MADERA SUBBASIN

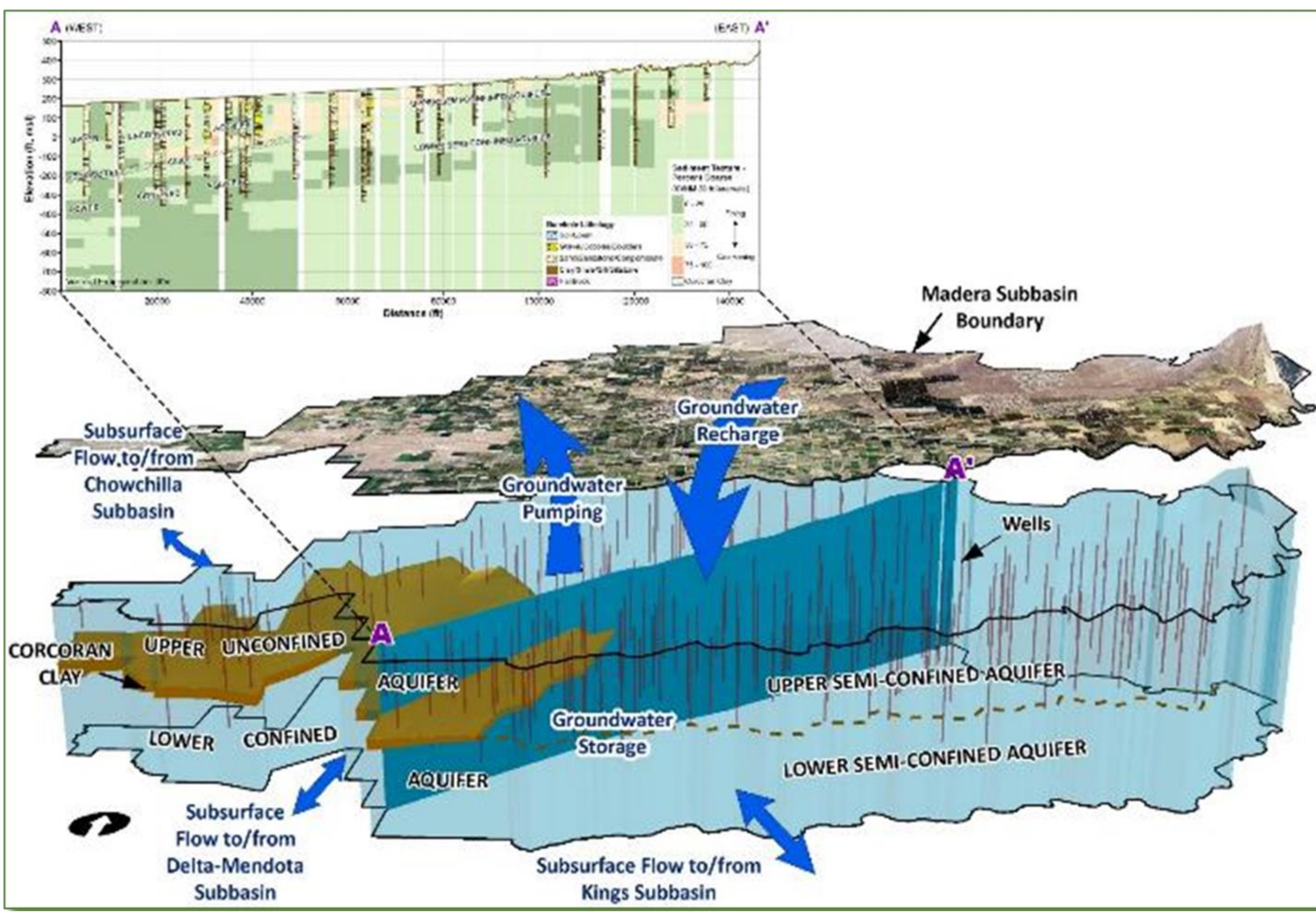
Sustainable Groundwater Management Act (SGMA)

Annual Report

April 2022

Prepared by

Davids Engineering, Inc
Luhdorff & Scalmanini



Madera Subbasin Joint
Groundwater Sustainability Plan (GSP)

2022 Joint GSP Annual Report

For Water Year 2021
(October 2020 – September 2021)

April 2022

Prepared For

City of Madera GSA
Madera County GSA – Madera
Madera Irrigation District GSA
Madera Water District GSA

Prepared By

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List of Abbreviations

AF	acre-feet
AG	Agricultural Land
AGR	agricultural supply
AN	above normal
AWMPs	Agricultural Water Management Plans
AWS	Automatic Weather Stations
BMP	Best Management Practice
BN	below normal
C	critical
C2VSim	California Central Valley Groundwater-Surface Water Simulation Model
C2VSim-CG	coarse-grid version of C2VSim, Version R374
C2VSim-FG	fine-grid version of C2VSim
CCP	Consensus and Collaboration Program at California State University, Sacramento
CCR	California Code of Regulations
CDEC	California Data Exchange Center
cfs	cubic feet per second
CIMIS	California Irrigation Management Information System
CM	City of Madera
CSUS	California State University, Sacramento (Consensus and Collaboration Program)
CVHM	Central Valley Hydrologic Model
CVP	Central Valley Project
CWC	California Water Code
CWD	Chowchilla Water District
D	dry
DDW	Division of Drinking Water
DE	Davids Engineering
DMS	Data Management System
DQO	data quality objectives
DTW	depth to water
DWR	California Department of Water Resources
EFH	Essential Fish Habitat
ERA	ERA Economics, LLC
ET	evapotranspiration
ET_a	actual ET
ET_{aw}	ET of applied water
ET_c	crop ET
ET_o	grass reference ET
ET_{pr}	ET of precipitation
ET_r	alfalfa reference ET
ET_{ref}	reference crop evapotranspiration
eWRIMS	Electronic Water Rights Information Management System
Flood-MAR	Flood Managed Aquifer Recharge
FTE	full-time-equivalent
GAMA	Groundwater Ambient Monitoring and Assessment
GDEs	groundwater dependent ecosystems
GFWD	Gravelly Ford Water District
GIS	geographic information system
GMP	Groundwater Management Plan
GRF	Gravelly Ford
GSA	Groundwater Sustainability Agencies
GSP	Groundwater Sustainability Plan
GWE	Groundwater Elevation
GWS	Groundwater system
HCM	hydrogeologic conceptual model

HGL	hydraulic grade line
IDC	Integrated Water Flow Model Demand Calculator
iGDEs	indicators of GDEs
ILRP	Irrigated Lands Regulatory Program
IND	industrial service supply
IWFM	Integrated Water Flow Model
K	hydraulic conductivity
K_h	horizontal hydraulic conductivity
K_v	vertical hydraulic conductivity
LDC	Little Dry Creek
LSCE	Luhdorff & Scalmanini Consulting Engineers
MA	management actions
maf	millions of acre-feet
MC	Madera County
MCL	maximum contaminant level
MCDEH	Merced County Department of Public Health, Division of Environmental Health
MCWPA	Madera-Chowchilla Water and Power Authority
Merced	Merced Irrigation District
mg/L	milligrams/liter
MID	Madera Irrigation District
MO	measurable objectives
MSL	mean sea level
MT	minimum thresholds
MUN	Municipal and domestic supply
MWD	Madera Water District
MWELO	Model Water Efficient Landscape Ordinance
NASA-JPL	National Aeronautics and Space Administration Jet Propulsion Laboratory
NCCAG	Natural Communities Commonly Associated with Groundwater
NOAA NCEI	National Oceanic and Atmospheric Administration National Centers for Environmental Information
NSWD	New Stone Water District
NTP	notice to proceed
NV	Native Vegetation Land
NWIS	National Water Information System
O&M	operation and maintenance
ORP	oxidation-reduction potential
pCi/L	picocuries per liter
PRO	industrial process supply
PV	Present Value
Q_b	Quaternary flood-plain deposits
QT_{cd}	Quaternary continental rocks and deposits
RCWD	Root Creek Water District
redox	reduction-oxidation
RFP	Request for Proposals
RH	relative humidity
RMS	Representative monitoring sites
RPE	Reference Point Elevation
R_s	solar radiation
SAGBI	Soil Agricultural Groundwater Banking Index
SB	Senate Bill
SCADA	Supervisory Control and Data Acquisition
SCS	USDA Soil Conservation Service (renamed Natural Resources Conservation Service)
SCS-CN	SCS curve number
SEBAL	Surface Energy Balance Algorithm for Land
SGMA	Sustainable Groundwater Management Act of 2014
SJRRP	San Joaquin River Restoration Program

SJV	San Joaquin Valley
SLDMWA	San Luis Delta-Mendota Water Authority
SMC	Sustainable Management Criteria
SOPs	Standard Operating Procedures
SS	Stillwater Sciences
SWRCB	State Water Resources Control Board
SWS	surface water system
Sy	specific yield
T	transmissivity
T_a	air temperature
TAF	thousand acre-feet
TDS	total dissolved solids
TM	Technical Memorandum
TMWA	Truckee Meadows Water Authority
UR	Urban Land
USACE	U.S. Army Corps of Engineers
USBR or Reclamation	United States Bureau of Reclamation
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	United States Geological Survey
UWMPs	Urban Water Management Plans
W	wet
WCRs	well completion reports
WDL	Water Data Library
W_s	wind speed
WYI	Water Year Index
YCWA	Yuba County Water Agency
Yield	net groundwater benefit
µg/L	micrograms per liter

Introduction

The California Code of Regulations Title 23 (23 CCR) §356.2 requires that Annual Reports be submitted to the California Department of Water Resources (DWR) by April 1 of each year following the adoption of the Groundwater Sustainability Plan (GSP). This Annual Report is the third Annual Report for the Madera Subbasin Joint GSP, which is required to be submitted to DWR by April 1, 2022.

