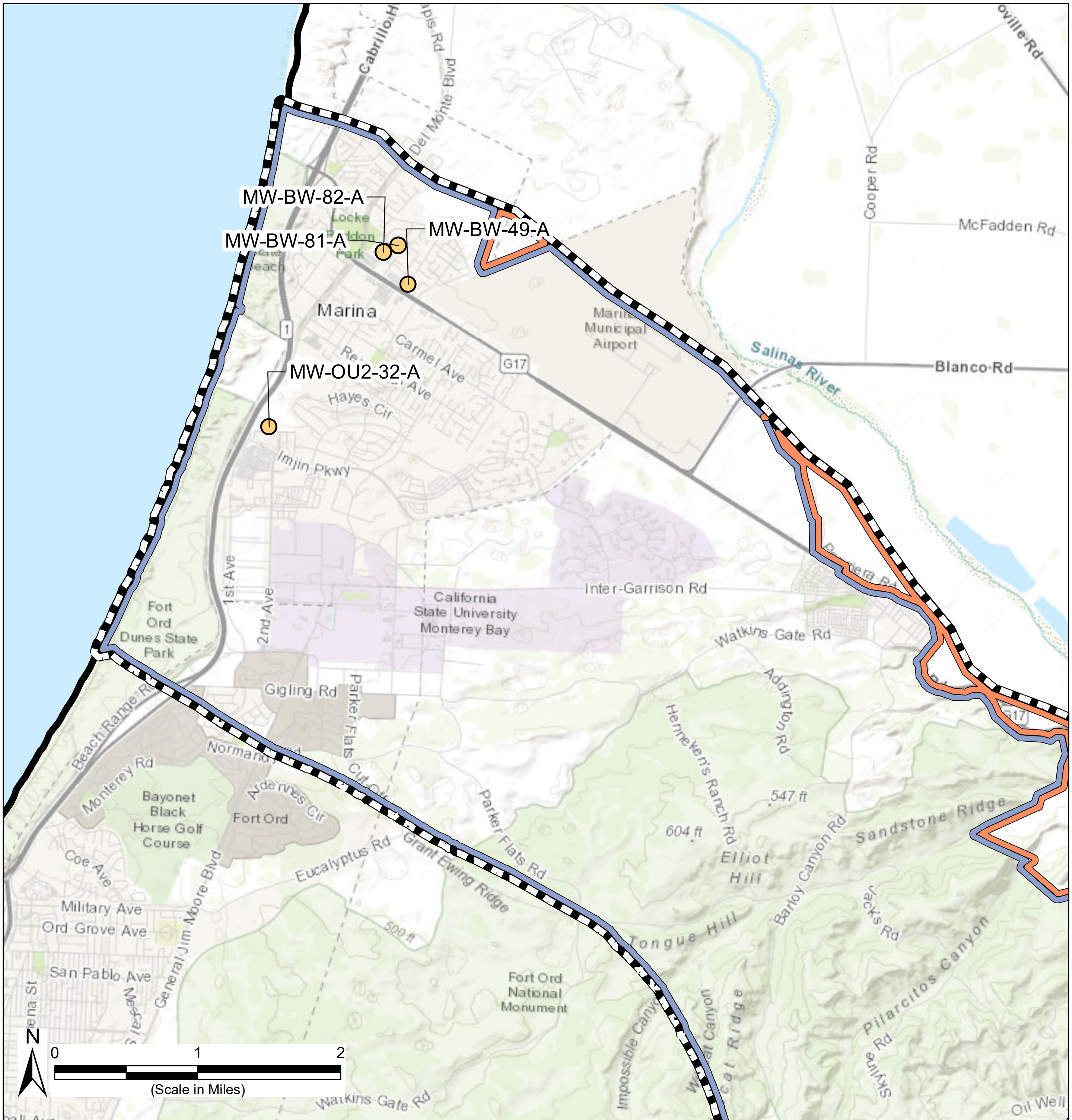
El Toro Primary Aquifer System
Well Screen: NA to NA ft bgs (NA to NA ft NAVD 88)




Robley Shallow (North)
El Toro Primary Aquifer System
Well Screen: NA to NA ft bgs (NA to NA ft NAVD 88)
GWE (ft)
400
350
300
250
200
150
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year
MO = 255.2
MT = 245.2
Wet
Above Normal
Below Normal
Dry
Critical

APPENDIX D

Long-term Chloride and TDS Concentrations in Seawater Intrusion RMS Wells



Legend

- Representative Monitoring Sites for Seawater Intrusion
- Monterey Subbasin

Management Areas

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

Abbreviations

DWR = California Department of Water Resources
NAVD 88 = North American Vertical Datum of 1988

Sources

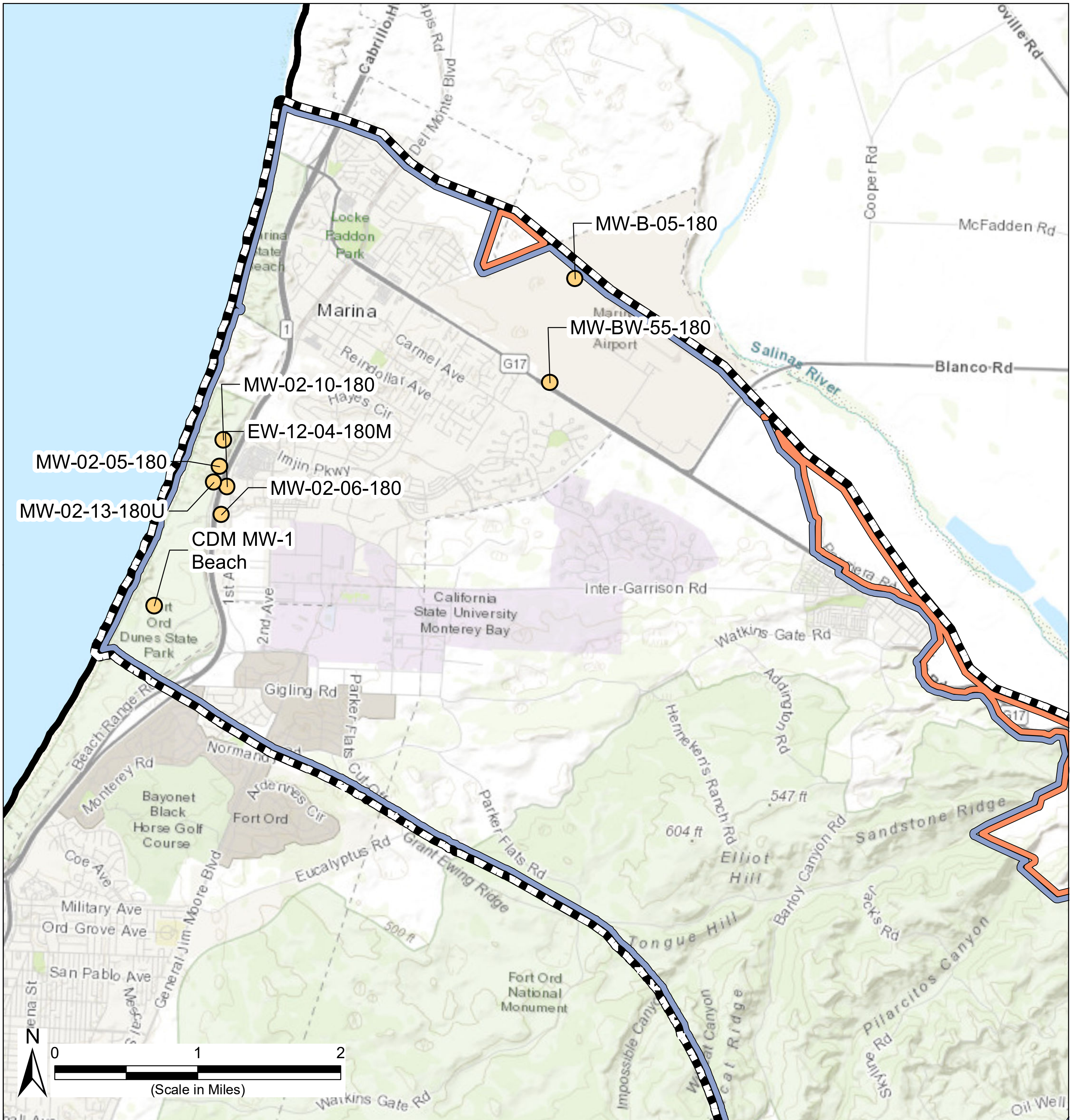
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 28 March 2025.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Seawater Intrusion Representative Monitoring Sites in the Dune Sand Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Appendix C-1

Path: X:\B60094\Maps\2025\03\Appendix_SWI_DS.mxd



Legend

- Representative Monitoring Sites for Seawater Intrusion
- Monterey Subbasin

Management Areas

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

Abbreviations

DWR = California Department of Water Resources
NAVD 88 = North American Vertical Datum of 1988

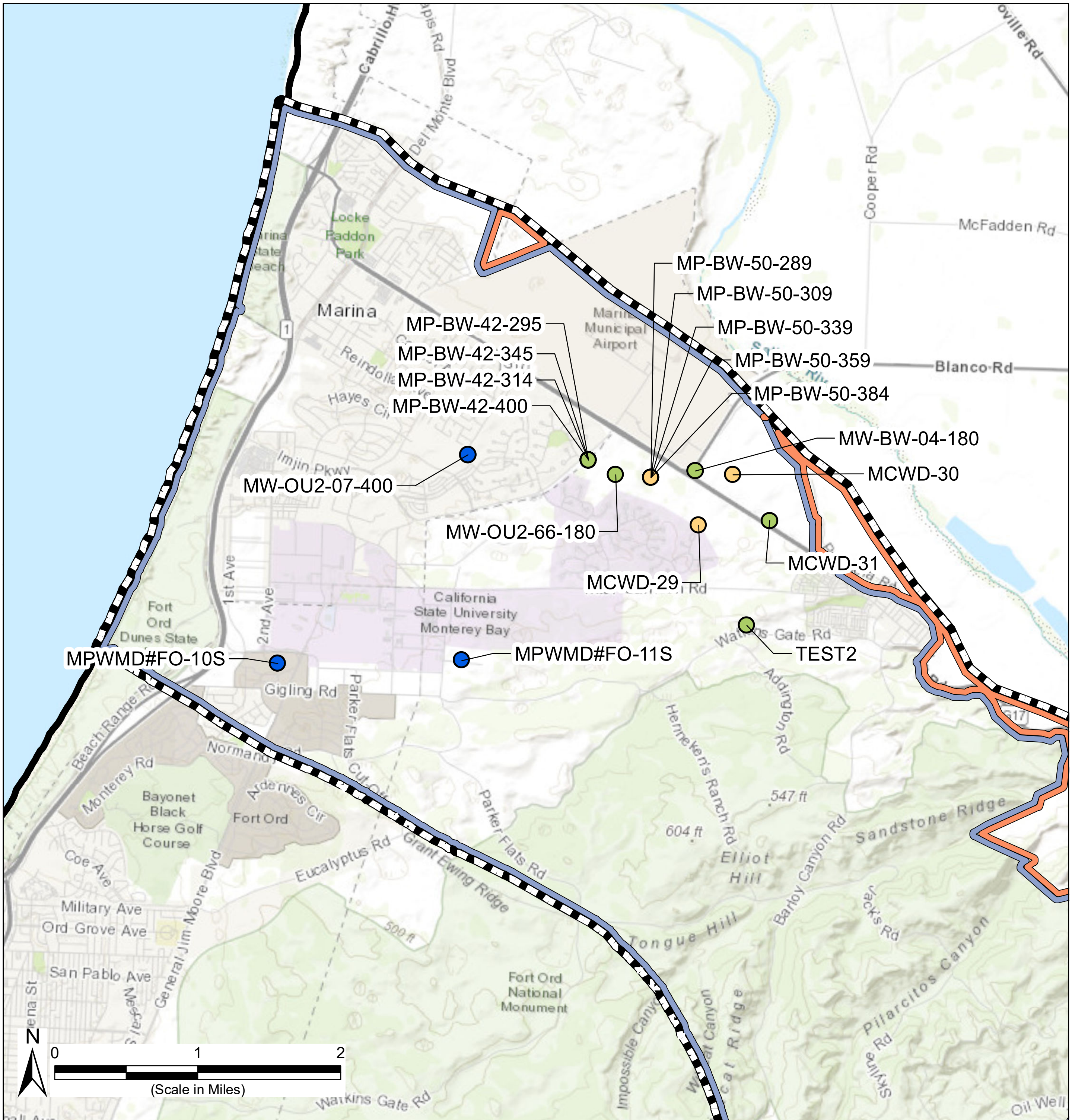
Sources

1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 28 March 2025.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Seawater Intrusion Representative Monitoring Sites in the Upper 180-Foot Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Appendix C-2



Legend

Representative Monitoring Sites for Seawater Intrusion

- 400-Foot Aquifer
- Lower 180-Foot Aquifer
- Lower 180-Foot, 400-Foot Aquifer

Monterey Subbasin

Management Areas

- Marina-Ord Area
- Corral de Tierra Area

Other Groundwater Subbasins within Salinas Valley Basin

Abbreviations

DWR = California Department of Water Resources
NAVD 88 = North American Vertical Datum of 1988

Sources

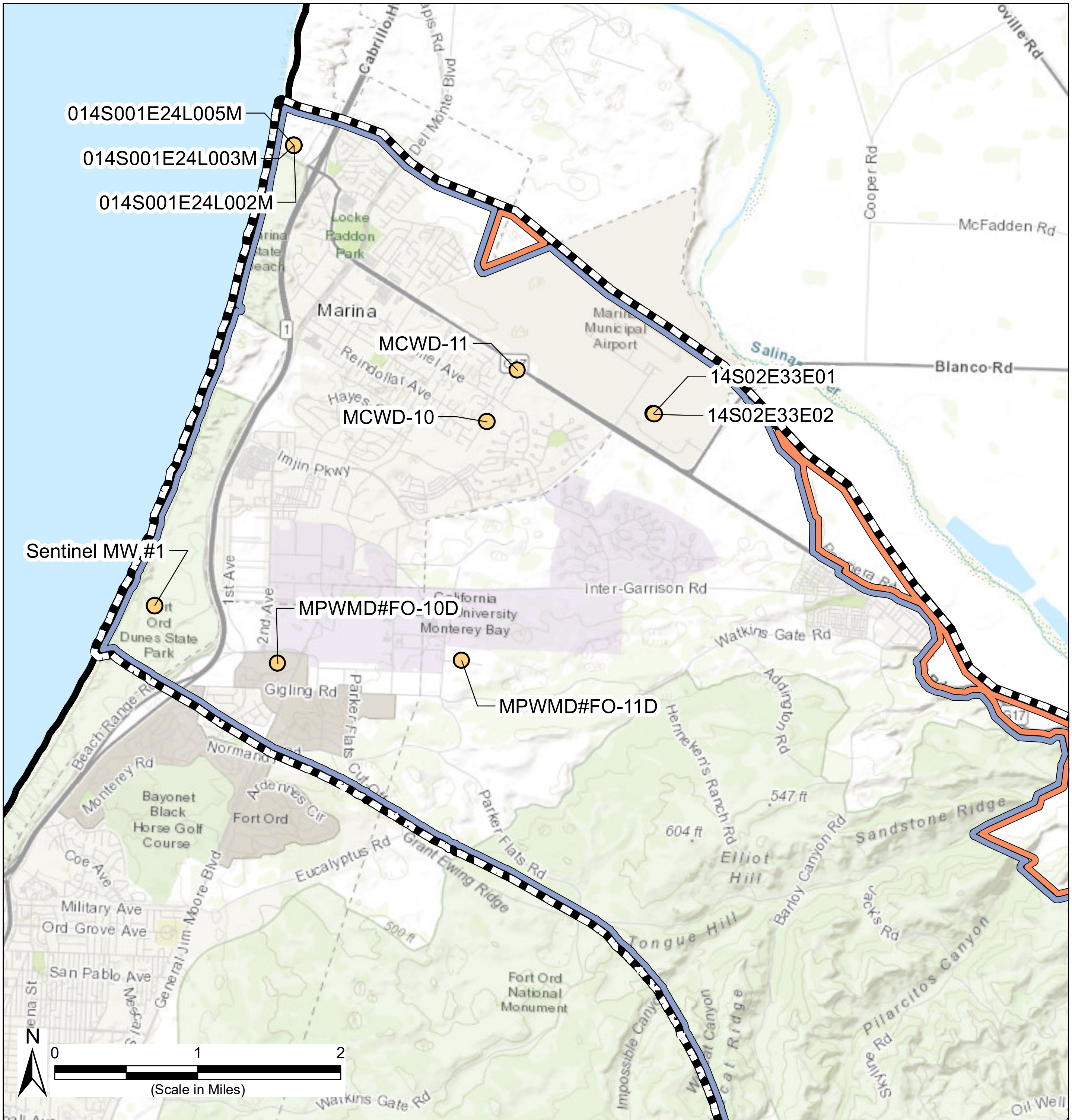
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2025.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

Seawater Intrusion Representative Monitoring Sites in the Lower 180-Foot, 400-Foot Aquifer

Monterey Subbasin
WY 2024 Annual Report
March 2025

Appendix C-3

Path: X:\B600094\Maps\2025\03\Appendix_SWI_Lower180400.mxd



Legend

- Representative Monitoring Sites for Seawater Intrusion
- Monterey Subbasin

Management Areas

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

Abbreviations

DWR = California Department of Water Resources
NAVD 88 = North American Vertical Datum of 1988

Sources

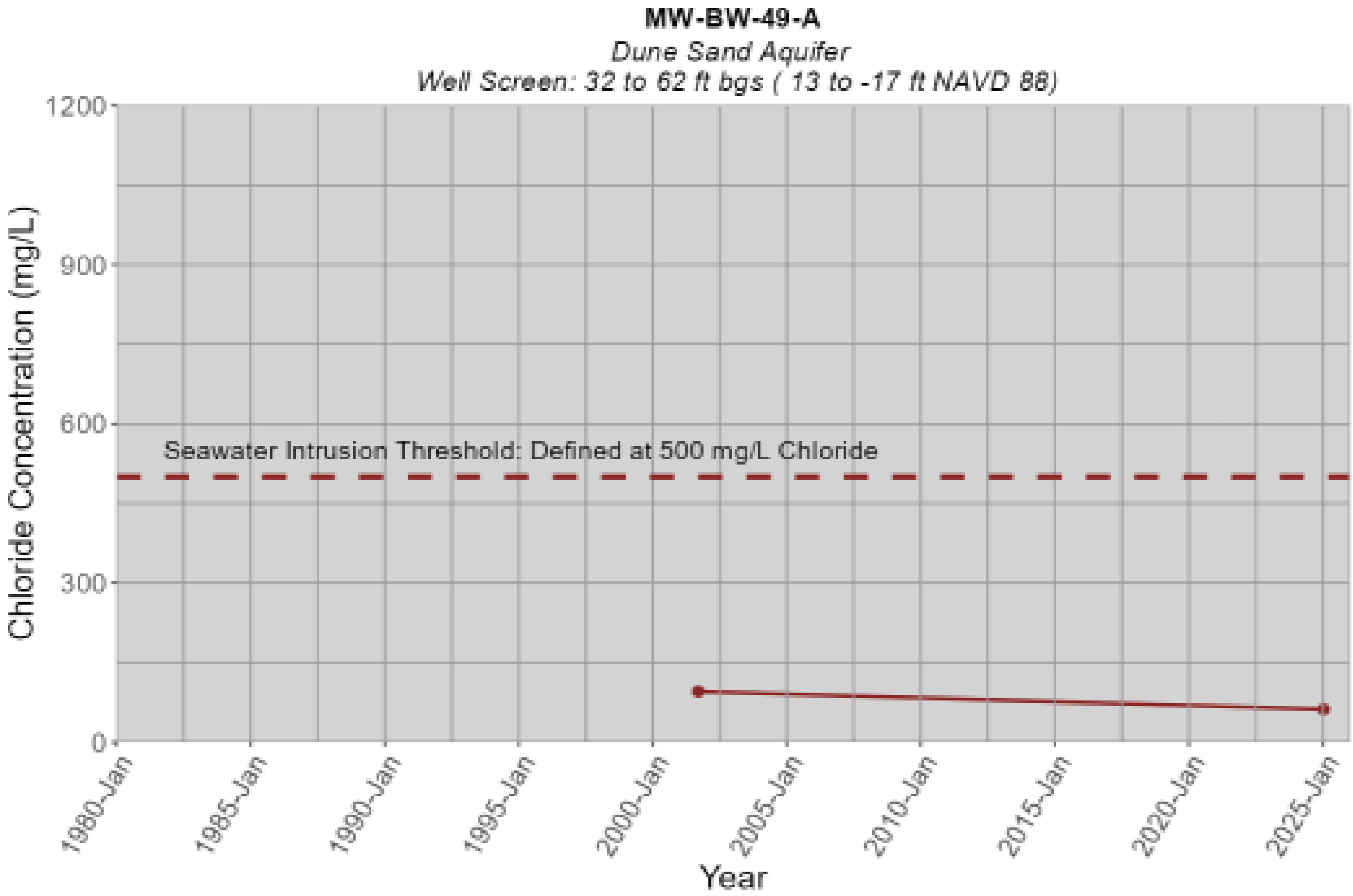
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 31 March 2025.
2. DWR groundwater basins are based on the boundaries defined in California's Groundwater, Bulletin 118 - 2018 Update.

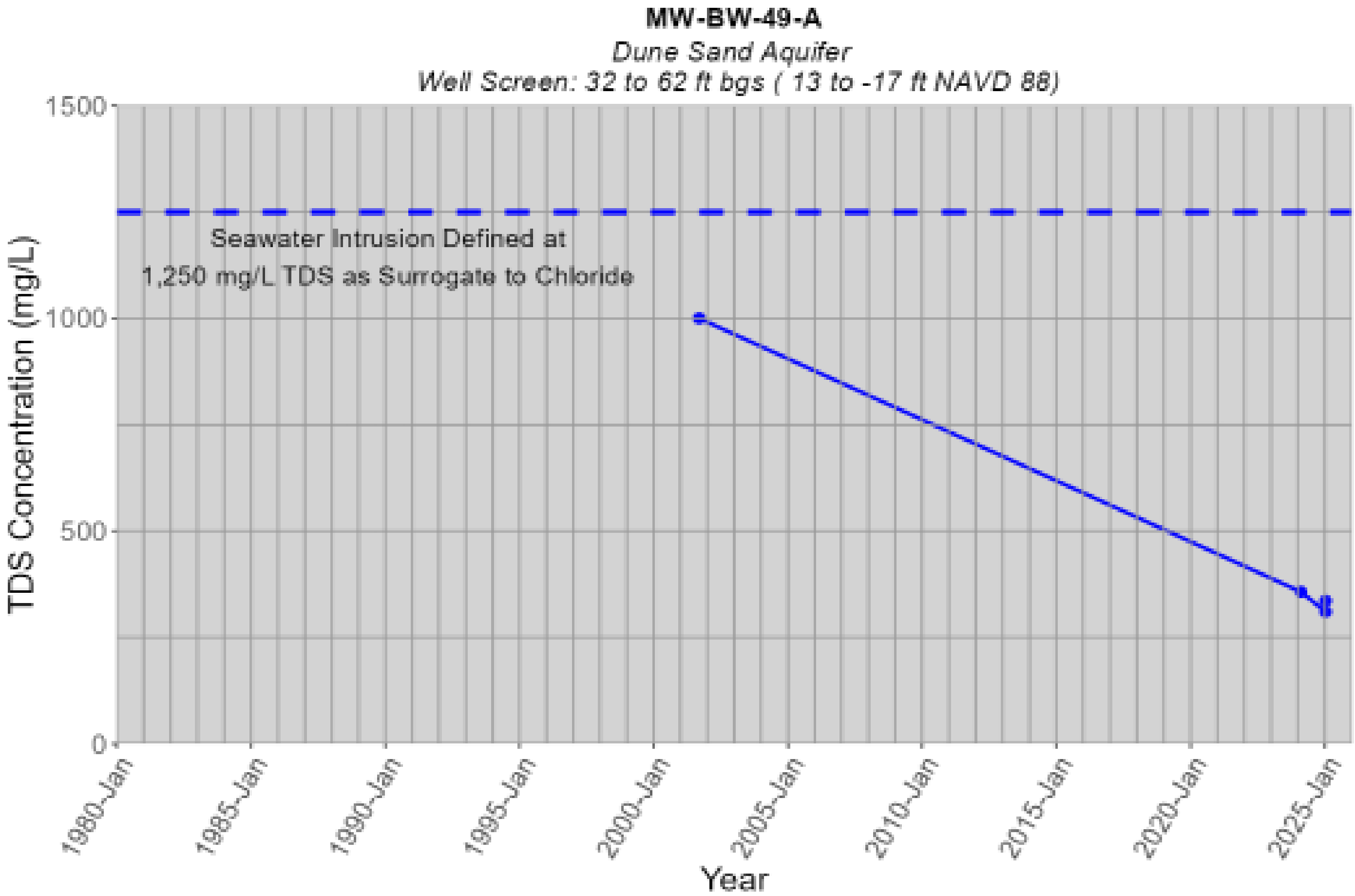
Seawater Intrusion Representative Monitoring Sites in the Deep Aquifer

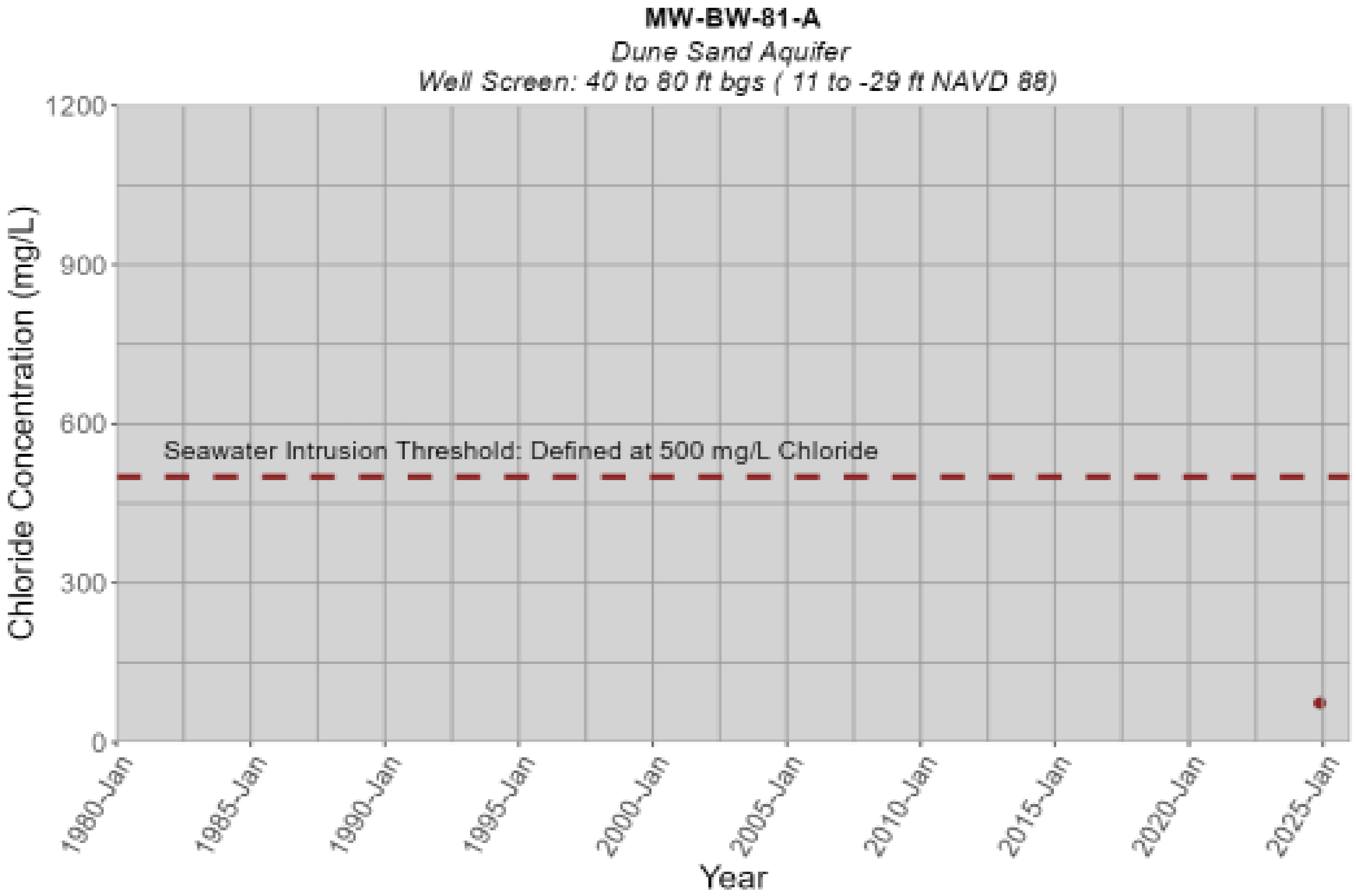
Monterey Subbasin
WY 2024 Annual Report
March 2025

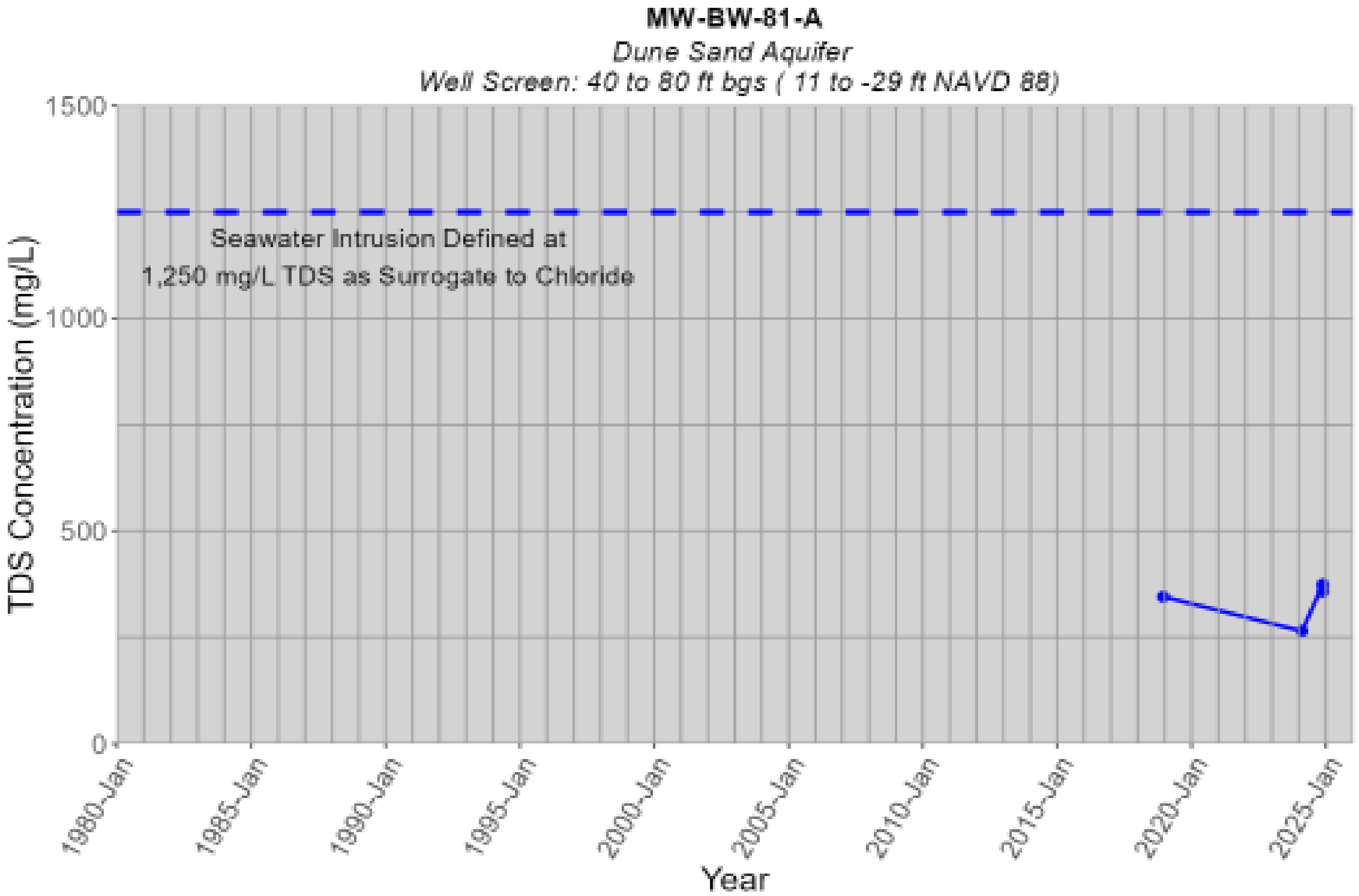
Appendix C-4

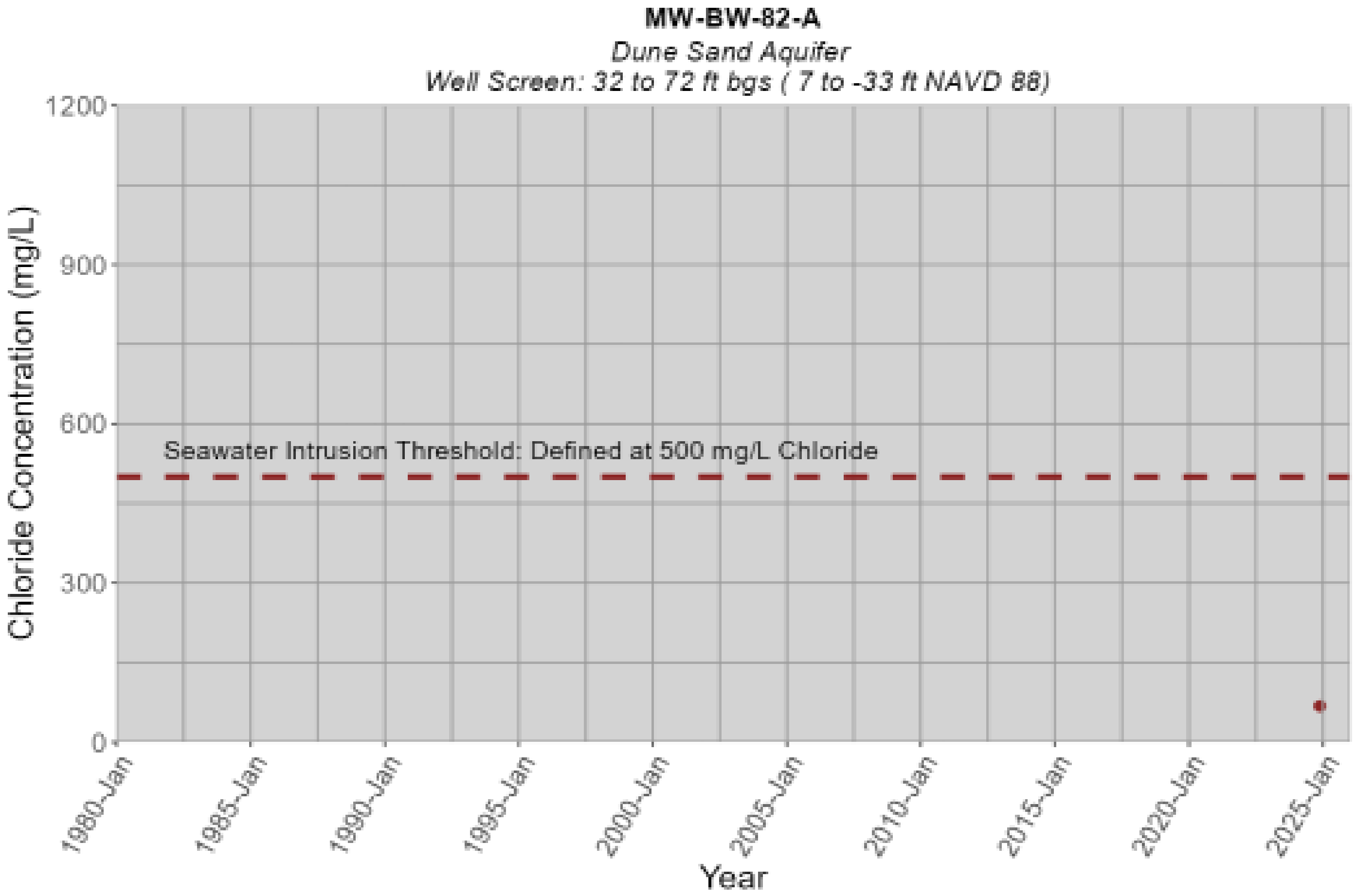
Path: X:\B60094\Maps\2025\03\Appendix_SWI_Deep.mxd

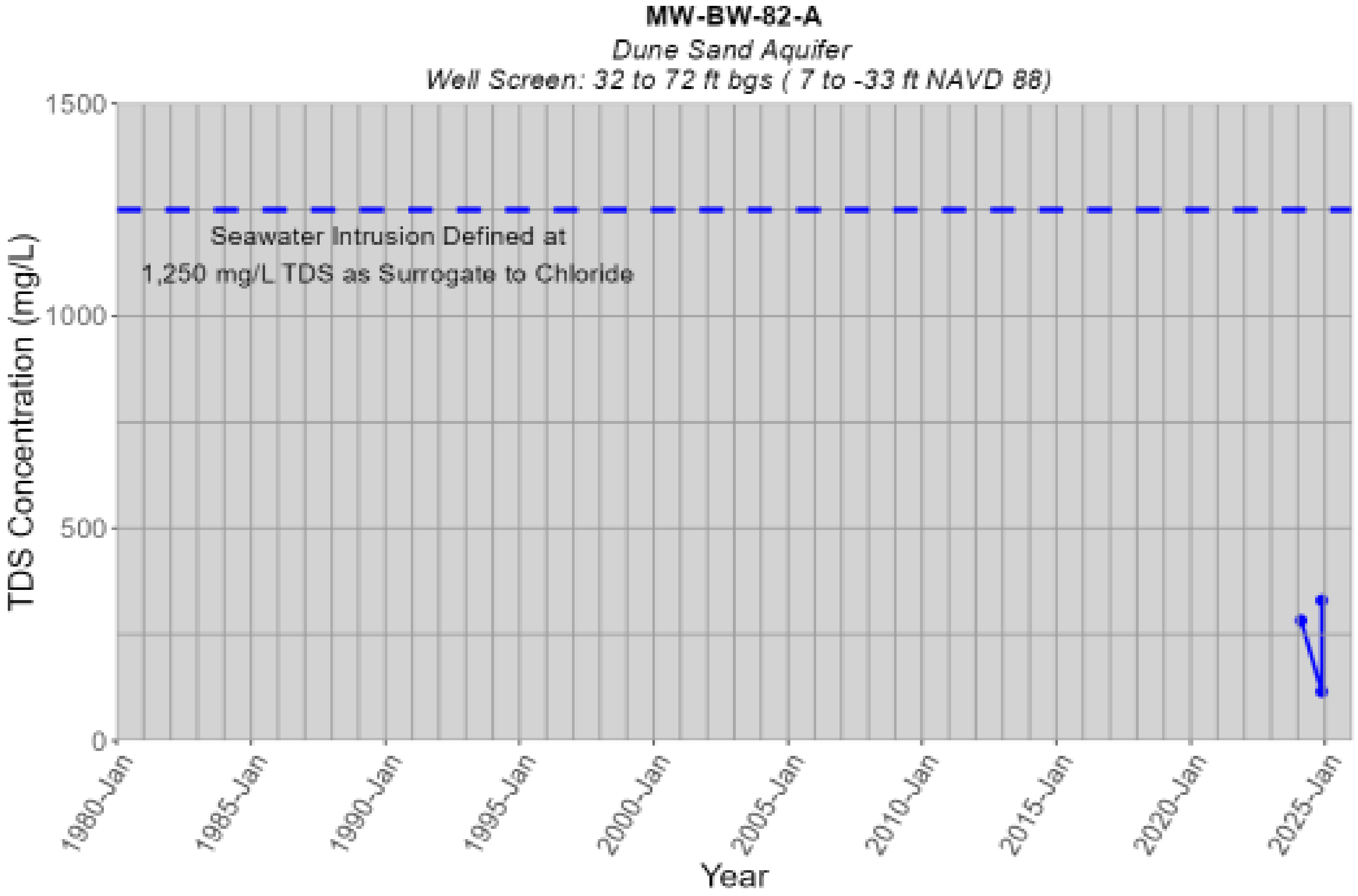

MW-BW-49-A
Dune Sand Aquifer
Well Screen: 32 to 62 ft bgs (13 to -17 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

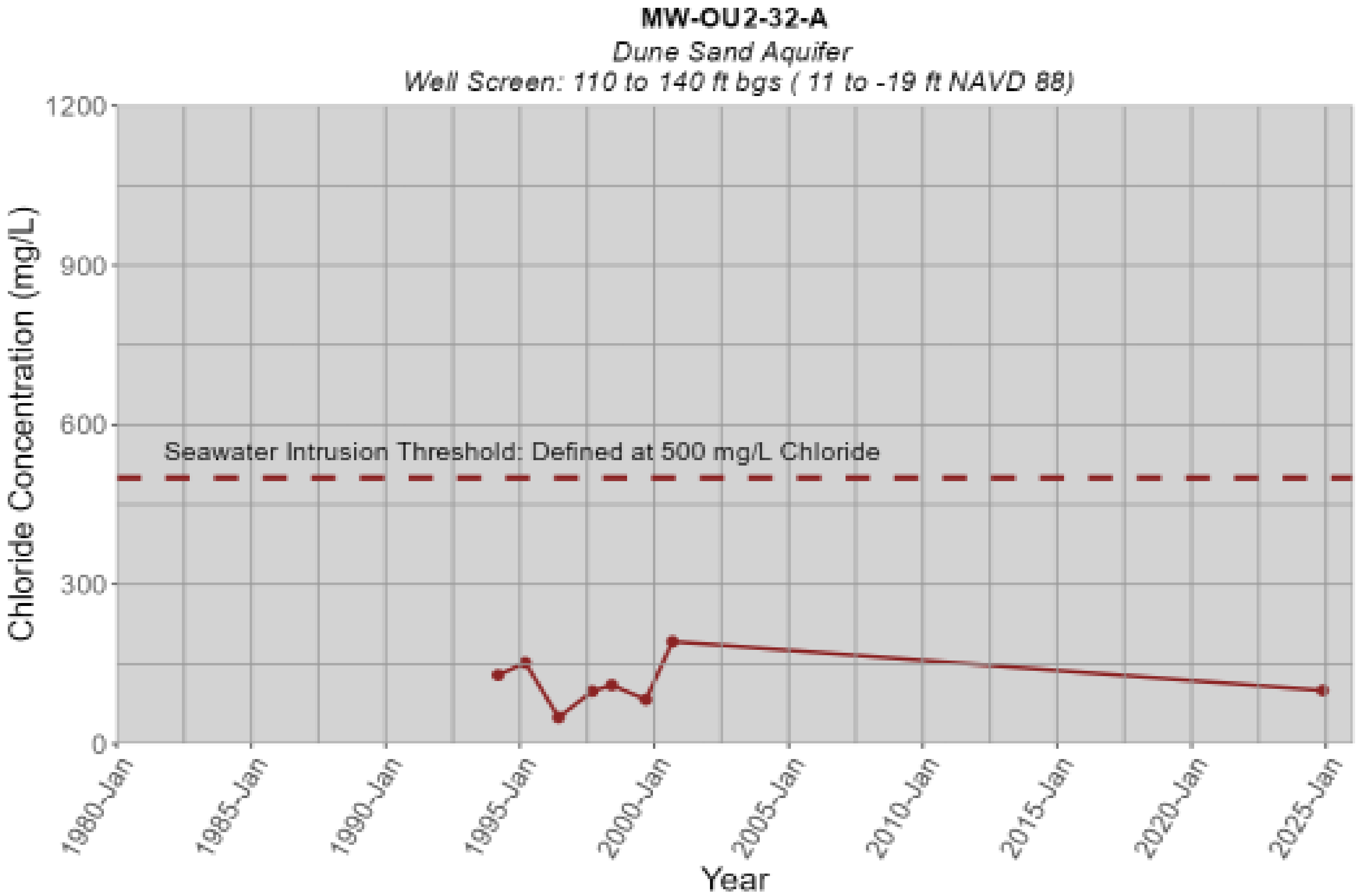

MW-BW-49-A
Dune Sand Aquifer
Well Screen: 32 to 62 ft bgs (13 to -17 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