The 2022 Annual Report for the Madera Subbasin Joint GSP has been developed in compliance with all of the requirements of 23 CCR §356.2. This Annual Report describes GSP implementation efforts through April 2022 and conditions in the Madera Subbasin within the area managed pursuant to this Joint GSP. This area is covered by the four GSAs that prepared the Joint GSP: City of Madera (CM) GSA, Madera County (MC) GSA – Madera, Madera Irrigation District (MID) GSA, and Madera Water District (MWD) GSA. These GSAs are referred to herein as the Joint GSP GSAs.

This Annual Report does not summarize the conditions within the areas managed by the other GSAs in the Madera Subbasin that elected to develop and implement individual GSPs. Please refer to the Annual Reports prepared by Gravelly Ford Water District (GFWD) GSA, New Stone Water District (NSWD) GSA, and Root Creek Water District (RCWD) GSA for a description of the conditions and GSP implementation efforts within each of their jurisdictional areas.

This Annual Report provides basic information about the Joint GSP plan area and presents technical information from water year 2015 (after the end of the historical water budget period) through the current reporting water year (2021) (23 CCR §356.2.b.5.B) including:

- Groundwater elevation data from monitoring wells
- Contour maps and hydrographs of groundwater elevations
- Total groundwater extractions
- Surface water supply used, including for groundwater recharge or other in-lieu uses
- Total water use
- Change in groundwater storage
- Progress towards implementing the Joint GSP

Groundwater elevation, groundwater extraction, surface water supply, and groundwater storage are summarized for the Joint GSP plan area, while progress towards implementing the GSP is described for each GSA. The DWR water year ends on September 30th of the named year and begins on October 1st of the previous year; therefore, the period covered by this Annual Report is October 1, 2020 through September 30, 2021. The structure for the Annual Report generally follows the structure of the requirements outlined in 23 CCR §356.2. Additionally, the Joint GSP GSAs have elected to include information on groundwater recharge and evapotranspiration to emphasize the importance of these two data sets.

Also included with this Annual Report are appendices that contain groundwater maps and hydrographs that must be submitted with each Annual Report and recommendations for

stakeholder communication and engagement during GSP implementation. The following appendices are located at the end of this Annual Report:

- Appendix A. Contour Maps of the Different Aquifer Units.
- Appendix B. Hydrographs of Time-Series Groundwater Level Data for Groundwater Level RMS Wells.
- Appendix C. Maps of Change in Groundwater Levels and Change in Groundwater Storage in 2016 through 2020, Separated by Principal Aquifer.
- Appendix D. Stakeholder Communication and Engagement During Groundwater Sustainability Plan (GSP) Implementation: Recommendations.
- Appendix E. Status of Monitoring Efforts for RMS Wells in Madera Subbasin.

Executive Summary (§356.2.a)

In January 2020, the Joint GSP GSAs in the Madera Subbasin collectively adopted and submitted the Madera Subbasin Joint GSP, fulfilling the requirements established under SGMA. Coordinated implementation of the Joint GSP is now underway, together with the three individual GSPs adopted by other agencies in the Madera Subbasin (**Table ES-1**). The full extent of the Madera Subbasin is covered by these four GSPs (**Figure ES-1**). Approximately 94% of the Madera Subbasin area is covered by the Joint GSP GSAs, while the remaining 6% of the Madera Subbasin area is covered by the three individual GSAs[1]. These GSPs will collectively result in sustainable operation of the Madera Subbasin by 2040.

Following adoption of the GSP, 23 CCR §356.2 requires that GSAs submit Annual Reports to DWR by April 1 of each year to document the progress made in GSP implementation. This Annual Report is the third Annual Report for the Madera Subbasin Joint GSP. In accordance with GSP Regulations, this Annual Report summarizes groundwater conditions and water use in the Joint GSP area, as well as the progress that has been made to implement projects and management actions and achieve interim milestones established in the Joint GSP. Key data sources and findings of each section are summarized below for water year 2021, and described in further detail in the associated Annual Report section.

Table ES-1. Coordination of Madera Subbasin Groundwater Sustainability Plans and Annual Reports.

<table>
<tr><th>Groundwater Sustainability Agency</th><th>Coordinating Body</th><th>Groundwater Sustainability Plan and Annual Report Type</th></tr>
<tr><td>City of Madera</td><td rowspan="7">Madera Subbasin Coordination Workgroup</td><td rowspan="4">Joint GSP and Joint Annual Reports</td></tr>
<tr><td>Madera County</td></tr>
<tr><td>Madera Irrigation District</td></tr>
<tr><td>Madera Water District</td></tr>
<tr><td>Gravelly Ford Water District</td><td>Individual GSP and Annual Reports</td></tr>
<tr><td>Root Creek Water District</td><td>Individual GSP and Annual Reports</td></tr>
<tr><td>New Stone Water District</td><td>Individual GSP and Annual Reports</td></tr>
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[1] In 2020 GFWD annexed 390 acres and removed 412 acres that were annexed to Madera ID.

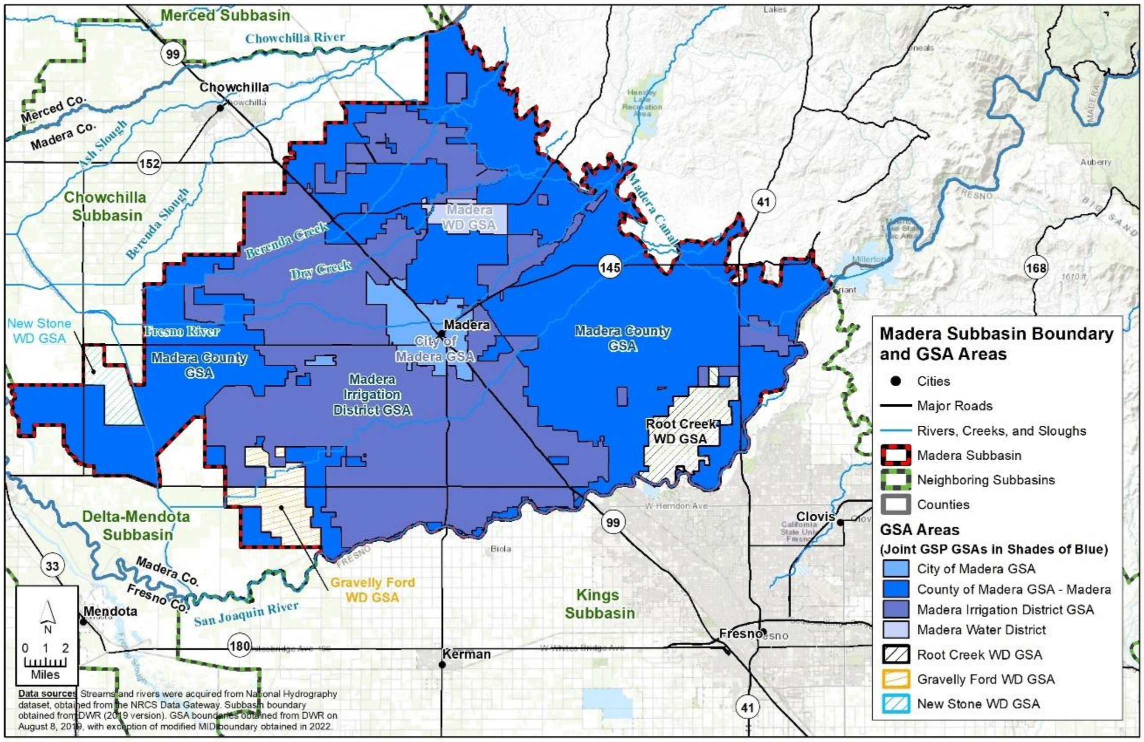

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Figure ES-1. Map of Madera Subbasin Joint GSP GSAs.

Groundwater Elevations (§356.2.b.1)

Groundwater level monitoring and groundwater elevations are described in **Section 1.1** of this Annual Report. Groundwater level monitoring data was assembled from publicly available and GSA-related sources for the historical period through water year 2021 (October 2020 to September 2021) and for the Fall 2021. Data was collected from various entities, including: MID, MC, CM, MWD, DWR, USBR, Geotracker GAMA, and CASGEM (the Madera-Chowchilla Groundwater Monitoring Group).

The GSAs conducted groundwater level monitoring in representative monitoring site (RMS) wells in Spring 2021 and Fall 2021 to evaluate seasonal high and low groundwater level conditions, respectively. During Spring 2021, groundwater elevations at available RMS wells in the Madera Subbasin ranged from -69.3 ft AMSL to 377.65 ft AMSL (mean groundwater elevation of 40 ft AMSL). During Fall 2021, groundwater elevations at available RMS wells in the Madera Subbasin ranged from -99.5 ft AMSL to 122 ft AMSL (mean groundwater elevation of 7 ft AMSL). Despite

attempts at measurement, some RMS water level data were not available in 2021 due to continued challenges encountered during implementation of the RMS monitoring program. Additional information on these challenges is provided in **Section 7.3** and **Appendix E** of this Annual Report.

Groundwater Elevation Contour Maps (§356.2.b.1.A)

Groundwater elevation contour maps are described in **Section 1.2** and shown in **Appendix A** of this Annual Report. Spring and fall groundwater elevation contour maps were prepared for 2021. Spring contours are intended to generally represent seasonal high groundwater levels, while fall contours are intended to represent seasonal low groundwater levels. Data was assembled from all known and available groundwater level information in the Joint GSP area, including from public sources, local GSAs, and other local entities.

In summary, general patterns seen in the Spring 2021 and Fall 2021 groundwater elevation contour maps are similar to patterns observed in earlier spring and fall time periods. In the Upper Aquifer and undifferentiated unconfined groundwater zone, spring and fall contours generally show higher groundwater elevations near the San Joaquin River with groundwater flow to the north-northwest to a broad depression located in the north-central portion of Madera Subbasin. In the Lower Aquifer (within the extent of the Corcoran Clay), spring and fall contours generally show higher groundwater elevations in the southeast and lower groundwater elevations in the northwest. In both aquifers, the fall groundwater level elevations are generally lower than those observed in the spring.

Groundwater Hydrographs (§356.2.b.1.B)

Groundwater hydrographs are described in **Section 1.3** and shown in **Appendix B** of this Annual Report. All available groundwater level monitoring data were used to prepare groundwater hydrographs for all years spanning the period from January 1, 2015 through the end of 2021. Between 2015 and 2021, the hydrographs for many RMS wells show varying degrees of groundwater level decline, while groundwater levels at other RMS wells remain generally stable. It is noted that some wells recorded a lower groundwater elevation in Fall 2021 than was observed in previous years.

Groundwater Extractions (§356.2.b.2)

Groundwater extractions are summarized in **Section 3** of this Annual Report. Groundwater extraction in the Joint GSP area was either measured directly from flowmeters or estimated using a water budget that provides a complete accounting of all inflows and outflows from the surface water system in each GSA. Flowmeter records were used when available; otherwise, groundwater extraction was estimated using the best available information (sources and methods are summarized below).

In total, an estimated 543,000 acre-feet (AF) of groundwater was extracted for use within the Joint GSP area during water year 2021 (October 2020 to September 2021). Of this total, approximately

93% was extracted for agricultural use (504,000 AF), and approximately 7% was extracted for urban and domestic use (39,000 AF).

Surface Water Supplies (§356.2.b.3)

Surface water supplies used or available for use are summarized in **Section 4** of this Annual Report. Surface water supplies available to certain GSAs within the Joint GSP include surface water deliveries (CVP supplies from Millerton Reservoir and other supplies from Hidden Dam releases), riparian and water rights diversions, and diversions of natural flows crossing the Joint GSP GSAs' boundaries. In this Annual Report, surface water supplies used or available for use are assumed to be the difference between surface water inflows and surface water outflows in the Joint GSP area. During water year 2021 (October 2020 to September 2021), approximately 23,000 AF of local supplies and 23,000 AF of CVP supplies were used in the Joint GSP area (combined irrigation deliveries, infiltration, and evaporation).

Total Water Use (§356.2.b.4)

Total water use is summarized in **Section 5** of this Annual Report. In this Annual Report, total water use is assumed to equal the total applied water from all sources and precipitation in the Joint GSP area, including all consumptive and non-consumptive water use. During water year 2021, total water use in the Joint GSP area is estimated to be approximately 613,000 AF. Of this total, approximately 5% is from surface water, approximately 88% is from groundwater, and approximately 7% is from precipitation.

Change in Groundwater Storage (§356.2.b.5)

Change in groundwater storage is described in **Section 6** and shown in **Appendix C** of this Annual Report. Consistent with §354.18.b, annual changes in groundwater elevation were calculated for each of the principal aquifers between Spring 2020 and Spring 2021 based on the difference in annual spring groundwater elevation contours (representing seasonal high groundwater conditions). Outside of the delineated confined area, changes in groundwater levels (in both the Upper and Lower Aquifers) were multiplied by representative specific yield values to estimate change in groundwater storage. Within the delineated confined area in the Lower Aquifer, groundwater potentiometric surface changes in the Lower Aquifer were multiplied by a much smaller storage coefficient value to calculate annual changes in groundwater storage in the Lower Aquifer. The specific yield and storage coefficient values used in the analysis are derived from values in the calibrated integrated groundwater flow model (MCSim) developed and applied during the preparation of the GSP.

In summary, the combined change in groundwater storage for the entire Joint GSP area was approximately -112,000 AF from Spring 2020 to 2021. A positive change in groundwater storage means that the volume of groundwater in storage increased, a negative change in groundwater storage means that the volume of groundwater in storage decreased. Notably, there is uncertainty in this estimate, and there are also other processes that contribute to the net change in groundwater storage besides groundwater pumping (e.g., subsurface inflows and outflows). These contributing factors were considered in the MCSim groundwater model used in

development of the Joint GSP, and will be further evaluated in future updates to the MCSim model.

Implementation of Projects and Management Actions (§356.2.c)

GSP implementation activities, including projects and management actions, are described in **Section 7** of this Annual Report. In the year since the last Annual Report submittal, quantitative benefits were reported for six PMAs developed by the Joint GSP GSAs, with a total combined benefit of approximately 7,100 AF in 2021. Due to dry conditions in 2021, recharge was lower than would occur in a wetter year. In spite of these conditions, the GSAs have continued to make significant progress in implementing existing projects, as well as developing and receiving grant funding for new projects.

In total, MID GSA is implementing or has begun active development of 18 projects and management actions. Since 2019, MID has utilized nine dedicated recharge basins (two jointly with other GSAs). While no water was delivered to these basins for recharge in 2021 due to drought conditions, MID has expanded the capacity of the existing basins, continued work on the Golf Course Basin with the CM, and also acquired three parcels for construction of new recharge basins. These activities in 2021 are all expected to augment recharge benefits in future years. In 2021, MID continued upgrading other MID infrastructure, replacing 5,350 feet of aging pipeline to increase efficiency and submitting grant applications to fund installation of additional SCADA equipment, automated gates, and new flowmeters. MID has also continued demand reduction efforts through strategic land annexation/detachment and conversion of irrigated agricultural land to dedicate recharge areas. Other tools and policies reported in previous Annual Reports, including the Water User Software Platform (UI) and the Intensive Groundwater Use Policy are still in effect with ongoing benefits. In addition to ongoing projects and management actions, MID has also begun work to develop water supply partnerships with partners outside of the Madera Subbasin, and has begun development of an incentive program to encourage on-farm recharge.

MWD GSA has continued work toward the expanded surface water purchase project proposed in the GSP, which is scheduled for implementation beginning in 2023. In 2021, despite dry conditions, MWD was able to purchase nearly 800 AF of surface water for in-lieu recharge as part of their efforts to preserve groundwater supplies. MWD also continues to move forward on the Madera Lake Project. In February 2022, the MWD GSA applied for and received Proposition 68 funding to support further development and construction of this project by 2025.

The CM GSA is cooperatively working with MID to operate the Berry Basin and to develop the Golf Course Basin. The CM has continued to implement a project to install water meters and a volumetric billing process. The installation of water meters is roughly 98% complete. To date, the average annual benefits have been 3,350 AF per year. The CM applied as a Local Project Sponsor in cooperation with Madera's Proposition 1 Round 1 IRWM grant for funding to install meters on the remaining unmetered services and to replace failing meters on higher volume services. The final grant agreement was approved in 2021. The CM is moving forward with investigation and installation of remaining missing meter locations.