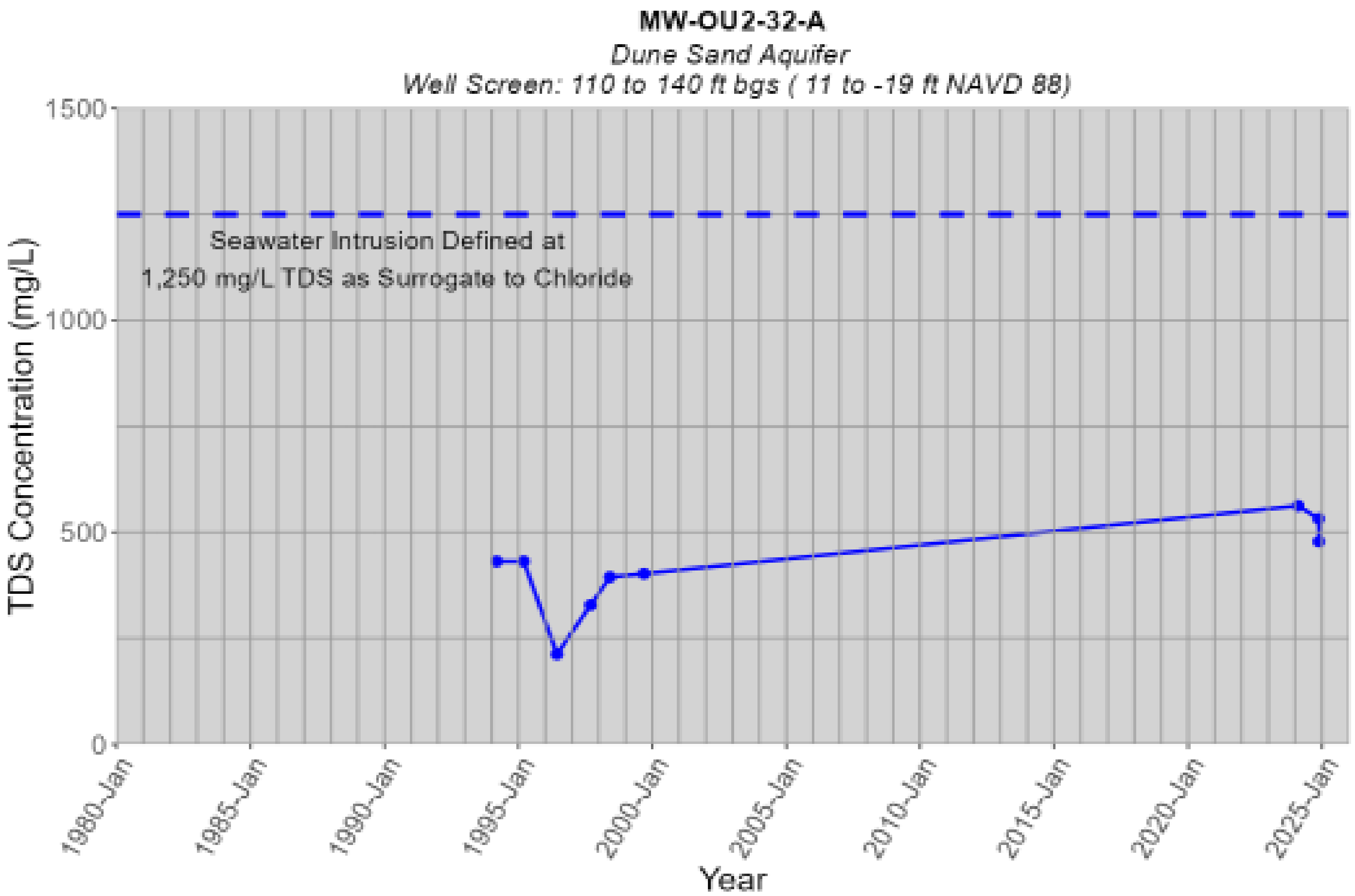

MW-BW-81-A
Dune Sand Aquifer
Well Screen: 40 to 80 ft bgs (11 to -29 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year


MW-BW-81-A
Dune Sand Aquifer
Well Screen: 40 to 80 ft bgs (11 to -29 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

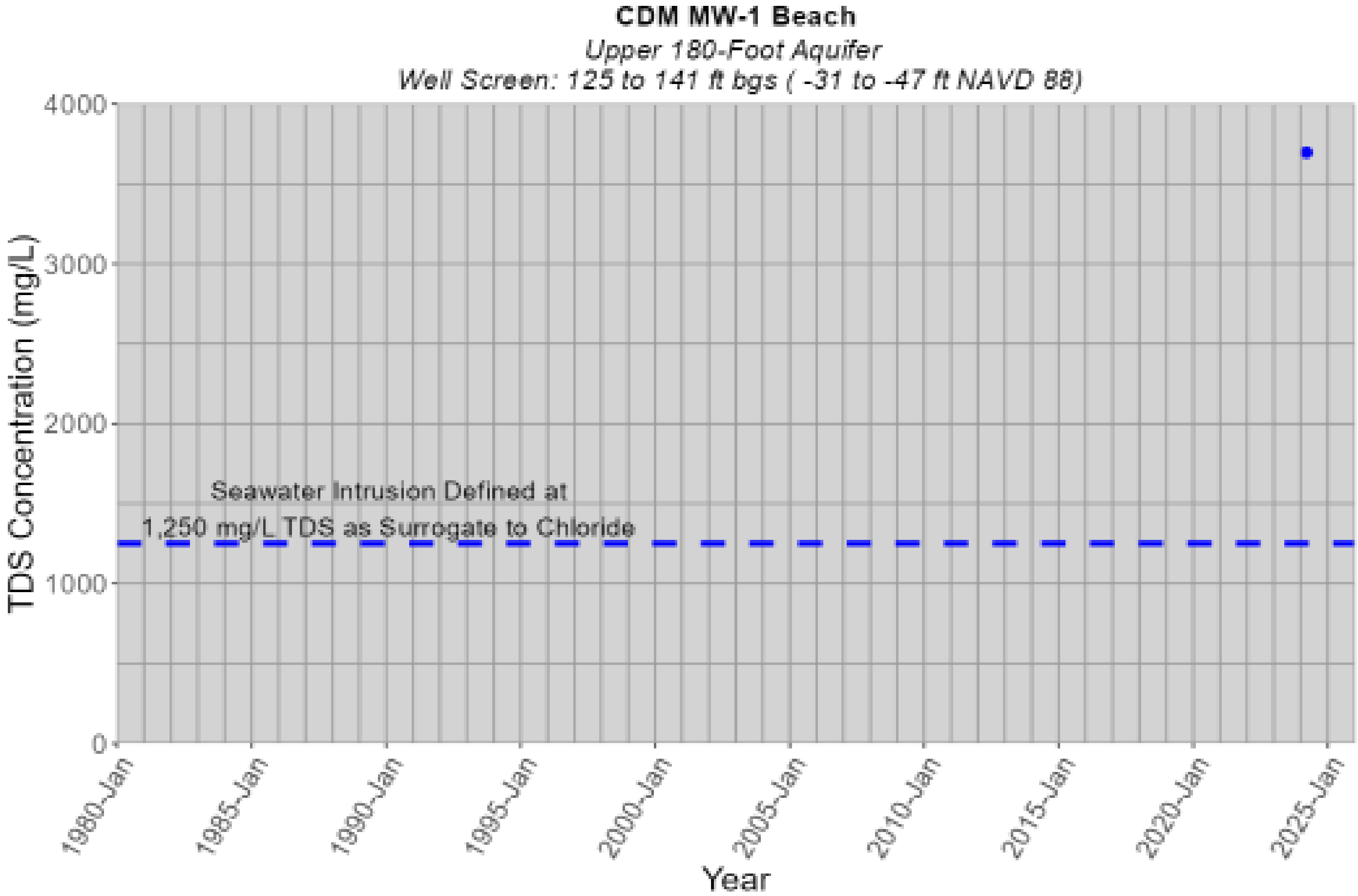

MW-BW-82-A
Dune Sand Aquifer
Well Screen: 32 to 72 ft bgs (7 to -33 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

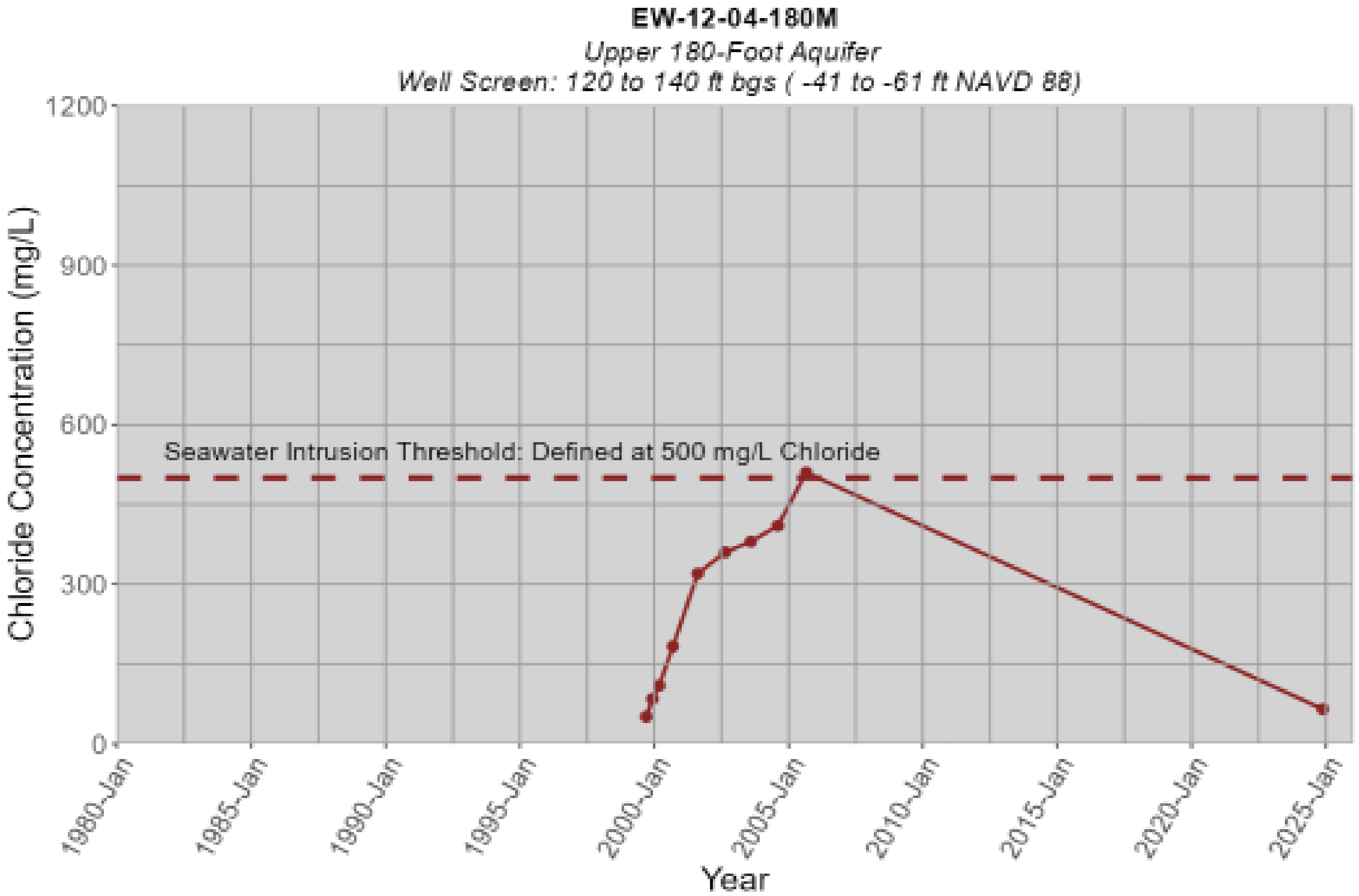

MW-BW-82-A
Dune Sand Aquifer
Well Screen: 32 to 72 ft bgs (7 to -33 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

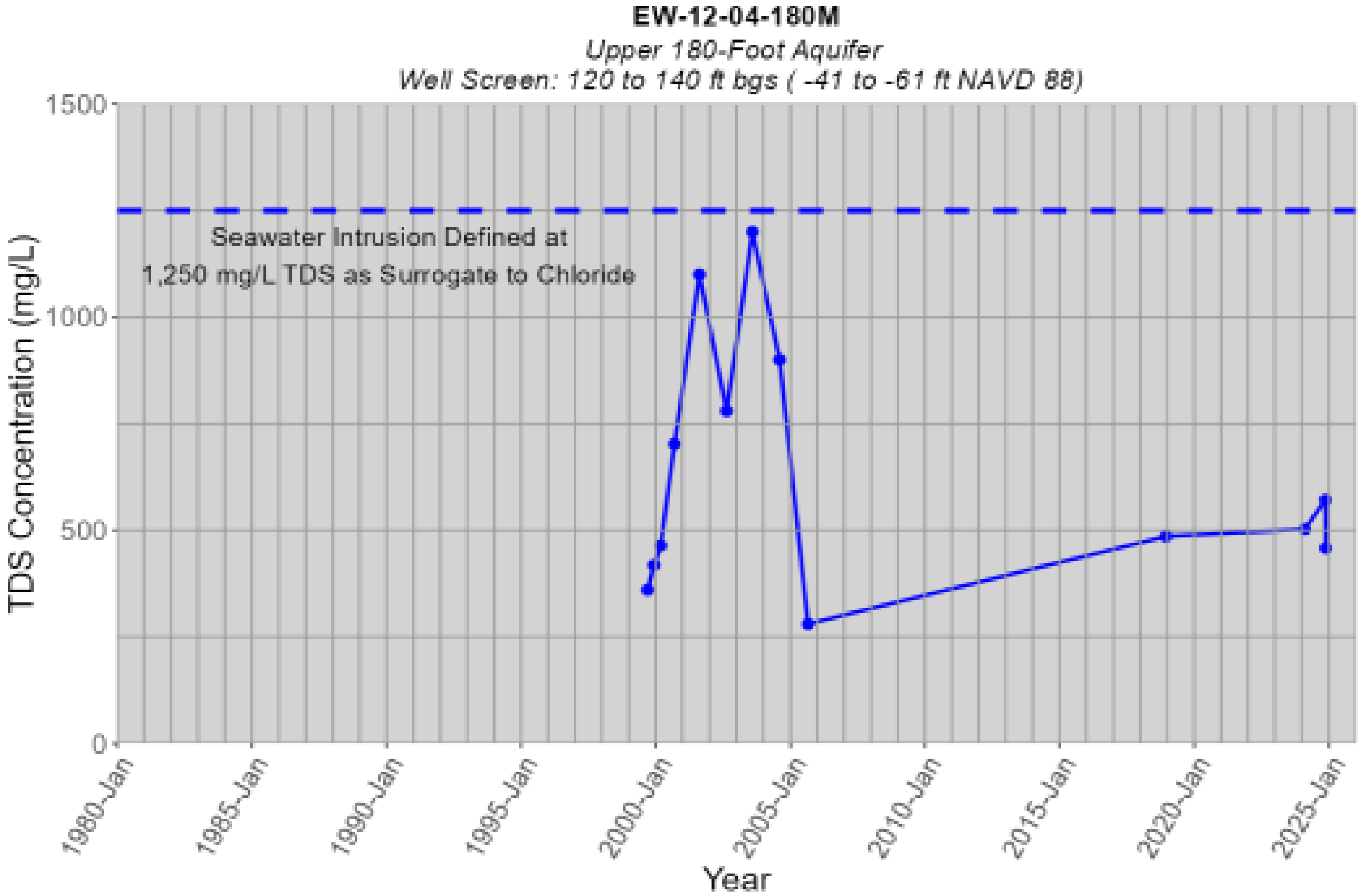

MW-OU2-32-A
Dune Sand Aquifer
Well Screen: 110 to 140 ft bgs (11 to -19 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

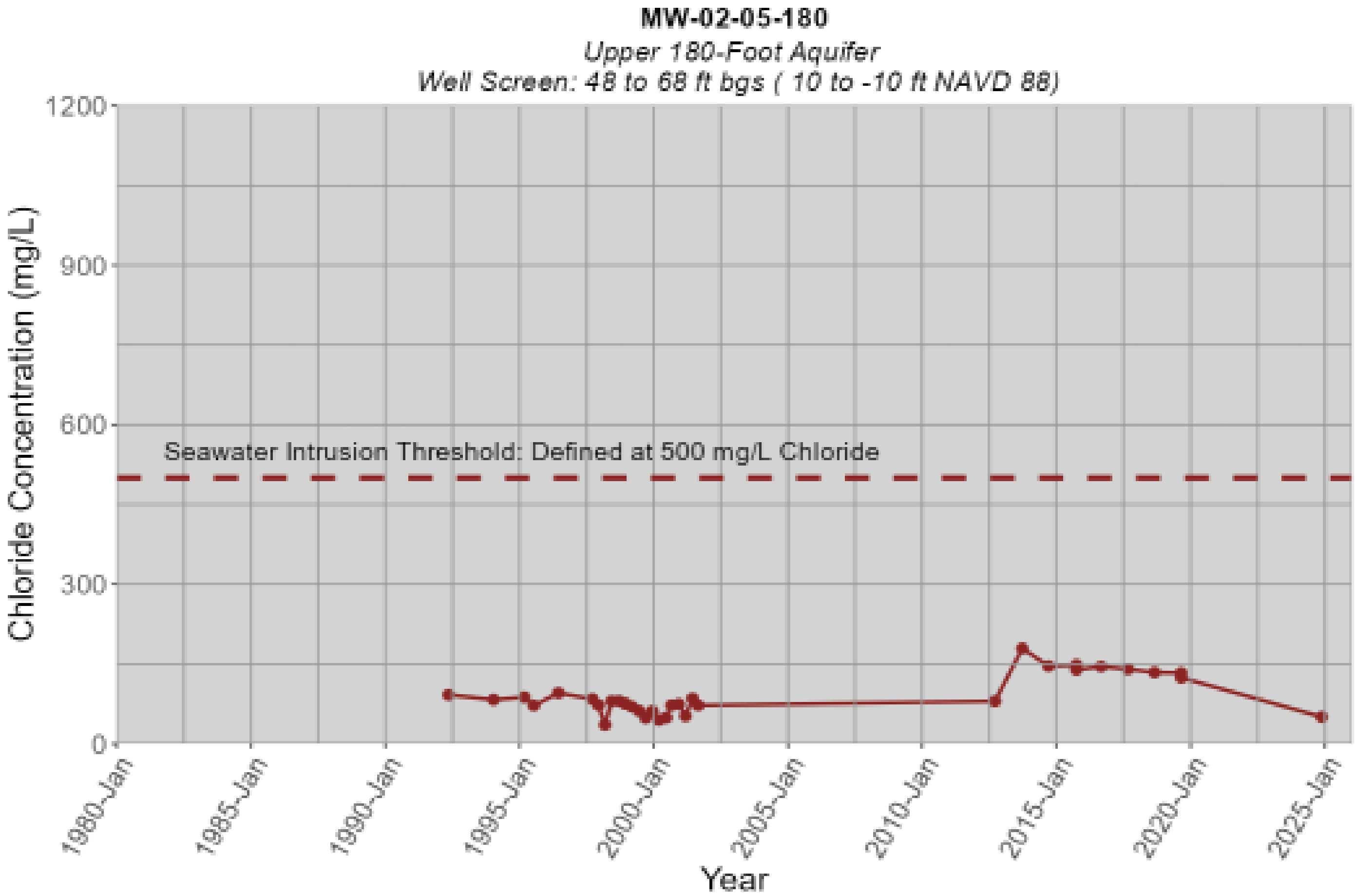

MW-OU2-32-A
Dune Sand Aquifer
Well Screen: 110 to 140 ft bgs (11 to -19 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

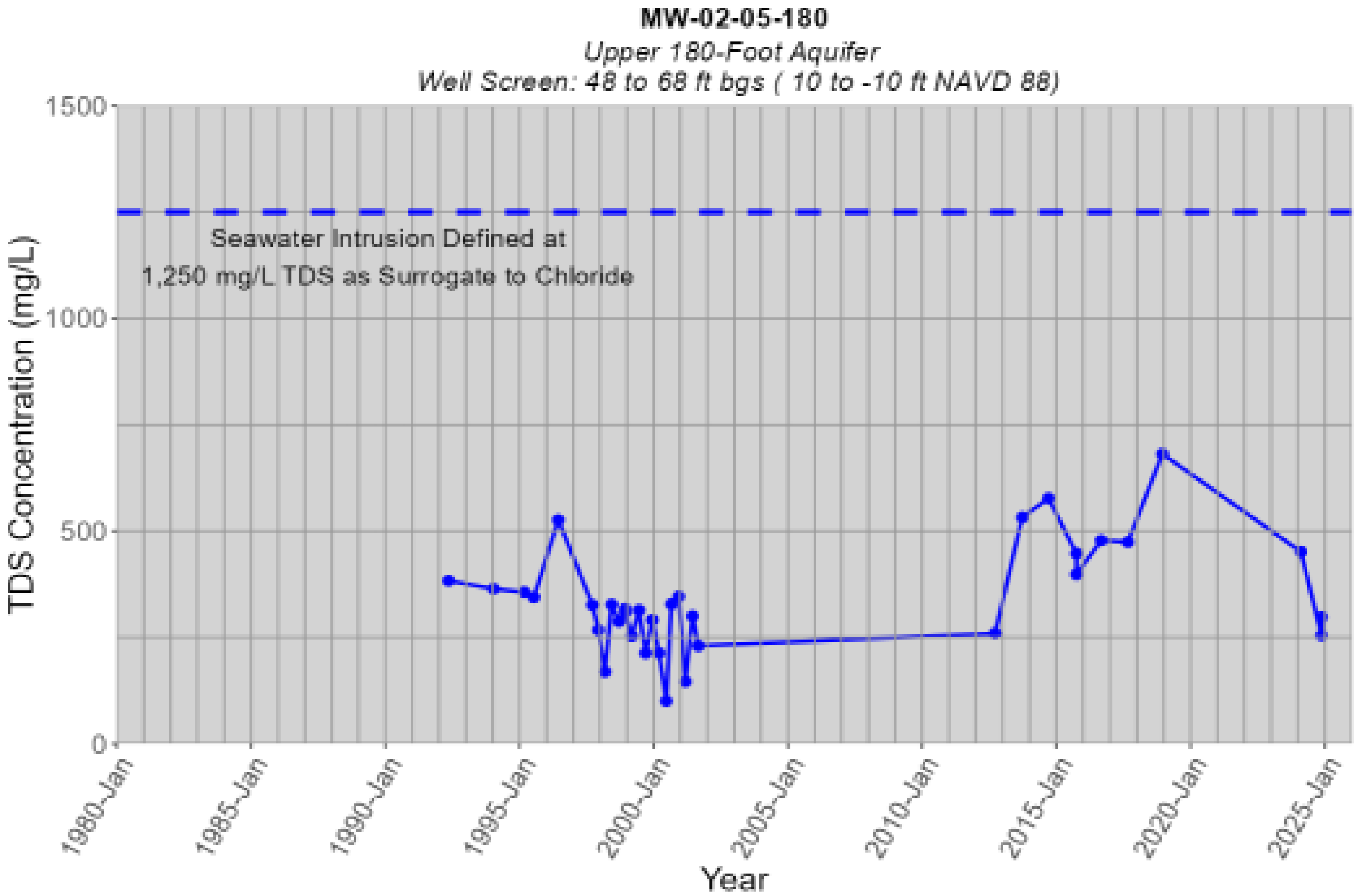
Chloride data for CDM MW-1 Beach is not available.

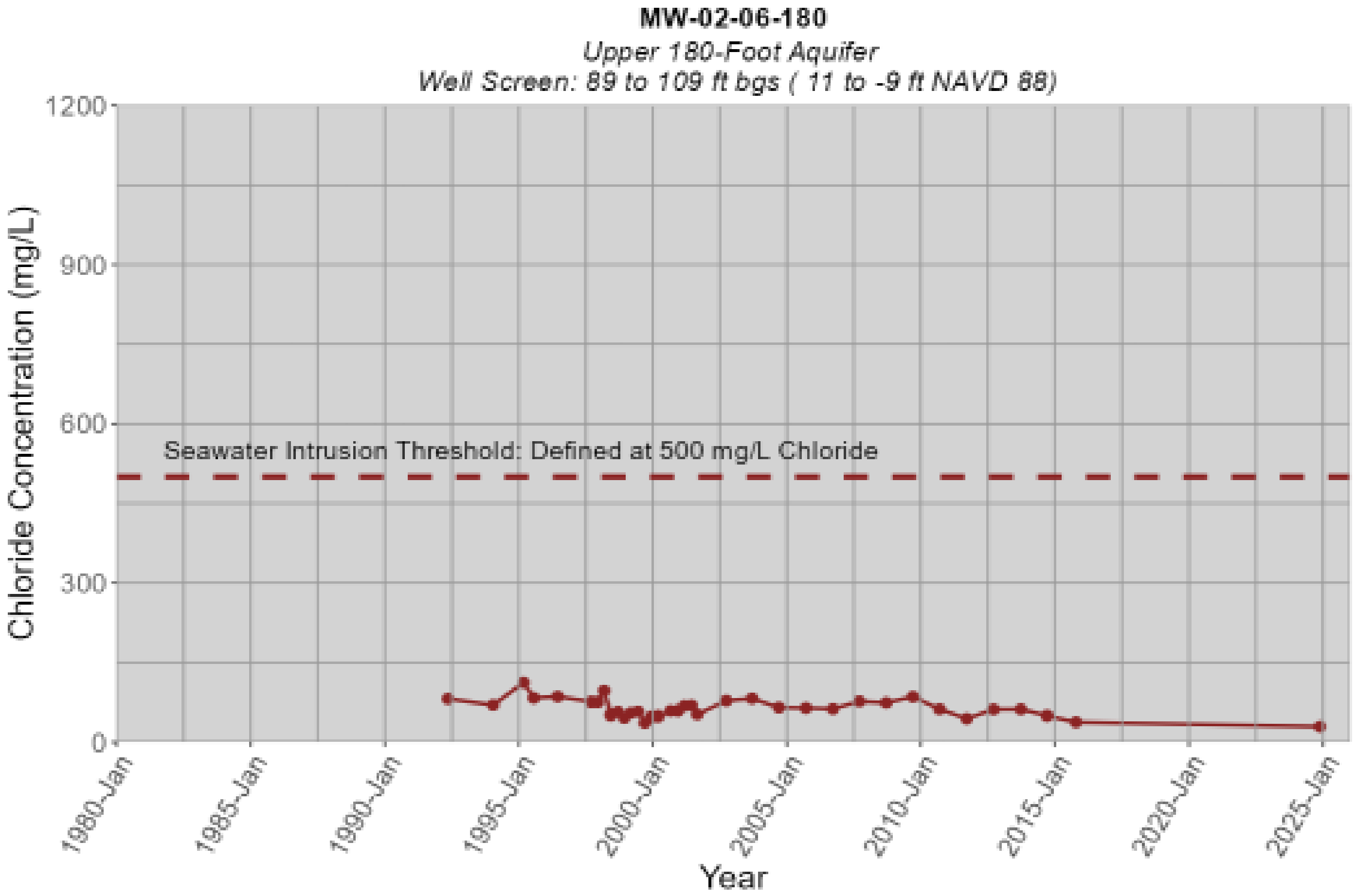


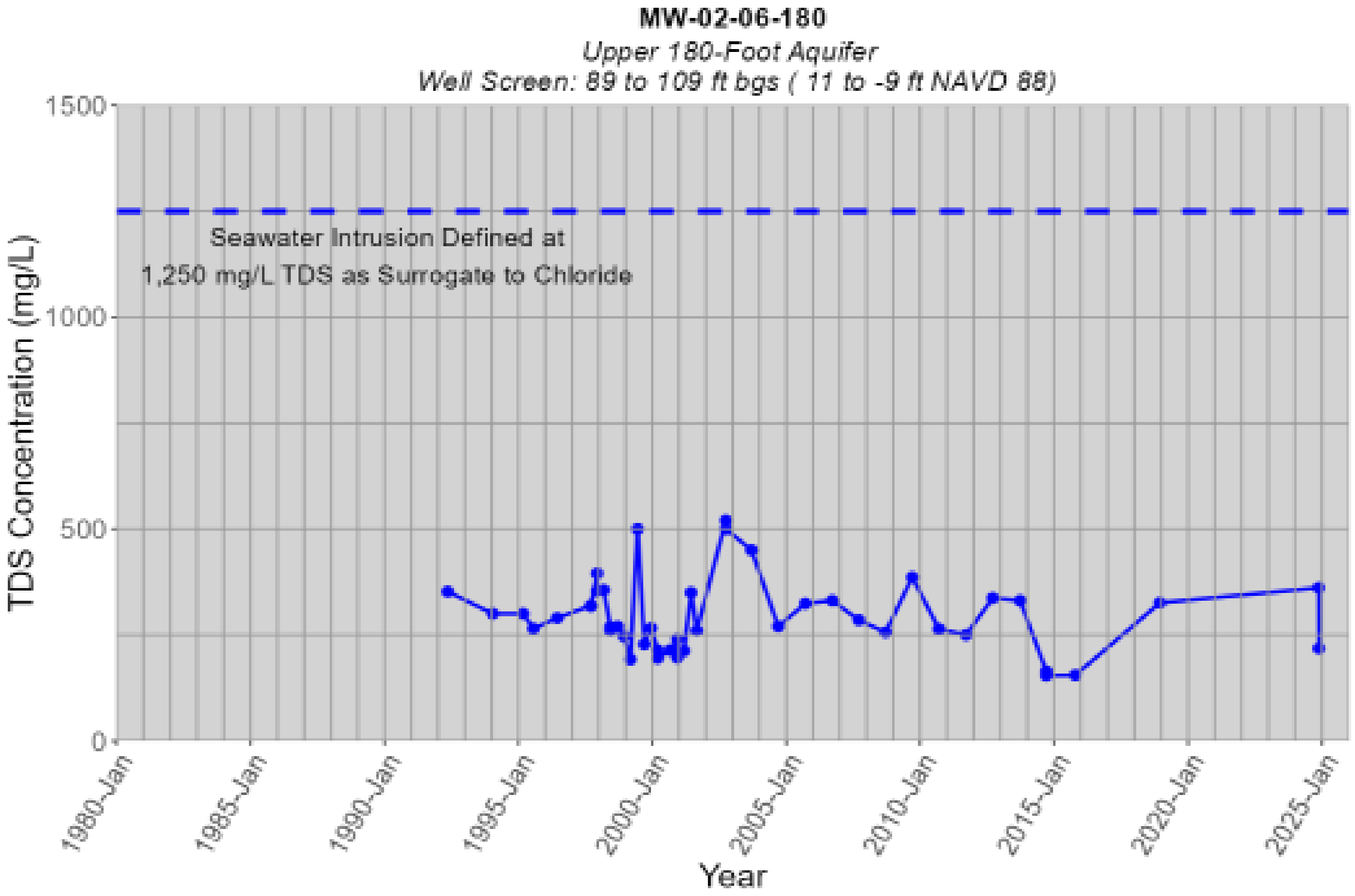

EW-12-04-180M
Upper 180-Foot Aquifer
Well Screen: 120 to 140 ft bgs (-41 to -61 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

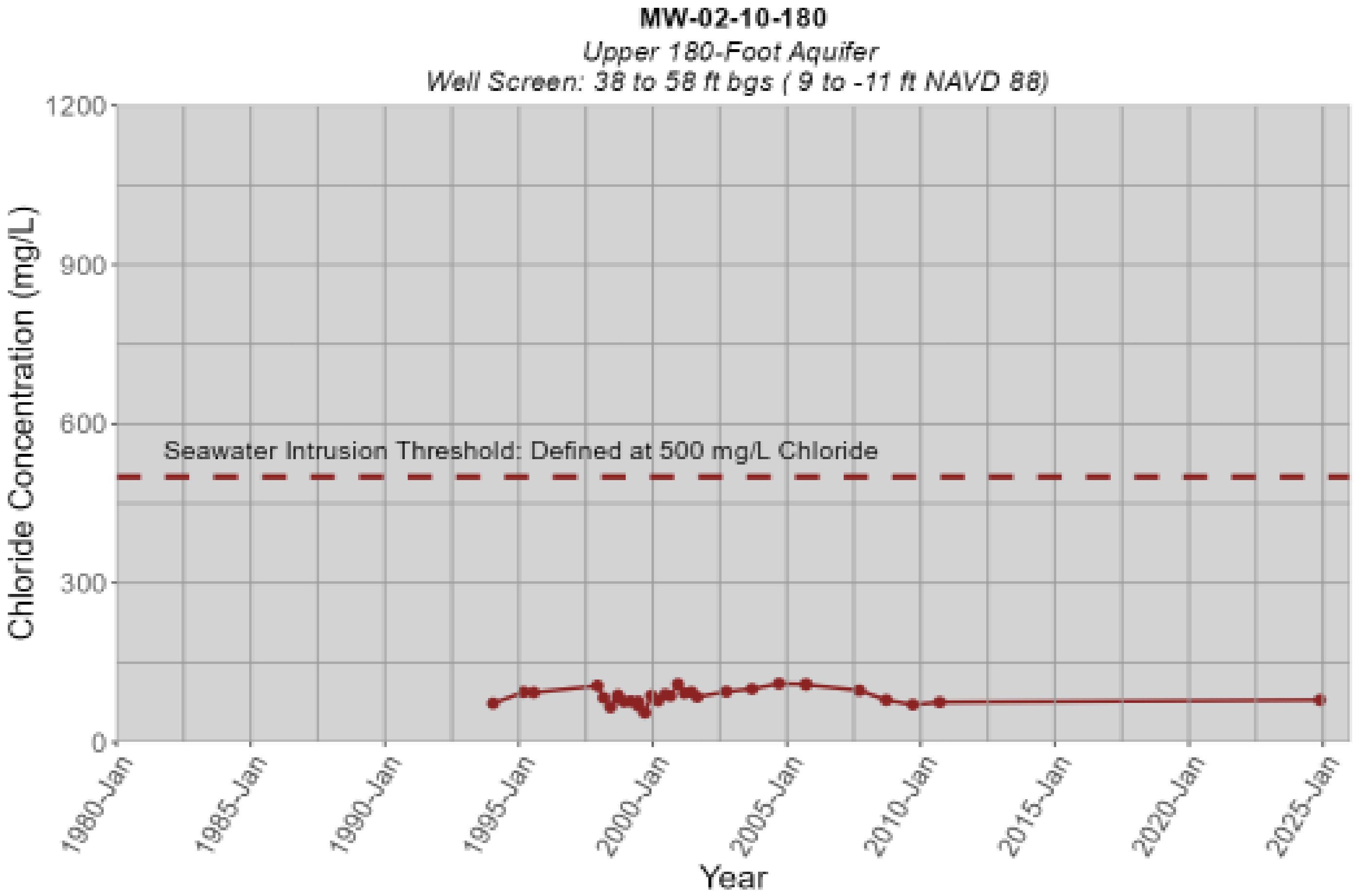

EW-12-04-180M
Upper 180-Foot Aquifer
Well Screen: 120 to 140 ft bgs (-41 to -61 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

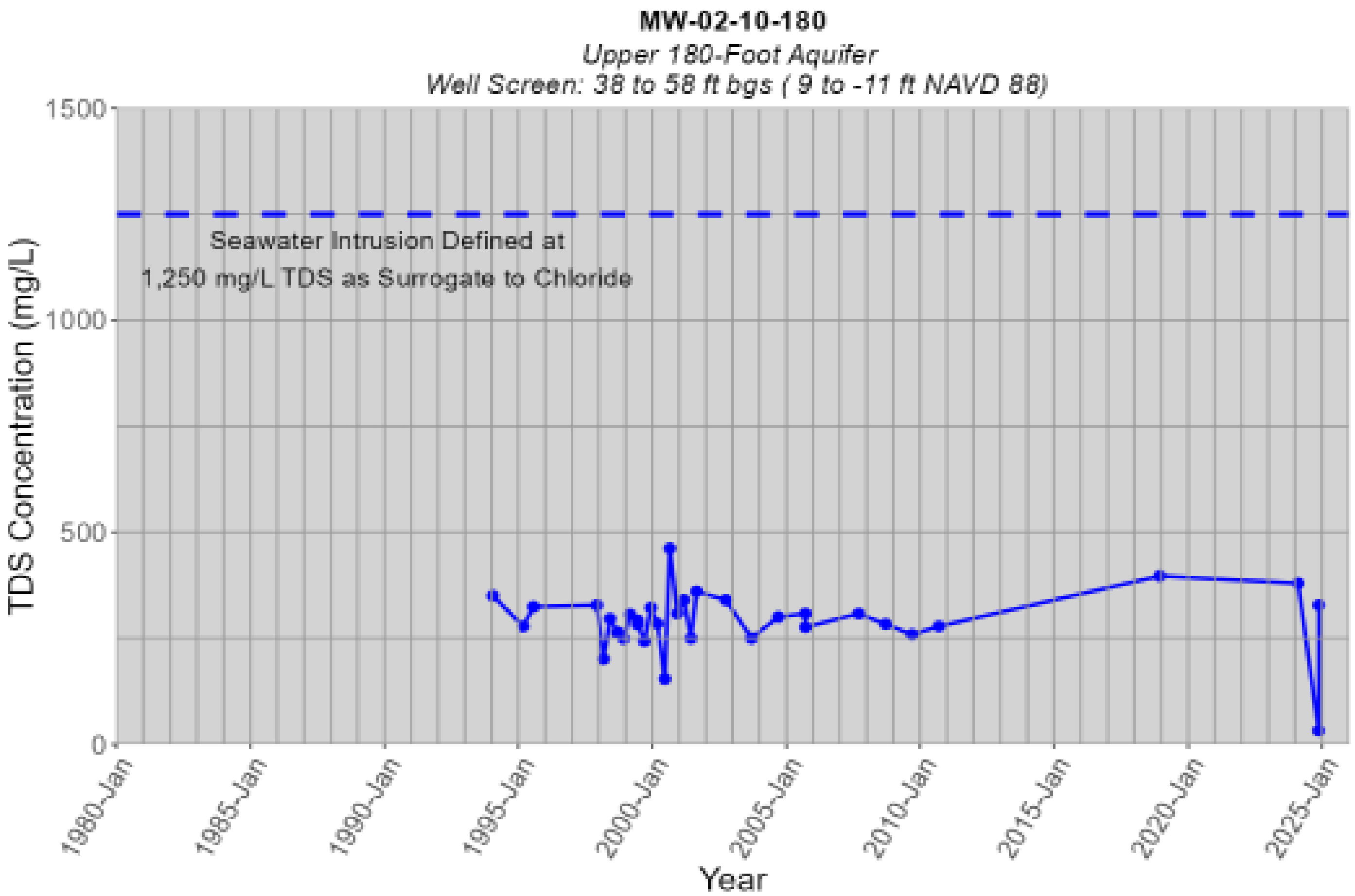

MW-02-05-180
Upper 180-Foot Aquifer
Well Screen: 48 to 68 ft bgs (10 to -10 ft NAVD 88)
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
Chloride Concentration (mg/L)
1200
900
600
300
0
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

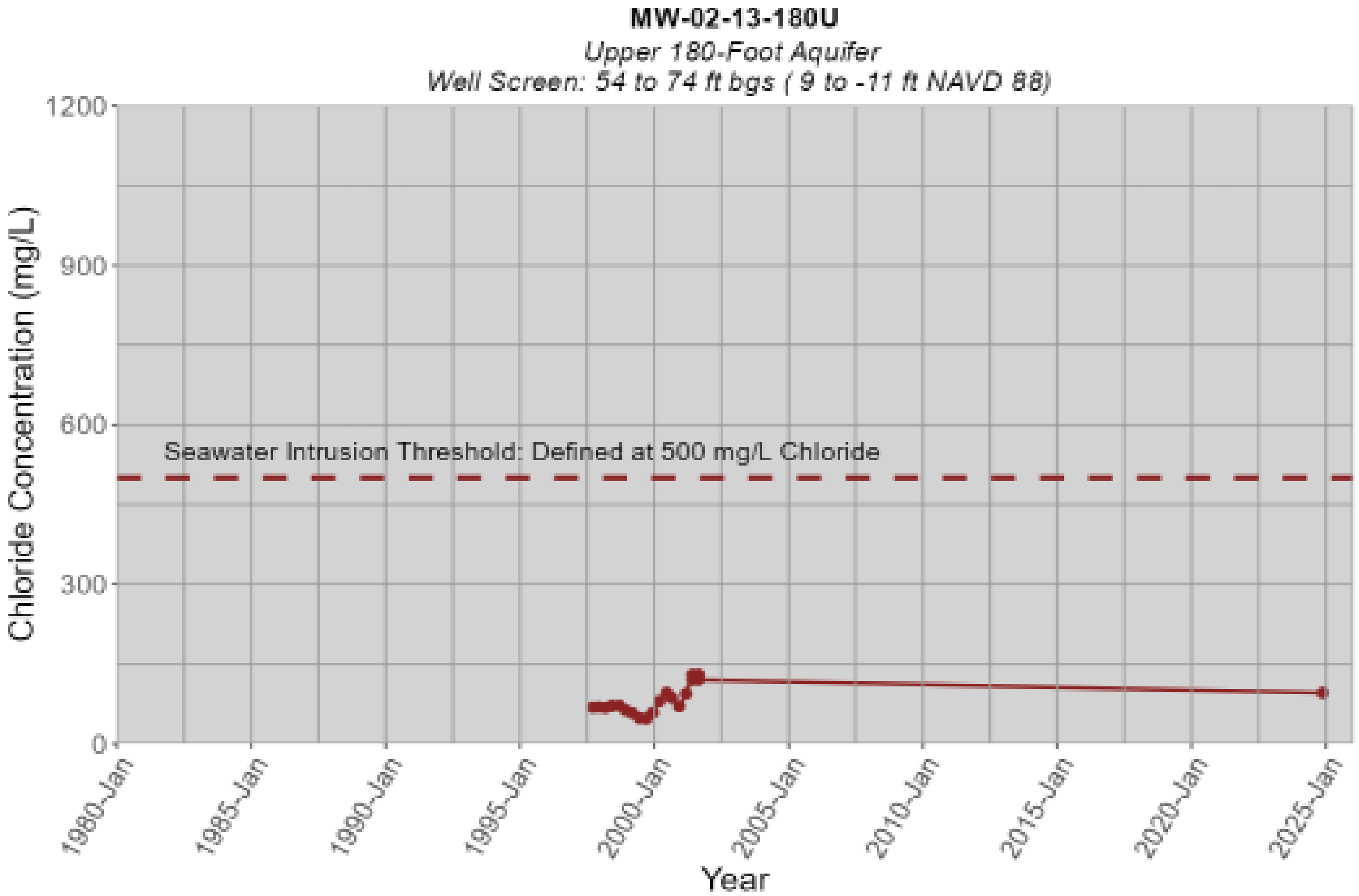

MW-02-05-180
Upper 180-Foot Aquifer
Well Screen: 48 to 68 ft bgs (10 to -10 ft NAVD 88)
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
TDS Concentration (mg/L)
1500
1000
500
0
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