The MC GSA – Madera has continued work on three planning studies in support of a rate study to fund Joint GSP implementation, and has continued progress toward a substantial demand management program and a recharge program that will collectively support achievement of the GSP sustainability goal. In 2021, the MC GSA continued development of a rate study that will result in a water rate for extraction of groundwater within the MC GSA to fund projects. A penalty for groundwater extraction above the allocation is also being considered separately. In support of the demand management program, the MC GSA completed a virtual pilot water market simulation and conducted stakeholder interviews and outreach with conservation groups to guide development of land repurposing strategies as part of the sustainable agricultural land conservation (SALC) program. The MC GSA Board of Directors adopted three resolutions between December 2020 and August 2021 that outline the County's allocation framework and rules, with significant consumptive use limits placed on growers beginning in 2022. The MC GSA also completed a test year using IrriWatch, a remote sensing platform that is planned to track evapotranspiration of applied water (ET_{aw}) against an ET_{aw} allocation. Finally, the MC GSA was awarded grant funding in spring 2021 to support continued planning, design, and construction of the recharge program. Phase 1 designs are anticipated to be completed later in 2022, and construction is anticipated to begin in 2022-2023. In February 2022, the MC GSA applied for and was awarded Proposition 68 funding to support further development and construction of phase 2.

In addition to the projects and management actions summarized above, progress has also been made in: (1) conducting the domestic well inventory; (2) focused planning for the Domestic Well Mitigation Program; and (3) development of new nested monitoring wells that are slated to be installed in 2022.

Interim Milestone Status (§356.2.c)

The status of groundwater conditions relative to Interim Milestones (IMs) established in the Joint GSP is described in **Section 7.4** of this Annual Report. In the Joint GSP, Interim Milestones (IMs) for chronic lowering of groundwater levels were established at five-year intervals over the Implementation Period from 2020 to 2040, at years 2025, 2030, 2035, and 2040, based on the modeled groundwater level for the month of October in the year preceding the IM date (e.g., October 2024 for the 2025 IM).

For the purpose of tracking groundwater levels in relation to the Sustainable Management Criteria in the Joint GSP, the status of groundwater level RMS wells are presented in relation to the 2025 IMs, Measurable Objectives (MOs), and Minimum Thresholds (MTs) defined in the Joint GSP.

Review of the Fall 2021 groundwater level measurements that are available for 20 RMS wells indicates that groundwater levels remain well above MTs with one exception; however, the majority of Fall 2021 RMS groundwater levels were below the 2025 IMs. It is important to recognize that groundwater elevations are anticipated to fluctuate above and below the IMs in the years leading up to 2025; and no conclusions can be drawn at this time regarding comparison to 2025 IMs based on only the current year of data. A more detailed analysis of observed groundwater levels vs. IMs will be performed for the five-year update report that coincides with the first IMs established in the Joint GSP.

1 Groundwater Elevations (§356.2.b.1)

1.1 GROUNDWATER LEVEL MONITORING

The groundwater level monitoring information presented in this Annual Report includes historical monitoring conducted in the Madera Subbasin by various entities, including some local GSA-coordinated monitoring conducted as part of efforts to establish the long-term Joint GSP monitoring program that will continue during the Joint GSP implementation period through 2040 and beyond. Monitoring data collected as part of early Joint GSP monitoring and additional monitoring data available for the period through water year 2021 (plus Fall 2021) are summarized and presented in this Annual Report (**Table 1-1 and Appendices A and B)**. Formal Joint GSP groundwater level monitoring conducted by the Joint GSP GSAs was initiated upon adoption and submittal of the Joint GSP in January 2020.

Historically, groundwater level monitoring in the Joint GSP area of the Madera Subbasin has been conducted by a variety of entities including MID, MC, CM, MWD, DWR, USBR, and GeoTracker. The California State Groundwater Elevation Monitoring Program (CASGEM) was initiated in 2011, with the Madera-Chowchilla Groundwater Monitoring Group as the local monitoring entity. This Group includes MID, MC, MWD, GFWD, and RCWD along with other entities in the Chowchilla Subbasin. Groundwater levels have been collected and submitted each fall and spring as part of the CASGEM program. Additionally, the Joint GSP GSAs conducted groundwater level monitoring in selected wells prior to adoption and submittal of the Joint GSP. Additional groundwater level data collection from newly installed nested monitoring wells (installed as part of a DWR grant) began in water year 2020. Groundwater level monitoring data available from the entities listed above and all GSAs party to the Madera Subbasin Joint GSP, were assembled for the period through the end of water year 2021 (plus Fall 2021) and are presented in this Annual Report. **Figure 1-1** includes a map presenting the well locations and most recent monitoring date for historical groundwater level monitoring conducted in the Joint GSP area. All available groundwater level measurements acquired for groundwater level RMS wells identified in the Joint GSP are submitted through the Monitoring Network Module on the SGMA Portal. **Figure 1-2** illustrates the groundwater level RMS well network included in the Joint GSP. A summary of RMS well information and recent groundwater level measurements is presented in **Table 1-1**. Despite attempts at measurement, some RMS water level data were not available in 2021 due to continued challenges encountered during implementation of the RMS monitoring program. Additional information on these challenges is provided in **Section 7.3** and **Appendix E** of this Annual Report.

1.2 GROUNDWATER ELEVATION CONTOUR MAPS (§356.2.B.1.A)

Groundwater elevation contours for Spring and Fall 2021 were prepared for this Annual Report. These contours were developed from all known and available groundwater level information in the Joint GSP area, including data from public sources and from local GSAs and other local entities. Annual spring and fall contour maps were prepared for each year and for each of the principal aquifers in the Madera Subbasin: Upper Aquifer and Lower Aquifer. Annual spring

contours are intended to generally represent seasonal high groundwater levels, while fall contours are intended to generally represent seasonal low groundwater levels. For the purpose of mapping groundwater elevations, the aquifer system in areas outside the Corcoran Clay was treated as a single undifferentiated unconfined aquifer system and interpretation of groundwater levels in these areas utilized data from wells assigned to both the Upper and Lower depth zones. In areas within the Corcoran Clay, the aquifer system was separated into an Upper Aquifer unconfined system above the Corcoran Clay and a Lower Aquifer below the Corcoran Clay. To evaluate recent groundwater level conditions in the Madera Subbasin, separate groundwater elevation contour maps were prepared for spring and fall of each year for the combined Upper Aquifer and undifferentiated unconfined groundwater zone and also for the Lower Aquifer within the extent of the Corcoran Clay. The groundwater elevation contour maps for the Lower Aquifer represent a combination of potentiometric elevations where the aquifer is under confined conditions and water table surface elevations where the Lower Aquifer is unconfined. Contour maps of the different aquifer units are presented in **Figure 1-3 through 1-6** and are discussed below. For comparison, contour maps for Spring 2016-2020 and Fall 2015-2020, prepared for previous Joint GSP Annual Reports, are included in **Appendix A**.