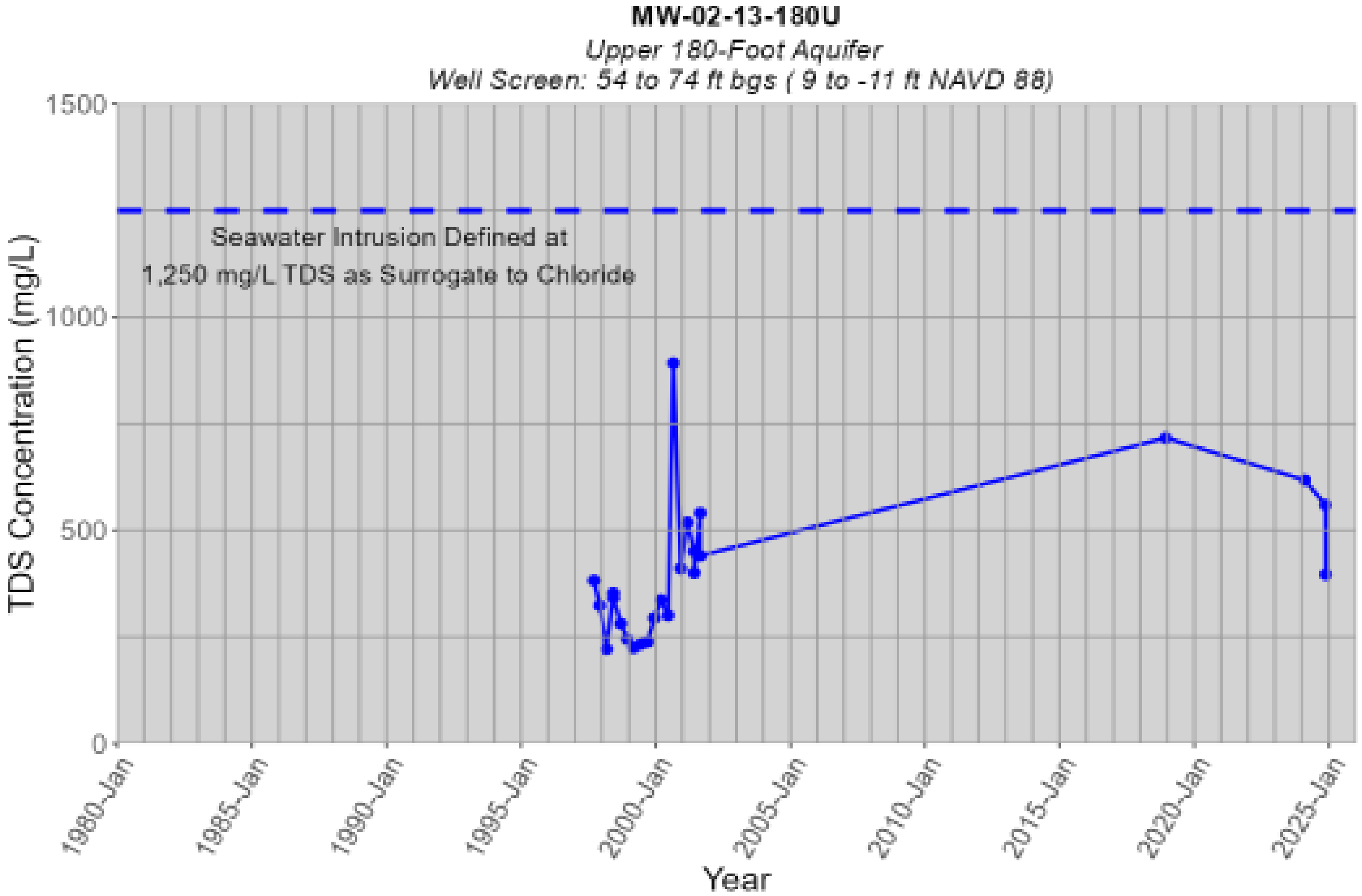

MW-02-06-180
Upper 180-Foot Aquifer
Well Screen: 89 to 109 ft bgs (11 to -9 ft NAVD 88)
Chloride Concentration (mg/L)
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
0
300
600
900
1200
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

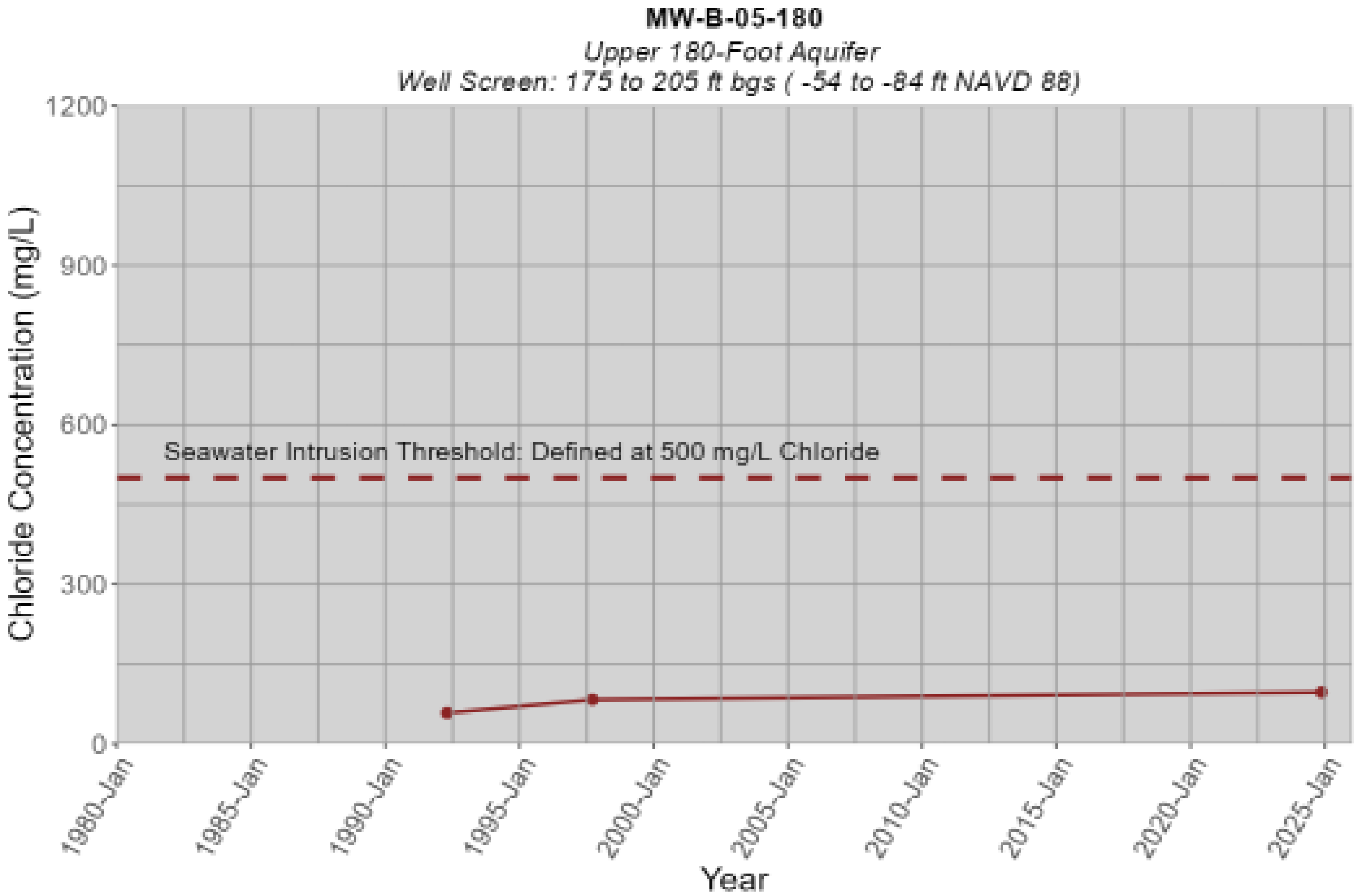

MW-02-06-180
Upper 180-Foot Aquifer
Well Screen: 89 to 109 ft bgs (11 to -9 ft NAVD 88)
TDS Concentration (mg/L)
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
0
500
1000
1500
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

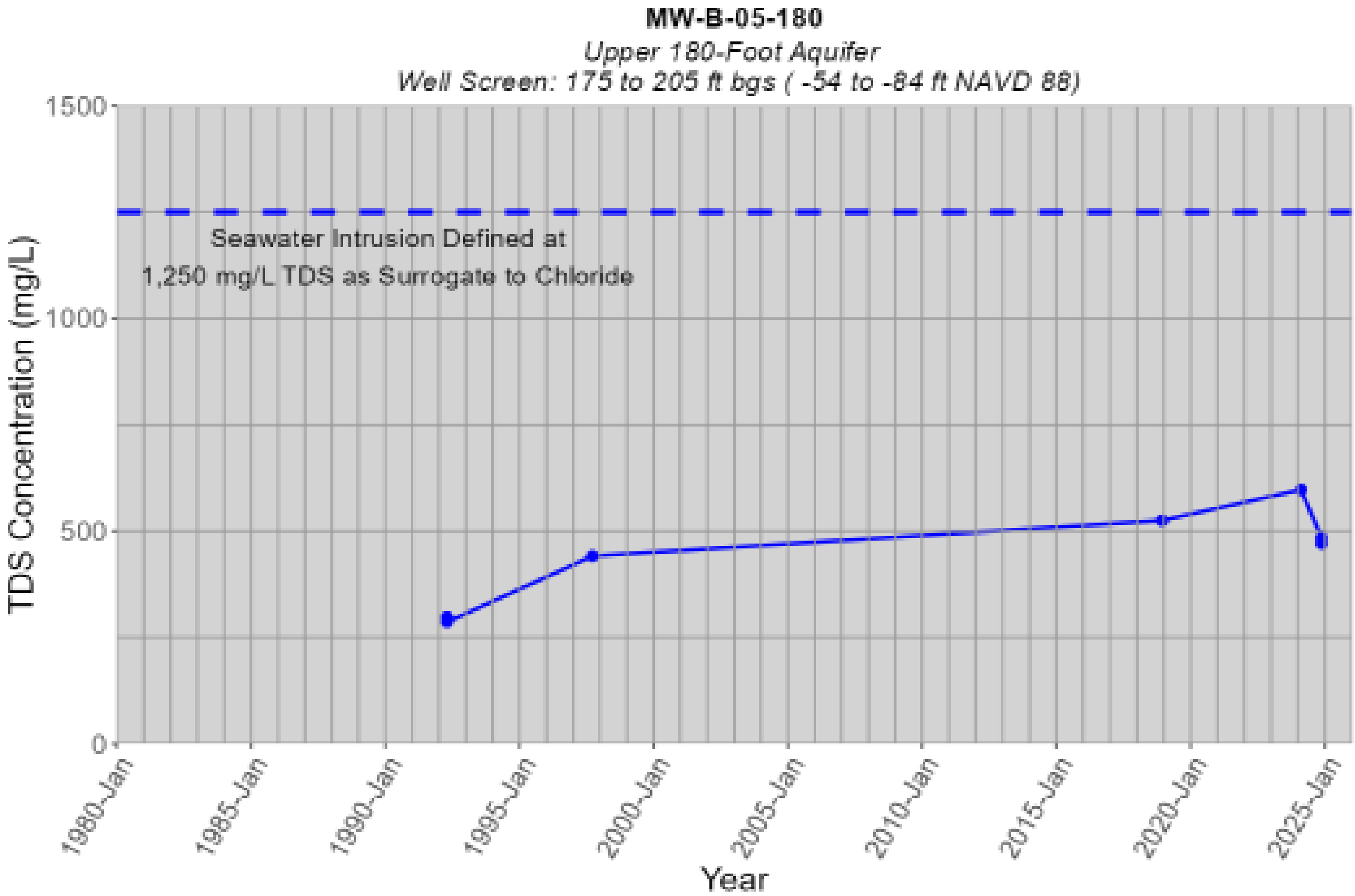

MW-02-10-180
Upper 180-Foot Aquifer
Well Screen: 38 to 58 ft bgs (9 to -11 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

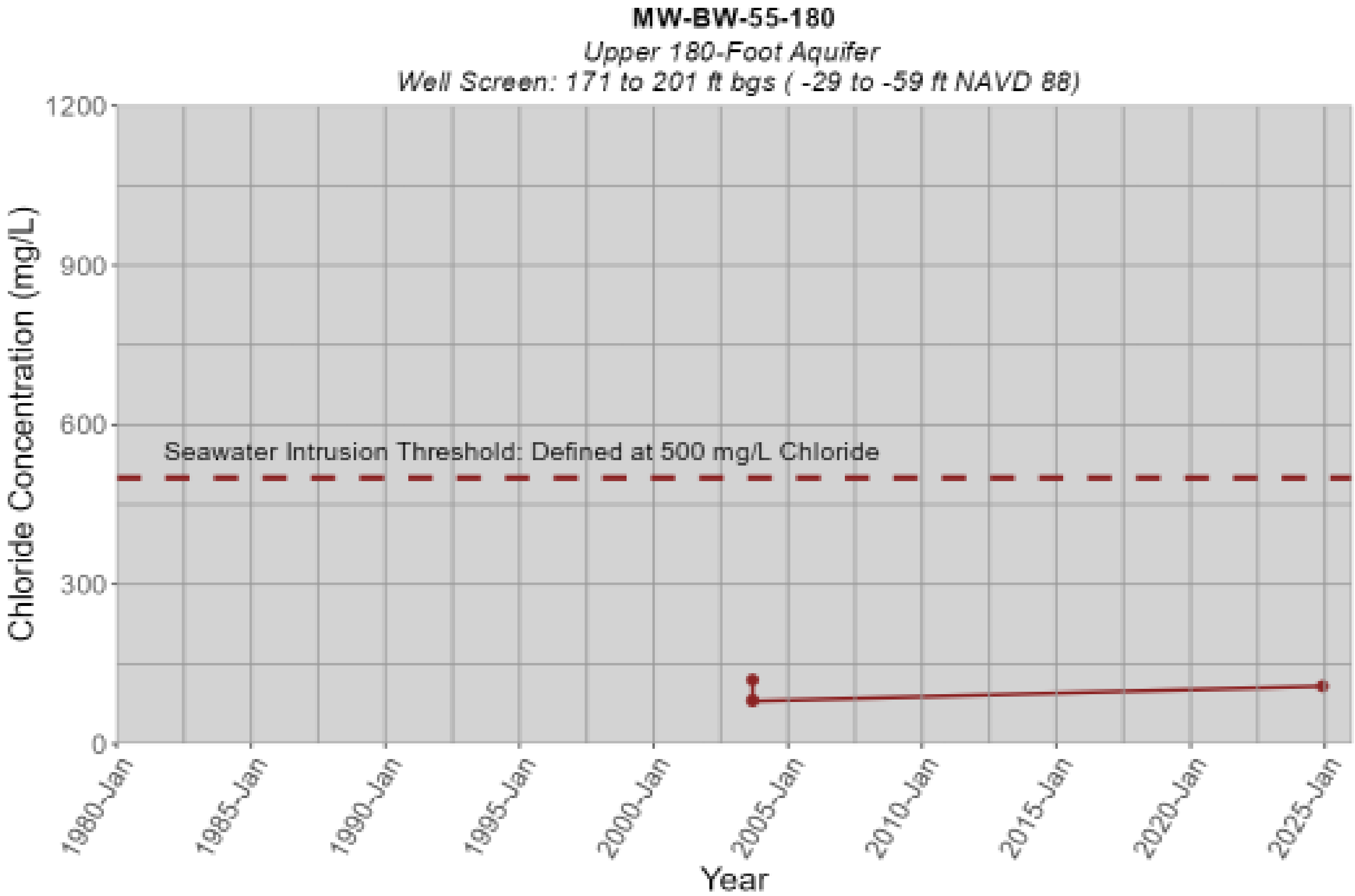

MW-02-10-180
Upper 180-Foot Aquifer
Well Screen: 38 to 58 ft bgs (9 to -11 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year


MW-02-13-180U
Upper 180-Foot Aquifer
Well Screen: 54 to 74 ft bgs (9 to -11 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

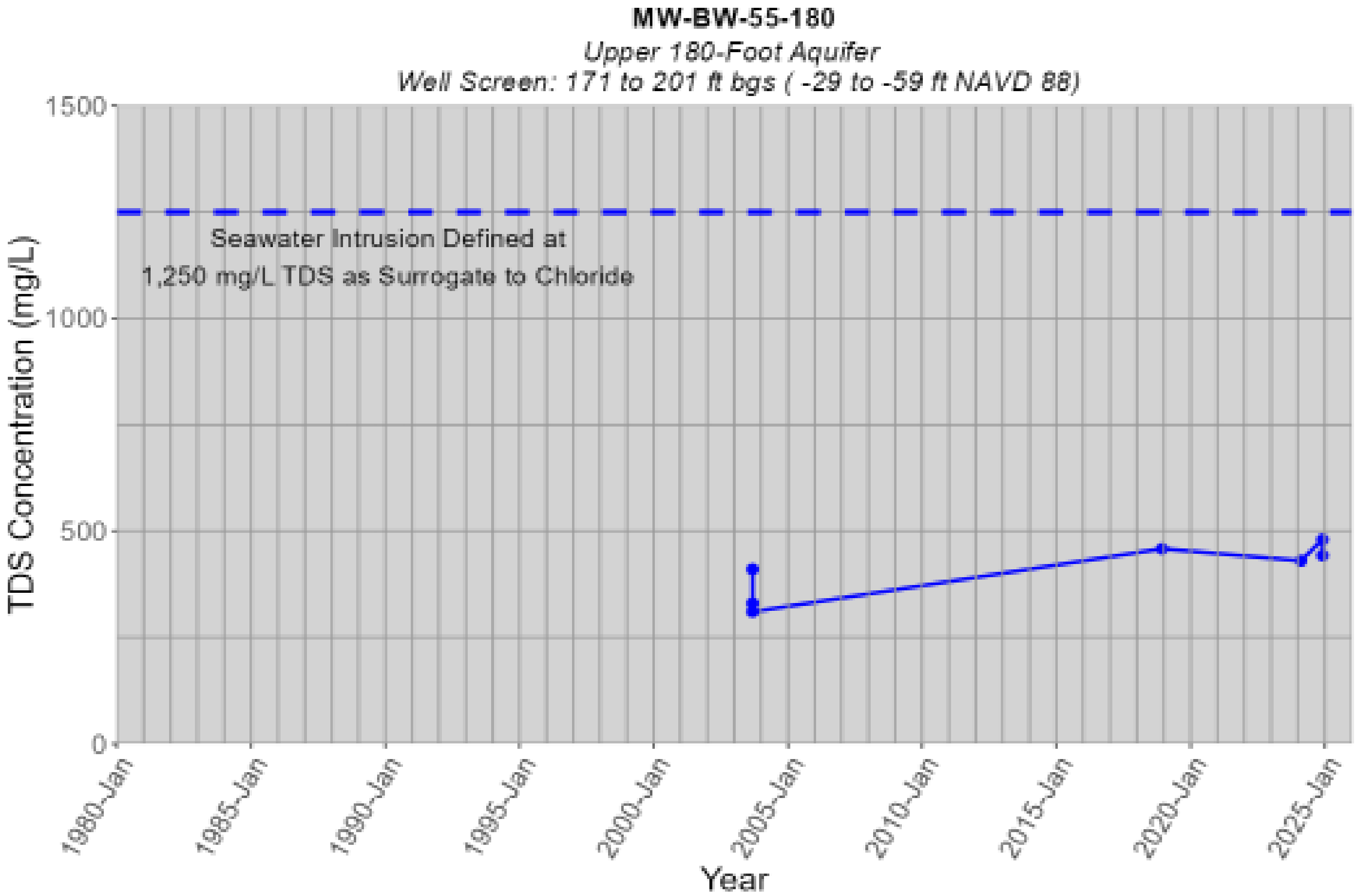

MW-02-13-180U
Upper 180-Foot Aquifer
Well Screen: 54 to 74 ft bgs (9 to -11 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year


MW-B-05-180
Upper 180-Foot Aquifer
Well Screen: 175 to 205 ft bgs (-54 to -84 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

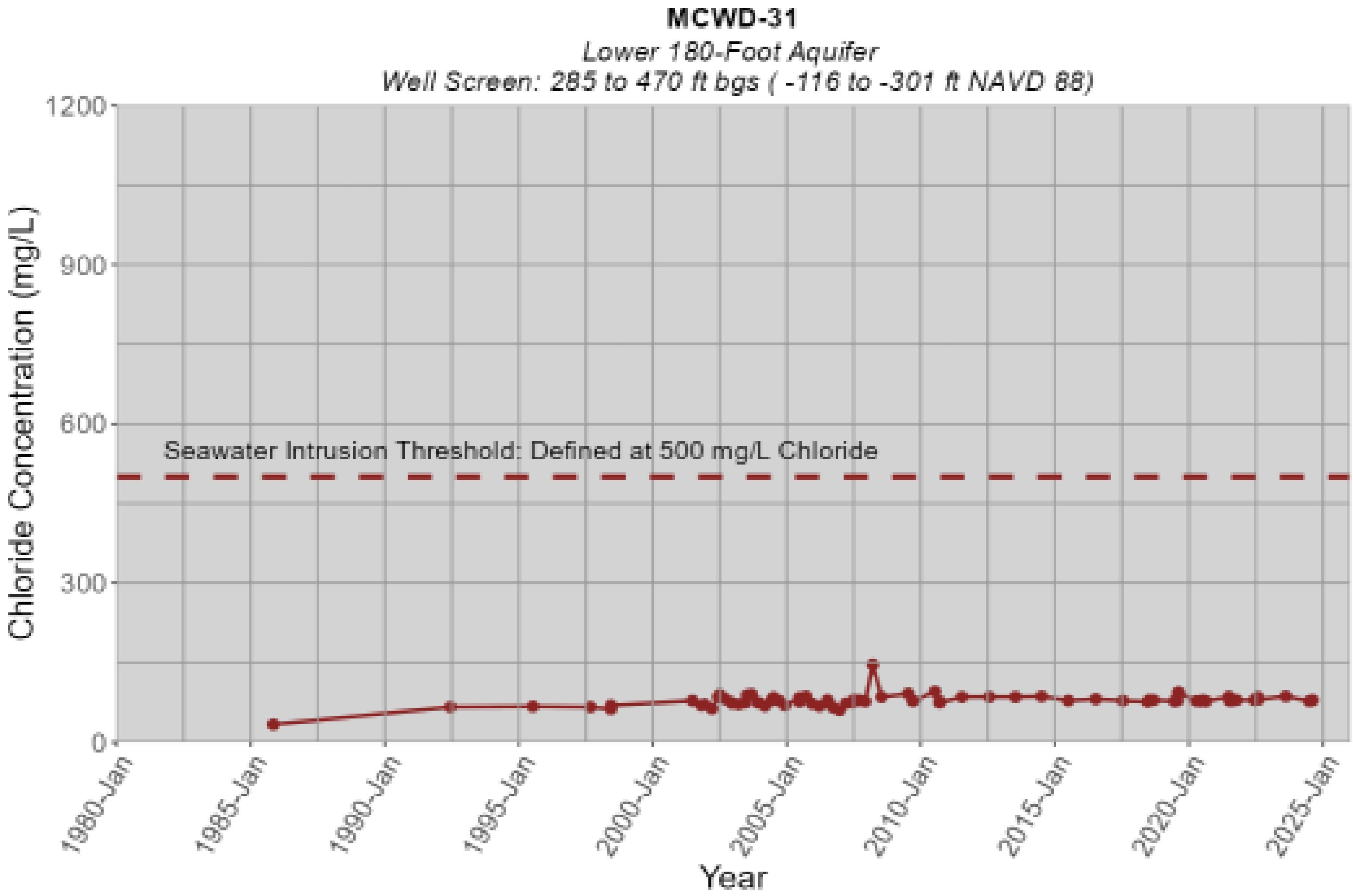

MW-B-05-180
Upper 180-Foot Aquifer
Well Screen: 175 to 205 ft bgs (-54 to -84 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

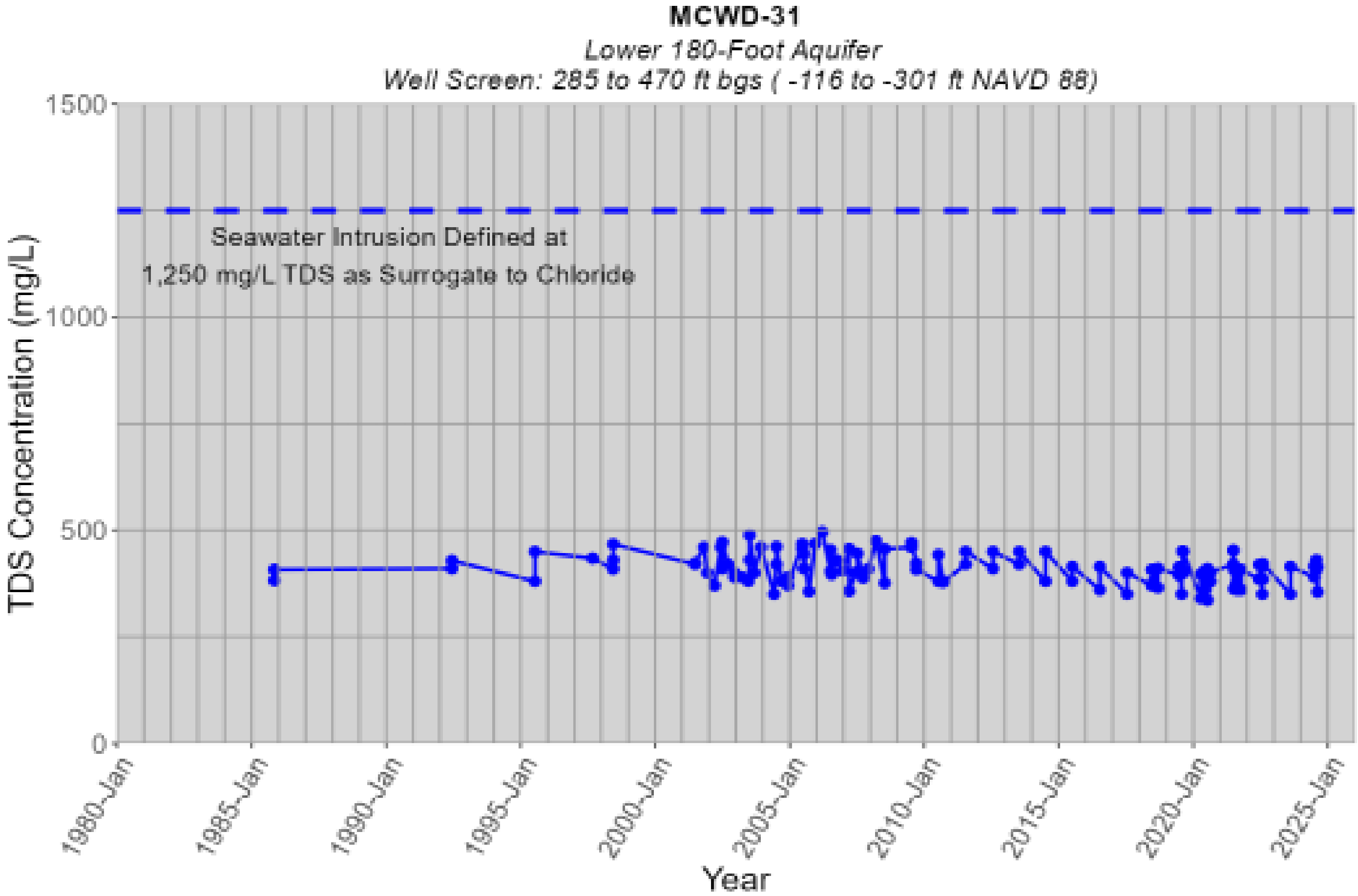


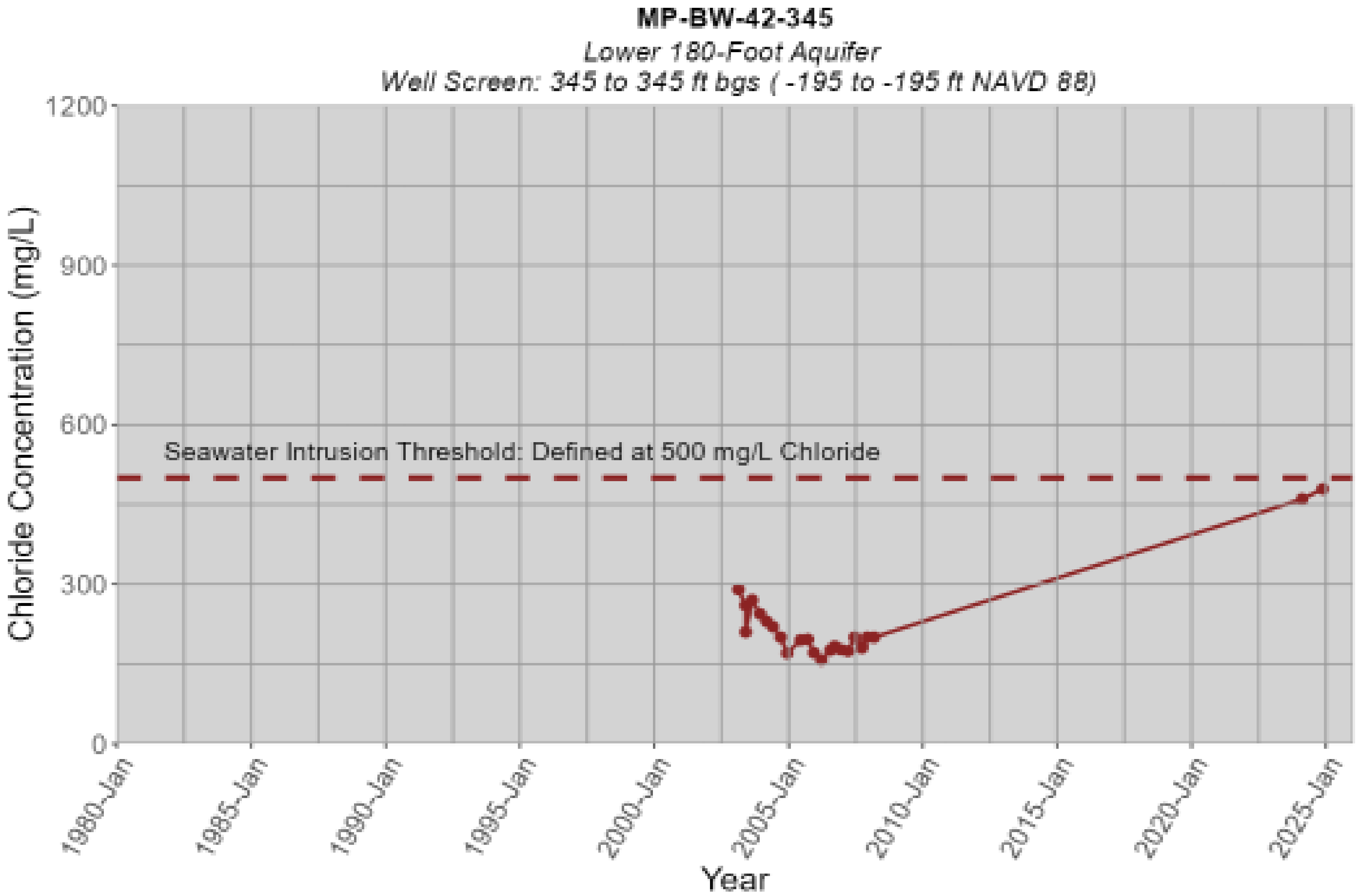
MW-BW-55-180
Upper 180-Foot Aquifer
Well Screen: 171 to 201 ft bgs (-29 to -59 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

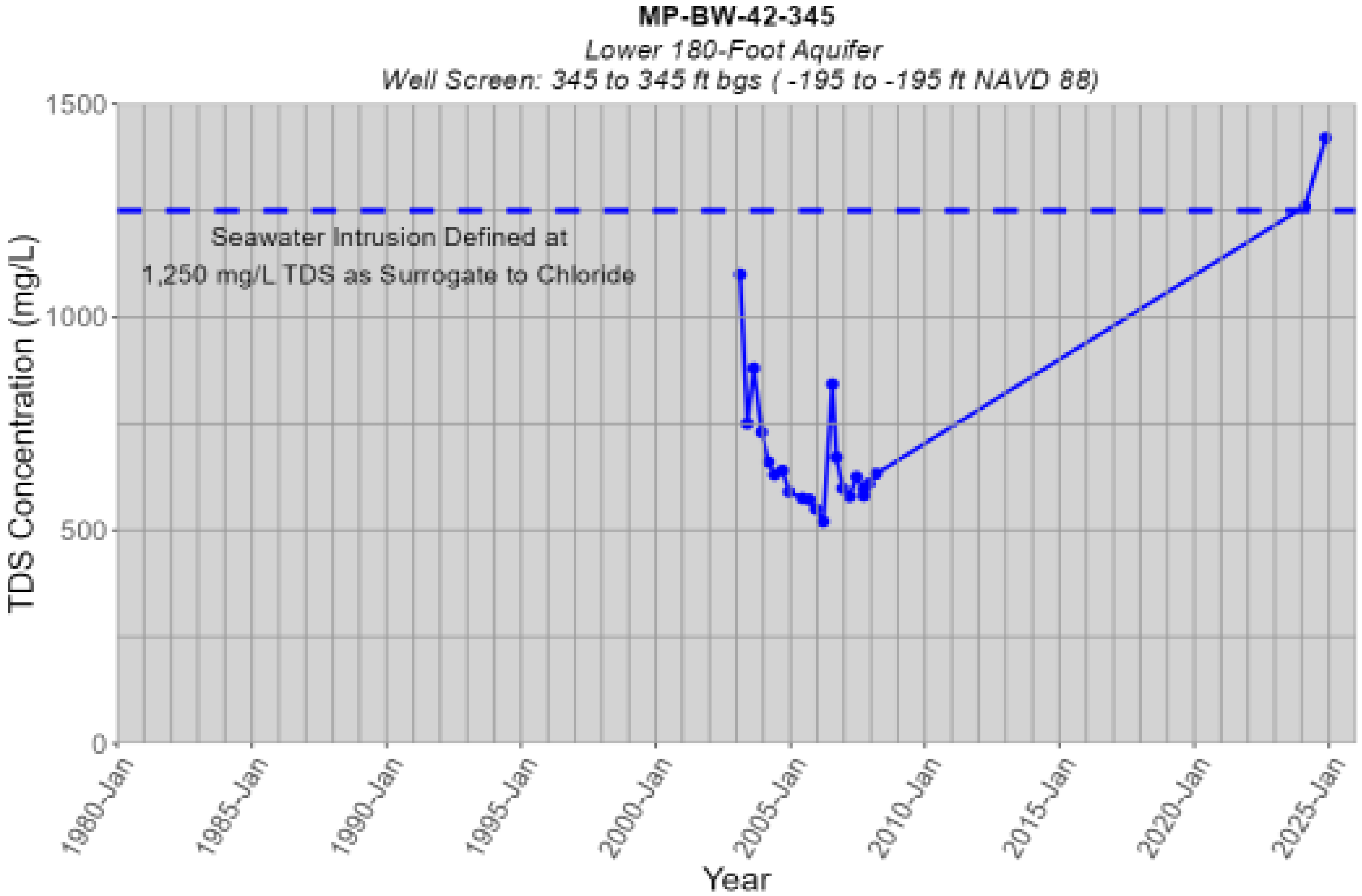


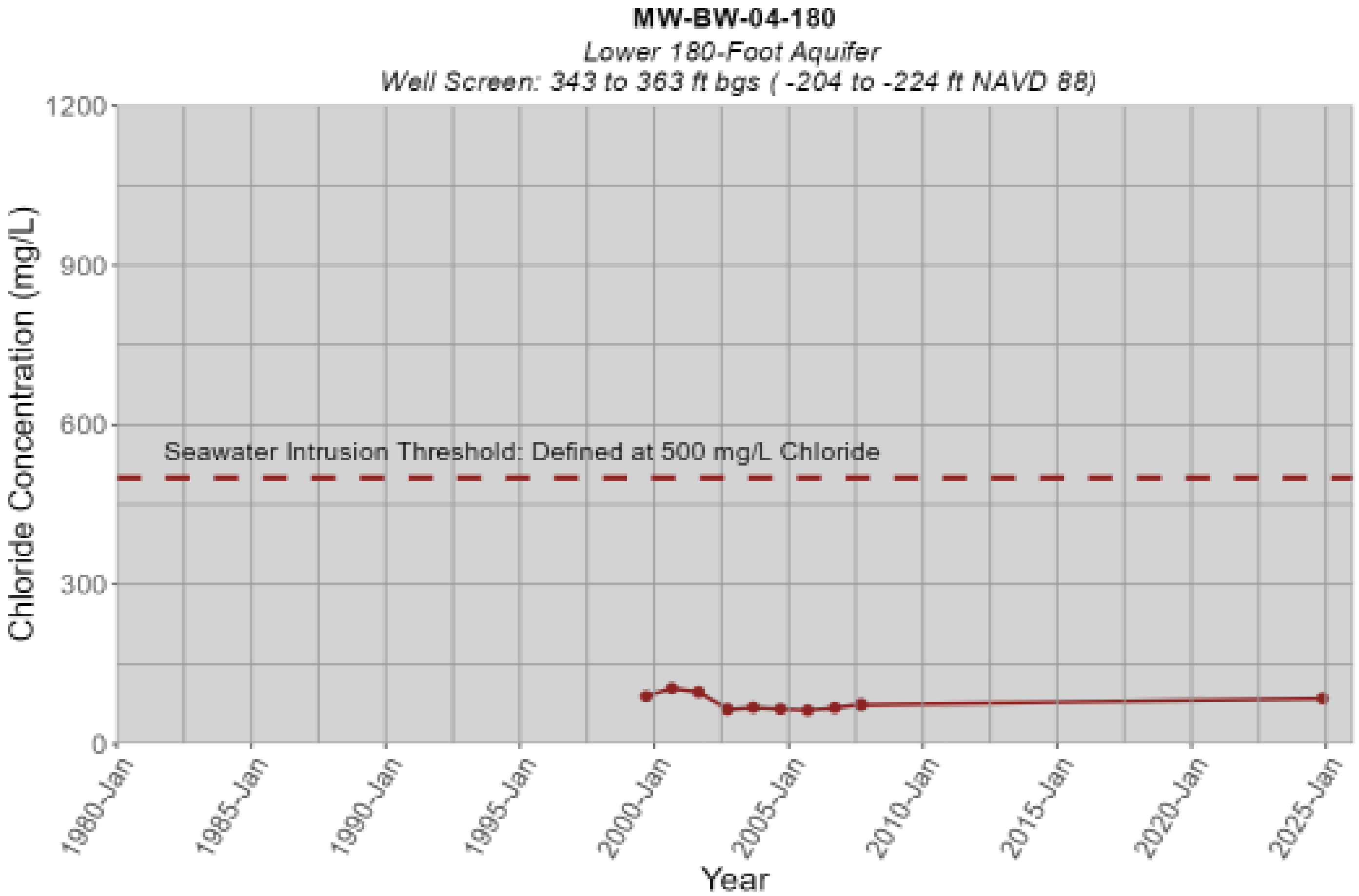
MW-BW-55-180
Upper 180-Foot Aquifer
Well Screen: 171 to 201 ft bgs (-29 to -59 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

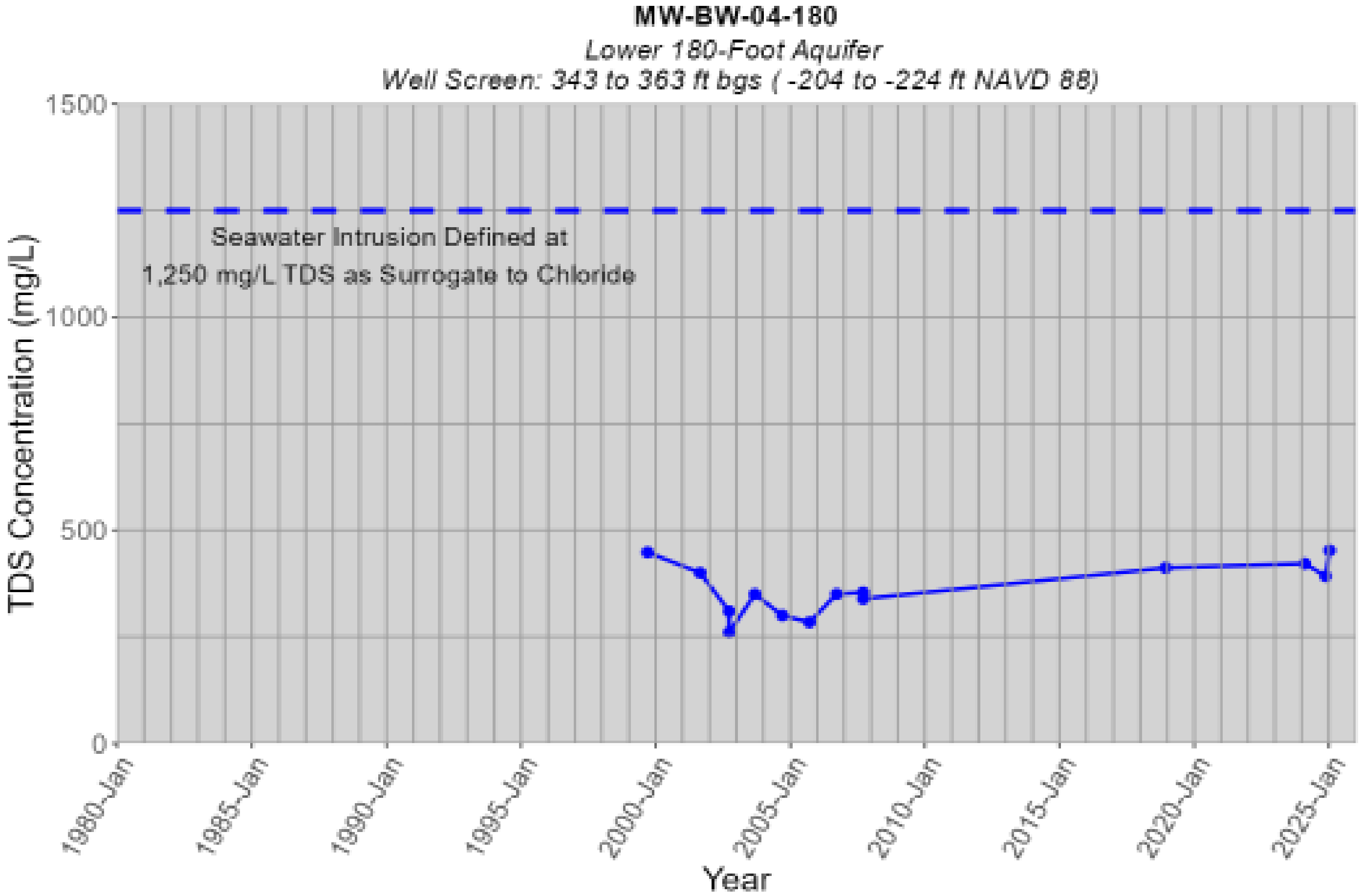

MCWD-31
Lower 180-Foot Aquifer
Well Screen: 285 to 470 ft bgs (-116 to -301 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

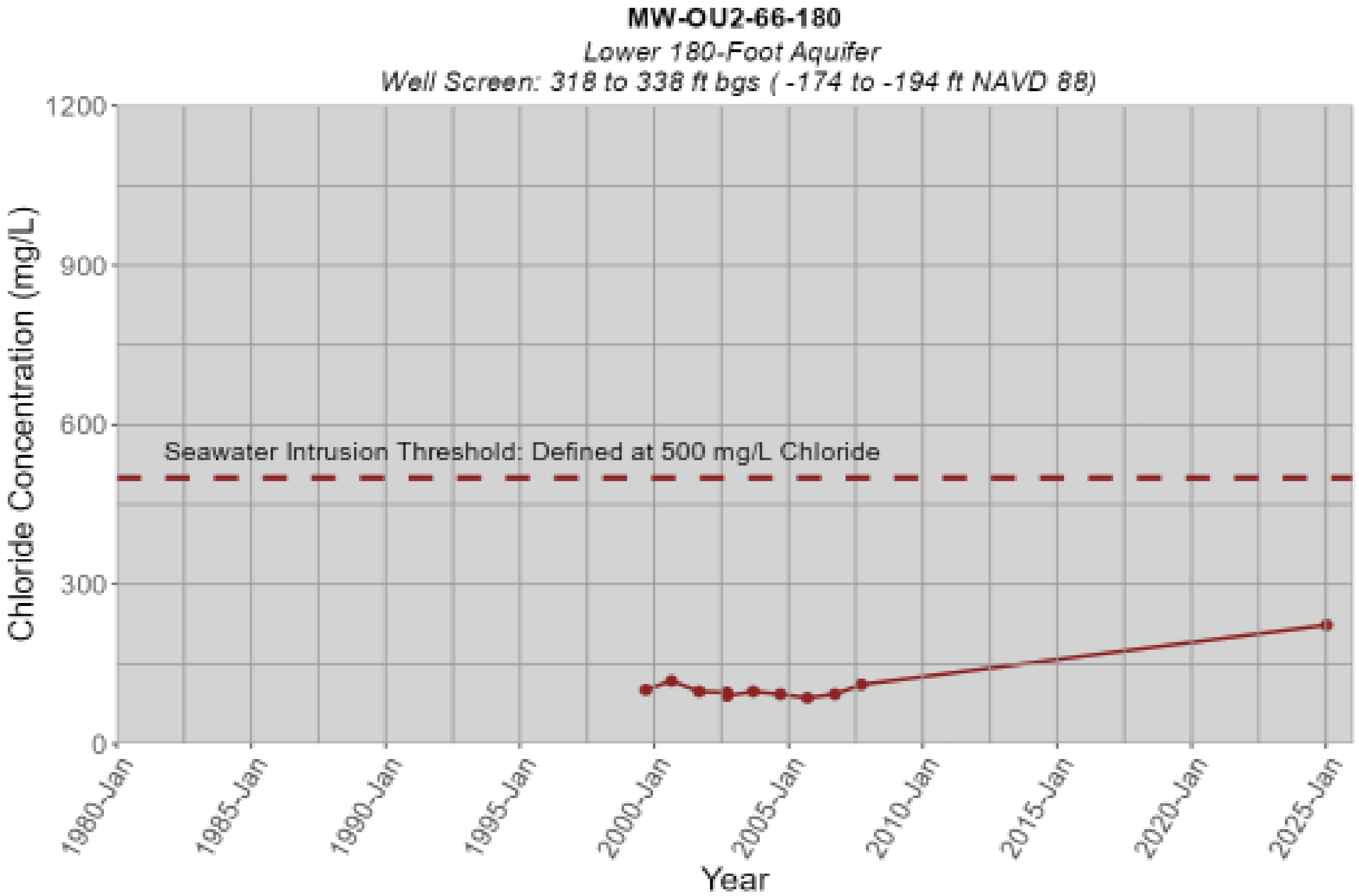

MCWD-31
Lower 180-Foot Aquifer
Well Screen: 285 to 470 ft bgs (-116 to -301 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

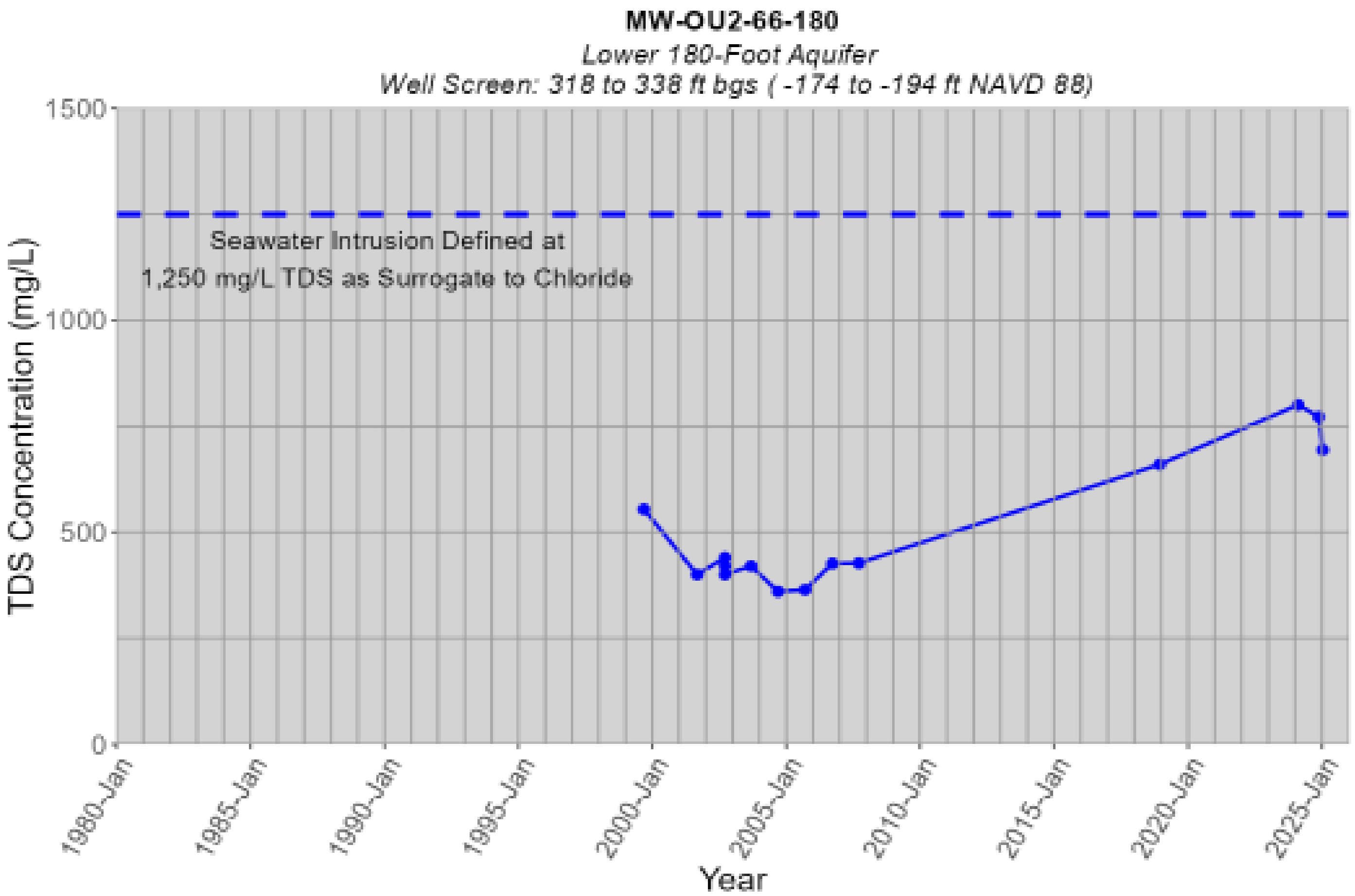

MP-BW-42-345
Lower 180-Foot Aquifer
Well Screen: 345 to 345 ft bgs (-195 to -195 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year


MP-BW-42-345
Lower 180-Foot Aquifer
Well Screen: 345 to 345 ft bgs (-195 to -195 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

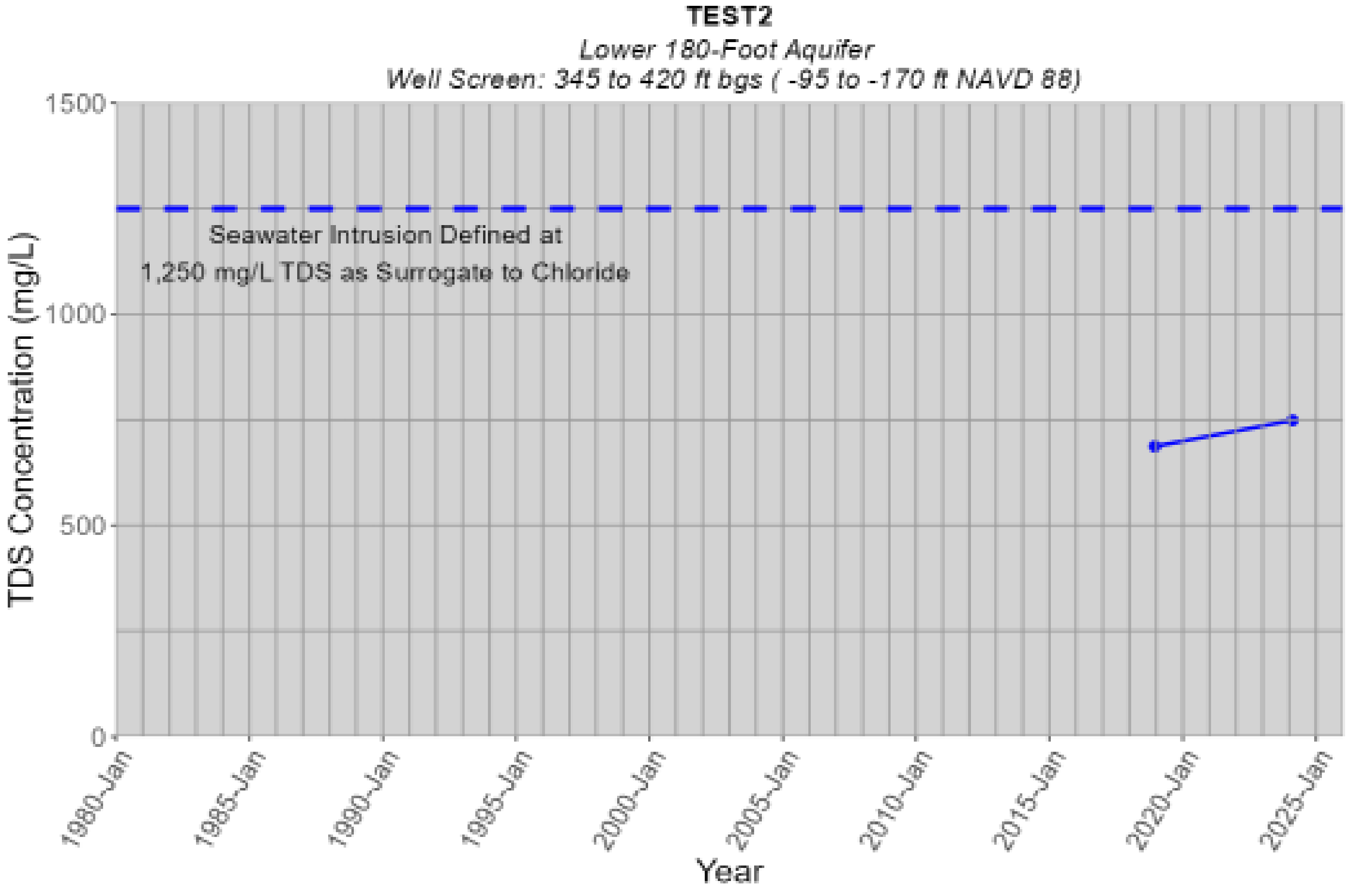

MW-BW-04-180
Lower 180-Foot Aquifer
Well Screen: 343 to 363 ft bgs (-204 to -224 ft NAVD 88)
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
Chloride Concentration (mg/L)
0
300
600
900
1200
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

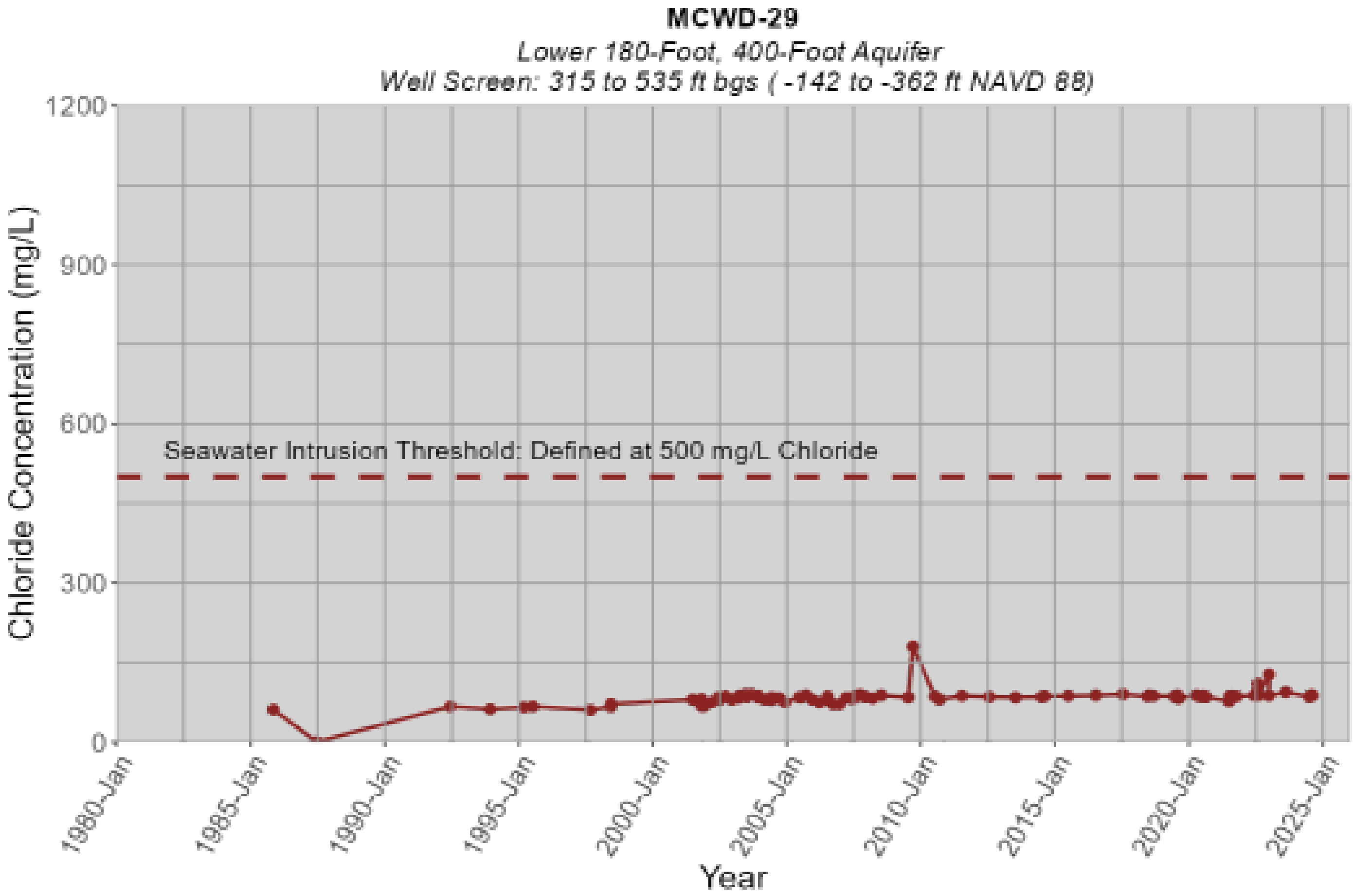

MW-BW-04-180
Lower 180-Foot Aquifer
Well Screen: 343 to 363 ft bgs (-204 to -224 ft NAVD 88)
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
TDS Concentration (mg/L)
0
500
1000
1500
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

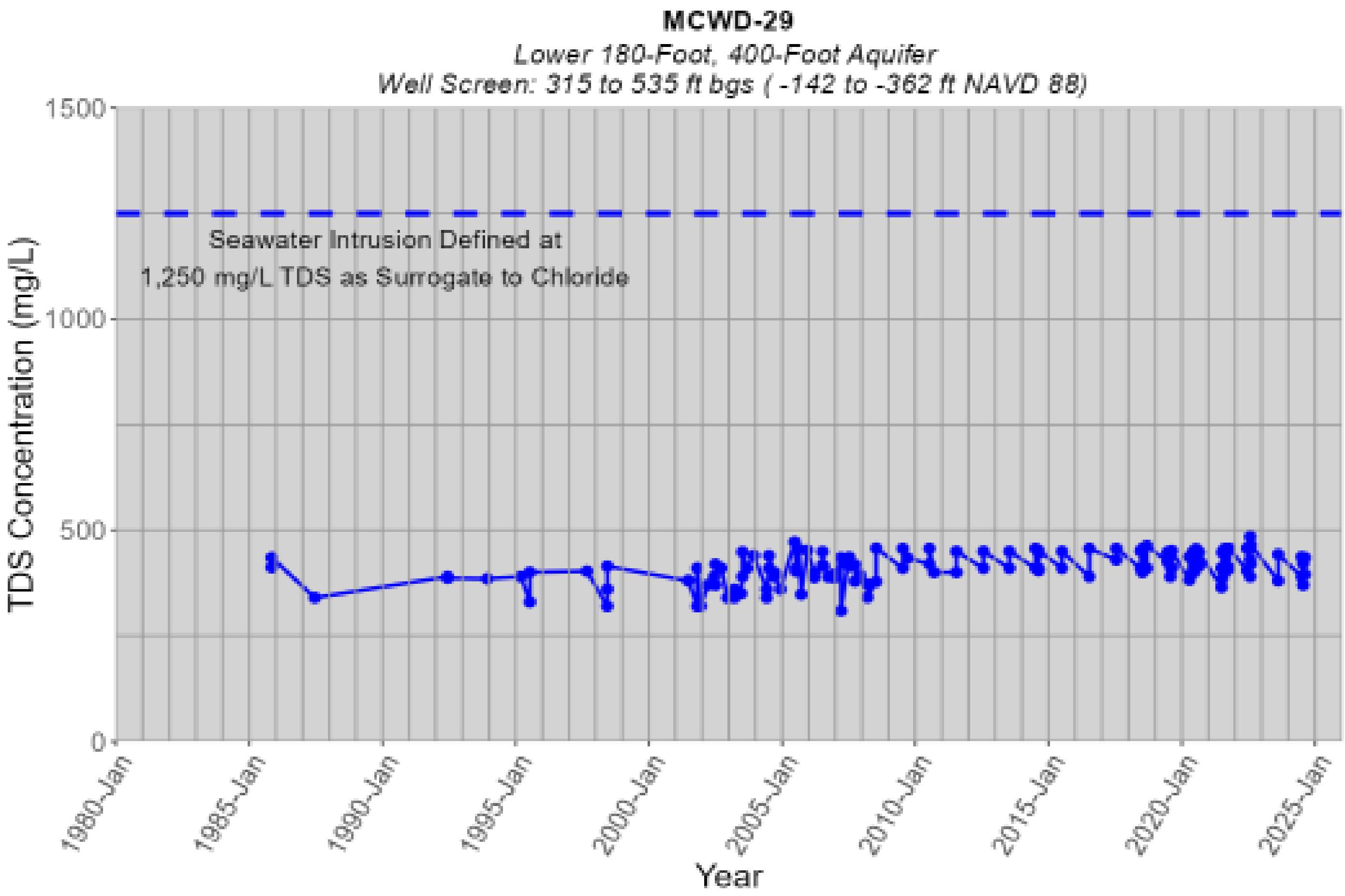

MW-OU2-66-180
Lower 180-Foot Aquifer
Well Screen: 318 to 338 ft bgs (-174 to -194 ft NAVD 88)
Chloride Concentration (mg/L)
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1200
900
600
300
0
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

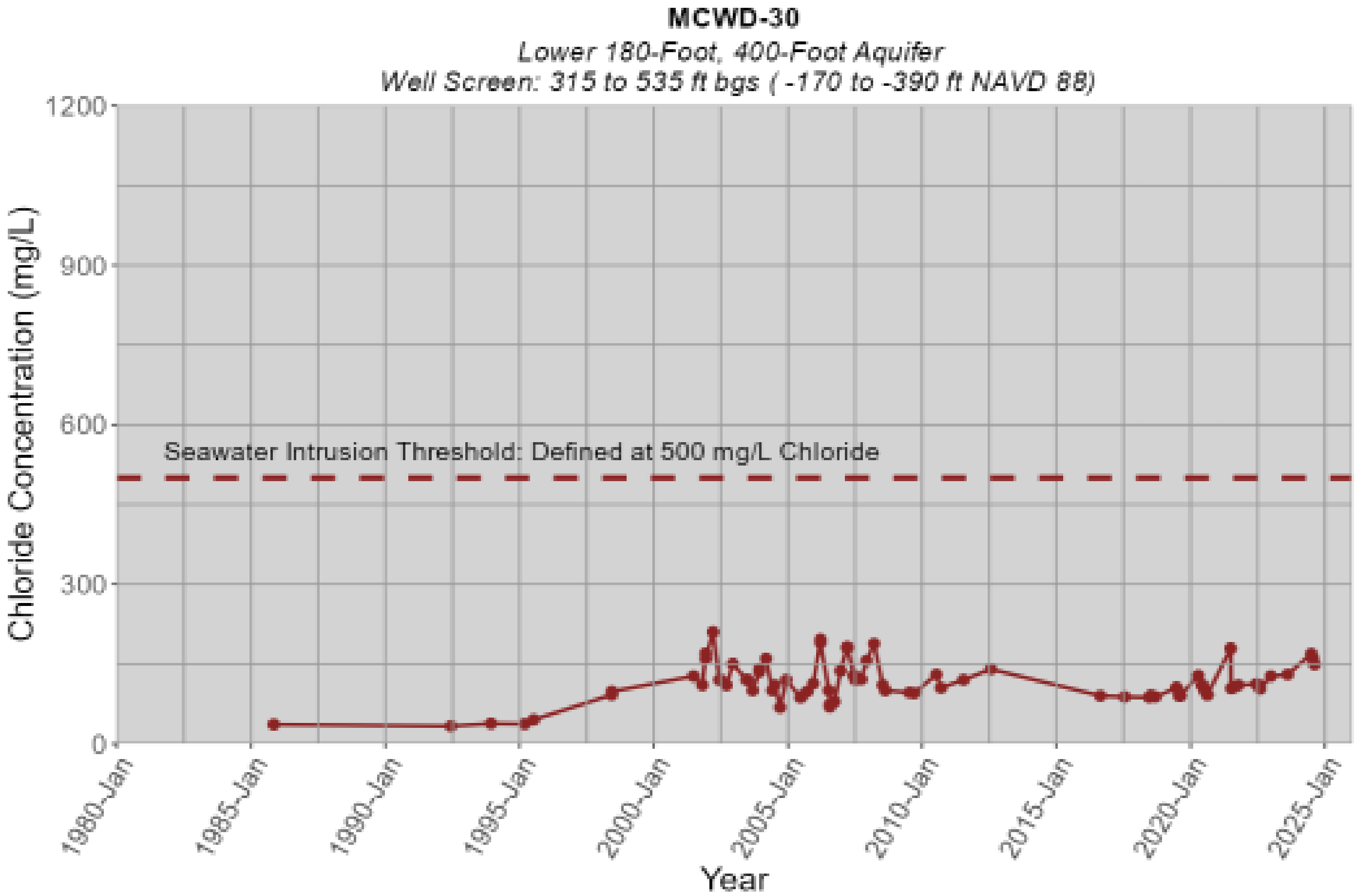

MW-OU2-66-180
Lower 180-Foot Aquifer
Well Screen: 318 to 338 ft bgs (-174 to -194 ft NAVD 88)
TDS Concentration (mg/L)
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1500
1000
500
0
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

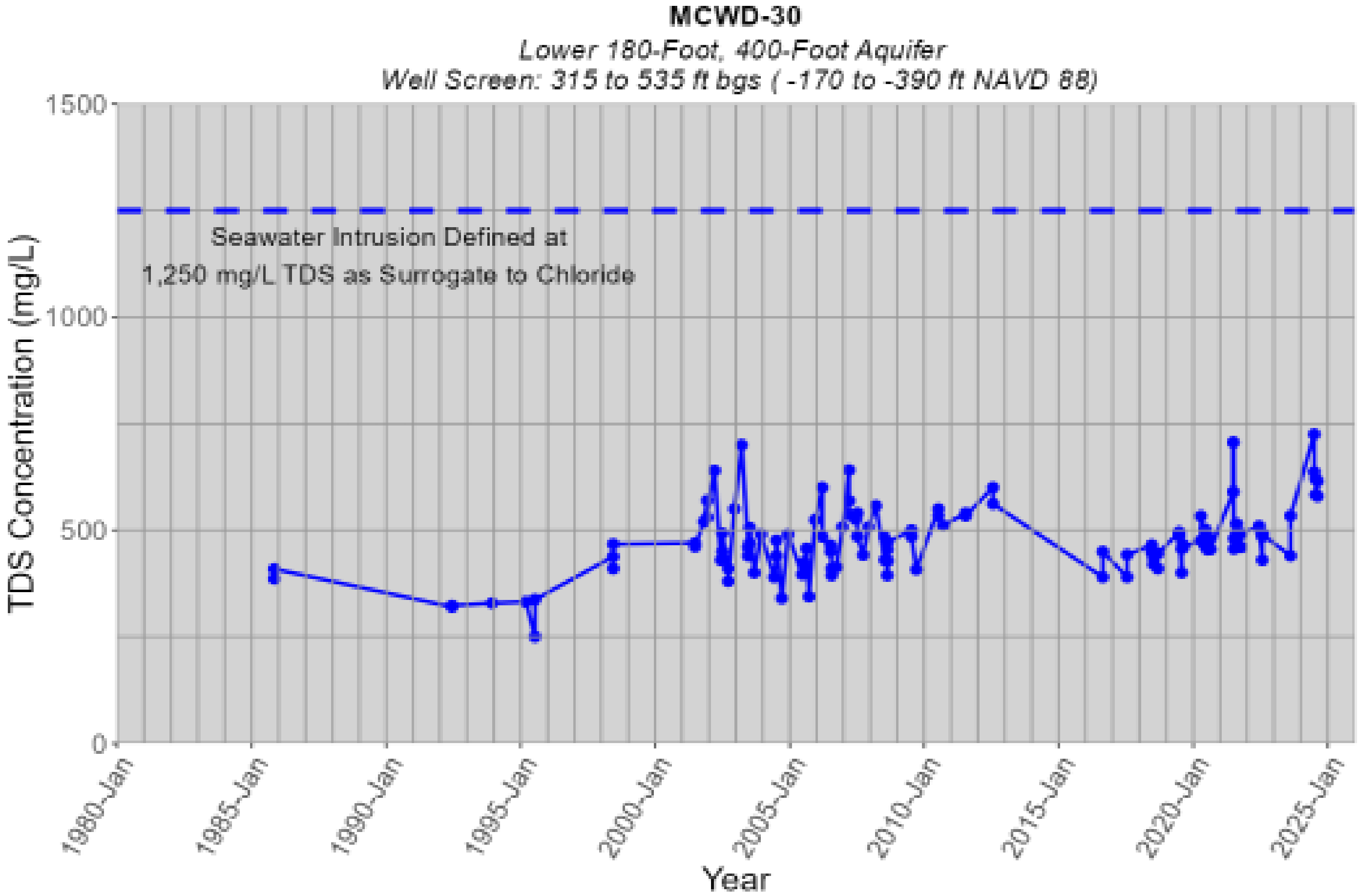
Chloride data for TEST2 is not available.

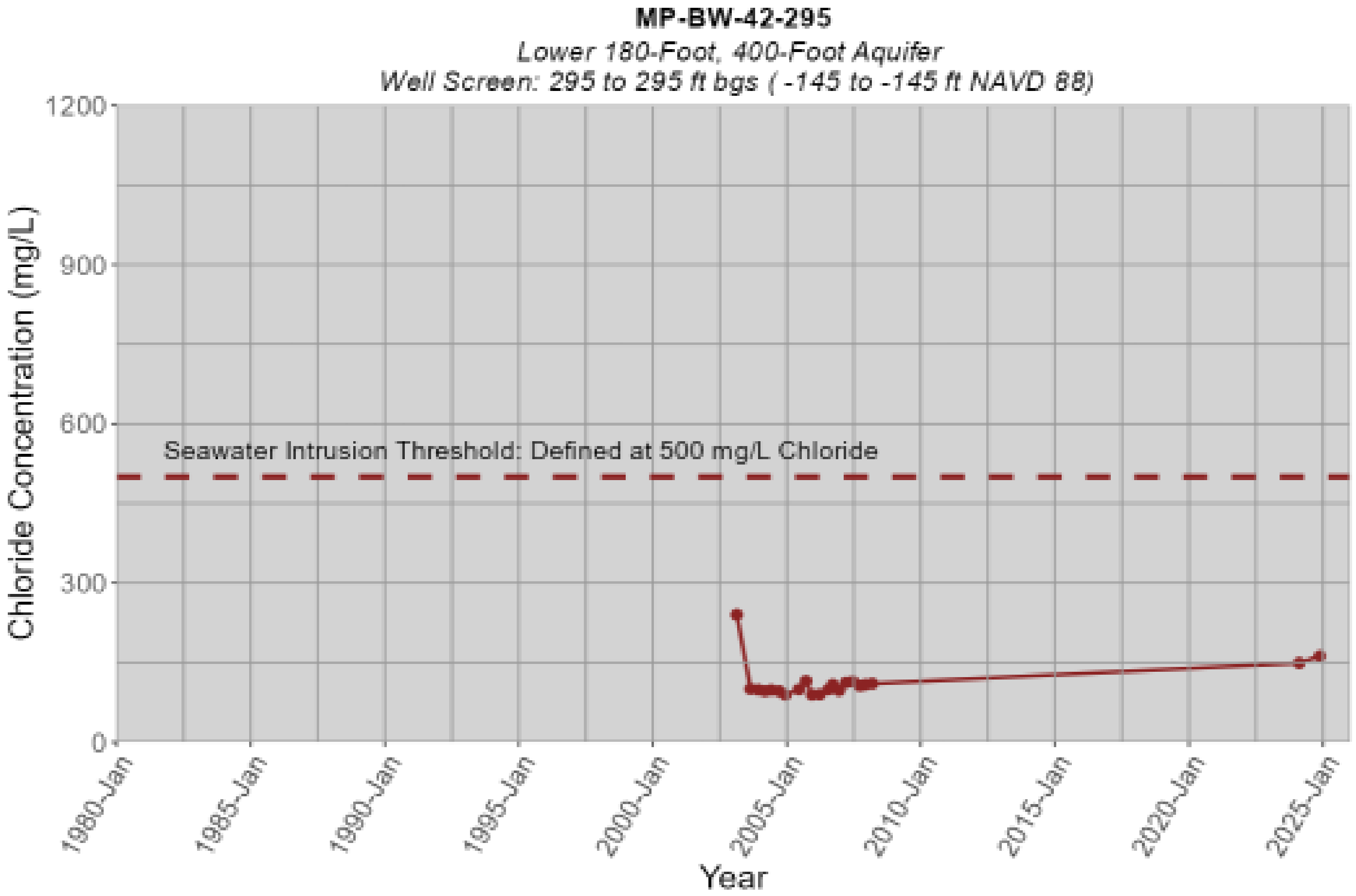


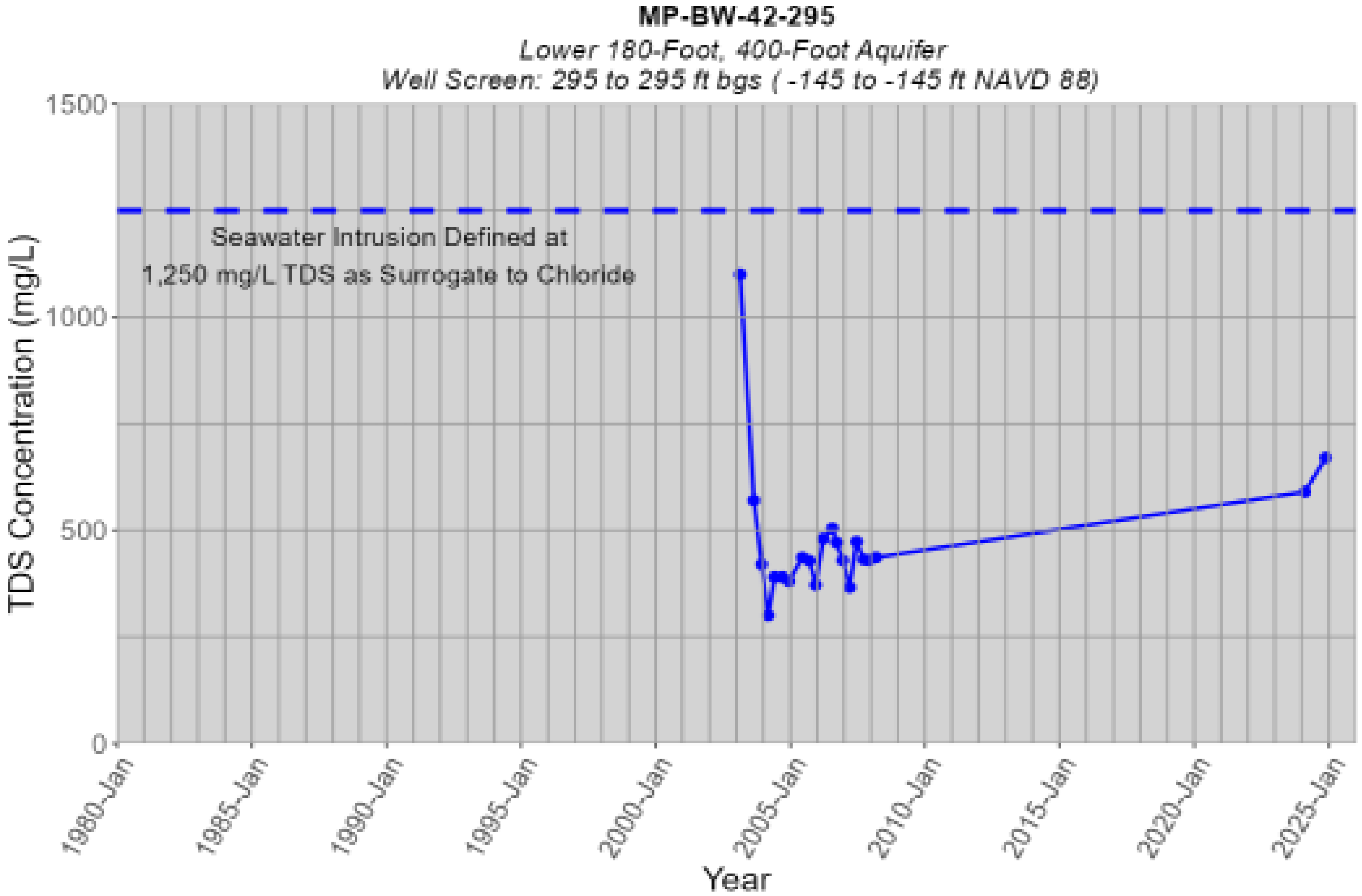

MCWD-29
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 315 to 535 ft bgs (-142 to -362 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

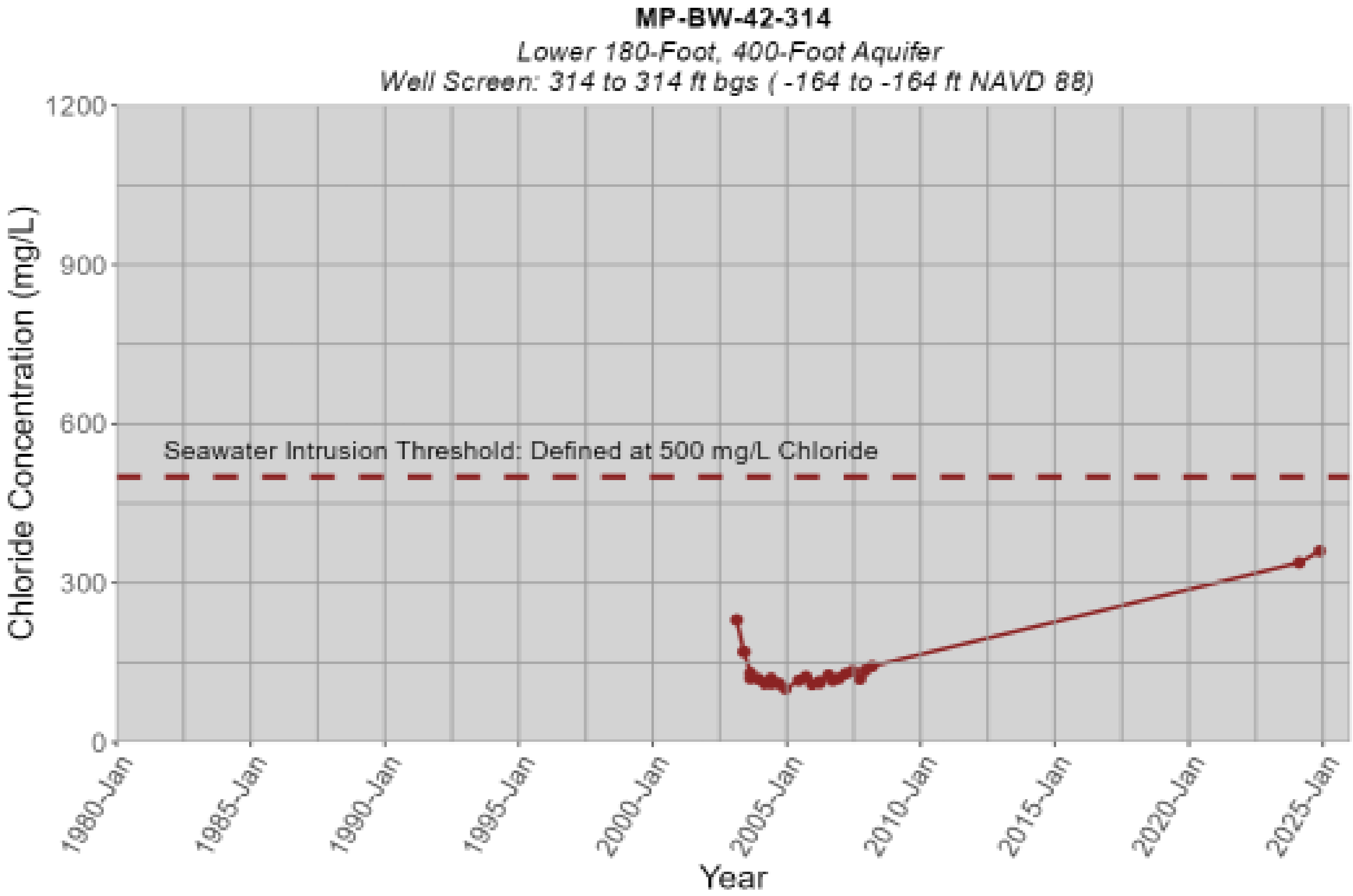

MCWD-29
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 315 to 535 ft bgs (-142 to -362 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

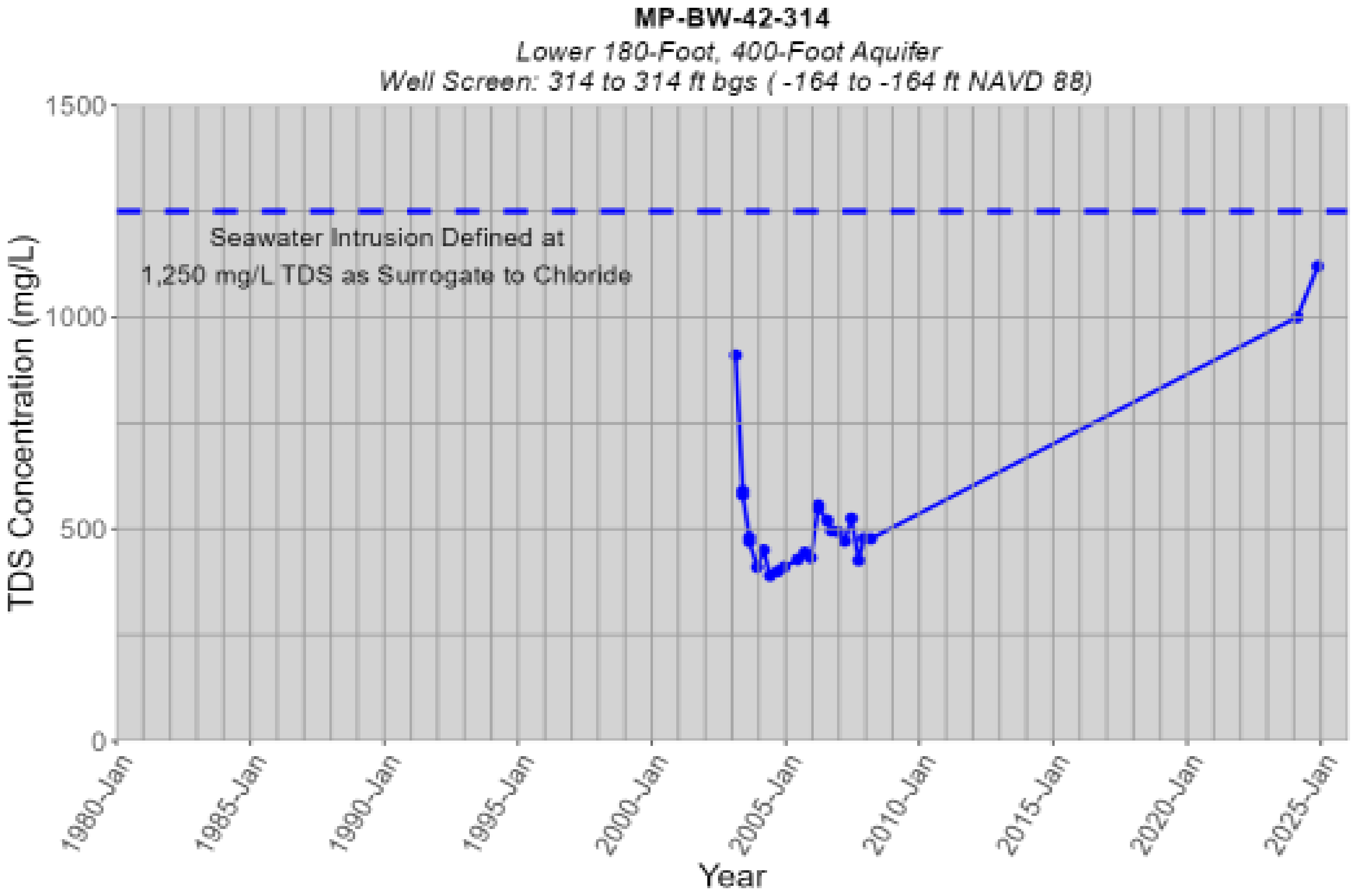

MCWD-30
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 315 to 535 ft bgs (-170 to -390 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

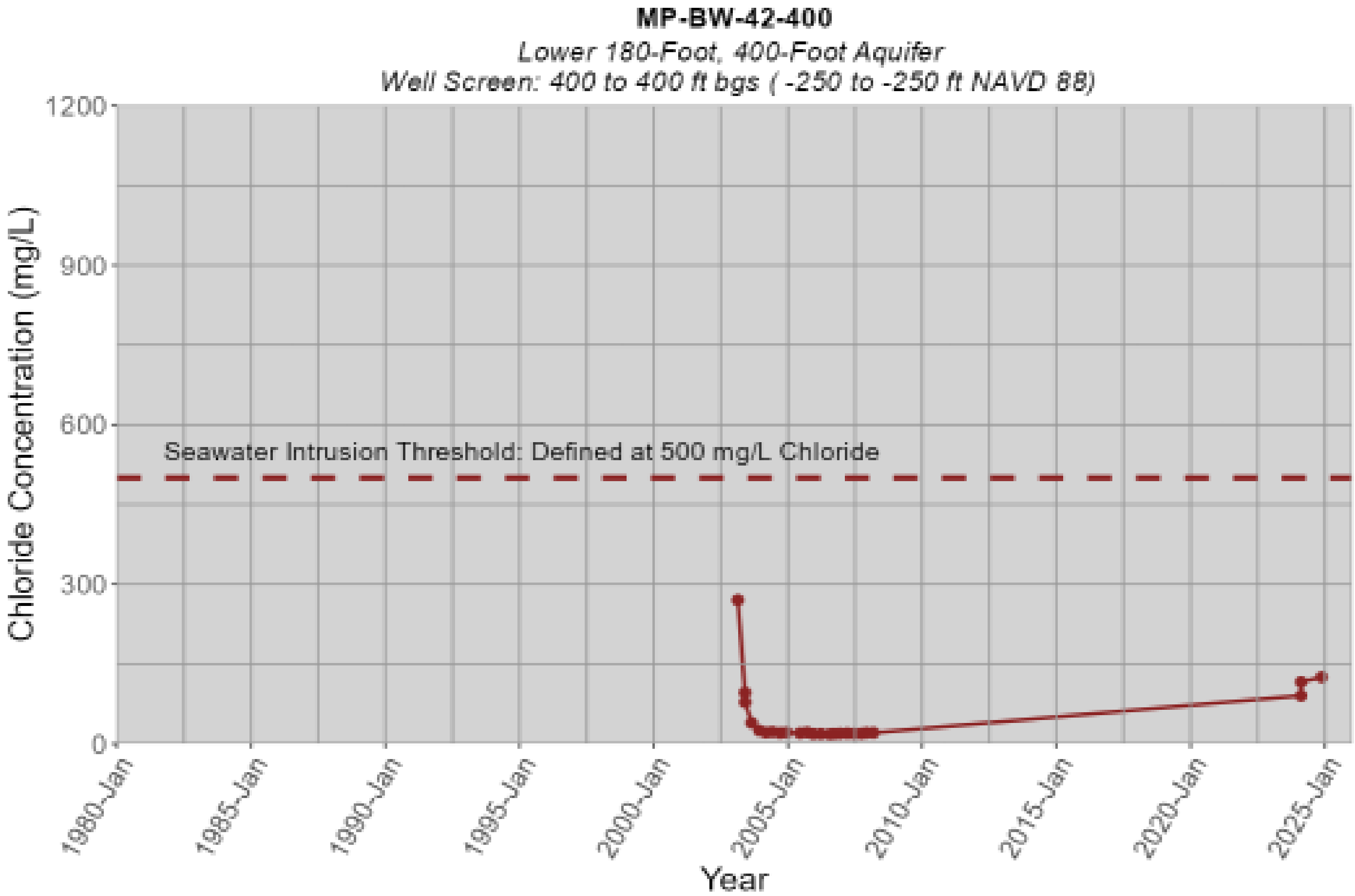

MCWD-30
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 315 to 535 ft bgs (-170 to -390 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