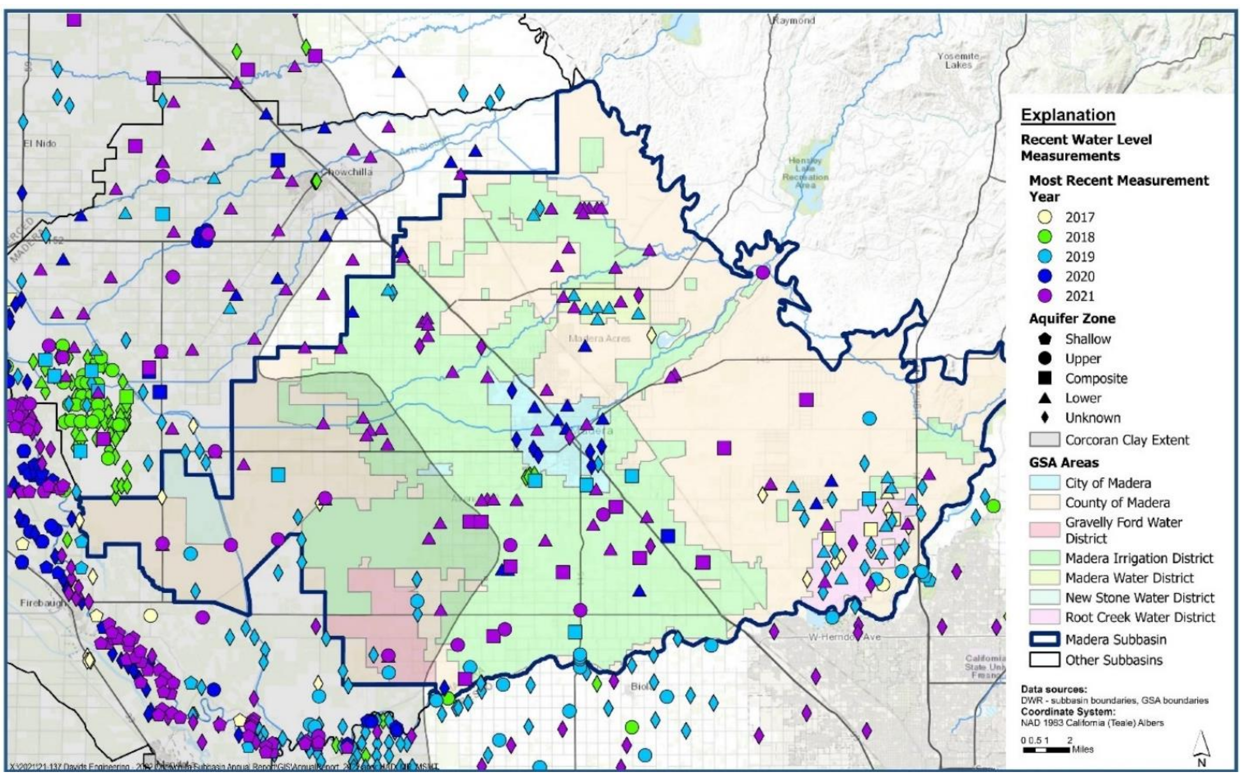

Figure 1-1. Most Recent Groundwater Level Measurement by Well.

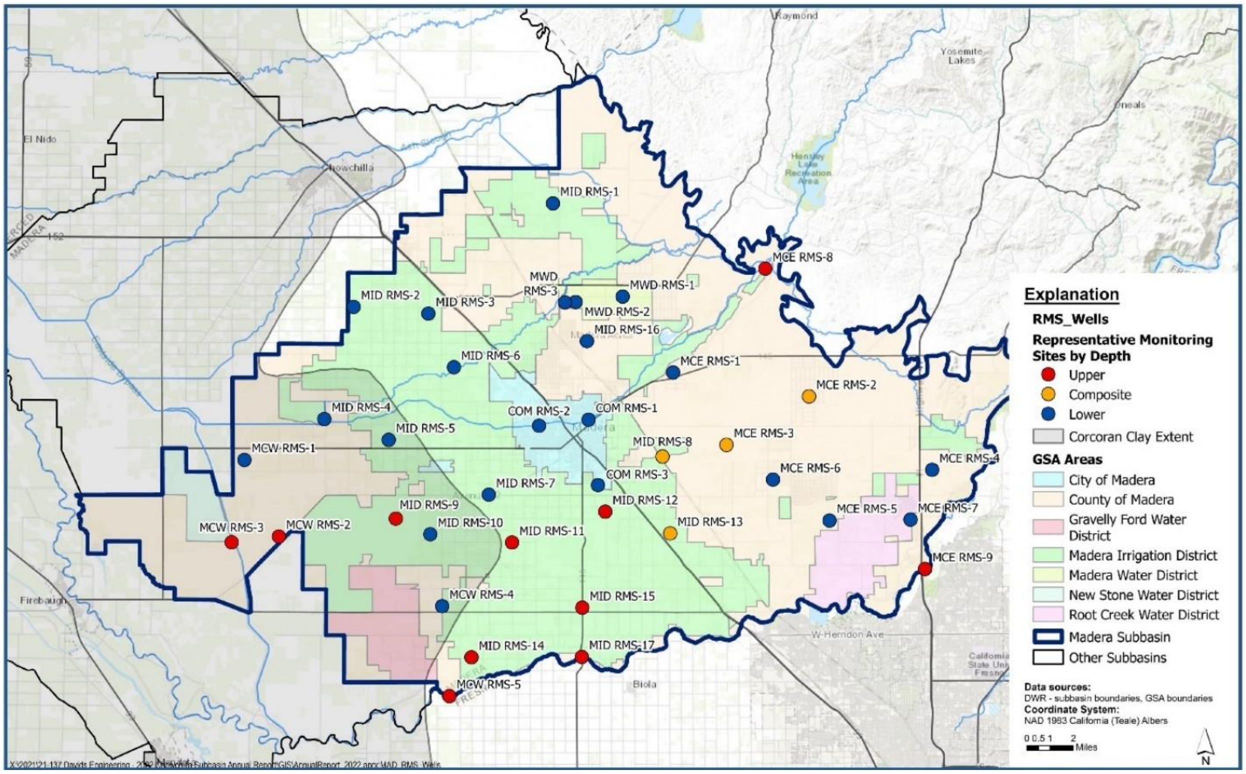

Figure 1-2. Groundwater Levels Sustainable Indicator Well.

Table 1-1. Summary of Groundwater Level RMS Well Information and Measurements During Report Year (2021).

RMS Well I.D.	Estimated Surface Elevation (msl, feet)	Well Depth	Screen Top-Bottom	Aquifer Designation	Spring 2021 GWEL	Date of Spring 2021 GWEL	Fall 2021 GWEL	Date of Fall 2021 GWEL	GSA
COM RMS-1	278	520	210-510	Lower[2]	24.11	4/14/2021[3]	29.11	11/8/2021	CM
COM RMS-2	262	590	370-590	Lower[2]	18.03	4/23/2021[3]	19.03	11/10/2021	CM
COM RMS-3	264	620	310-600	Lower[2]	37.2	4/28/2021[3]	48.2	11/17/2021	CM
MCE RMS-1	332	500	420-500	Lower[2]	33.27	3/16/2021	NM[4]	11/10/2021	MC - East
MCE RMS-2	378	Unknown	Unknown	Composite	79.06	3/11/2021	90.95	11/10/2021	MC - East
MCE RMS-3	327	Unknown	Unknown	Composite	7.54	3/15/2021	-4.63	11/10/2021	MC - East
MCE RMS-4	404	Unknown	Unknown	Lower[2]	377.65	3/30/2021	NM[4]	11/10/2021	MC - East
MCE RMS-5	340	Unknown	Unknown	Lower[2]	44.07	3/30/2021	36.88	11/10/2021	MC - East
MCE RMS-6	328	550	450-550	Lower[2]	17	3/1/2021	-1	10/4/2021	MC - East
MCE RMS-7	388	840	370-820	Lower[2]	NM[4]	3/11/2021	NM[4]	11/10/2021	MC - East
MCE RMS-8	367	92	32-92	Upper	NM[4]	3/1/2021	NM[4]	11/10/2021	MC - East
MCE RMS-9	265	37.1	17-37	Upper					MC - East
MCW RMS-1	169	800	Unknown	Lower[1]	NM[4]	3/12/2021	NM[4]	11/10/2021	MC - West
MCW RMS-2	173	216	205-212	Upper	3.74	3/12/2021	NM[4]	11/10/2021	MC - West
MCW RMS-3	162	Unknown	Unknown	Upper	NM[4]	4/8/2021	NM[4]	11/10/2021	MC - West
MCW RMS-4	208	580	220-580	Lower[1]	77.2	3/17/2021	60.3	10/7/2021	MC - West
MCW RMS-5	198	30		Upper					MC - West
MID RMS-1	308	950	320-942	Lower[2]	NM[4]	3/31/2021	NM[4]	11/10/2021	MID
MID RMS-2	218	563	298-509	Lower[2]					MID
MID RMS-3	241	516	260-507	Lower[2]	-69.3	3/23/2021	-95.4	10/13/2021	MID
MID RMS-4	190	698	320-667	Lower[1]	-61.9	3/16/2021	-99.5	10/21/2021	MID
MID RMS-5	207	570	270-570	Lower[1]	-30.4	3/23/2021	-58.1	10/12/2021	MID
MID RMS-6	237	680	320-680	Lower[2]	NM[4]	3/22/2021	-55	10/20/2021	MID
MID RMS-7	238	656	290-635	Lower[2]	50	3/16/2021	22.8	10/12/2021	MID
MID RMS-8	287	Unknown	Unknown	Composite					MID

RMS Well I.D.	Estimated Surface Elevation (msl, feet)	Well Depth	Screen Top-Bottom	Aquifer Designation	Spring 2021 GWEL	Date of Spring 2021 GWEL	Fall 2021 GWEL	Date of Fall 2021 GWEL	GSA
MID RMS-9	202	143	Unknown	Upper					MID
MID RMS-10	213	615	315-615	Lower[1]	51.2	3/18/2021	33.7	10/27/2021	MID
MID RMS-11	232	Unknown	Unknown	Upper	85.4	3/16/2021	62.4	10/7/2021	MID
MID RMS-12	262	176	Unknown	Upper	85.3	3/12/2021	84.1	10/20/2021	MID
MID RMS-13	271	600	228-552	Composite					MID
MID RMS-14	214	Unknown	Unknown	Upper					MID
MID RMS-15	247	502	160-200	Upper	134	3/1/2021	122	10/8/2021	MID
MID RMS-16	308	452	348-388	Lower[2]					MID
MID RMS-17	225	47	26.5-46.5	Upper					MID
MWD RMS-1	330	500	200-500	Lower[2]	-3.96	3/25/2021	-32.67	11/9/2021	MWD
MWD RMS-2	310	537	200-537	Lower[2]	-37.32	3/25/2021	-53.38	11/9/2021	MWD
MWD RMS-3	295	800	380-800	Lower[2]	-45.89	3/25/2021	-73.76	11/9/2021	MWD

[1] Lower Aquifer wells within Corcoran Clay

[2] Lower Aquifer wells outside Corcoran Clay; considered representative of undifferentiated unconfined groundwater zone

[3] April measurements are outside the preferred data collection time period of March and not included in the Spring Groundwater Contour Map.

[4] NM = no measurement. Measurement attempted on date listed but was unsuccessful. See Appendix E for more information.

1.2.1 Upper Aquifer and Undifferentiated Unconfined Groundwater Zone

Seasonal high groundwater elevation contour maps for the Upper Aquifer and undifferentiated unconfined groundwater zone were generated for Spring 2021 (**Figure 1-3**). The Spring 2021 Groundwater Elevation Contour Map (**Figure 1-3**) generally shows higher groundwater elevations near the San Joaquin River with groundwater flow to the north-northwest to a broad depression located in the north-central portion of Madera Subbasin.

Seasonal low groundwater elevation contour maps for the Upper Aquifer and undifferentiated unconfined groundwater zone were generated for Fall 2021 (**Figure 1-4**). Similar to the spring contour maps, the Fall 2021 Groundwater Elevation Contour Map (**Figure 1-4**) generally shows higher groundwater elevations near the San Joaquin River with groundwater flow to the north-northwest towards a broad depression located in the north-central portion of Madera Subbasin. As would be expected, the fall groundwater level elevations are generally lower than for spring.

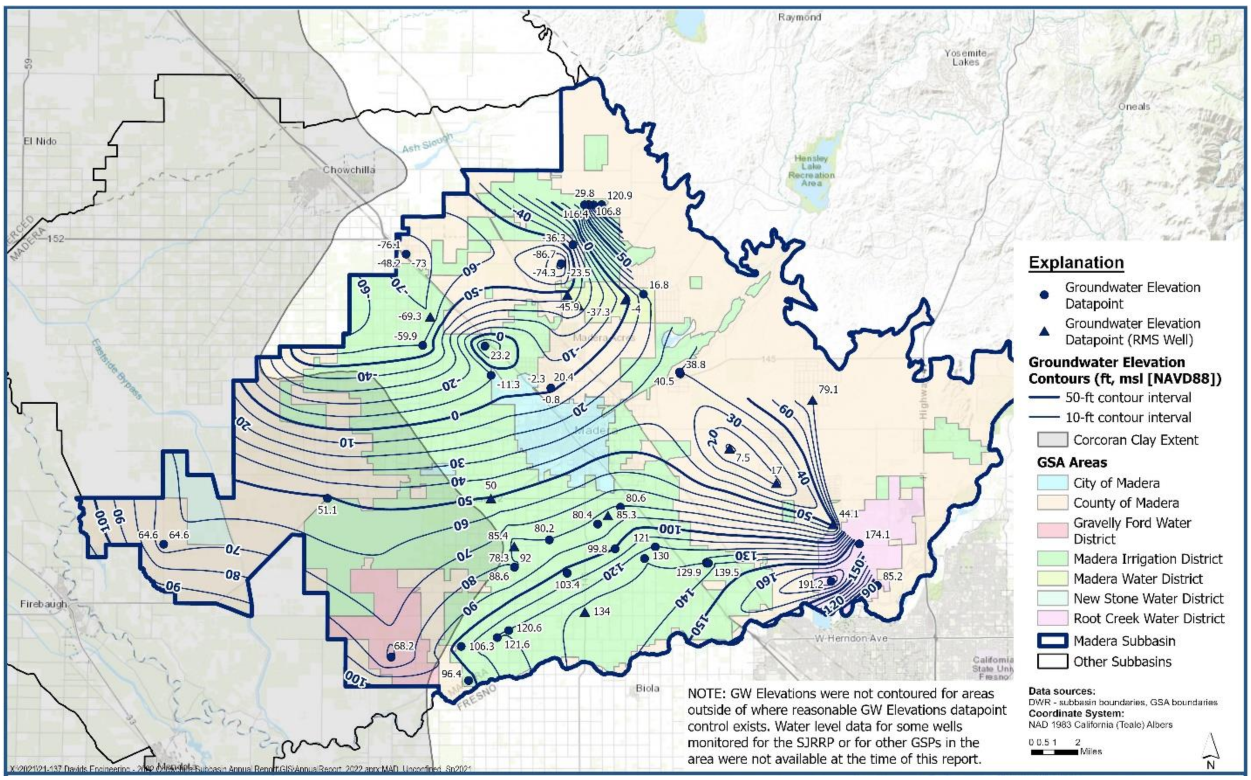

Figure 1-3. Contours of Equal Groundwater Elevation Upper Aquifer/Undifferentiated Unconfined Zone – Spring 2021.

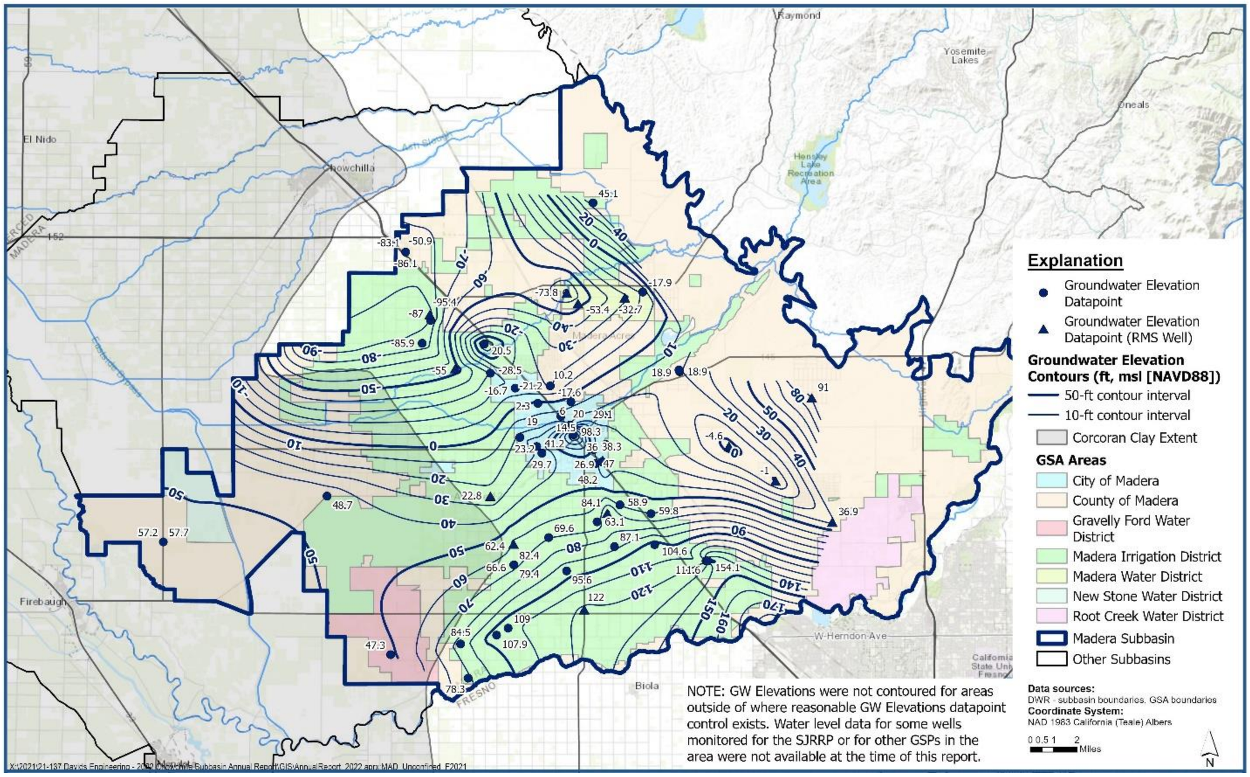

Figure 1-4. Contours of Equal Groundwater Elevation Upper Aquifer/Undifferentiated Unconfined Zone – Fall 2021.

1.2.2 Lower Aquifer

Seasonal high groundwater elevation contour maps for the Lower Aquifer (within the extent of the Corcoran Clay) were generated for Spring 2021 (**Figure 1-5)**. The Spring 2021 Groundwater Elevation Contour Map for the Lower Aquifer beneath the Corcoran Clay (**Figure 1-5**) generally shows higher groundwater elevations in the southeast and lower groundwater elevations in the northwestern portion of the Lower Aquifer. The difference in groundwater elevations from southeast to northwest is greater than 100 feet.