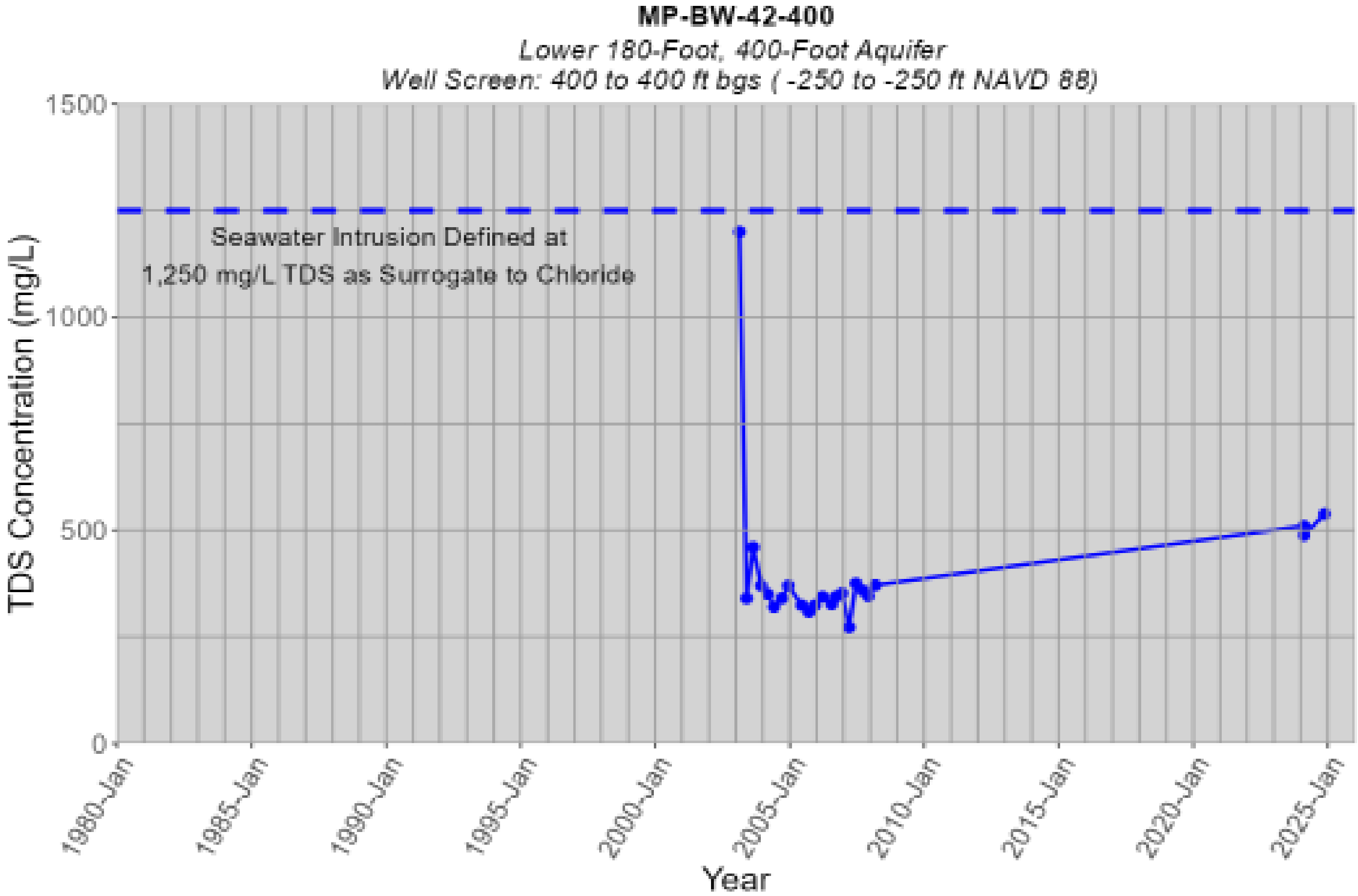

MP-BW-42-295
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 295 to 295 ft bgs (-145 to -145 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

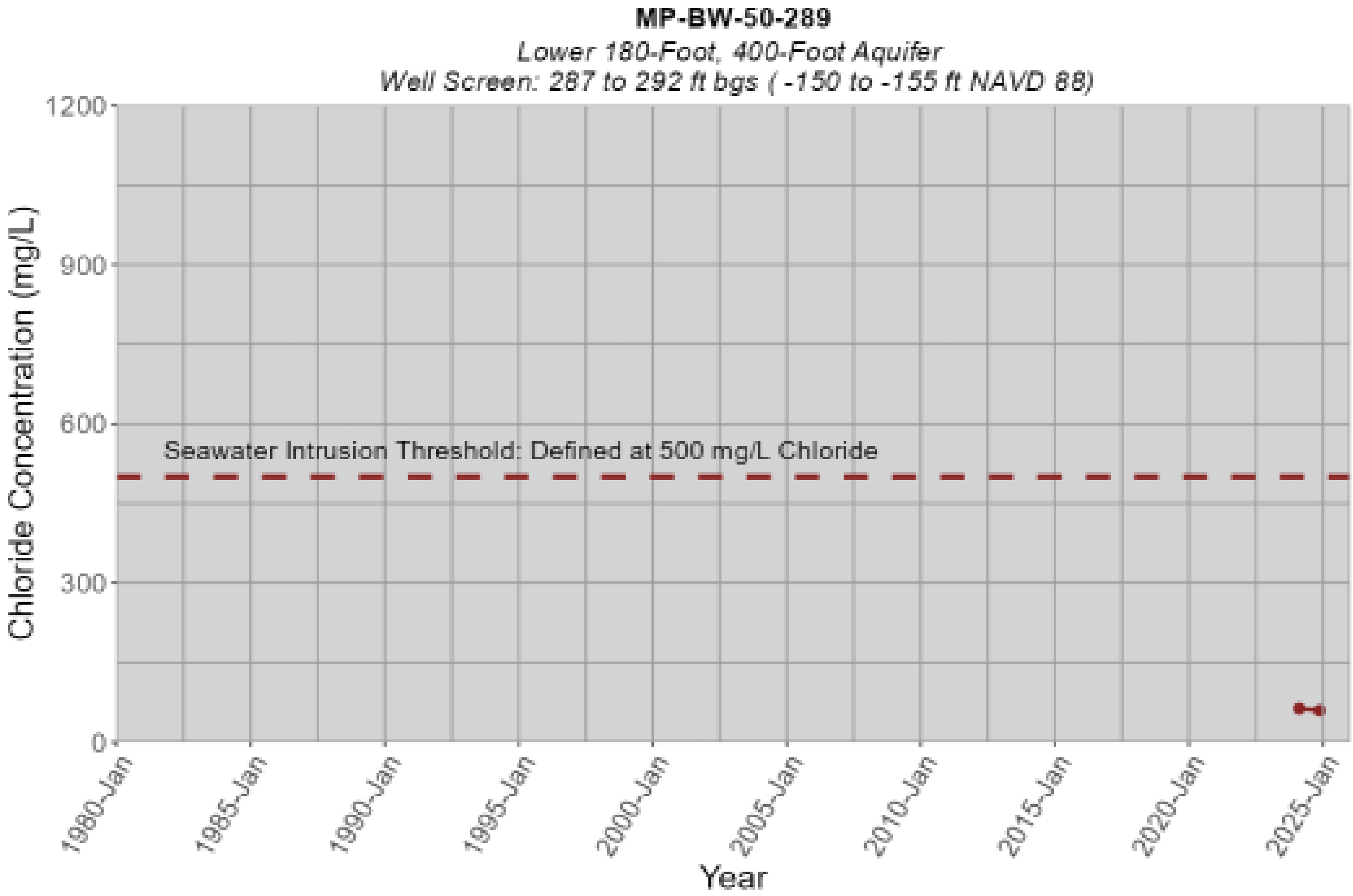

MP-BW-42-295
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 295 to 295 ft bgs (-145 to -145 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

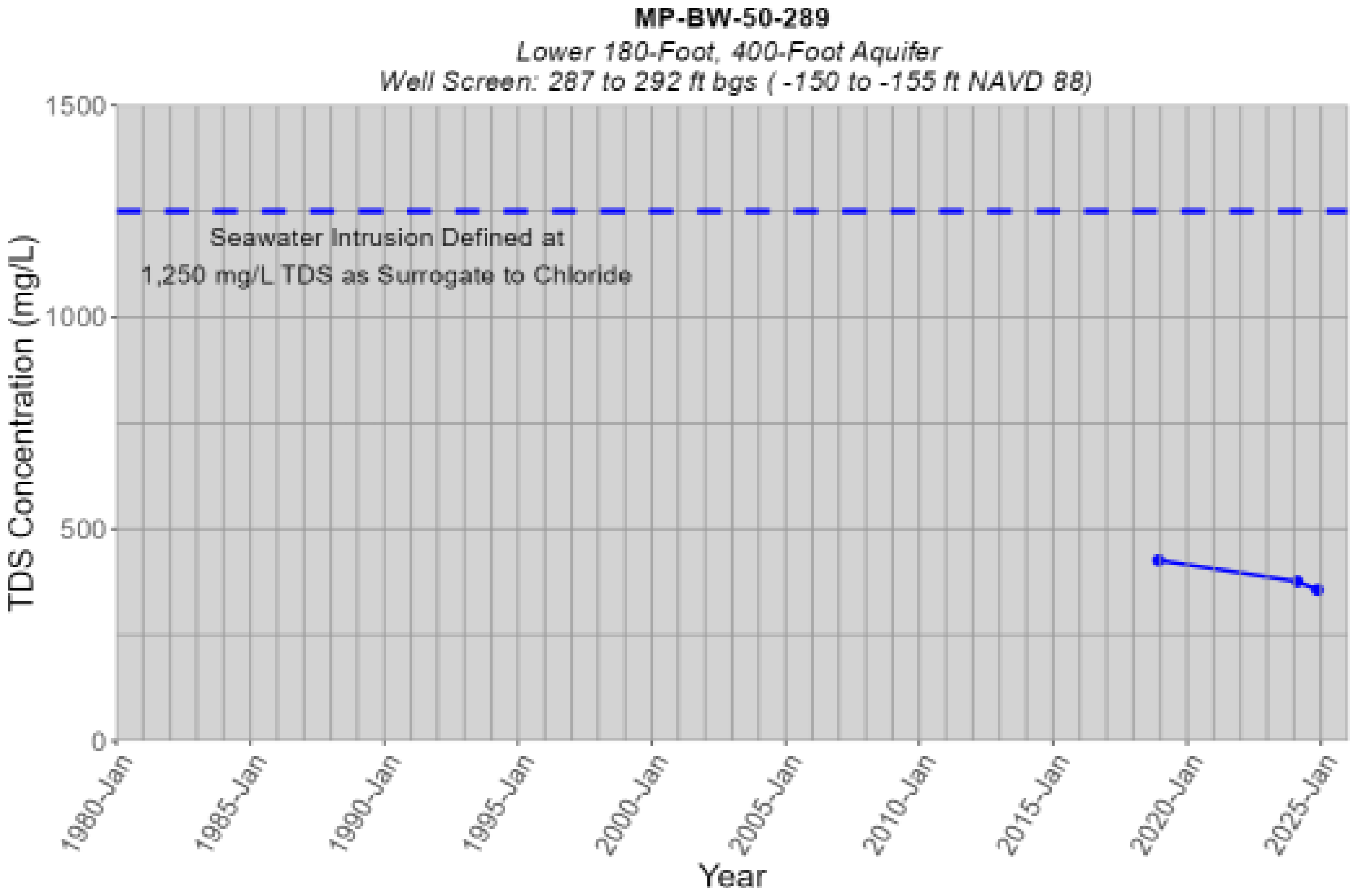

MP-BW-42-314
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 314 to 314 ft bgs (-164 to -164 ft NAVD 88)
Chloride Concentration (mg/L)
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1200
900
600
300
0
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

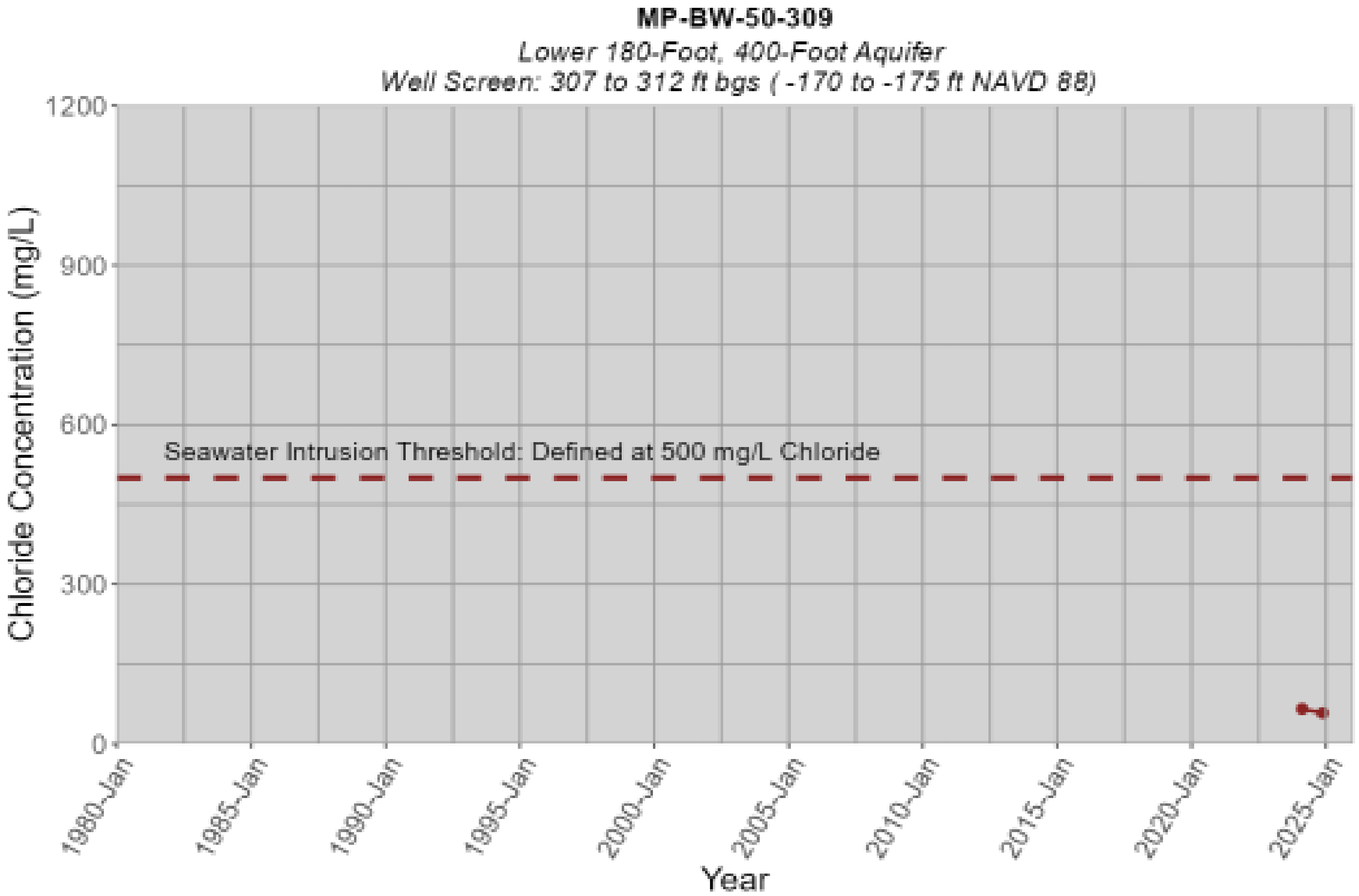

MP-BW-42-314
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 314 to 314 ft bgs (-164 to -164 ft NAVD 88)
TDS Concentration (mg/L)
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1500
1000
500
0
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

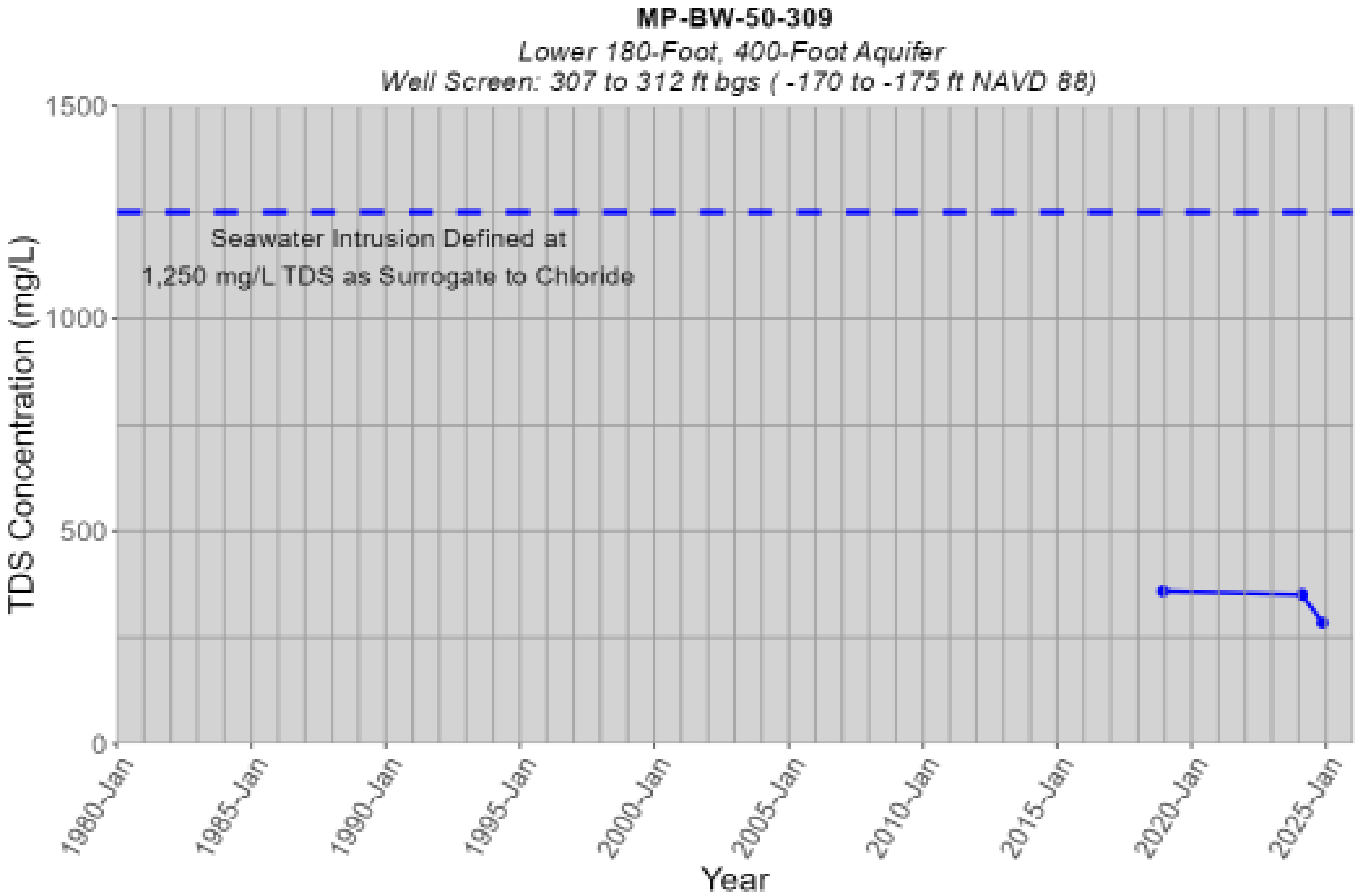

MP-BW-42-400
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 400 to 400 ft bgs (-250 to -250 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

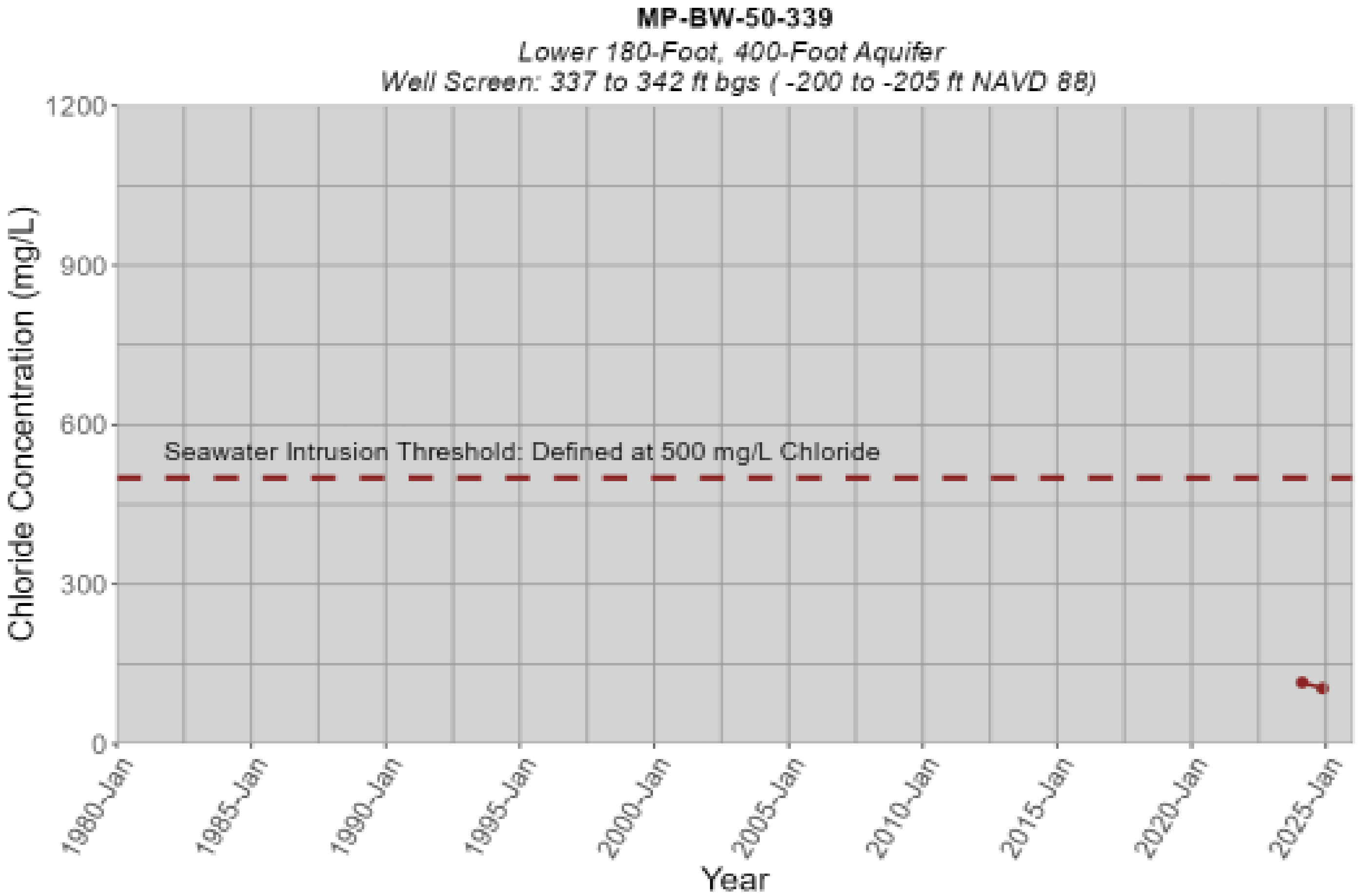

MP-BW-42-400
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 400 to 400 ft bgs (-250 to -250 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

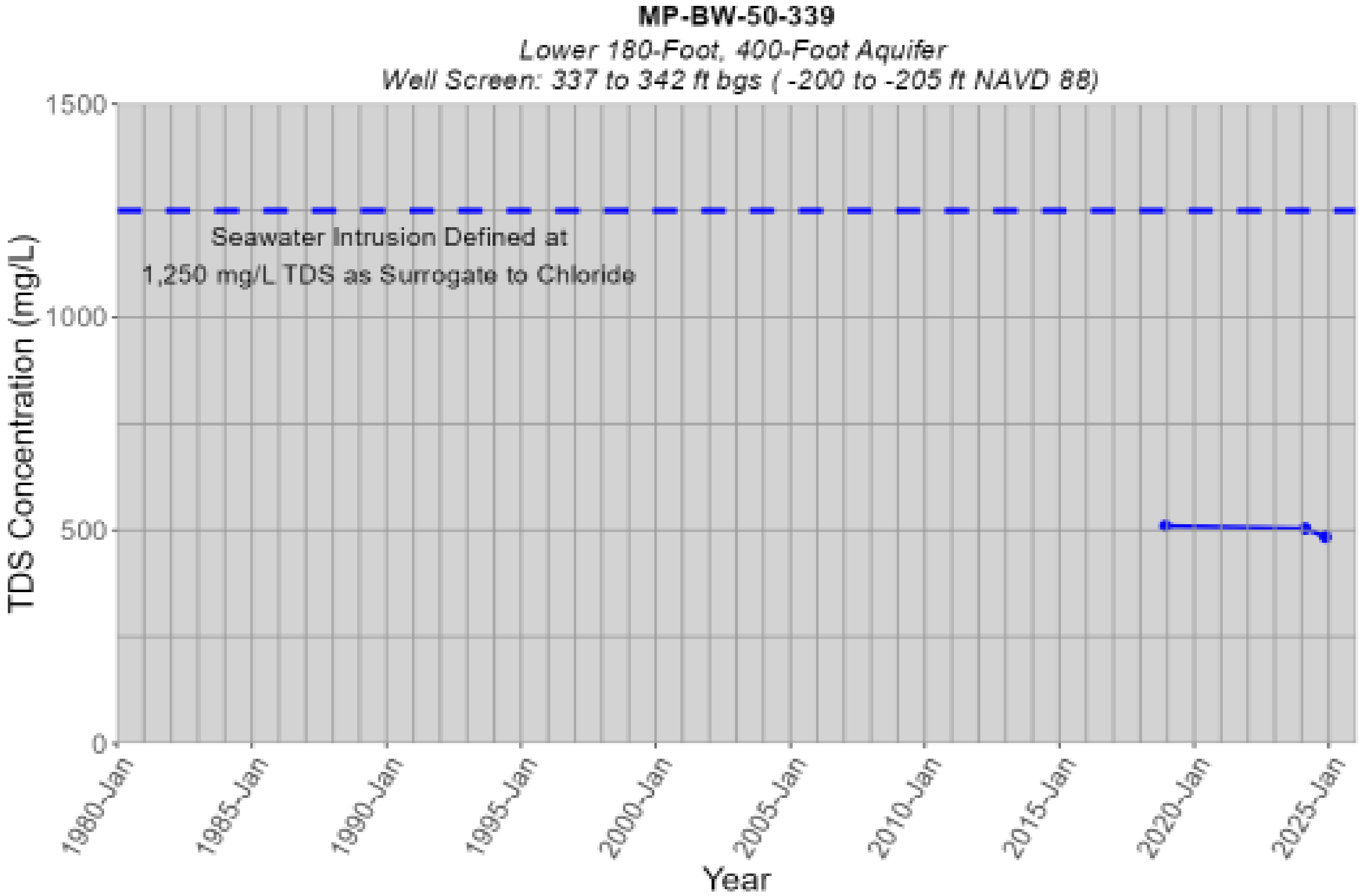

MP-BW-50-289
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 287 to 292 ft bgs (-150 to -155 ft NAVD 88)
Chloride Concentration (mg/L)
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
0
300
600
900
1200
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

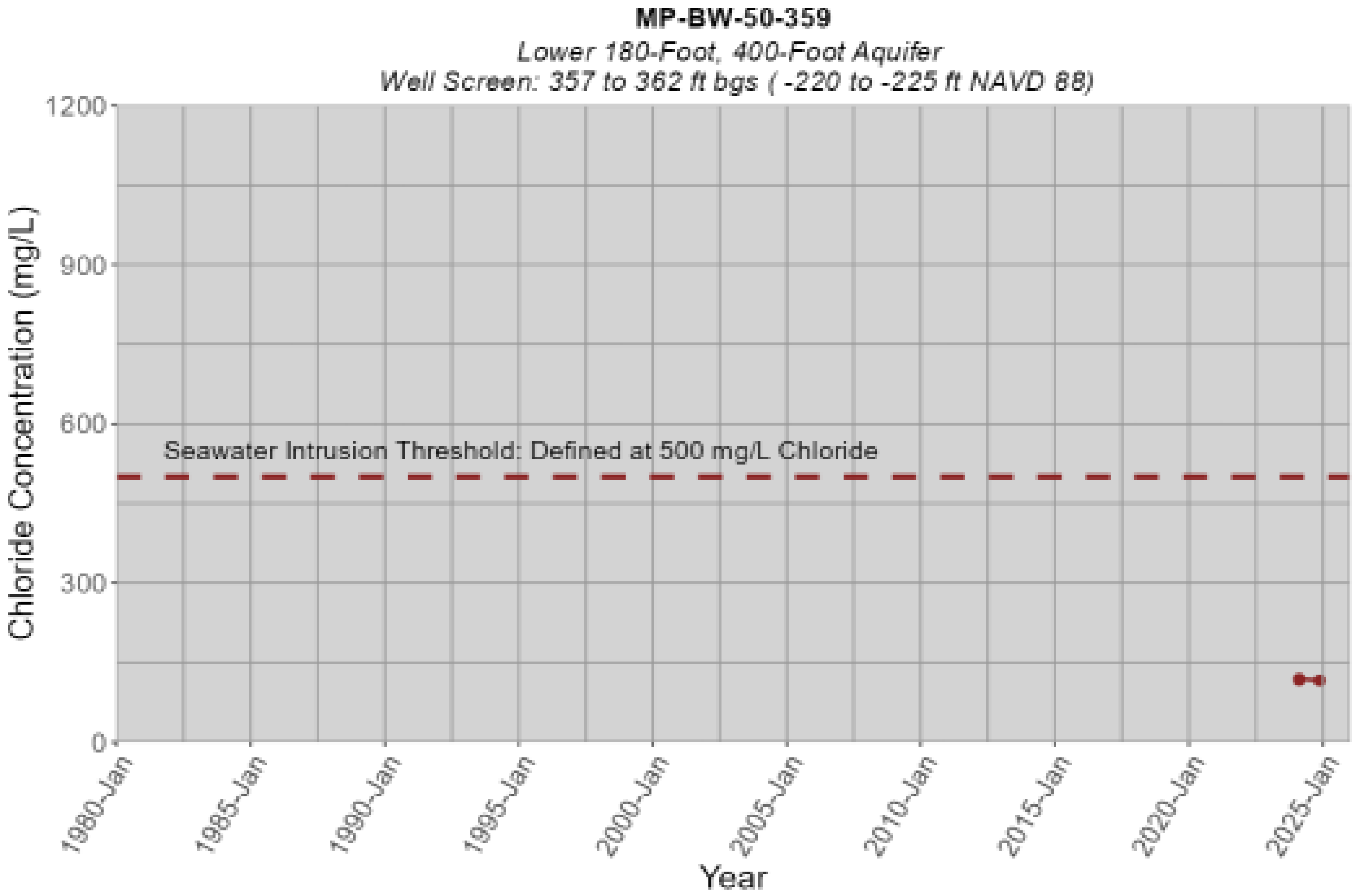

MP-BW-50-289
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 287 to 292 ft bgs (-150 to -155 ft NAVD 88)
TDS Concentration (mg/L)
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
0
500
1000
1500
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

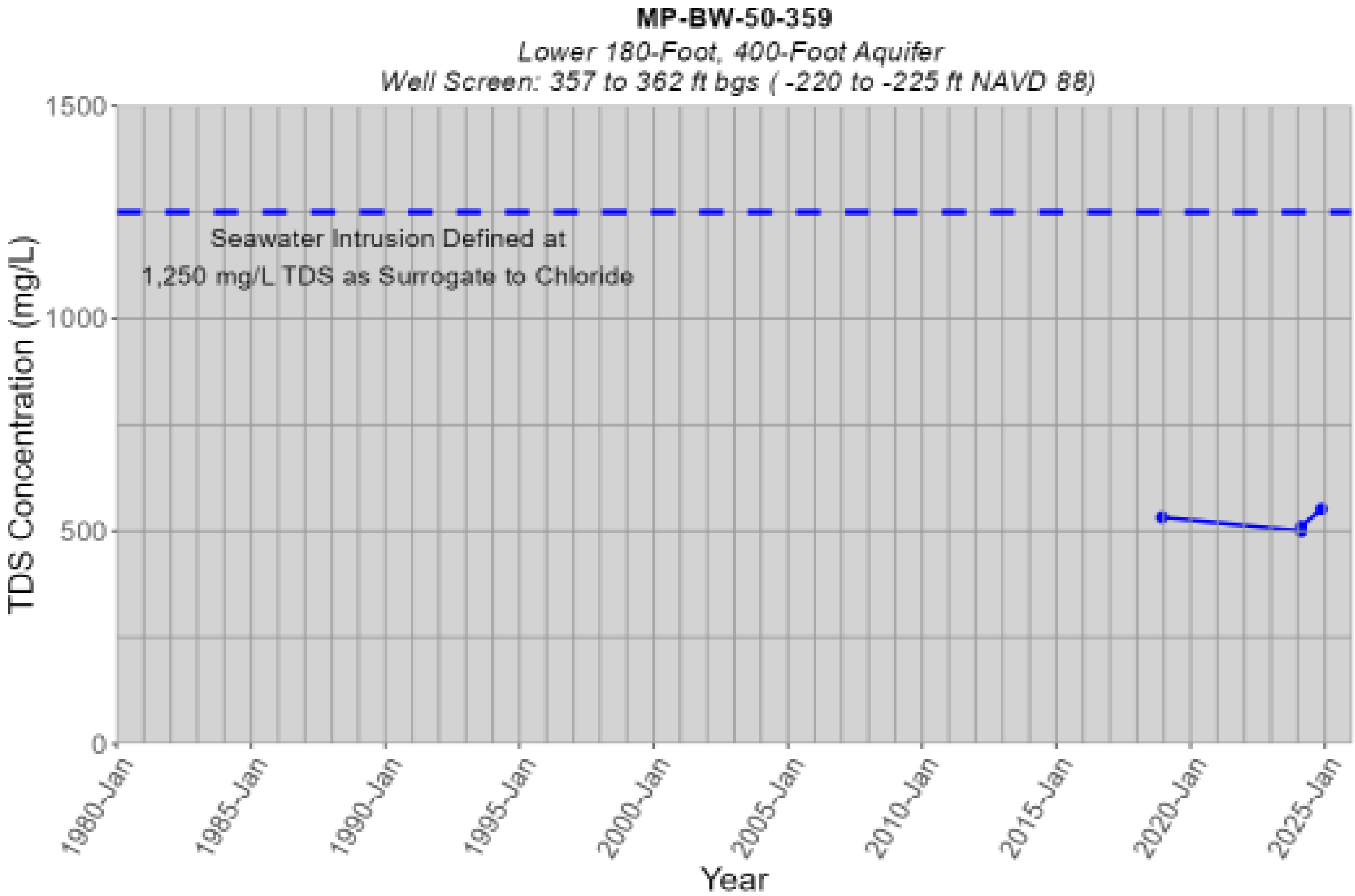

MP-BW-50-309
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 307 to 312 ft bgs (-170 to -175 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

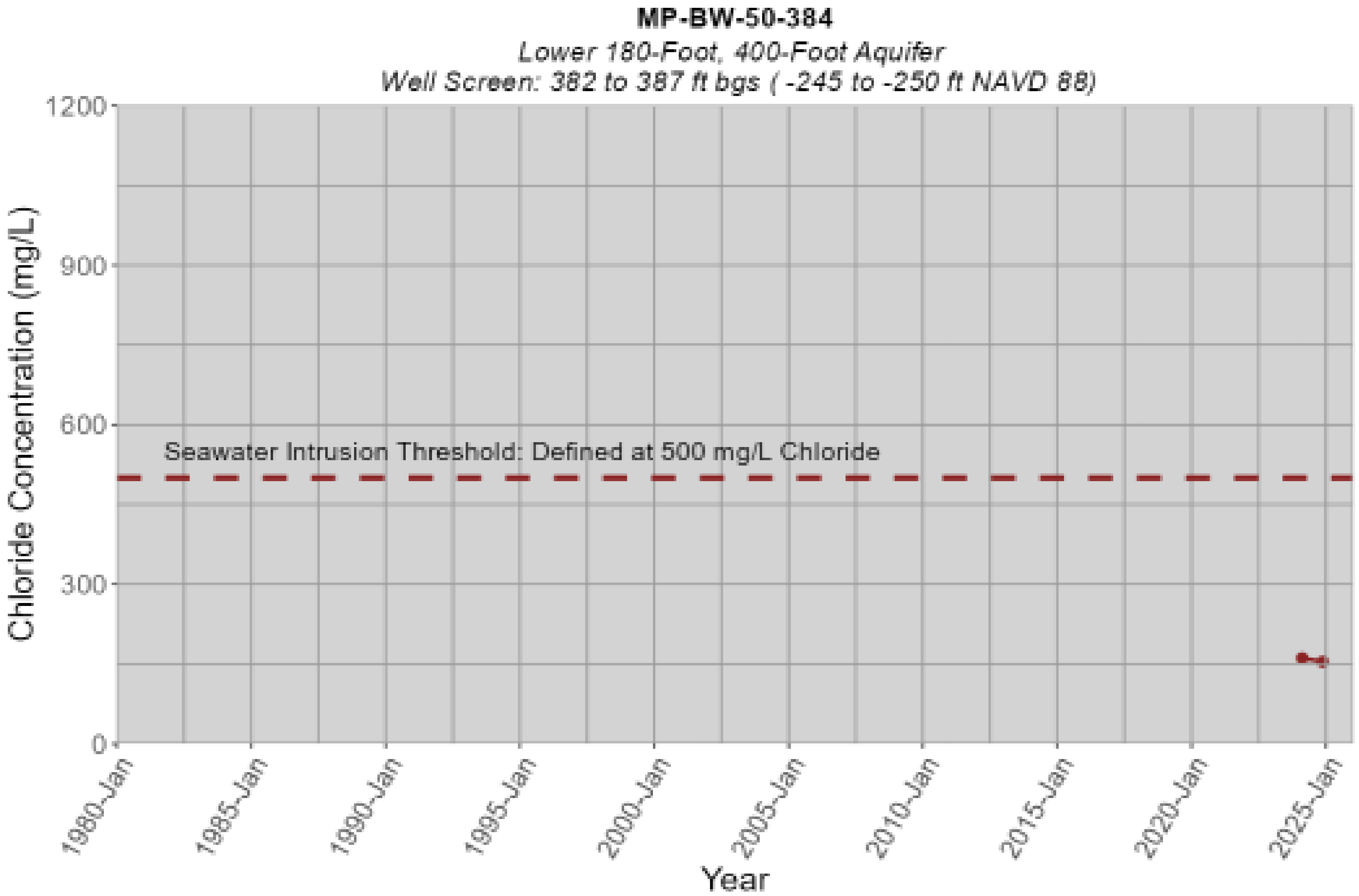

MP-BW-50-309
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 307 to 312 ft bgs (-170 to -175 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year


MP-BW-50-339
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 337 to 342 ft bgs (-200 to -205 ft NAVD 88)
Chloride Concentration (mg/L)
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
0
300
600
900
1200
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

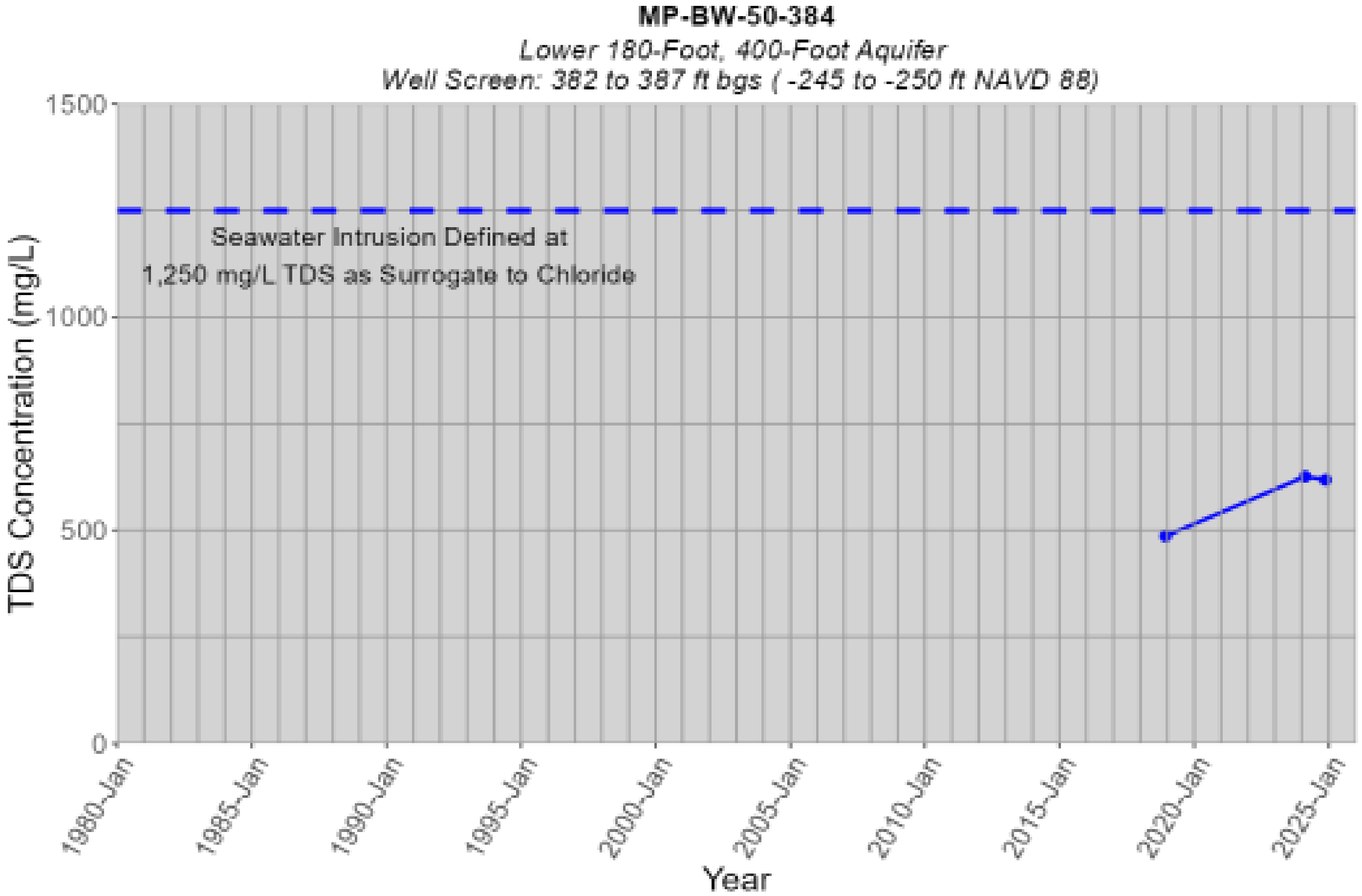

MP-BW-50-339
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 337 to 342 ft bgs (-200 to -205 ft NAVD 88)
TDS Concentration (mg/L)
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
0
500
1000
1500
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year