Seasonal low groundwater elevation contour maps for the Lower Aquifer were generated for Fall 2021 (**Figure 1-6**). Similar to the spring contour maps, the Fall 2021 Groundwater Elevation Contour Map (**Figure 1-6**) generally shows higher groundwater elevations in the southeast and lower groundwater elevations in the northwestern portions of the Lower Aquifer. As would be expected, the fall groundwater elevations are generally lower than for spring.

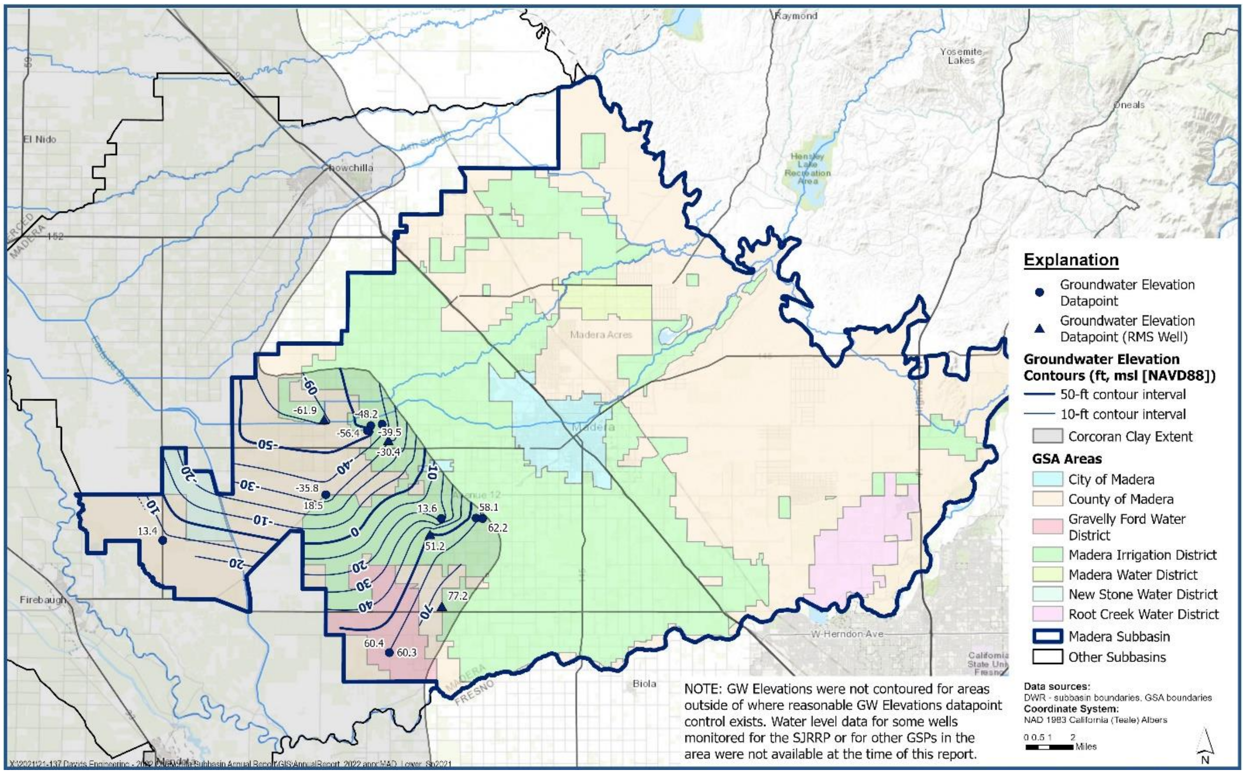

Figure 1-5. Contours of Equal Groundwater Elevation Lower Aquifer – Spring 2021.

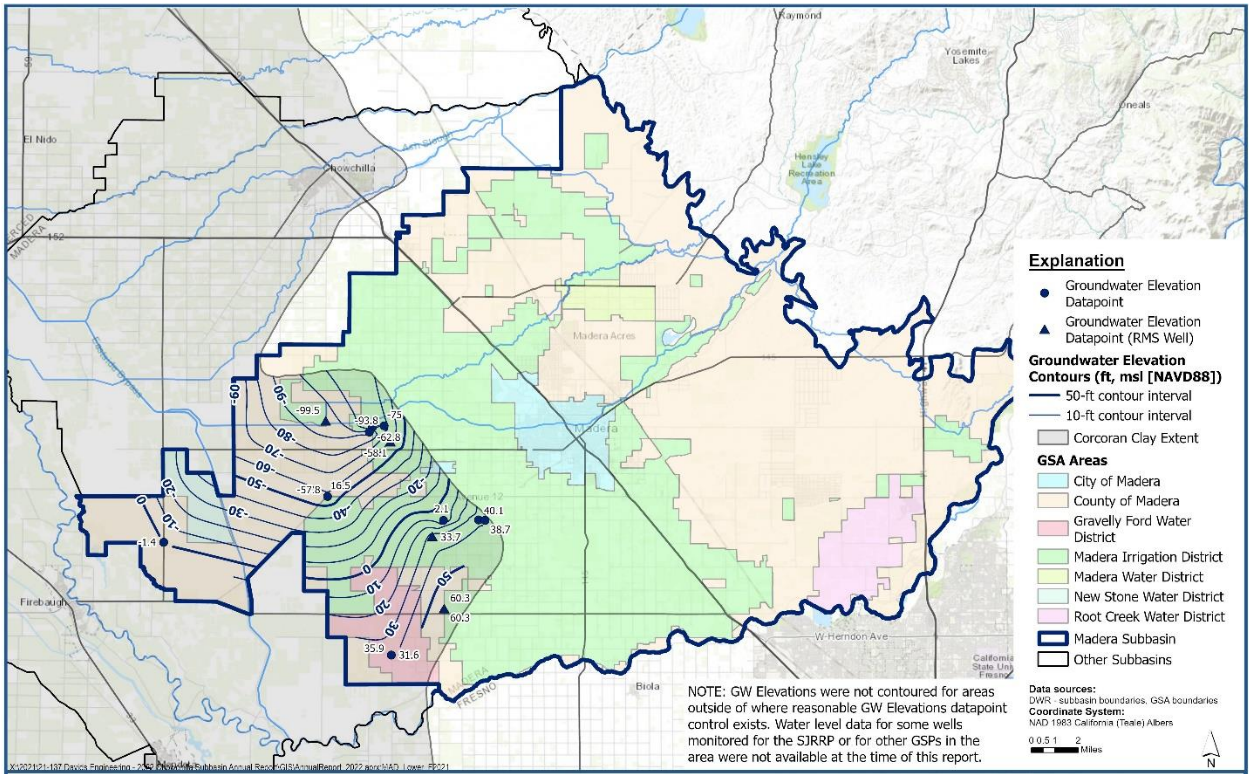

Figure 1-6. Contours of Equal Groundwater Elevation Lower Aquifer – Fall 2021.

1.3 GROUNDWATER HYDROGRAPHS (§356.2.B.1.B)

Hydrographs of time-series groundwater level data for groundwater level RMS wells were prepared with all available groundwater level monitoring data through water year 2021 (plus Fall 2021) and are contained in **Appendix B**. Madera Irrigation District RMS wells (designated MID) generally showed stable to slightly decreasing trends in groundwater elevations between 2015 and 2021. Madera County East (designated MCE) and Madera County West (designated MCW) RMS wells show variable trends in groundwater elevations over the 2015 to 2021 time period ranging from increasing to stable and decreasing levels. Lower groundwater level elevations than in previous years were reported for MCE RMS-3 and MCE RMS-5. The three City of Madera RMS wells (designated COM) generally showed stable to slightly decreasing trends from 2015 to 2021. Similarly, the three Madera Water District wells (designated MWD) showed stable to slightly decreasing groundwater elevation trends from 2015 to 2021. It is notable in MWD RMS wells that the sharp declines in groundwater levels that occurred during the 2012 to 2015 drought had largely stabilized between 2015 and 2021, although MWD RMS-3 showed a lower Fall 2021 groundwater elevation than in previous years.

2 Water Budget Approach for Quantifying Groundwater Extraction, Surface Water Supplies, and Total Water Use

In fulfillment of the Annual Report requirements, a water budget approach has been used to quantify groundwater extraction, surface water supply availability, and total water use in the Joint GSP area. This section describes the structure and uncertainties of these water budgets.

2.1 WATER BUDGET STRUCTURE

A water budget is defined as a complete accounting of all water flowing into and out of a defined volume[2] over a specified period of time. During development of the Joint GSP, water budgets were prepared for each GSA in the Madera Subbasin to characterize historical, current, and projected water budget conditions. For this Annual Report, the historical water budgets of the Joint GSP GSAs have been extended through the current reporting year to characterize historical water use through 2021.

Water budgets were prepared for the Surface Water System (SWS) and Groundwater System (GWS). The SWS represents the land surface down to the bottom of the plant root zone, within the lateral boundaries of the Madera Subbasin. The GWS extends from the bottom of the root zone to the definable bottom of the subbasin, within the lateral boundaries of the Madera Subbasin.

These systems are referred to as accounting centers. Flows between accounting centers and storage within each accounting center are water budget components. Separate but related water budgets were prepared for each accounting center that together represent the overall water budget for the Madera Subbasin. A schematic of the general water budget accounting structure is provided in **Figure 2-1**.

During Joint GSP development, the SWS water budget accounting center was further subdivided into detailed accounting centers, including the Land Surface System that represents water use in all irrigated and non-irrigated lands. To estimate the water budget components required by the GSP Regulations, the Land Surface System was subdivided into accounting centers representing water use sectors identified in the GSP Regulations as “categories of water demand based on the general land uses to which the water is applied, including urban, industrial, agricultural, managed wetlands, managed recharge, and native vegetation” (23 CCR §351(al)). Across the Madera Subbasin and within each GSA, the water use sector accounting centers include Agricultural Land (AG), Urban Land (UR) (urban, industrial, and semi-agricultural), Native Vegetation Land (NV), and Managed Recharge (MR) Land. Industrial land covers only a small

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[2] Where ‘volume’ refers to a space with length, width and depth properties, which for purposes of the GSP means the defined aquifer and associated surface water system.

area of the Madera Subbasin, so industrial water uses have been combined with urban and semi-agricultural uses in the Urban land use sector.

To meet the Annual Report requirements, groundwater extraction and total water use were tracked by water use sector, and surface water supplies were calculated. Water budgets for each water use sector accounting center were developed with distinct, but similar, inflow and outflow components. Water budgets for each water use sector accounting center were developed uniquely for each Madera Subbasin GSA, as described in the Madera Subbasin Joint GSP.

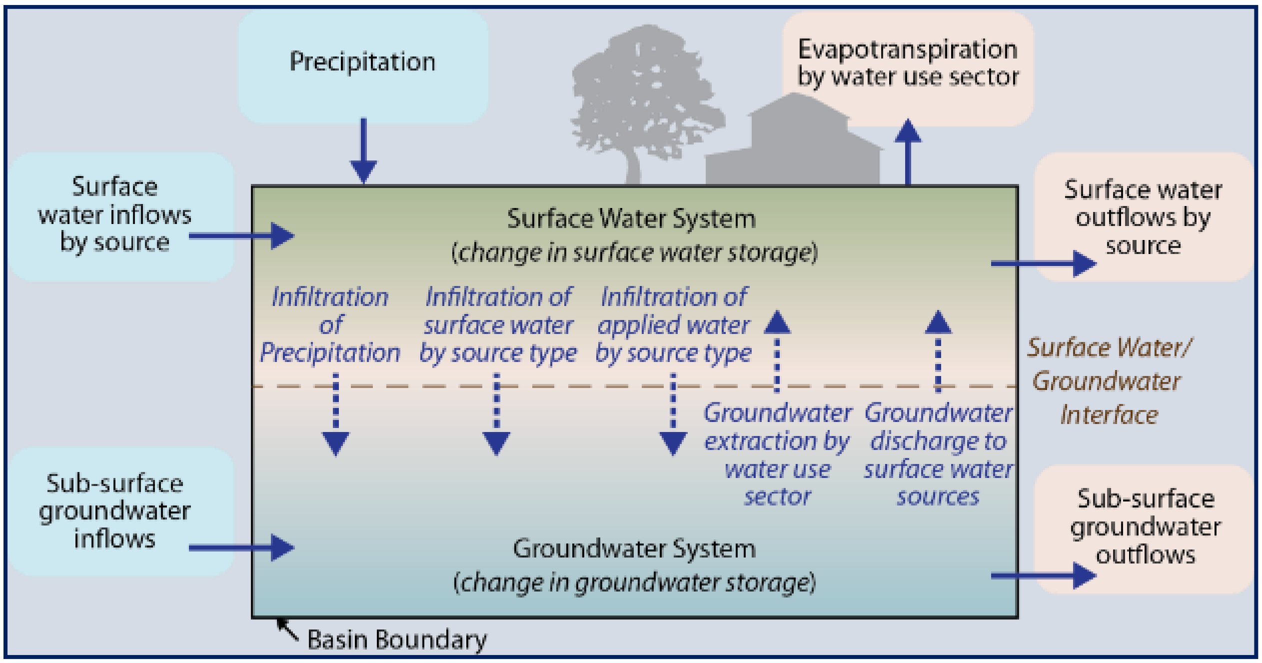


Figure 2-1. Water Budget Accounting Structure (Source: DWR, 2016).

For this Annual Report, flows through the SWS in each Joint GSP GSA were accounted for on a monthly timestep using interrelated water budgets. These water budgets resulted in complete accounting of all SWS inflows and outflows in each GSA, including all water budget components required to quantify groundwater extraction, surface water supplies, and total water use:

- **Groundwater Extraction**: Equal to “Groundwater Extraction”
- **Surface Water Supplies (used, or available for use)**: Assumed to be equal to the difference between “Surface Water Inflows” and “Surface Water Outflows.”
- **Total Water Use**: Water use is defined by ASCE (2016) as “water that is used for a specific purpose such as domestic use, irrigation, or industrial processing.” This definition includes both consumptive and non-consumptive components. The total consumptive water use (the sum of “Evapotranspiration of Applied Water” and “Evapotranspiration of

Precipitation”) is also reported as this is the volume of water that is no longer available for use within the Madera Subbasin.

The data sources, calculation procedures, and results pertaining to these key water budget components are described in the sections below for each the Joint GSP GSAs. Details about groundwater extractions, surface water supplies, and total water use for the GFWD GSA, NSWD GSA, and RCWD GSA can be found in each of their respective Annual Reports.

2.2 UNCERTAINTIES IN WATER BUDGET COMPONENTS

Uncertainties associated with each water budget component have been estimated as described by Clemmens and Burt (1997), as follows:

1. The uncertainty of each independently-estimated water budget component (excluding the closure term) is calculated or estimated as a percentage that approximately represents a 95% confidence interval. Uncertainties are influenced by the accuracy of available data, the uncertainty of supporting calculations and estimation procedures.
2. Assuming random, normally-distributed error, the standard deviation is calculated for each independently-estimated component as the average uncertainty on a volumetric basis (uncertainty percentage multiplied by the average component volume) divided by two.
3. The variance is calculated for each independently-estimated component as the square of the standard deviation.
4. The variance of the closure term is estimated as the sum of variances of all independently-estimated components.
5. The standard deviation of the closure term is estimated as the square root of the sum of variances.
6. The 95% confidence interval of the closure term is estimated as twice the estimated standard deviation.

Estimated uncertainties were calculated following the above procedure for all Joint GSP GSA water budgets.

3 Groundwater Extraction (§356.2.b.2)

This section summarizes the measurement methods, accuracy, and volumes of groundwater extraction by the Joint GSP GSAs for the current reporting year (2021).

3.1 QUANTIFICATION AND ACCURACY

Groundwater extraction by the Joint GSP GSAs was either measured directly from flowmeters or estimated based on other inflows and outflows from the surface water system. Flowmeter records were used when available (MWD GSA agricultural water use sector, and CM GSA urban water use sector); otherwise, groundwater extraction was estimated using the best available information. **Table 3-1** summarizes groundwater extraction in 2021 and the associated measurement methods, by water use sector.

Figure 3-1 provides a map of the 2021 agricultural groundwater extraction volumes and depths in irrigated areas in the Joint GSP area. Notably, the groundwater extraction values shown in MC GSA in **Figure 3-1** are quantified using the IDC root zone water budget methodology used in the Joint GSP. In subsequent annual reports, results from the IrriWatch demand measurement project (described in **Section 7**) may be used to quantify reported groundwater extraction in MC GSA.

Table 3-2 further summarizes the total groundwater extraction by water use sector in the Joint GSP area between 1989 (the beginning of the Madera Joint GSP historical water budget period) and 2021 (the current reporting year).

3.2 DATA SOURCES

3.2.1 Measured Groundwater Extraction

Measured groundwater pumping was available from flowmeter records available from MWD (for agricultural groundwater extraction) and CM (for urban groundwater extraction). MWD pumping records were available from the MWD Groundwater Management Plan for 1993-2014, and MWD metered pumping data were available for 2015-2021. CM SCADA records were available for years 2013-2021. Available pumping records from 2021 were used to complete the CM GSA and MWD