MP-BW-50-359
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 357 to 362 ft bgs (-220 to -225 ft NAVD 88)
Chloride Concentration (mg/L)
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
0
300
600
900
1200
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

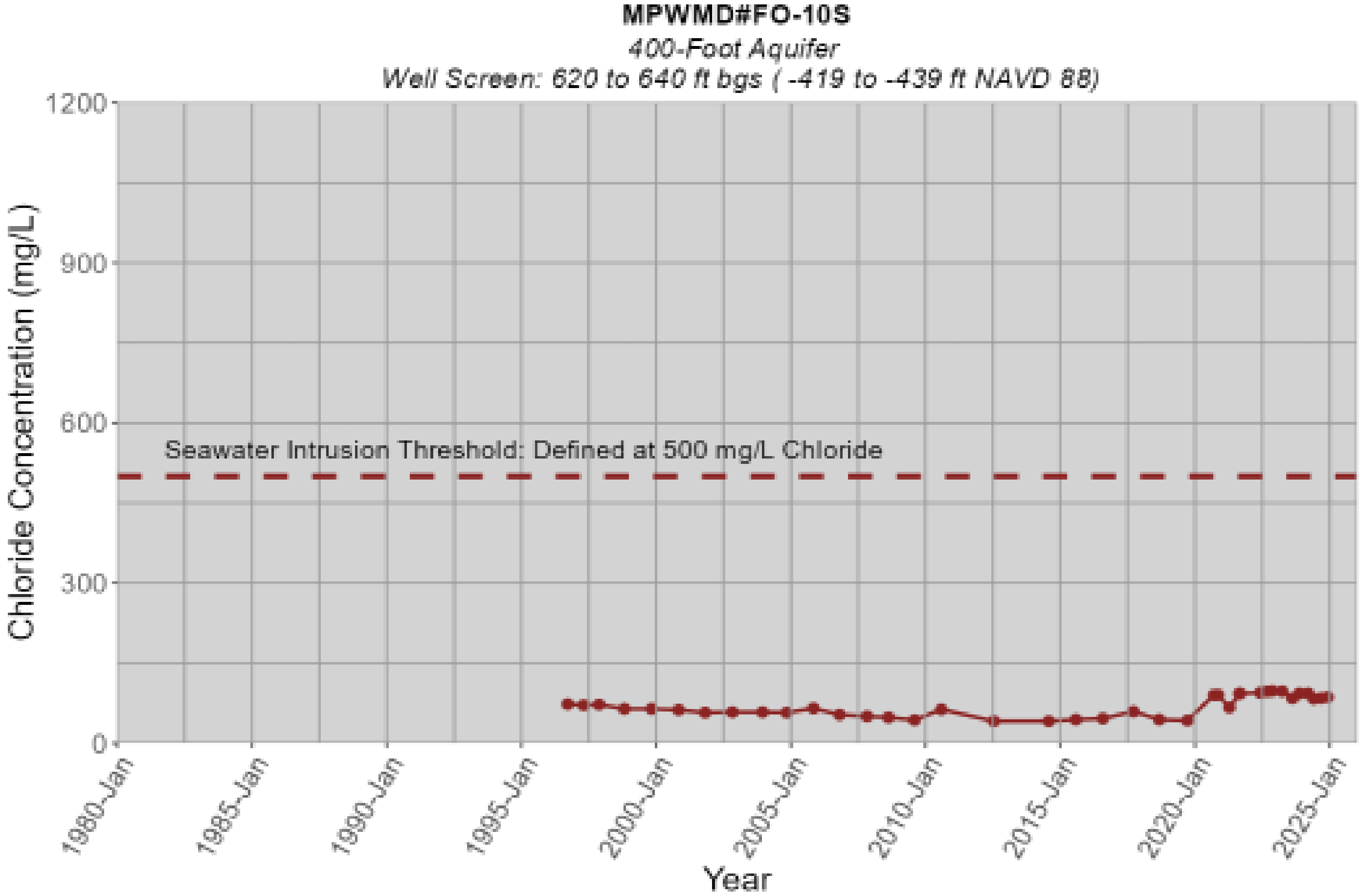

MP-BW-50-359
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 357 to 362 ft bgs (-220 to -225 ft NAVD 88)
TDS Concentration (mg/L)
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
0
500
1000
1500
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

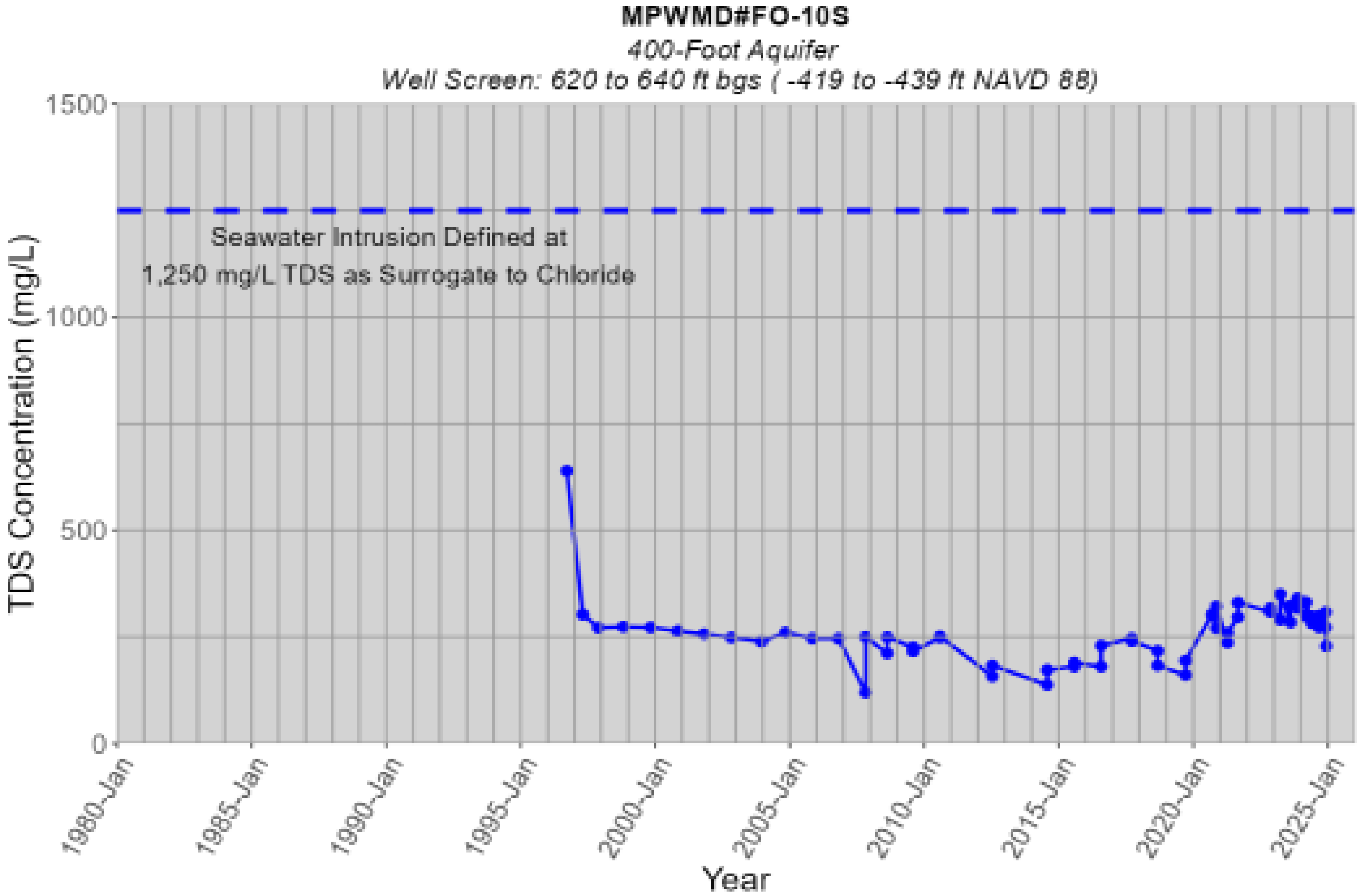


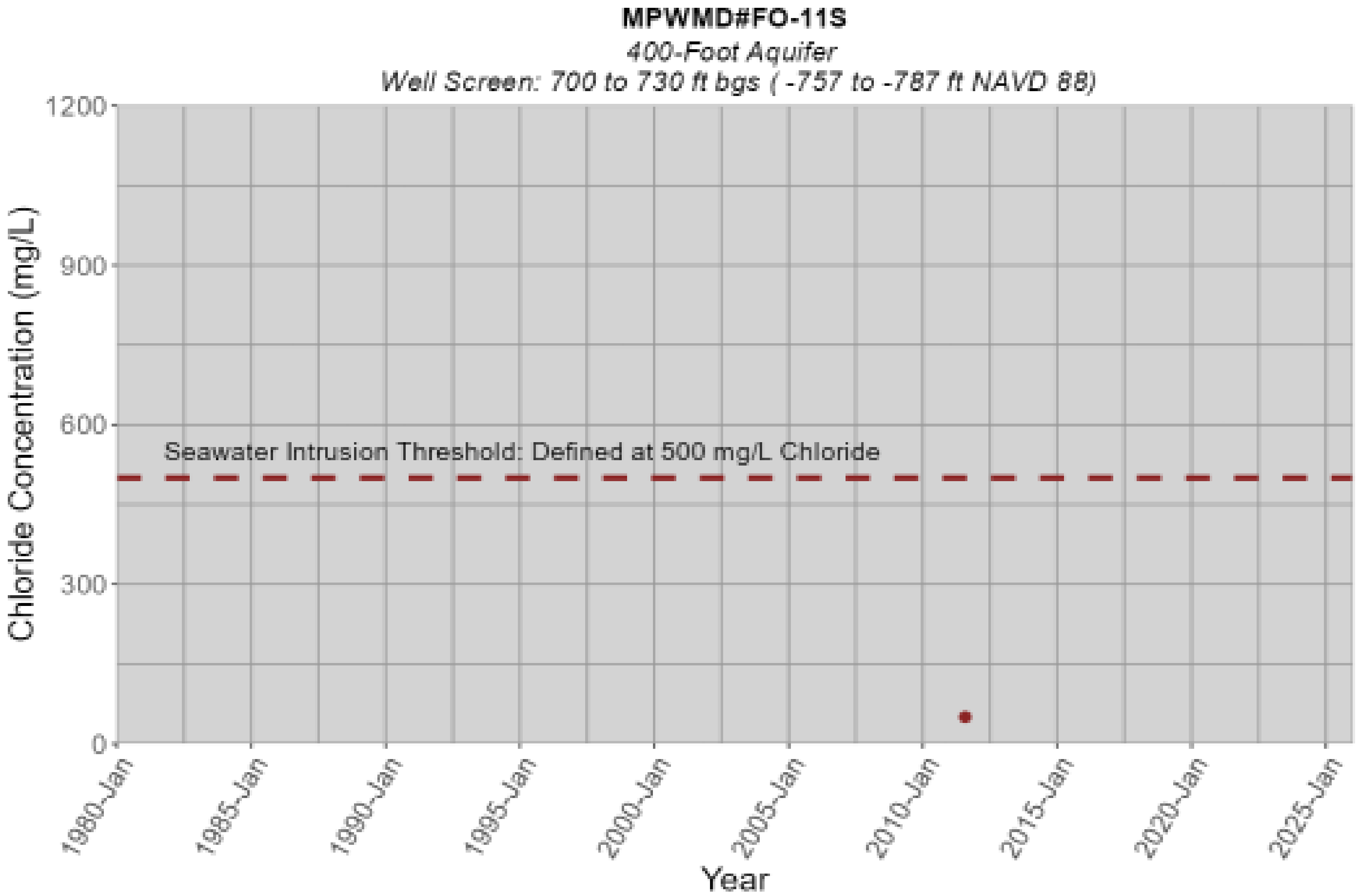
MP-BW-50-384
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 382 to 387 ft bgs (-245 to -250 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

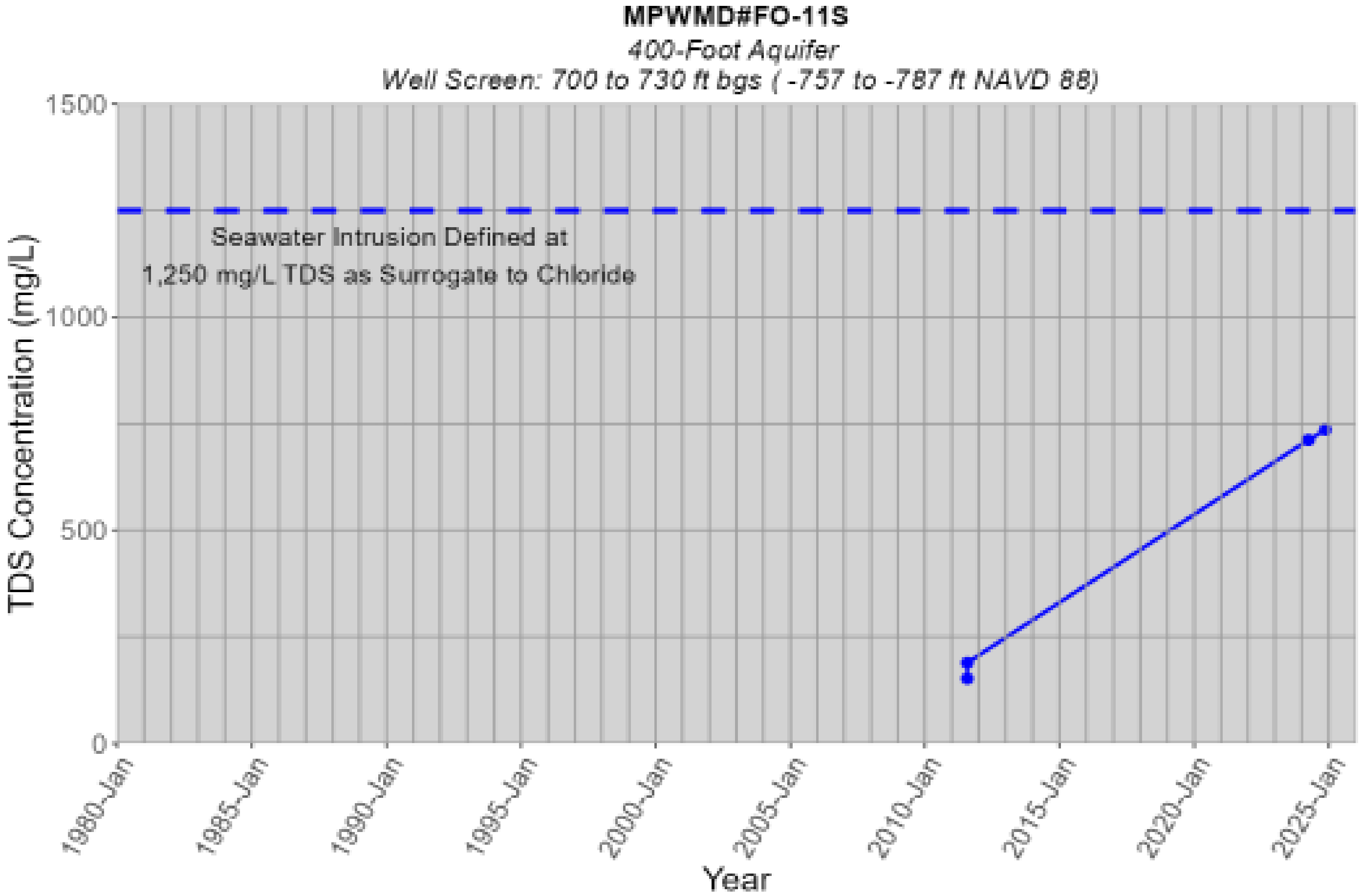


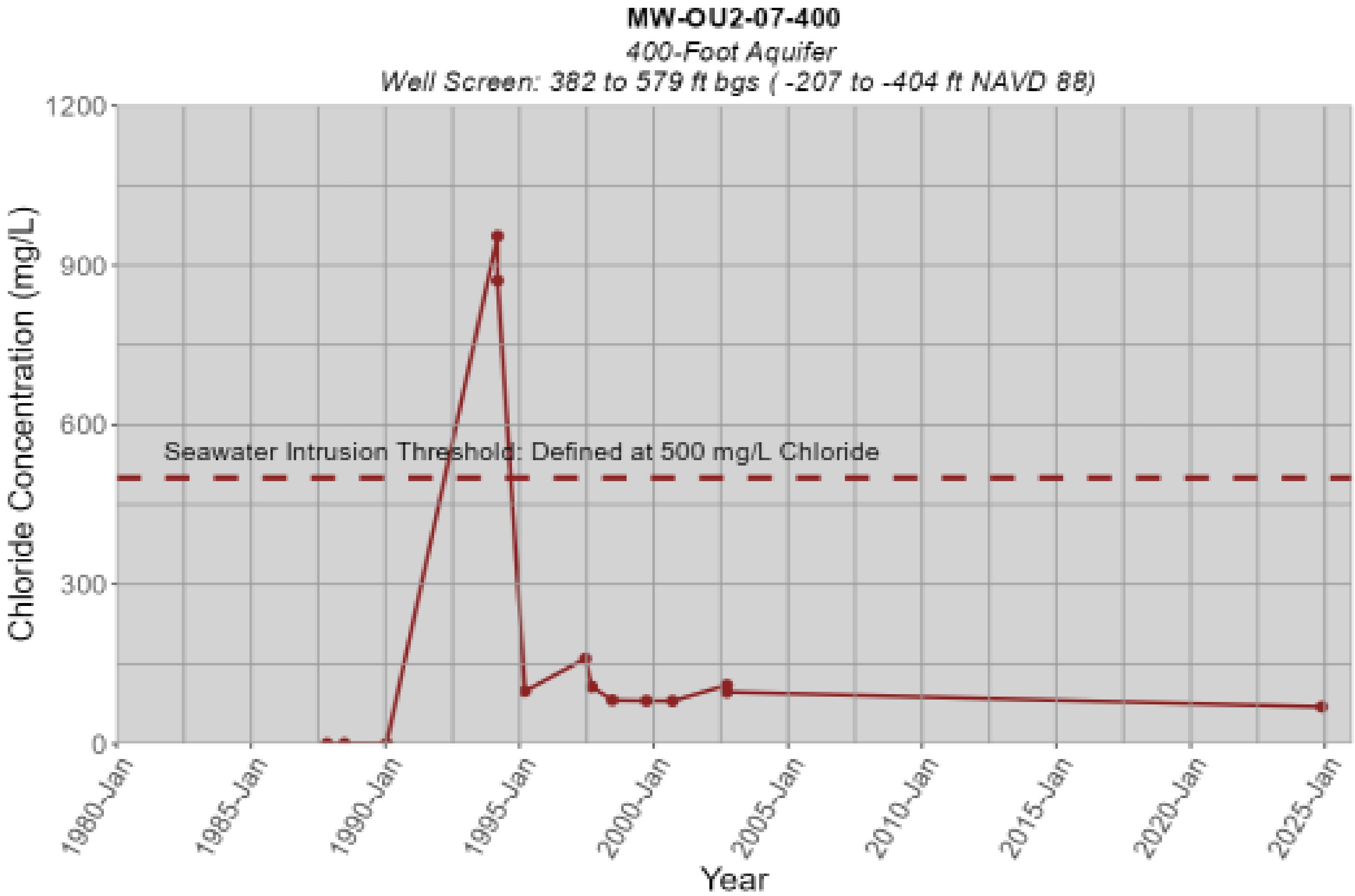
MP-BW-50-384
Lower 180-Foot, 400-Foot Aquifer
Well Screen: 382 to 387 ft bgs (-245 to -250 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year


MPWMD#FO-10S
400-Foot Aquifer
Well Screen: 620 to 640 ft bgs (-419 to -439 ft NAVD 88)
1200
900
600
300
0
Chloride Concentration (mg/L)
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

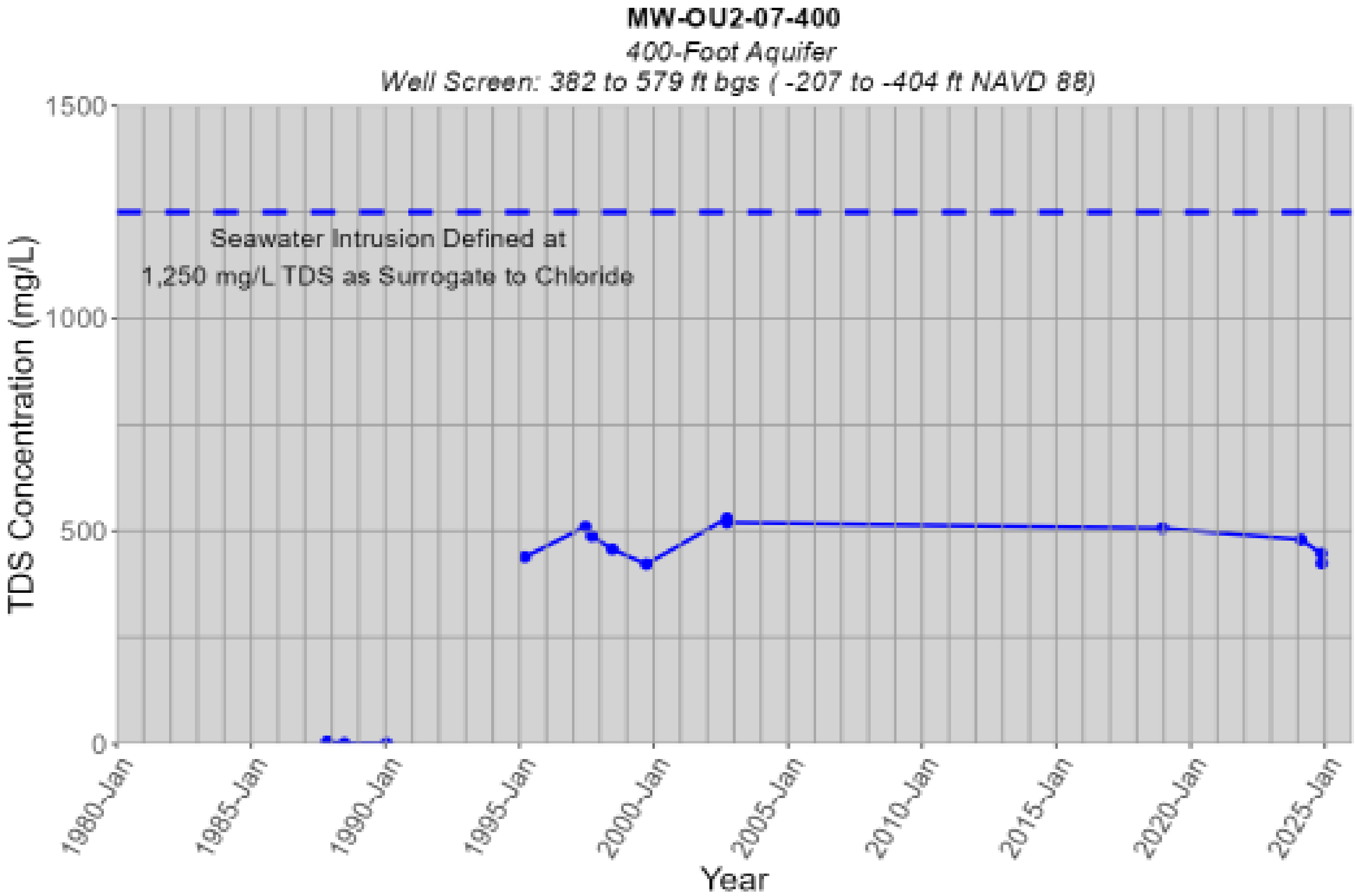

MPWMD#FO-10S
400-Foot Aquifer
Well Screen: 620 to 640 ft bgs (-419 to -439 ft NAVD 88)
1500
1000
500
0
TDS Concentration (mg/L)
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year


MPWMD#FO-11S
400-Foot Aquifer
Well Screen: 700 to 730 ft bgs (-757 to -787 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

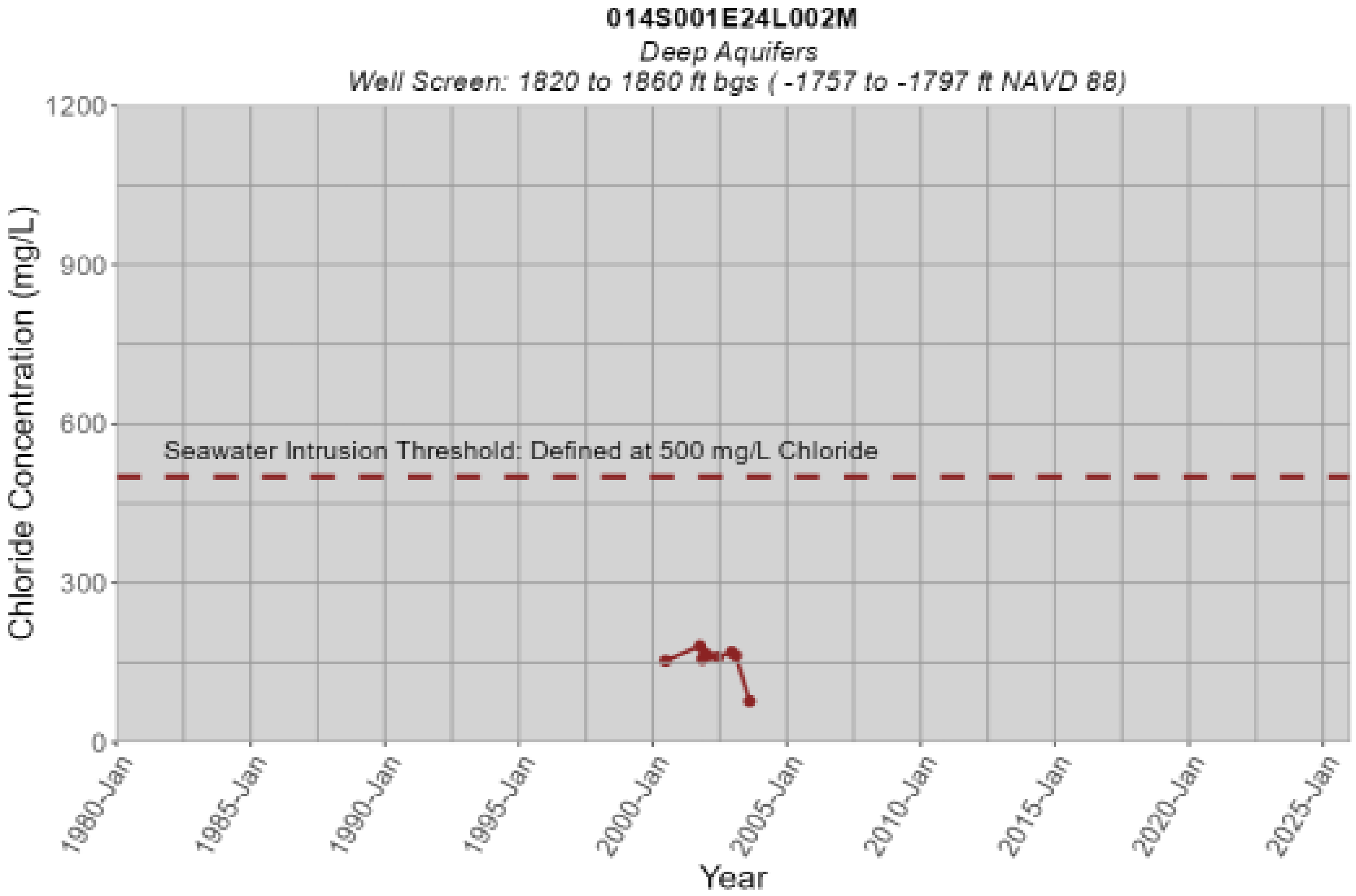

MPWMD#FO-11S
400-Foot Aquifer
Well Screen: 700 to 730 ft bgs (-757 to -787 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

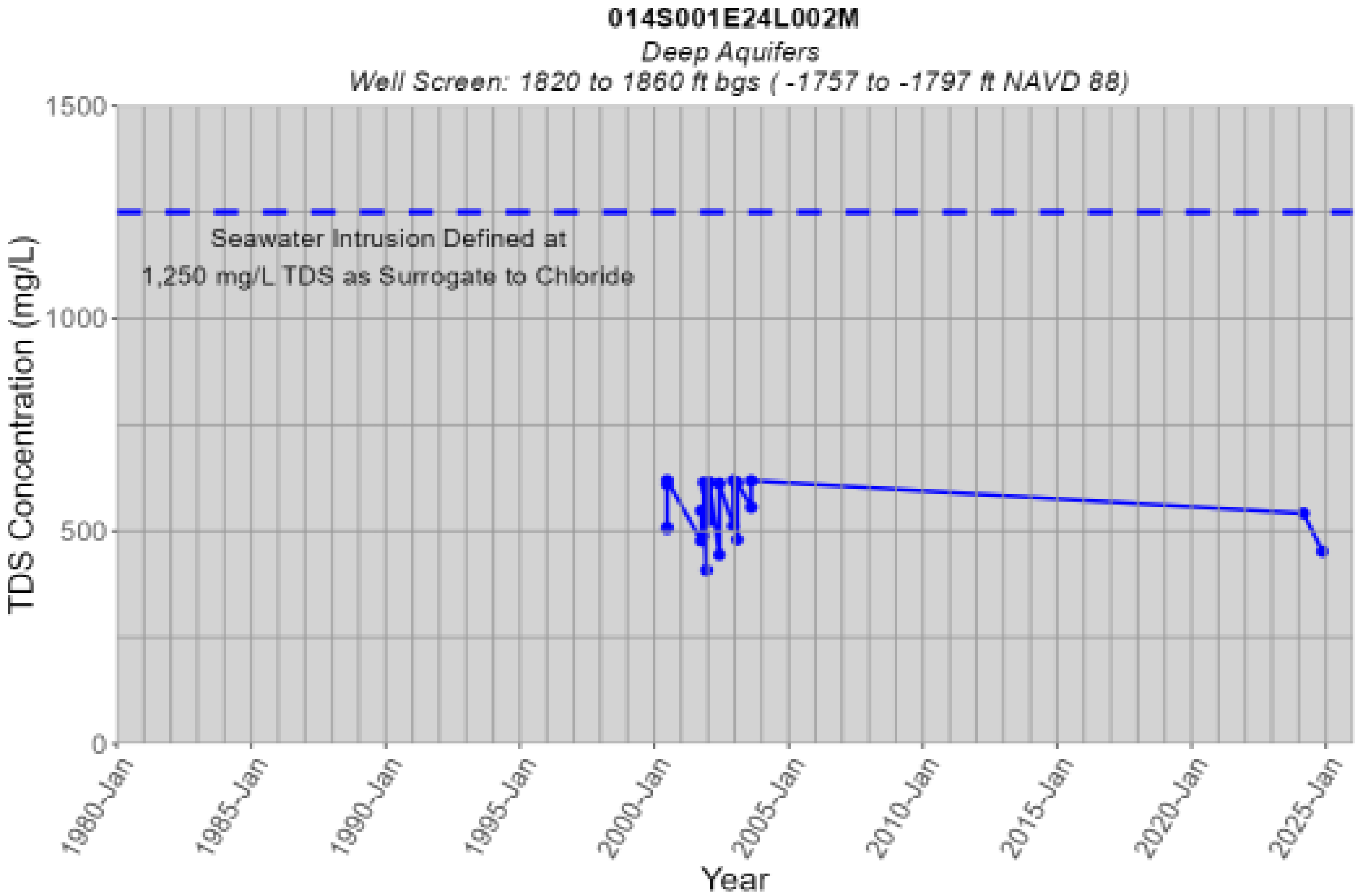


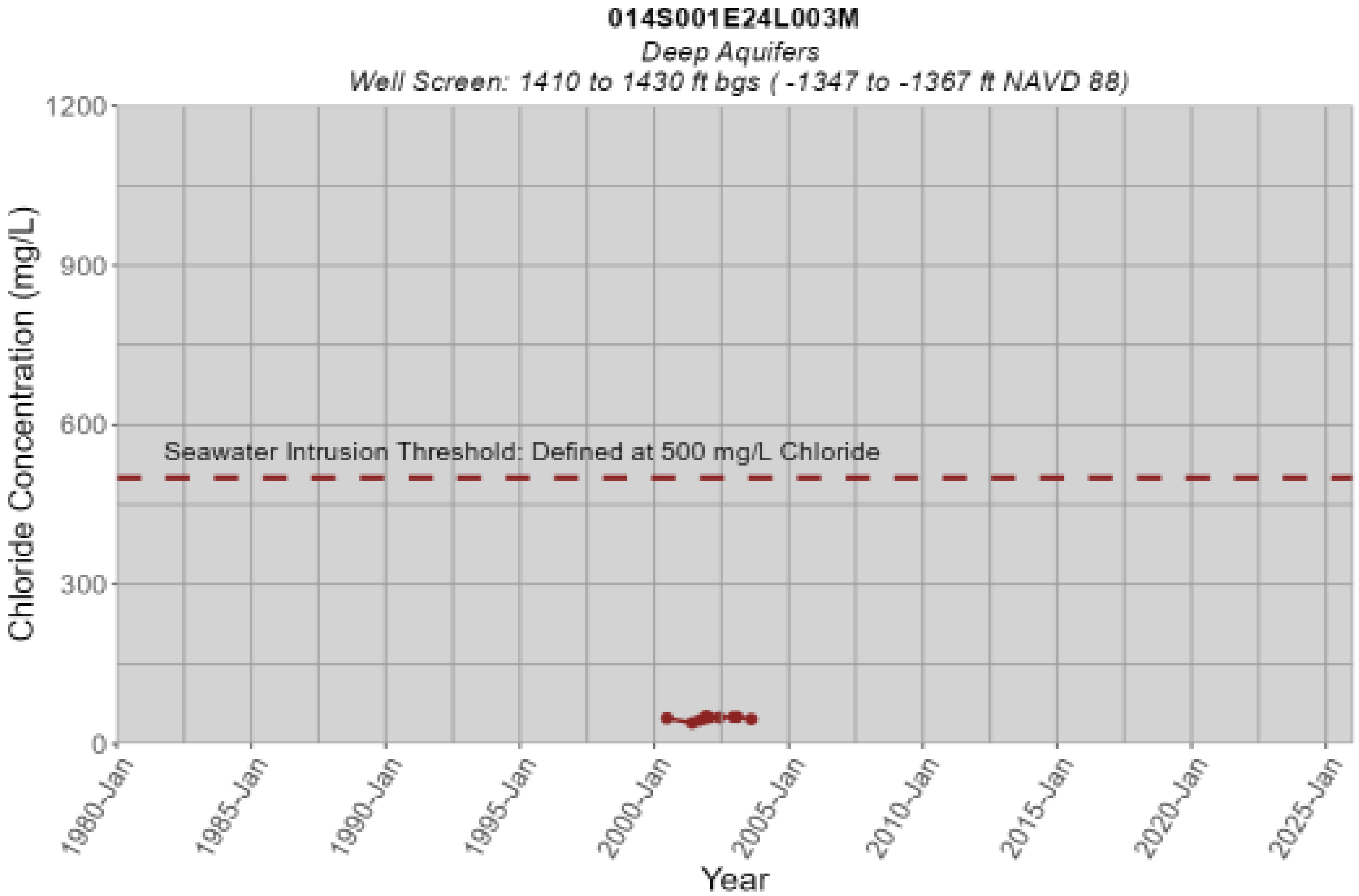
MW-OU2-07-400
400-Foot Aquifer
Well Screen: 382 to 579 ft bgs (-207 to -404 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

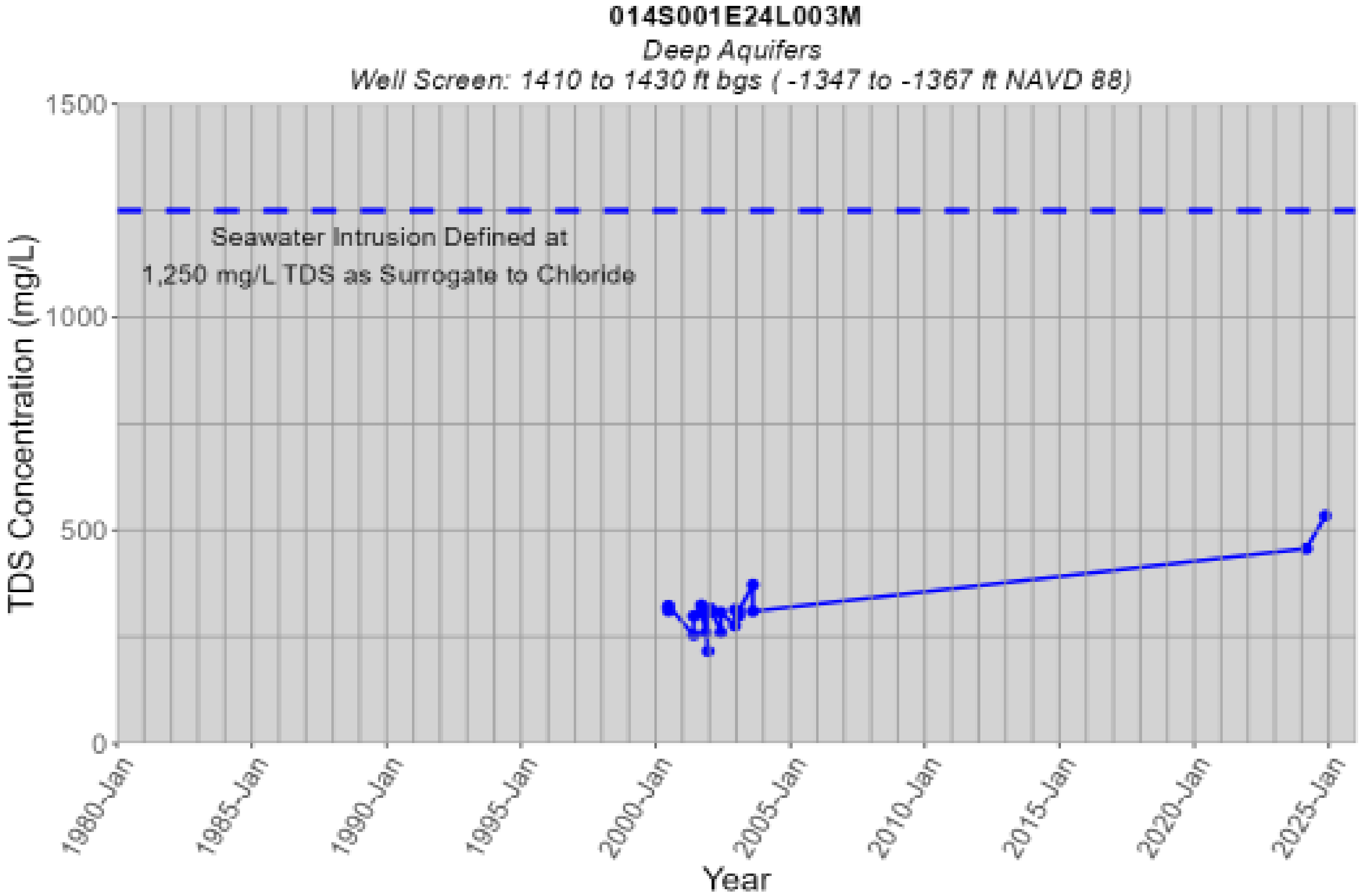


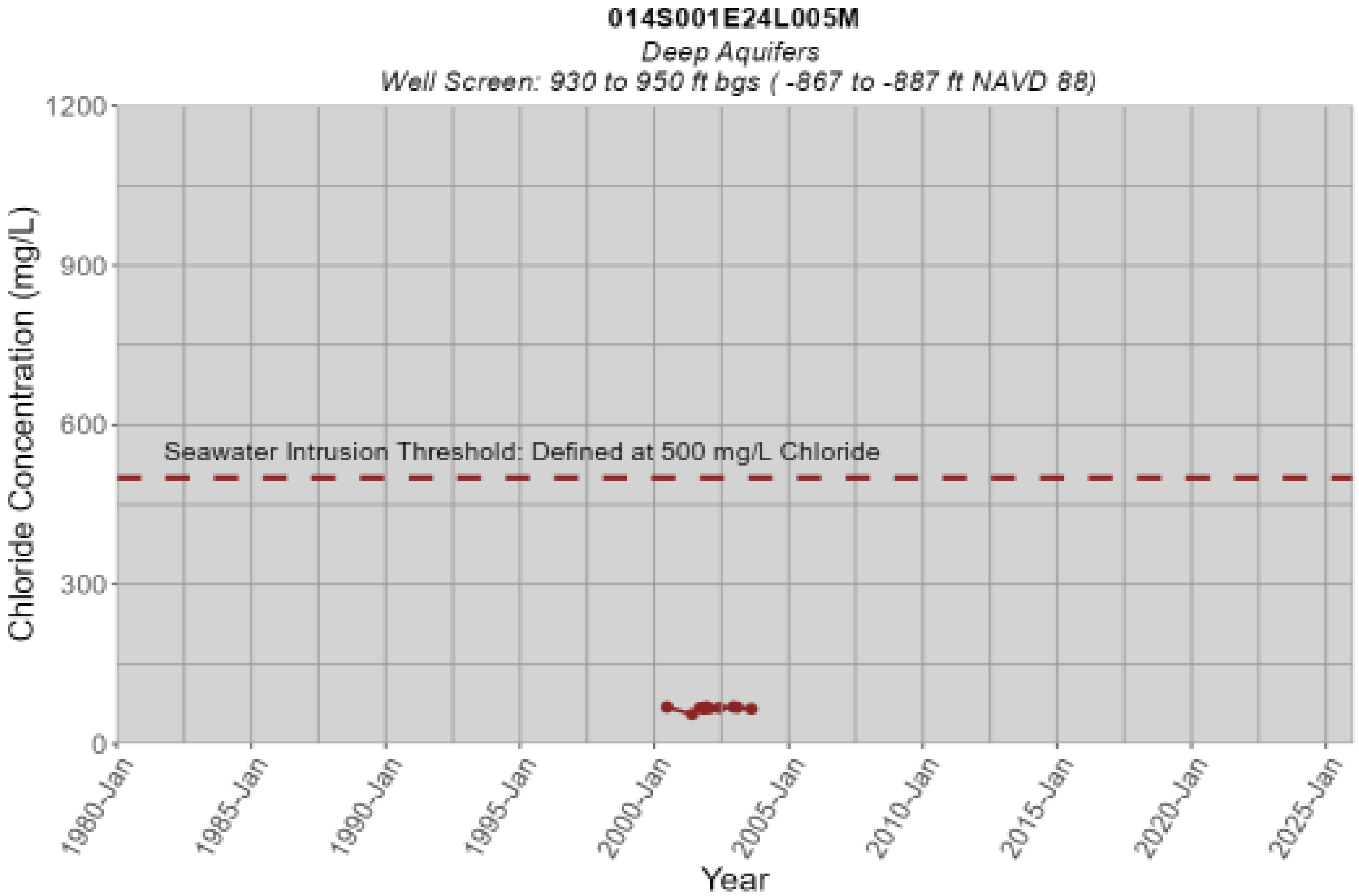
MW-OU2-07-400
400-Foot Aquifer
Well Screen: 382 to 579 ft bgs (-207 to -404 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

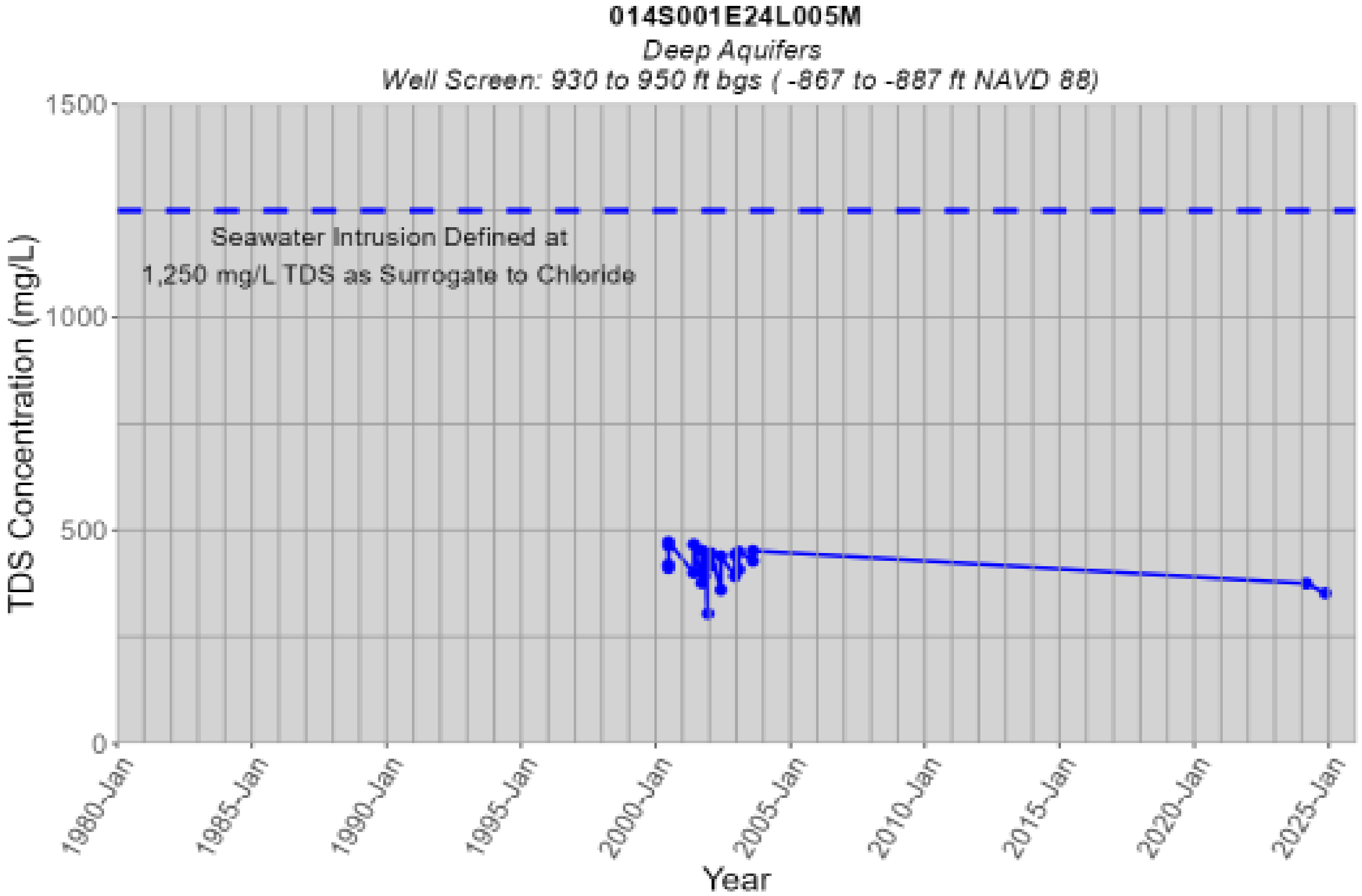

014S001E24L002M
Deep Aquifers
Well Screen: 1820 to 1860 ft bgs (-1757 to -1797 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year


014S001E24L002M
Deep Aquifers
Well Screen: 1820 to 1860 ft bgs (-1757 to -1797 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year


014S001E24L003M
Deep Aquifers
Well Screen: 1410 to 1430 ft bgs (-1347 to -1367 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year


014S001E24L003M
Deep Aquifers
Well Screen: 1410 to 1430 ft bgs (-1347 to -1367 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year


014S001E24L005M
Deep Aquifers
Well Screen: 930 to 950 ft bgs (-867 to -887 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year


014S001E24L005M
Deep Aquifers
Well Screen: 930 to 950 ft bgs (-867 to -887 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

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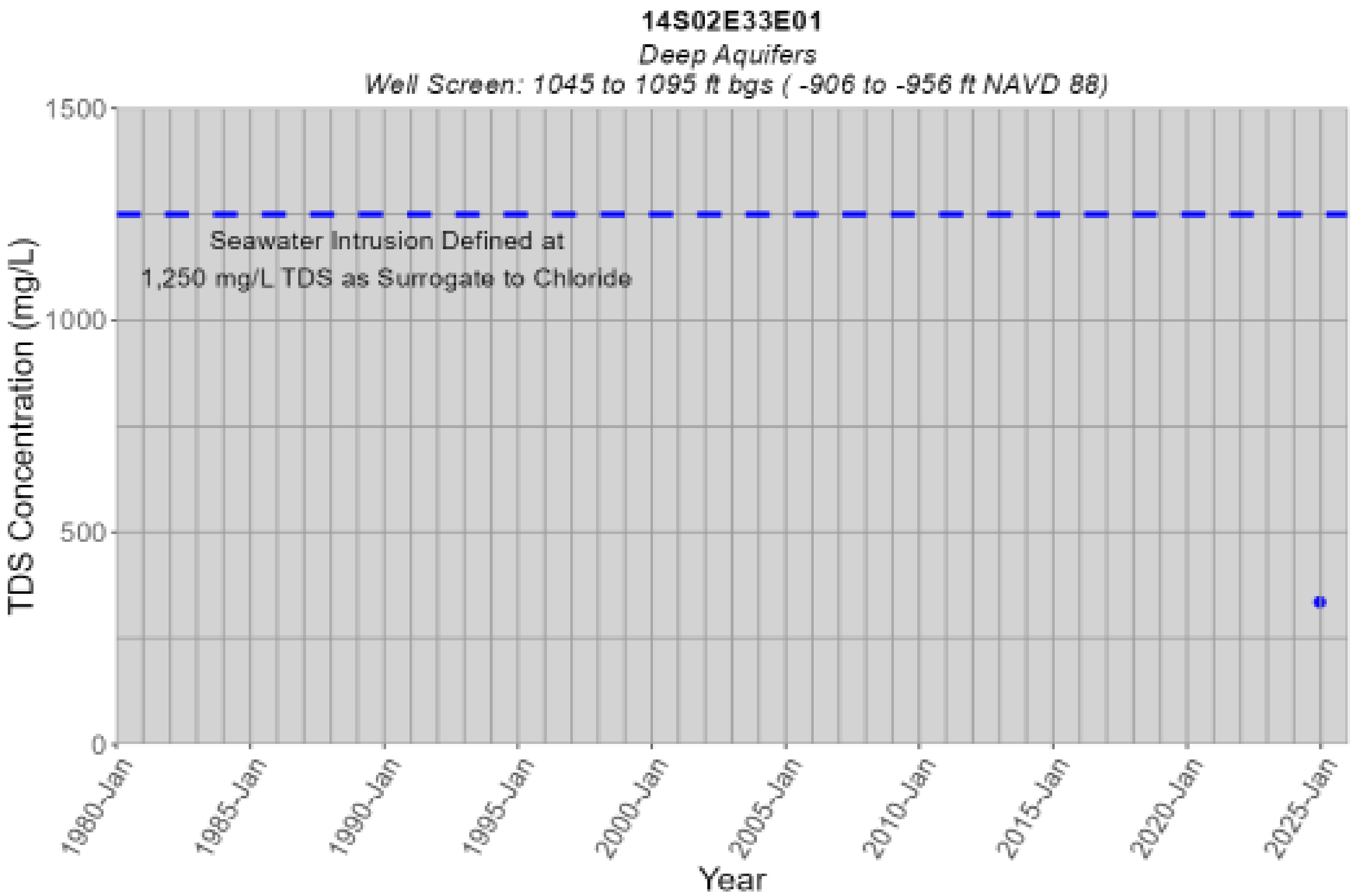

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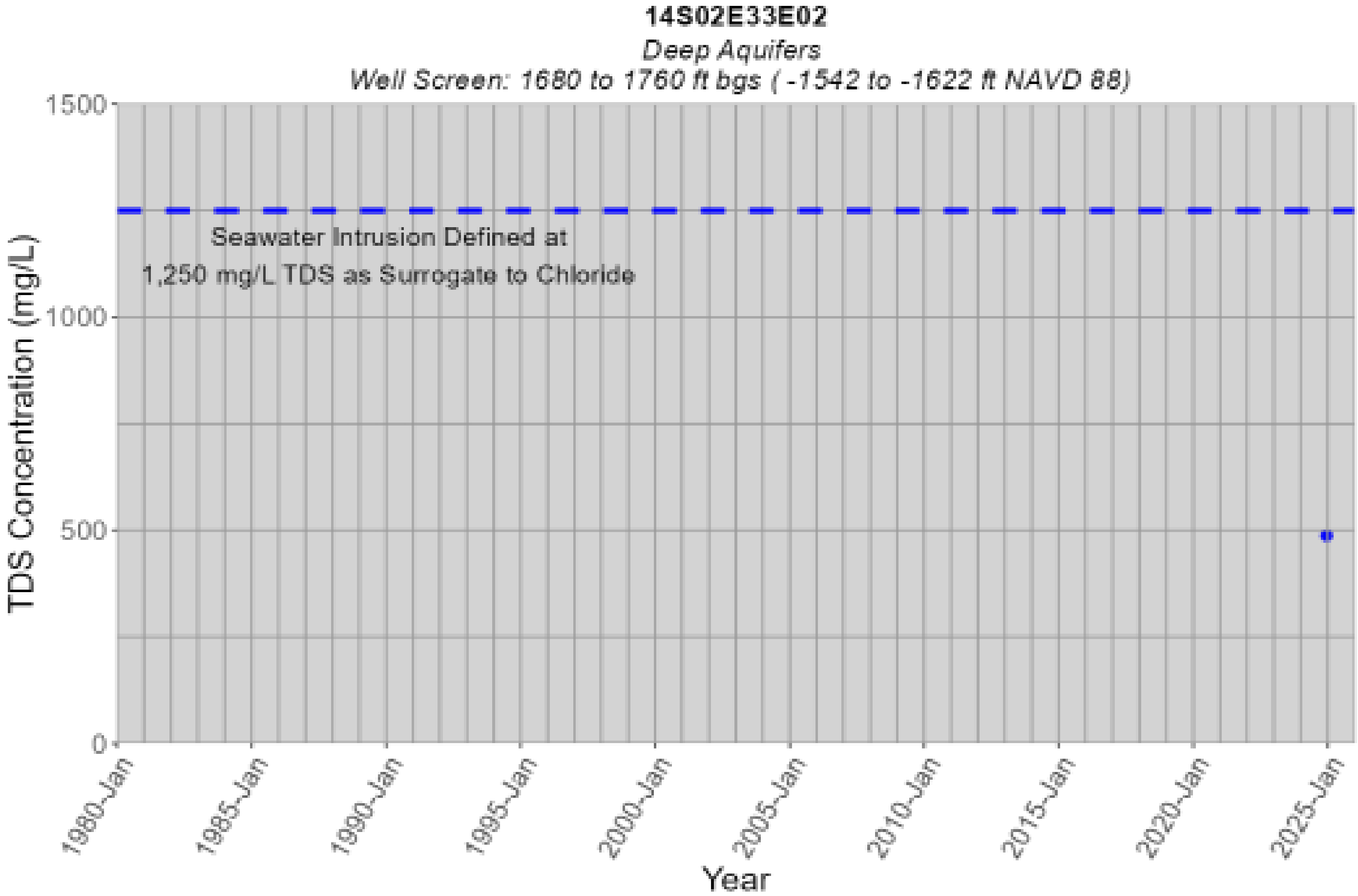
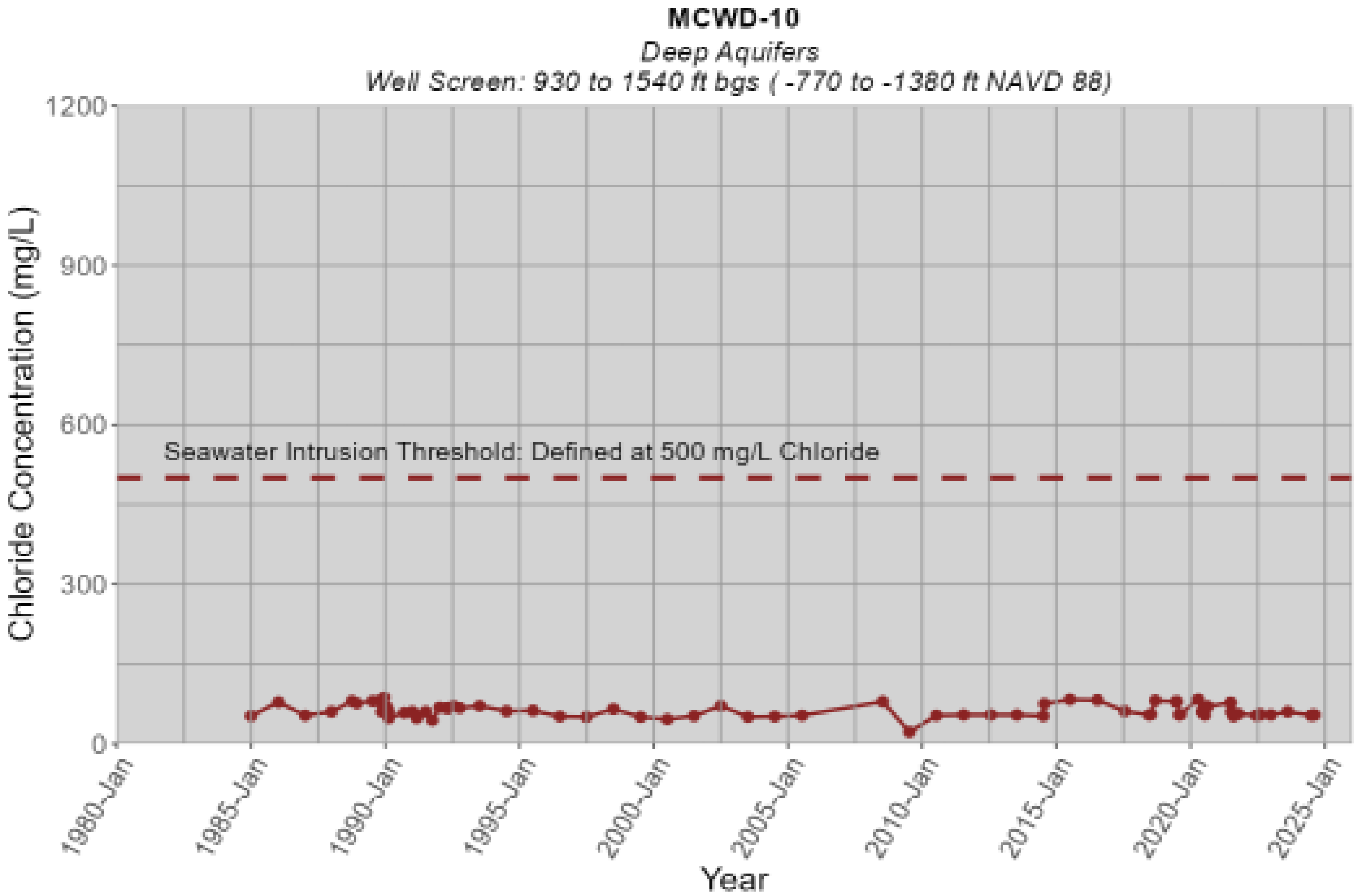
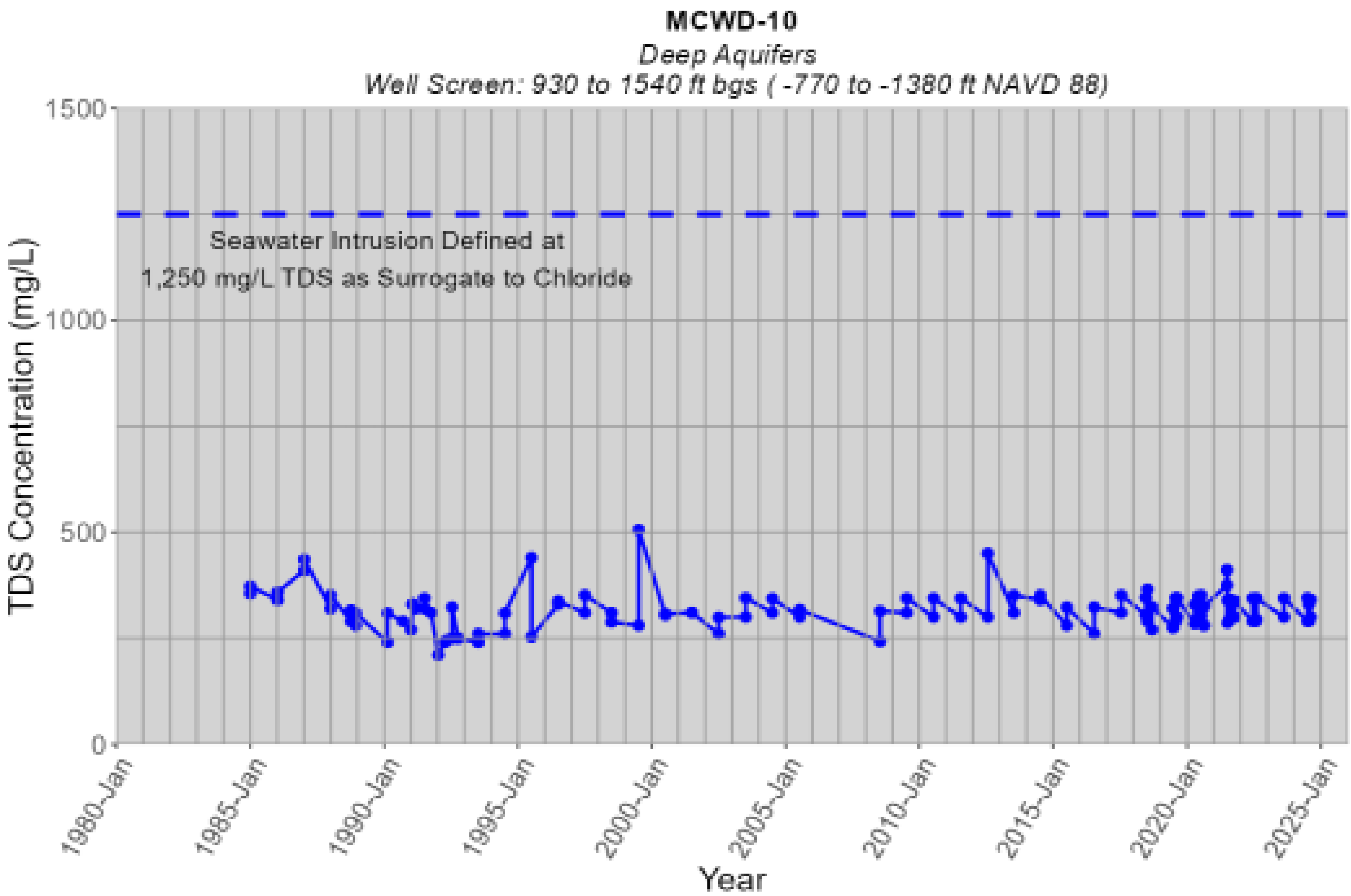
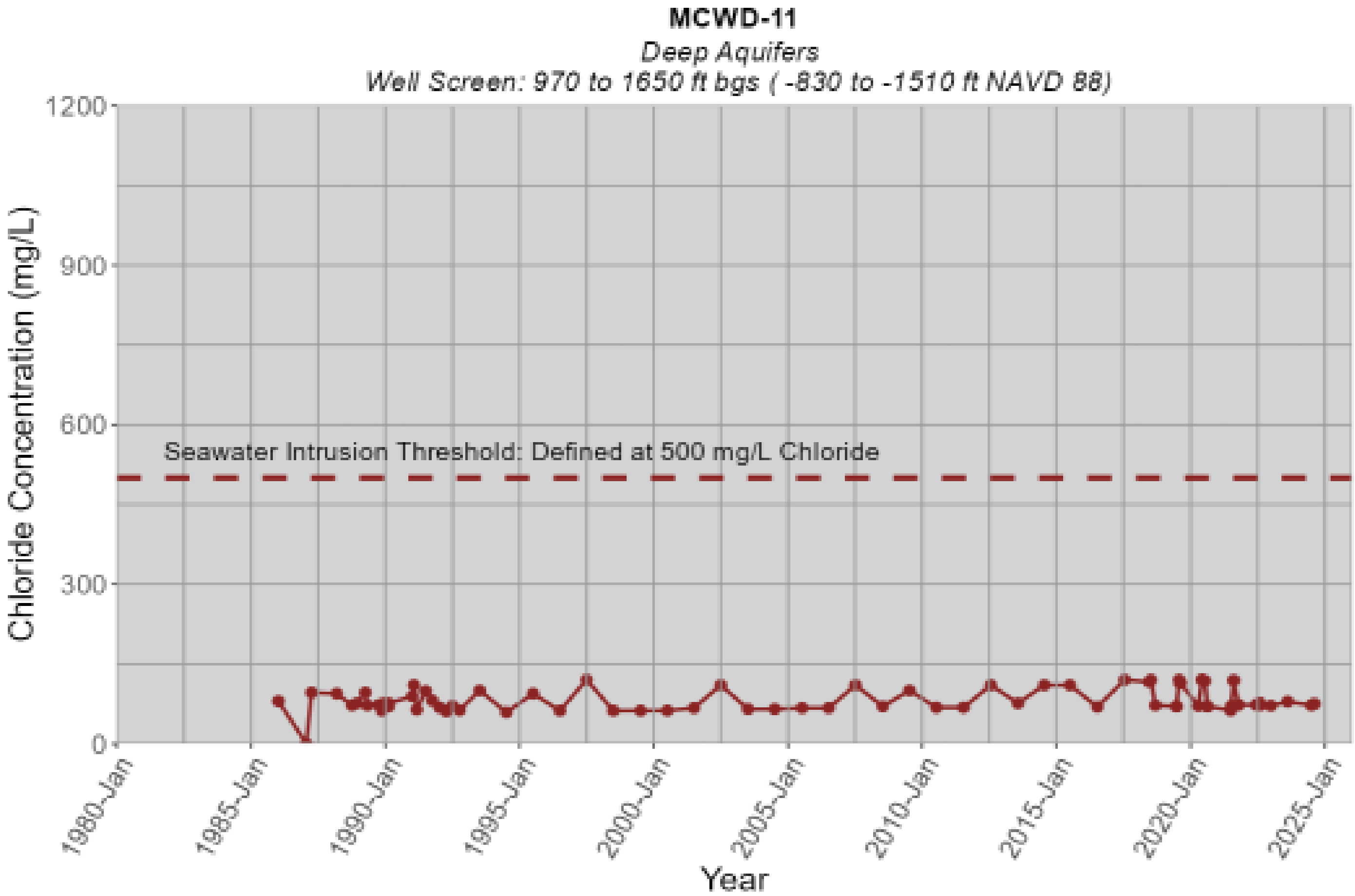
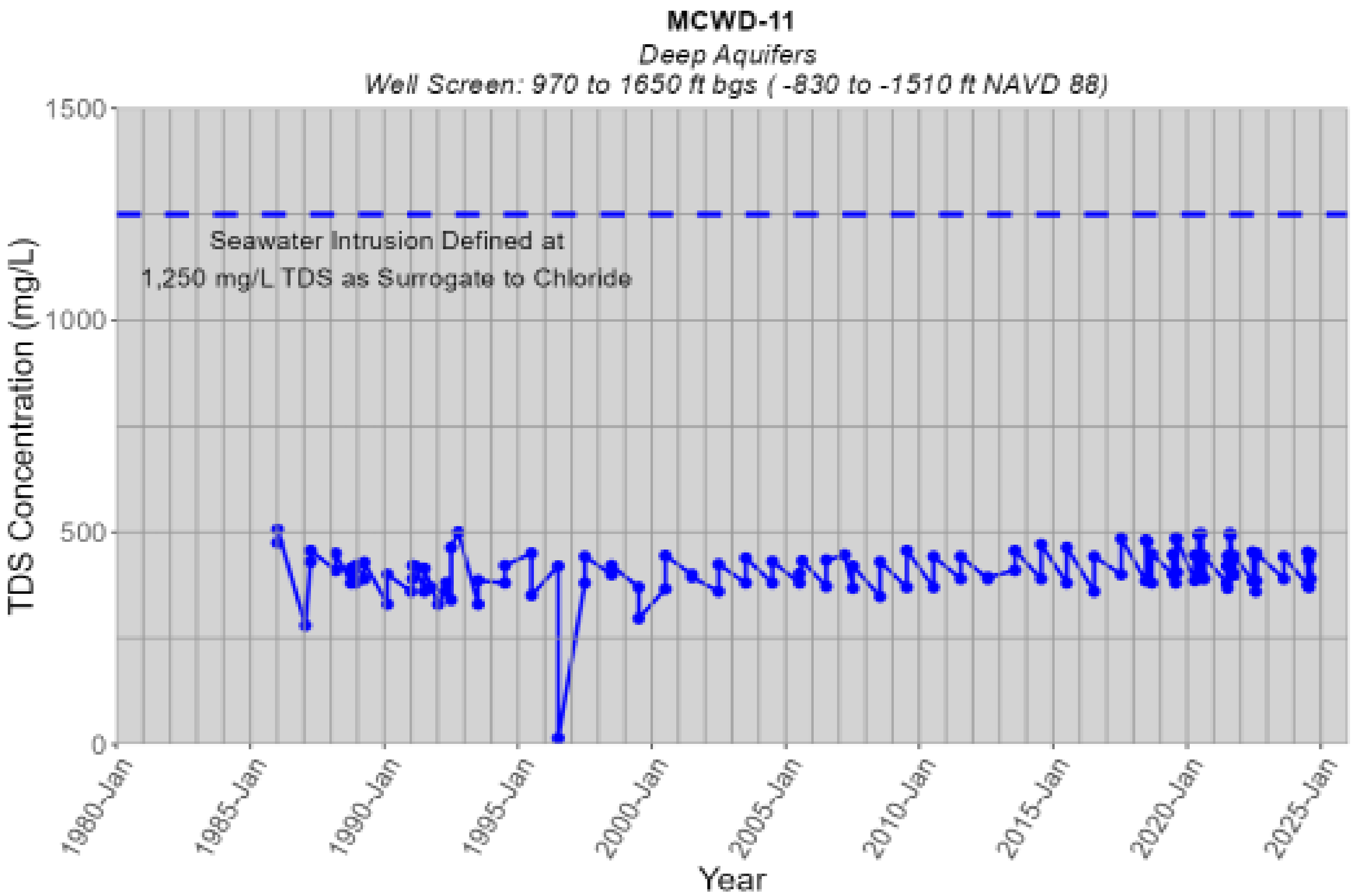



MCWD-10
Deep Aquifers
Well Screen: 930 to 1540 ft bgs (-770 to -1380 ft NAVD 88)
Chloride Concentration (mg/L)
1200
900
600
300
0
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

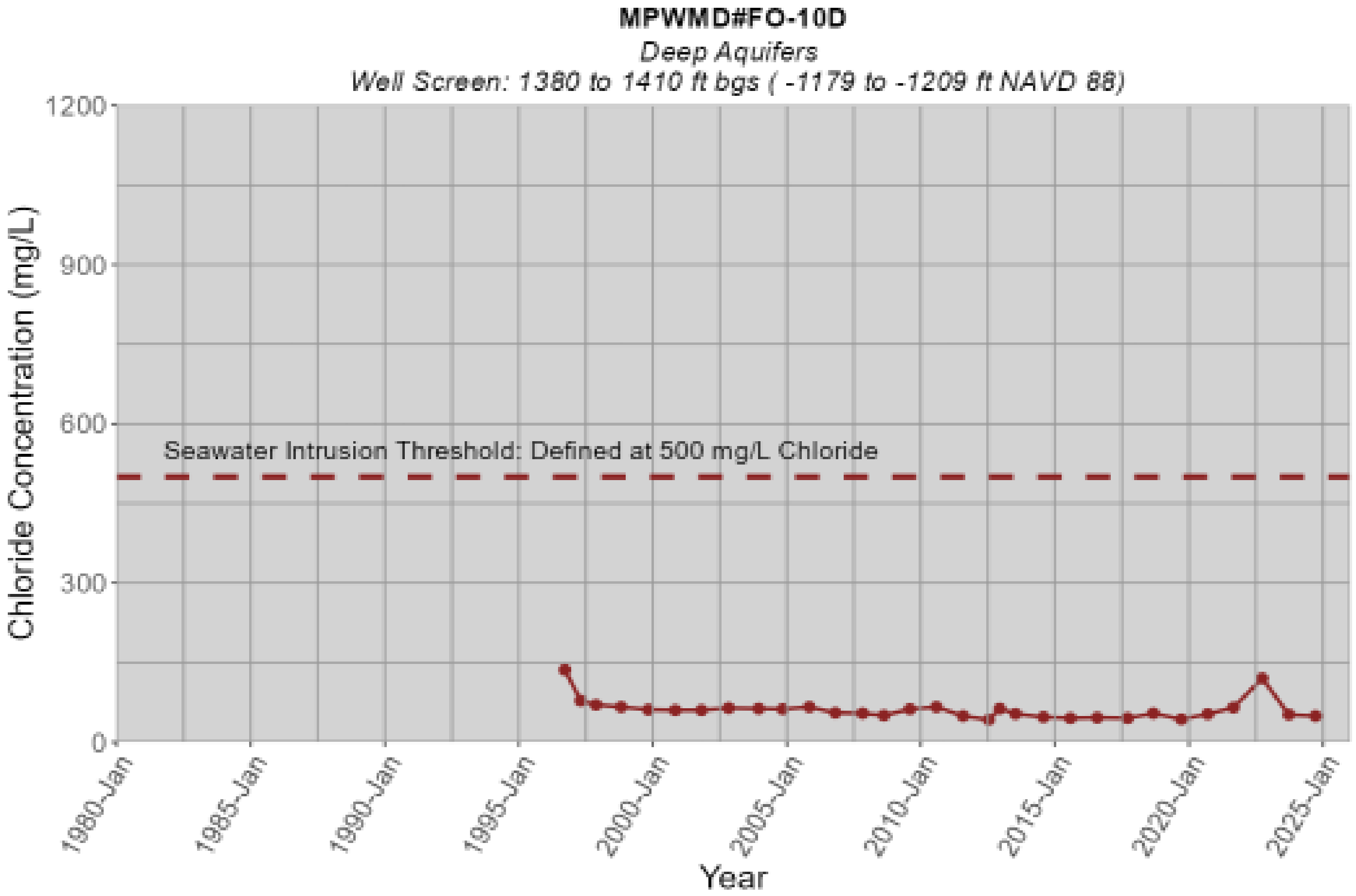

MCWD-10
Deep Aquifers
Well Screen: 930 to 1540 ft bgs (-770 to -1380 ft NAVD 88)
TDS Concentration (mg/L)
1500
1000
500
0
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

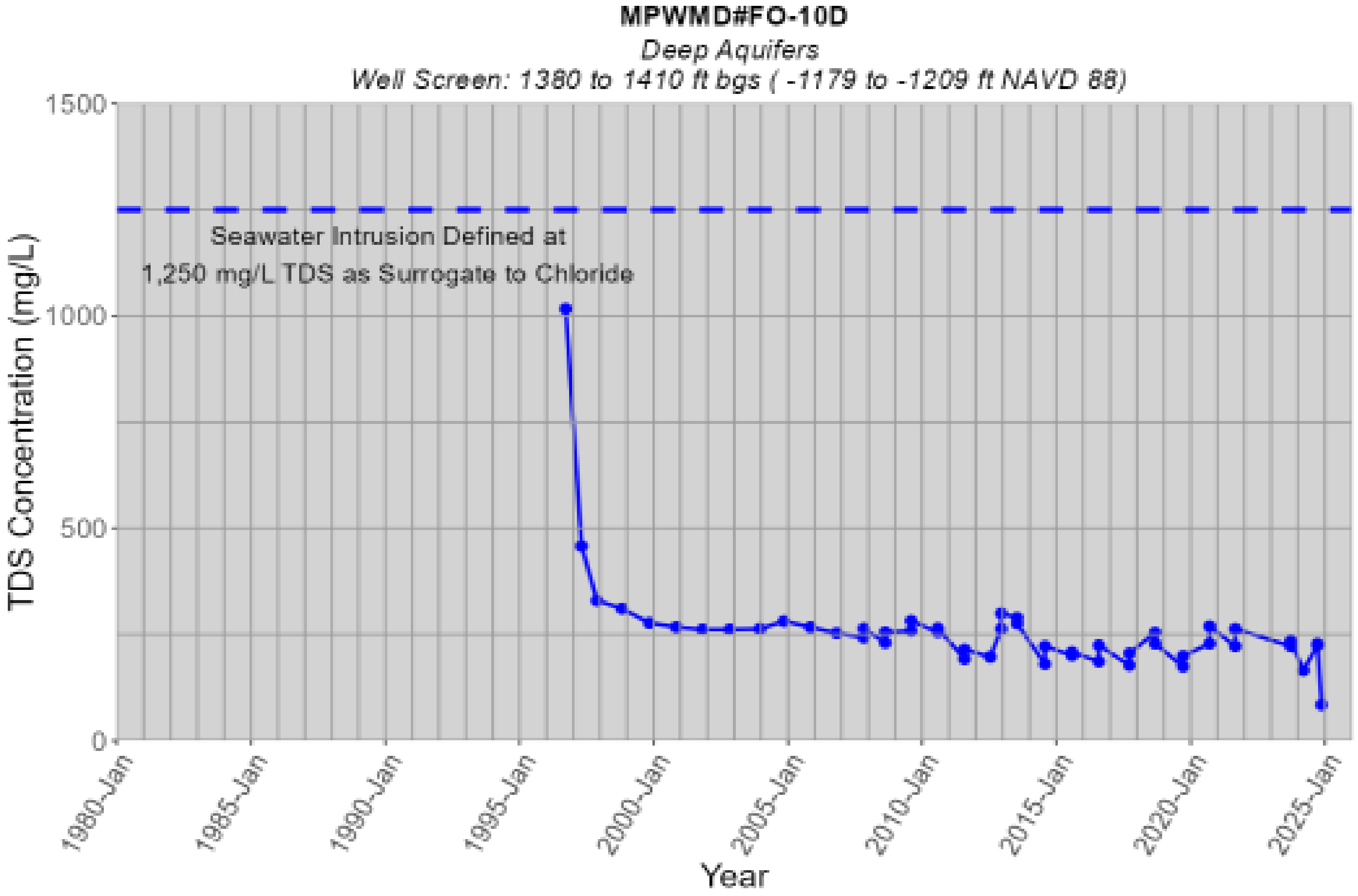


MCWD-11
Deep Aquifers
Well Screen: 970 to 1650 ft bgs (-830 to -1510 ft NAVD 88)
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
Chloride Concentration (mg/L)
0
300
600
900
1200
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

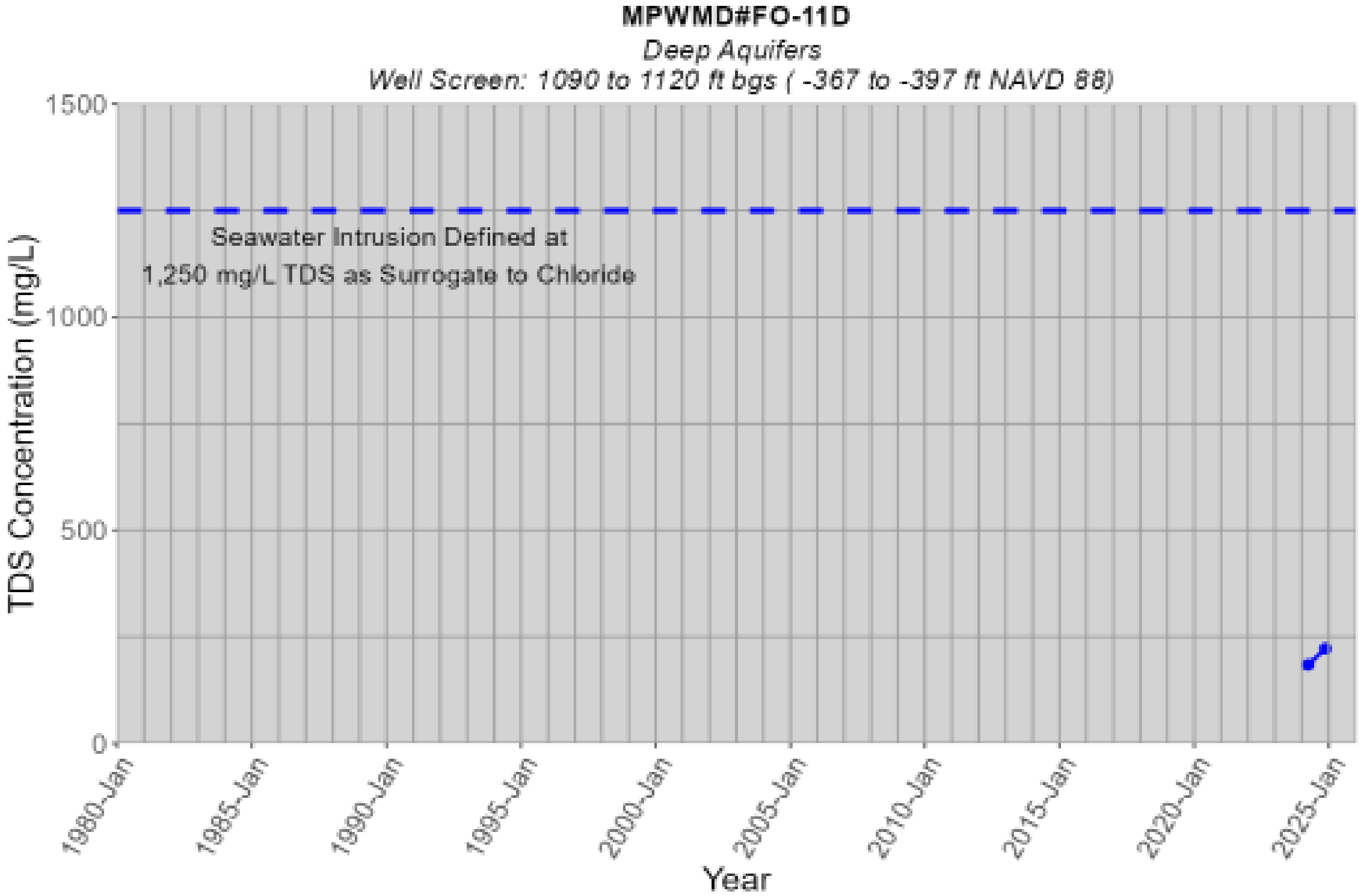


MCWD-11
Deep Aquifers
Well Screen: 970 to 1650 ft bgs (-830 to -1510 ft NAVD 88)
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
TDS Concentration (mg/L)
0
500
1000
1500
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year


MPWMD#FO-10D
Deep Aquifers
Well Screen: 1380 to 1410 ft bgs (-1179 to -1209 ft NAVD 88)
Chloride Concentration (mg/L)
0
300
600
900
1200
Seawater Intrusion Threshold: Defined at 500 mg/L Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year


MPWMD#FO-10D
Deep Aquifers
Well Screen: 1380 to 1410 ft bgs (-1179 to -1209 ft NAVD 88)
TDS Concentration (mg/L)
0
500
1000
1500
Seawater Intrusion Defined at
1,250 mg/L TDS as Surrogate to Chloride
1980-Jan
1985-Jan
1990-Jan
1995-Jan
2000-Jan
2005-Jan
2010-Jan
2015-Jan
2020-Jan
2025-Jan
Year

Chloride data for MPWMD#FO-11D is not available.



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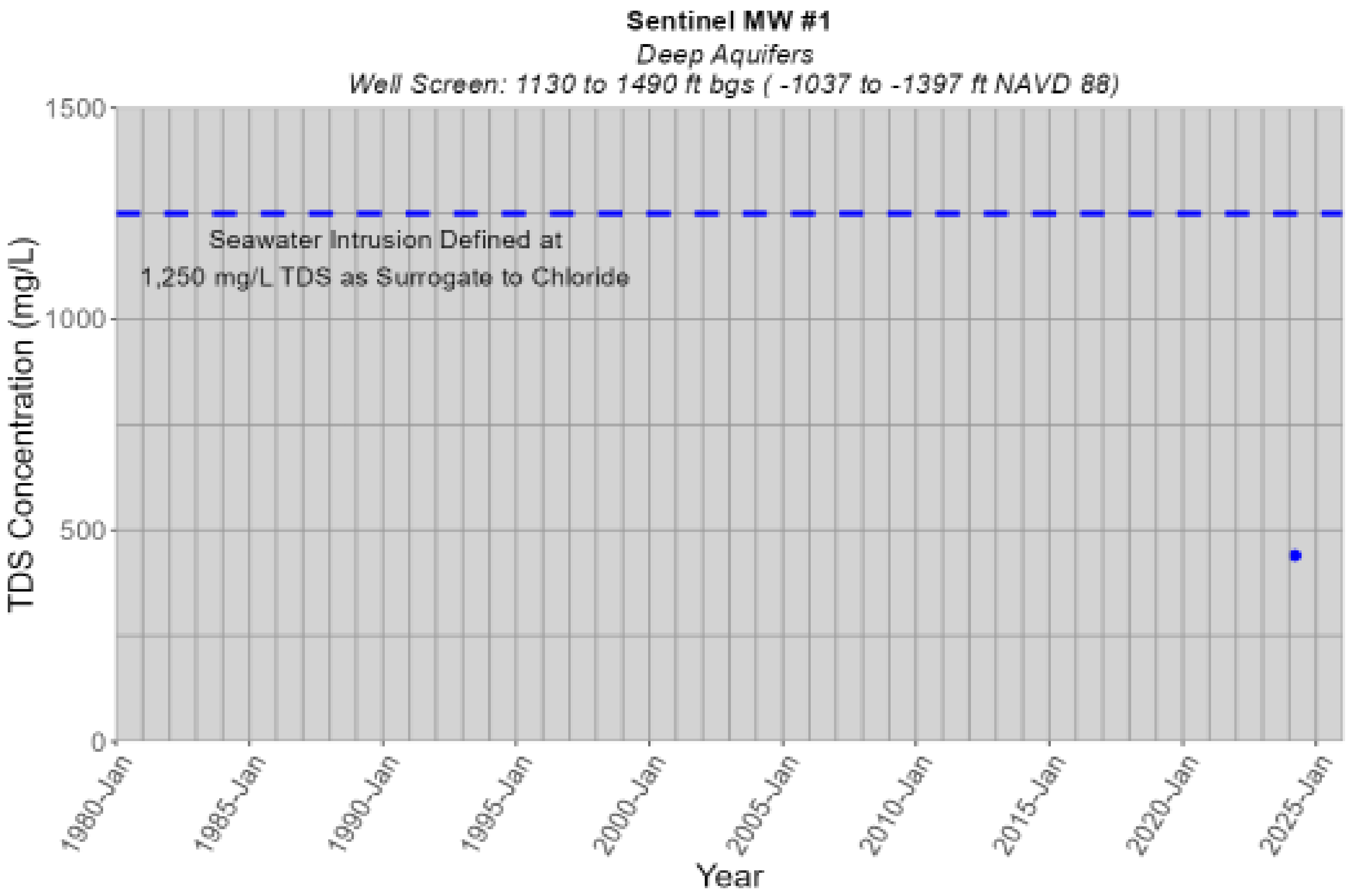

APPENDIX E

Technical Memorandum: FO-10 Nested Wells

Pneumatic Slug Tests

Corporate Office
2001 Junipero Serra Boulevard, Suite 300
Daly City, CA 94014
(650) 292-9100
ekiconsult.com

26 February 2025

MEMORANDUM

To: Patrick Breen, PE, Marina Coast Water District (MCWD)

From: Vera Nelson, PE, EKI Environment & Water, Inc. (EKI)
Jeff Shaw, PG, CHg, EKI
Tina Wang, PE, EKI
Nathan Cutler, EKI

Subject: FO-10 Nested Wells Pneumatic Slug Tests
Monterey County, CA
(EKI B60094.22)

INTRODUCTION

The work summarized in this technical memorandum addresses Task 3.2 of Monterey Subbasin Groundwater Sustainability Plan (GSP) implementation for the fiscal year 2024-2025. This work was undertaken to address a critical data gap identified during GSP implementation of the ongoing risk of additional seawater intrusion to the 400 Foot and Deep Aquifers, and the potential impact of nested monitoring well FO-10 as a source of hydraulic connectivity between the two aquifers.

Nested monitoring well FO-10, located in Seaside, California (**Figure 1**) consists of three nested wells installed in a single 1,500-foot borehole. FO-10 was constructed in 1996 by advancing a 17-inch diameter borehole to 285 feet below ground surface (bgs) and subsequently a 10-inch diameter borehole to total depth. Each of the well completions in FO-10 are constructed of 2-inch PVC, with 20-foot screened intervals. Well FO-10S (shallow) is completed in the Paso Robles Formation and screened from 620 to 640 feet bgs (believed to be within the 400 Foot Aquifer). Wells FO-10M (middle) and FO-10D (deep) are completed in the Santa Margarita Sandstone (Deep Aquifer), screened from 990 to 1010 feet bgs and 1380 to 1400 feet bgs, respectively. The original driller's log for nested well FO-10 is included as **Attachment A**.

Since at least 2020, the Seaside Watermaster has detected a sustained increase in chloride concentrations in samples from well FO-10S. In 2022 the Seaside Watermaster also detected an increase in chloride concentrations in samples from well FO-10D. Additionally, groundwater levels in wells FO-10S and FO-10D have been closely aligned since monitoring began soon after the nested wells were constructed (Montgomery & Associates, 2022). No record of chloride or water level monitoring at FO-10M is available.

Due to these observations, the Seaside Watermaster raised questions about the integrity of the nested well cluster. A review of results from induction logging conducted in 2021 and the original well construction field notes suggest that approximately 1,300 feet of 2-inch steel tremie pipe was lost in the borehole annular space during well construction (Feeney, 2022). The tremie pipe itself may be acting as a conduit of hydraulic connectivity between the screened intervals, and/or the position of the abandoned tremie pipe may have prevented successful continuous grouting of the borehole annular space between screened intervals. Given the uncertainty of the condition of the FO-10, the well owner, Monterey Peninsula Water Management District granted MCWD and EKI access to the wells to conduct hydraulic testing and assess the potential interconnectivity of aquifers occurring in the borehole. EKI designed and implemented a pneumatic slug testing program for the investigation.

METHODOLOGY

Overview

Pneumatic slug testing is a commonly preferred alternative to conventional slug testing for wells with fully saturated screens in highly transmissible formations due to the near instantaneous pressure release, or 'slug', the method permits. Additionally, the pneumatic method allows for greater hydraulic stress to be applied to the test well than with the solid slug method.

In this case, the slug test was not conducted with the typical objective of estimating aquifer parameters. Instead, the objective of the investigation was to qualitatively assess whether any of the three aquifer zones corresponding to the three well completion depths are hydraulically interconnected via the borehole. To best assess the integrity of nested well FO-10, the pneumatic method was selected to introduce the greatest possible hydraulic stress to the test well and avoid the potential false negative error of not observing a signal in observation well(s) if the stress introduced to the test well was too weak to propagate to other screened interval zones.

Equipment

A typical pneumatic slug test well-head assembly consists of a plug affixed over the top of the well casing with an air compressor and regulator, quick-release valve, and access port for instrumentation. The three FO-10 casing surface completions are very closely spaced, however, and standard equipment would not work in this case. To test the well, EKI constructed a valved custom well-head assembly using an internal expansion plug inserted into the top of the well casing to seal each test well casing.

The pneumatic slug testing configuration included:

- The custom well-head assembly
- Manual air pump
- Electric air compressor

Instrumentation used to collect test data included:

- Solinst Water Level Meter manual well sounder
- Three In-Situ Level TROLL 400 unvented pressure transducers
- One In-Situ Rugged Baro TROLL barometric pressure transducer

Test Procedure

The pneumatic slug testing was conducted on 21 January 2025. Two slug tests were conducted in each of wells FO-10S and FO-10D. During each test absolute pressure data were collected in the test well and in each of the other two observation wells at ½-second intervals. Barometric pressure was collected continuously throughout the duration of testing at 1-minute intervals.

The well FO-10S tests were conducted first, beginning with Test 1 at 11:15. The well FO-10D tests were conducted subsequently, with Test 1 starting at 12:50. All testing was completed by 14:20. Prior to the start of each slug test, the test well pressure transducer was affixed to a line, lowered to several feet below the static water level (SWL), and the line was tied to the bottom of the expansion plug bolt inside the casing. The plug was then expanded within the top of the well casing, sealing the test well casing from the atmosphere. During each test, the other two wells were used as observation wells, with pressure transducers deployed approximately 20 feet below SWL or deeper, using direct-read data cables.

Pressurization of the well casing for the FO-10S tests was completed using a manual air pump. The casing was pressurized for over 12 minutes for Test 1 and over 10 minutes for Test 2. The 'slug' was then initiated by opening the wellhead assembly ball-valve to release the air pressure in the casing. Recovery in the test well and response in the observation wells were observed and the subsequent test was set up.

To introduce greater pressure to the test well, an electric air compressor was used to pressurize the well casing for the FO-10D tests. The casing was pressurized for over 21 minutes for each test. The 'slug' and observations for the well FO-10D tests were conducted in the same manner as for the well FO-10S tests.

DATA PROCESSING

Following the completion of all tests, raw instrument data was processed in Microsoft Excel. Observation well absolute pressure data was barometrically compensated to account for atmospheric pressure difference throughout each test. Test well pressure data for the pressurization period was not barometrically compensated since after the test well casing was sealed for each test, no atmospheric pressure influence occurred. Test well recovery period data was barometrically compensated, although the impact of atmospheric pressure difference to the change in absolute pressure over this short period was near zero.

The convention for slug tests is to report normalized change in pressure head, however since the objective of the FO-10 slug tests was to assess the response of observation wells to the test well slugs, the real magnitude of change in pressure head is reported in this case. Processed data is reported in delta pressure head (feet of water), i.e. deviation of pressure head from pre-test static conditions (H(t)). Time is reported in minutes elapsed since the start of each test, or the onset of pressure introduced to the test well.

RESULTS

During each of the four slug tests a near-immediate response was observed in each of the observation wells at the onset of pressurization of the test well, and again when the test well was depressurized for the 'slug' initiation. The results between each of Tests 1 and 2 at the same test well yielded very similar responses in the observation wells, suggesting the results are reliable.

During slug testing of the shallow-screened well FO-10S, observed maximum delta pressure head in the test well were 7.58 and 7.86 feet during Test 1 and 2, respectively. Each of the FO-10S tests yielded a response in each of the observation wells FO-10M and FO-10D of at least 0.10 feet. Observation well pressure head responses commenced immediately as FO-10S was depressurized, and the maximum displacement occurred less than two minutes later.

During testing of the deep-screened well FO-10D, observed maximum delta pressure head in the test well were 54.27 and 56.17 feet during Test 1 and 2, respectively. Each of the well FO-10D tests yielded a response in each of the observation wells FO-10S and FO-10M of at least 0.97 feet. As with FO-10S, observation well pressure head responses commenced immediately as FO-10D was depressurized, and the maximum displacement occurred less than two minutes later.

Table 1 below summarizes the recovery in the test well and associated response in the observation wells during each depressurization 'slug' event.

Table 1: Summary of Slug Testing Results

Well	Screened Interval (feet, bgs)	Shallow Test 1	Shallow Test 2	Deep Test 1	Deep Test 2
		Maximum H(t) (feet of H_2O)	Maximum H(t) (feet of H_2O)	Maximum H(t) (feet of H_2O)	Maximum H(t) (feet of H_2O)
FO-10S	620-640	**7.58**	**7.86**	0.97	1.10
FO-10M	990-1010	0.10	0.11	1.60	1.27
FO-10D	1380-1400	0.14	0.15	**54.27**	**56.17**

Abbreviations:
bgs = below ground surface
H(t) = delta pressure head

Notes:
a. **Bold text** values indicate test well.
b. Maximum H(t) is maximum delta pressure head after depressurization of test well ('slug').

The plots of H(t) versus time for the well FO-10S tests are shown in **Figures 2** and **3**. Similar plots of H(t) versus time for the well FO-10D tests are shown in **Figures 4** and **5**. The respective A plots show data for all three wells, and the respective B plots show more detailed data with a condensed y-axis to show the relatively small magnitude of displacement in the observation wells. The initial positive delta pressure head observed on the plots corresponds to the pressurization period for each test. The subsequent rapid change in delta pressure head corresponds to the depressurization 'slug' response for each test.

The oscillation observed in the delta pressure head data during the pressurization period for the FO-10S tests was caused by the variable output from the manual air pump used for these tests. In each of the well

FO-10S Tests 1 and 2, the oscillatory response is also visible in the delta pressure head data for each observation well.

ANALYSIS

The slug test results suggest that all three of the aquifer zones screened by nested well FO-10 are hydraulically interconnected via the borehole. The responses observed in well FO-10M suggest that in addition to the tremie pipe, channelized voids in sealing materials also may provide conduits of hydraulic connectivity in the borehole annulus. The well casings at the surface nearly touch each other; if no spacers were used between the casing strings during well construction, a vertical channel may exist in much of the annular fill wherever two or more casings are in contact.

During the well FO-10S slug tests, observation well FO-10M had a lesser response than the more vertically distant observation well FO-10D. Conversely, during the well FO-10D slug tests, observation well FO-10M had a greater response than the more vertically distant observation well FO-10S. The response lag times also differed between the tests: during the well FO-10S test, the observation well responses occurred nearly simultaneously, however during the FO-10D tests the response in observation well FO-10M was slightly delayed compared to the response in observation well FO-10S. The mixed results suggest occurrence of both faster, direct hydraulic communication via the tremie pipe and more tortuous hydraulic communication via void space in the borehole annulus.

The rapid hydraulic responses in the observation wells to both pressurization and depressurization suggest that the responses are due to a compromised nested well that allows hydraulic communication between all screened intervals. An alternate hypothesis is that the induced hydraulic stress propagated from the upper to middle and lower screens outside of the borehole (i.e., within the native geologic media). To test this alternate hypothesis, EKI estimated the theoretical propagation time of the hydraulic response and compared it to the observed data.

The calculation was performed using the observed data from the well FO-10D Test 1. A conservative approach was used, specifically the following assumptions:

- Homogenous, sand-dominated aquifer encompassing wells FO-10D and FO-10M screened intervals and the entire thickness between them, without any confining units.
- High-end horizontal hydraulic conductivity for sand with any fines present (K_h): **100 ft/d**.
- Low hydraulic conductivity anisotropy ratio (K_h / K_v): **3**
- Low specific storage: **1 x 10^{-5} ft^{-1}**

To further constrain the theoretical propagation time, a second calculation was performed to estimate the propagation time through the clay unit recorded on the original well driller's log from 1035 to 1240 feet bgs, between the intervals screened by wells FO-10M and FO-10D. Again, a conservative approach was used for analysis parameters, specifically the following assumptions:

- High horizontal hydraulic conductivity for clay (K_h): **0.1 ft/d**.
- Low hydraulic conductivity anisotropy ratio (K_h / K_v): **3**

- Low specific storage: **1 x 10^{-5} ft^{-1}**

The equation for one-dimensional, linear vertical hydraulic diffusivity follows as Equation 1.

Equation [1] Vertical Hydraulic Diffusivity

$$D = K_v / S_s$$

where:

D = Hydraulic diffusivity [ft^2/d],
K_v = Vertical hydraulic conductivity [ft/d], and
S_s = Specific storage [ft^{-1}].

Assuming the FO-10 borehole annular space is effectively sealed and intact, theoretical propagation time was calculated from estimated hydraulic diffusivity (Wang, 2020), as demonstrated by Equation 2 below.

Equation [2] Hydraulic Disturbance Propagation Time from Hydraulic Diffusivity

$$t = x^2 / (2 * D)$$

where:

t = Propagation time [days],
x = Distance from source [ft], and
D = Hydraulic diffusivity [ft^2/d].

The propagation time was calculated for a hydraulic disturbance with origin at well FO-10D to reach well FO-10M, for the two scenarios: (a) assuming a homogenous sand aquifer, and (b) through the clay confining unit that appears to be present between the two screened intervals, based on the available driller's log. The propagation time represents the time required for the peak of the hydraulic disturbance to reach the distance, *x*. **Table 2** below summarizes the propagation time results.

Table 2: Summary of Theoretical Hydraulic Disturbance Propagation Times

Analysis	Kh (ft/d)	Kv (ft/d)	Ss (ft^{-1})	D (ft^2/d)	x (ft)	t (min)
Sand Aquifer	100	33	1.0 x 10^{-5}	3.3 x 10^6	370	**29.6**
Clay Aquitard	0.1	0.033	1.0 x 10^{-5}	3,300	205	**9,080**

Notes:
a. Propagation time, *t*, converted from days to minutes.

The theoretical propagation times suggest that even with a very permissive aquifer parameterization, the estimated time for the peak hydraulic disturbance from the 'slug' in well FO-10D to reach well FO-10M is over 29 minutes, far greater than the observed peak response of less than two minutes. The estimated time for the peak hydraulic disturbance to travel through the clay aquitard recorded on the drilling log is over 9,000 minutes, or over 6 days.

The theoretical results presented above do not support the alternative hypothesis that the borehole is competent and the response in observation wells is due to propagation of the hydraulic stress outside of the borehole through the geologic media. Thus, based on the available data, nested well FO-10 is compromised throughout its annular seals, and hydraulic or water quality data obtained historically or in the future are probably not representative of actual aquifer conditions. Additionally, the well appears to behave as a conduit, connecting different aquifer units and allowing movement of groundwater from zones of higher hydraulic head to zones of lower hydraulic head, which may potentially degrade water quality in the aquifers.

RECOMMENDATIONS

Available data indicate that the FO-10 nested monitoring well directly connects multiple aquifers and will continue to be a potential risk factor in spreading elevated chloride concentrations from the shallower aquifer, where seawater intrusion has been widely documented in the region, to the deeper aquifer zones. To prevent further hydraulic connection of the three aquifer zones screened by the FO-10 nested well and associated impairment to water quality, FO-10 should be decommissioned and destroyed.

Destruction of the FO-10 nested wells should be completed in general accordance with the California Department of Water Resources Monitoring Well Standards (Bulletin 74-90) Part III: Destruction of Monitoring Wells.[1] Due to the lost steel tremie pipe present in approximately 1,300 vertical feet of the borehole annulus, overdrilling and removal of all material in the borehole may not be feasible. However, to ensure proper sealing of void spaces that are likely present in the borehole, EKI recommends overdrilling to at least 200 feet bgs (the estimated top of the lost tremie pipe) prior to tremie grouting from the maximum depth reached by the drill string. Use of a rotosonic drilling technique may allow more effective overdrilling of the upper parts of the well. Other possible aids to improve well and vertical conduit destruction could be mechanical ripping of the deepest casing or puncturing it at regular intervals, or controlled explosives to breach the casing prior to grouting. The volume of grout placed into the borehole while sealing must be monitored to ensure a competent grout seal has been constructed. The County or local well authorities may have additional requirements for borehole destruction due to the complications of the condition of the FO-10 borehole.

In addition to well destruction, groundwater level and chloride concentration data from wells FO-10S and FO-10D should be removed from future evaluations of groundwater conditions in the area due to the potential misleading nature of data from the compromised borehole.

To address the new data gap in monitoring data with the removal of nested well cluster FO-10, a new monitoring well cluster should be constructed. EKI is currently in the process of supporting MCWD with

[1] Available at: https://water.ca.gov/Programs/Groundwater-Management/Wells/Well-Standards/Combined-Well-Standards/Monitoring-Destruction

contracting and permitting of two new well clusters, including developing well specifications for a well cluster near FO-10, as part of Task 4 of GSP implementation for the fiscal year 2024-2025.

Nested monitoring well FO-11, consisting of two nested wells with screened intervals from 700 to 730 feet bgs and from 1090 to 1120 feet bgs, respectively, does not display the same close alignment of water levels observed in well FO-10S and well FO-10D; however the two FO-11 wells do show similar short- and long-term trends. Given the similar construction, age, and potential for compromised well integrity, we recommend conducting a similar pneumatic slug test investigation at nested monitoring well FO-11.

List of Figures

Attachments

References

Feeney, M.B., 2022, *Addendum to Geophysical Investigation of Fort Ord Monitoring Well FO-10*, prepared for: Seaside Groundwater Basin Watermaster, April 5.

Montgomery & Associates, 2022, *Seaside Groundwater Basin 2022 Seawater Intrusion Analysis Report*, prepared for: Seaside Groundwater Basin Watermaster, November 23.

Wang, H.F., 2020, *Groundwater Storage in Confined Aquifers*, The Groundwater Project. https://books.gw-project.org/groundwater-storage-in-confined-aquifers/chapter/diffusion-equation/.

Legend

Nested Well Set FO-10

Notes

1. All locations are approximate.

Sources

1. Basemap is ESRI's ArcGIS Online world imagery, obtained 24 February 2025.

Location of Nested Well Set FO-10
4230 Gigling Rd, Seaside, California

Marina Coast Water District
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Marina, CA
February 2025
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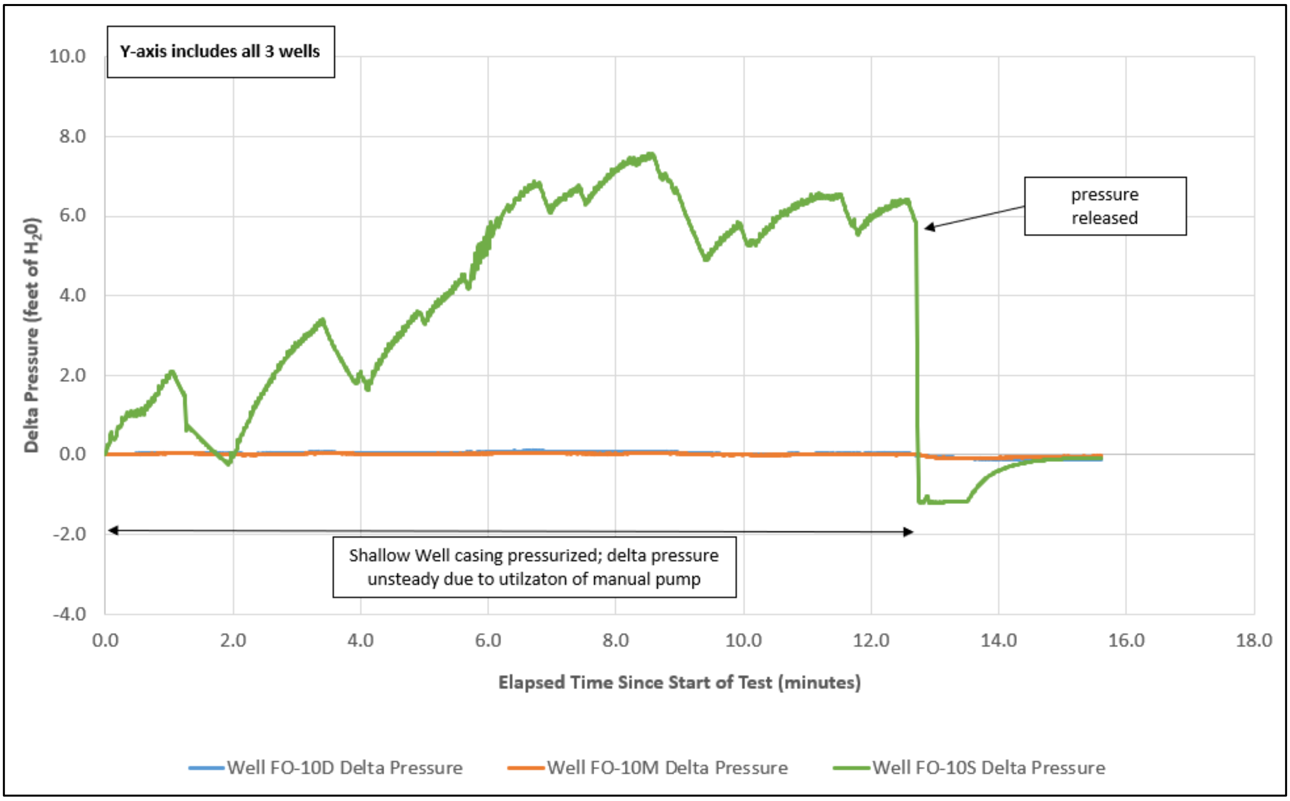
Figure 1

Path: X:\B60094\Maps\2025\02\FO-10_SlugTest_Figure.aprx

A



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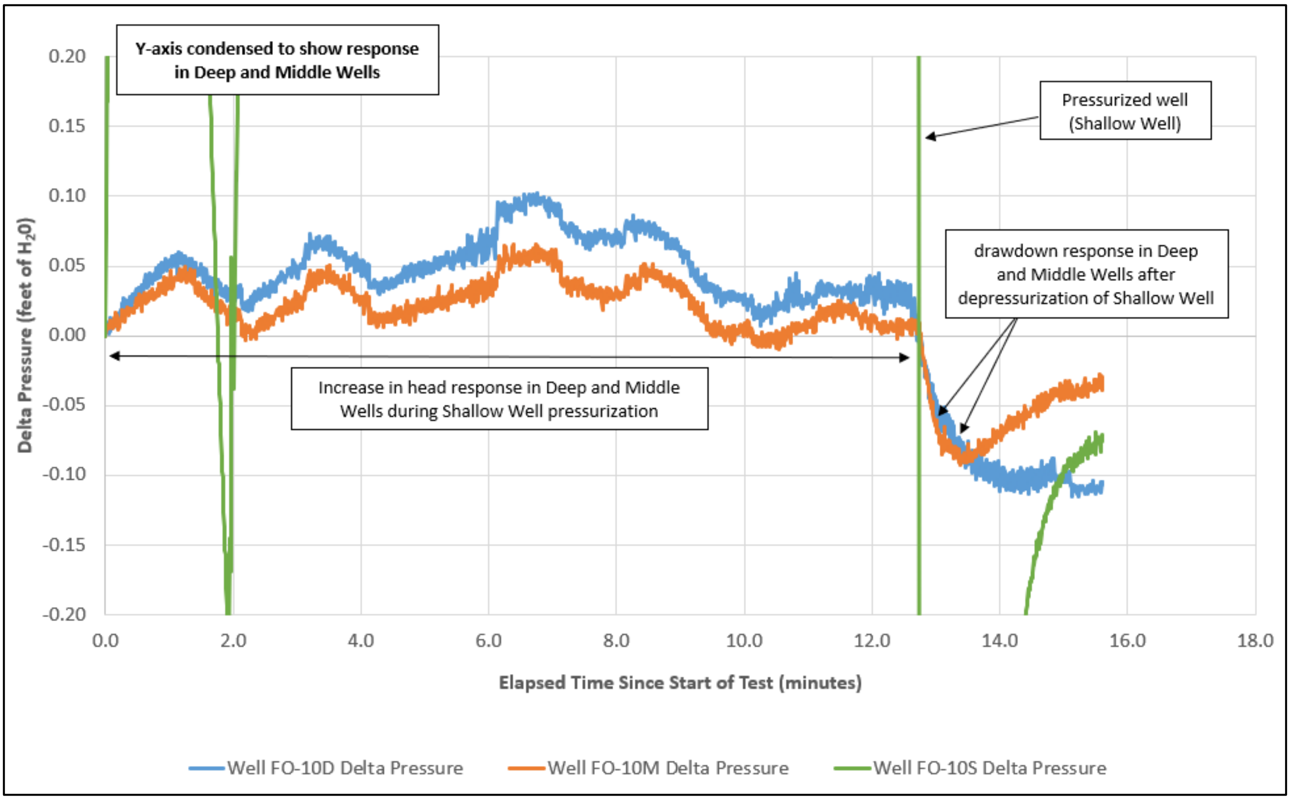

Notes

1. Pneumatic slug test conducted January 21, 2025.
2. Well FO-10S screened from 620 to 640 feet below ground surface (bgs); well FO-10M screened from 990 to 1010 feet bgs; well FO-10D screened from 1380 to 1400 feet bgs.

Well FO-10S, Slug Test #1

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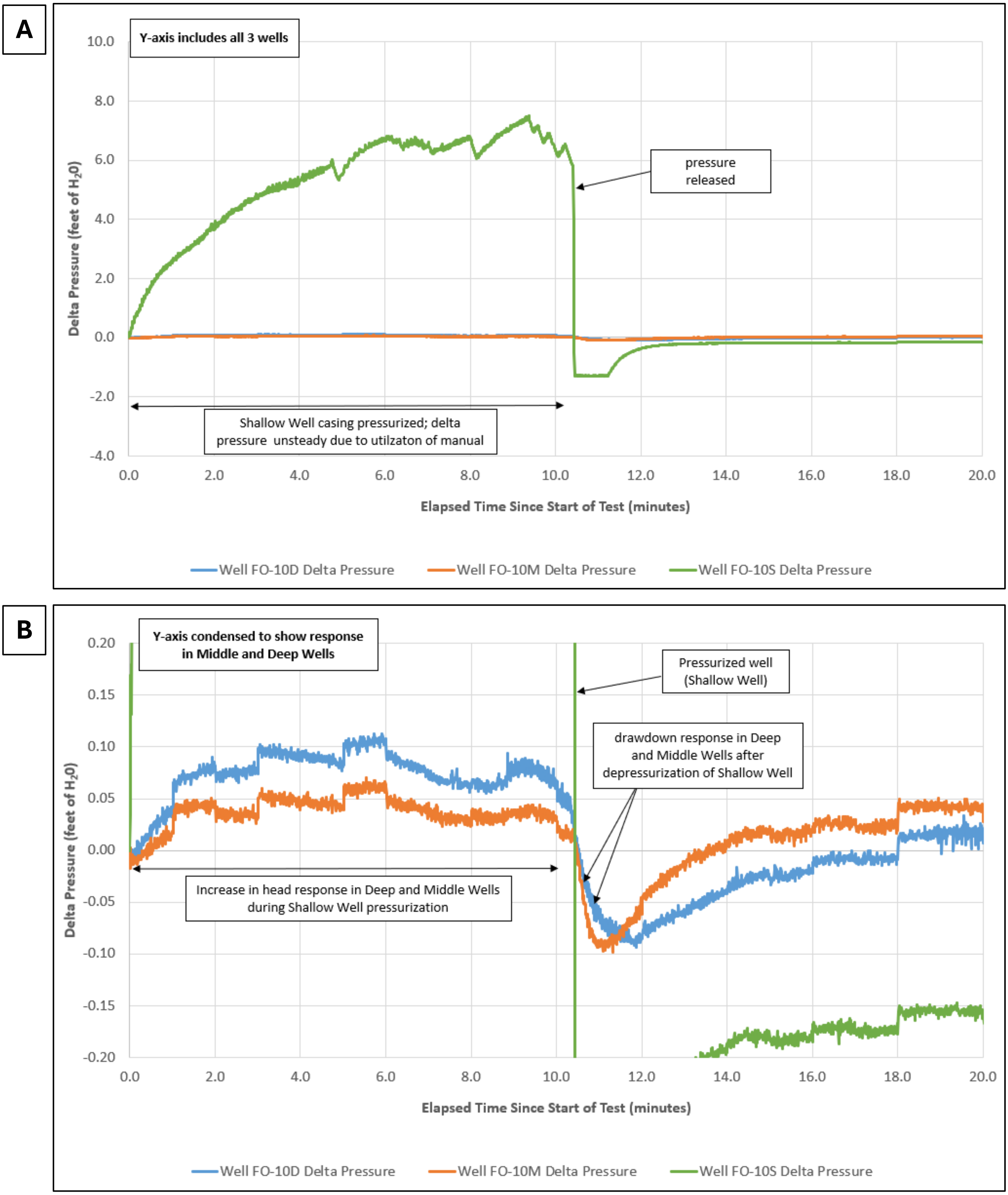
Figure 2



<u>Notes</u>

1. Pneumatic slug test conducted January 21, 2025.
2. Well FO-10S screened from 620 to 640 feet below ground surface (bgs); well FO-10M screened from 990 to 1010 feet bgs; well FO-10D screened from 1380 to 1400 feet bgs.

Well FO-10S, Slug Test #2

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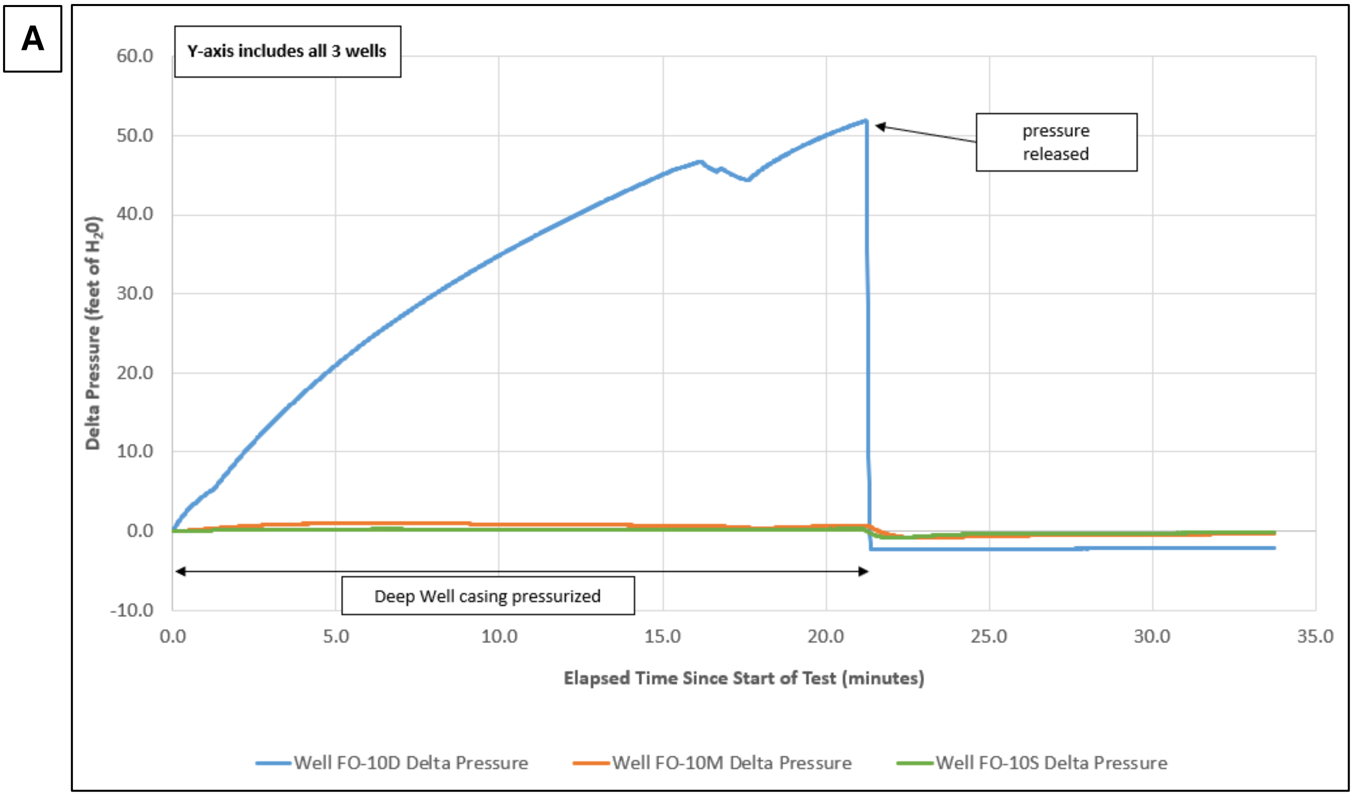
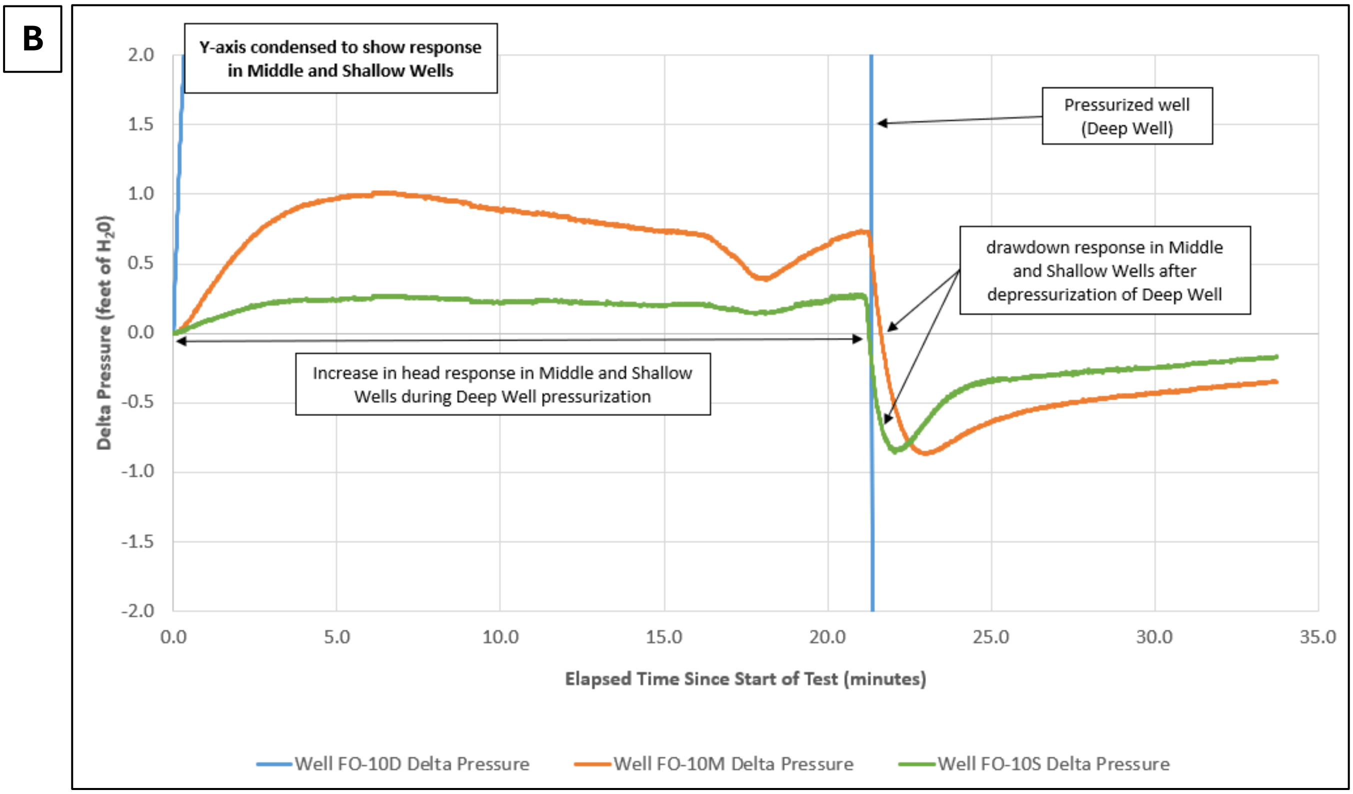
Figure 3





Notes
1. Pneumatic slug test conducted January 21, 2025.
2. Well FO-10S screened from 620 to 640 feet below ground surface (bgs); well FO-10M screened from 990 to 1010 feet bgs; well FO-10D screened from 1380 to 1400 feet bgs.

Well FO-10D, Slug Test #1

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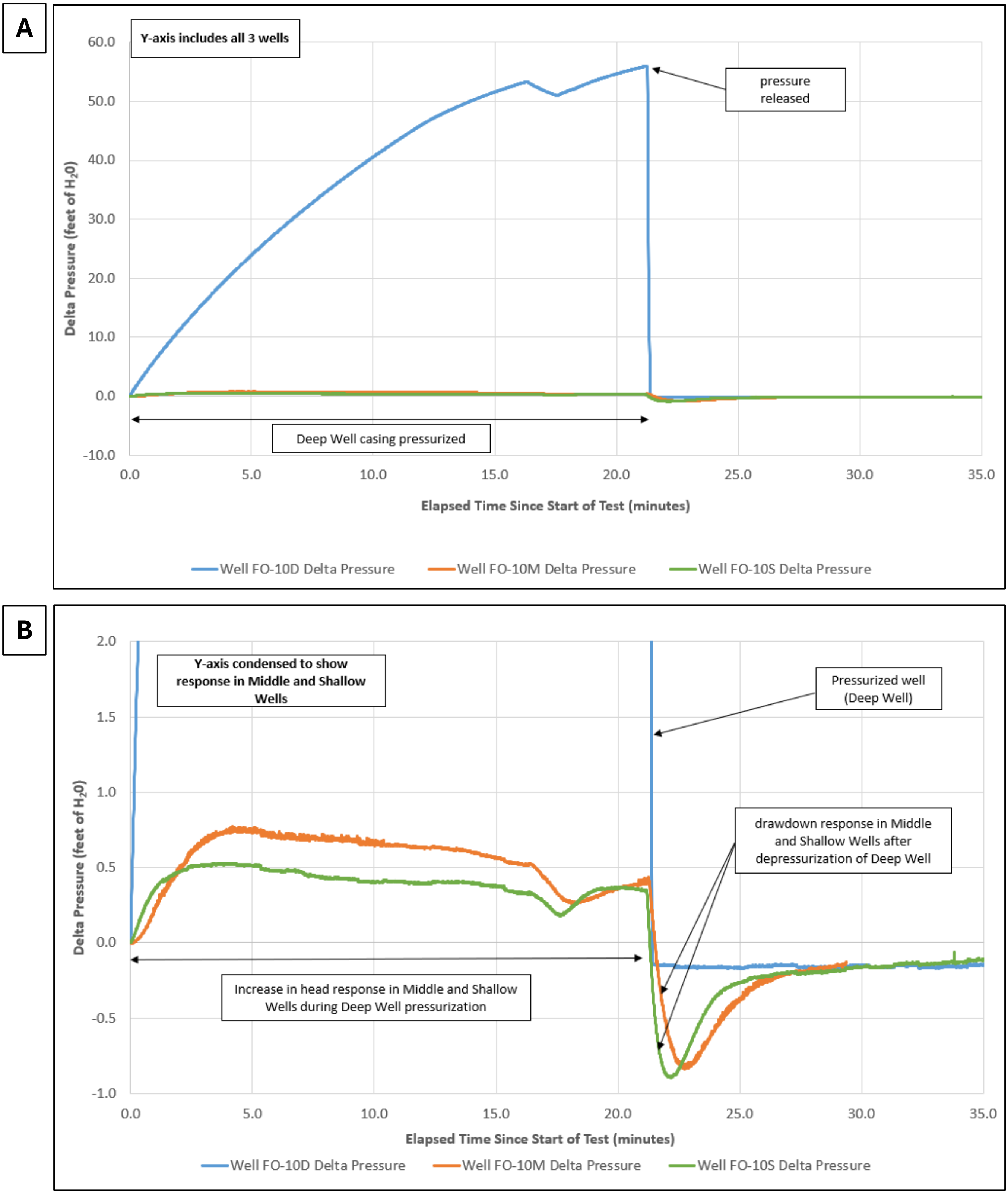
Figure 4



Notes

1. Pneumatic slug test conducted January 21, 2025.
2. Well FO-10S screened from 620 to 640 feet below ground surface (bgs); well FO-10M screened from 990 to 1010 feet bgs; well FO-10D screened from 1380 to 1400 feet bgs.

Well FO-10D, Slug Test #2

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Figure 5

ATTACHMENT A

FO-10 Nested Wells

Well Completion Report

MPWMD FO-10

JWO 10/97

QUADRUPLICATE
For Local Requirements

M.P.W.M.D. RECEIVED OCT 16 1997

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 442738

Page 1 of 1
Owner's Well No. FO-10
Date Work Began 07/30/96 Ended 08/21/96
Local Permit Agency COUNTY OF MONTEREY EHS
Permit No. WSOL 96-118 Permit Date 06/19/96

DWR USE ONLY — DO NOT FILL IN
15S01E12F
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DEPTH TO FIRST WATER 285 (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	215	YELLOW SANDY CLAY
215	265	BROWN SANDY CLAY
265	280	MEDIUM RED SAND
280	500	CLAY STREAKED WITH SAND
500	550	GREEN BROWN CLAY
550	605	COARSE SAND SHALE
605	670	BLUE CLAY
670	755	BROWN SANDY CLAY
755	790	BLUE SANDY CLAY
790	795	CHERT
795	895	COARSE WHITE SAND
895	910	BROWN SANDY CLAY
910	1035	BLUE SANDY CLAY
1035	1240	CLAY STREAKED WITH SAND
1240	1420	SAND WITH HARD STREAKS
1420	1500	CLAY STREAKED WITH SAND
		Casing Log (continued)
1010	1020	2" PVC Blank
+2	1380	2" PVC Blank
1380	1400	2" PVC Screen
1400	1410	2" PVC Blank
		Annular Material Continued
1300	1320	Cement Seal
1320	1430	8x16 Sand Pack
1430	1440	Cement Seal
1440	1500	8x16 Sand Pack

TOTAL DEPTH OF BORING 1500 (Feet)
TOTAL DEPTH OF COMPLETED WELL 1410 (Feet)

WELL OWNER

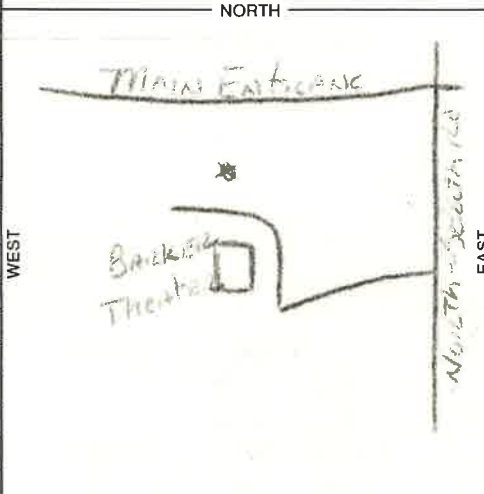
Name MPWMD
Mailing Address P.O. BOX 85
MONTEREY CA 93942
CITY STATE ZIP

WELL LOCATION

Address BEHIND BARKER THEATER
City PRESIDO ANEX
County MONTEREY
APN Book N\A Page ___ Parcel ___
or Township ___ Range ___ Section ___
or Latitude ___ DEG. MIN. SEC. NORTH Longitude ___ DEG. MIN. SEC. WEST

LOCATION SKETCH

NORTH



WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc.
PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (*Describe Procedures and Materials Under "GEOLOGIC LOG"*)

PLANNED USE(S) (✓)

X MONITORING
WATER SUPPLY
___ Domestic
___ Public
___ Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD MUD ROTARY FLUID BIO-POLYMER

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 0 (Ft.) & DATE MEASURED / /
ESTIMATED YIELD* 0 (GPM) & TEST TYPE ___
TEST LENGTH 0 (Hrs.) TOTAL DRAWDOWN 0 (Ft.)
** May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL/GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	285	17		Y			STEEL	10.2	.188	
+2	620	10	Y				PVC	02.0	SCH40	
620	640	10		Y			"	02.0	"	32
640	650	10	Y				"	02.0	"	
+2	990	10	Y				"	02.0	"	
990	1010	10		✓			"	02.0	"	32

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	Y			
50	400				8 X 16
400	500	Y			
500	800				8 X 16
800	900	Y			
900	1300				8 X 16

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME CHAPPELL PUMP & SUPPLY
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

585 LAS ANIMAS AVE, GILROY, CA, 95020
ADDRESS CITY STATE ZIP

Signed John C. Fields 12/15/96 647140
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 7-90

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM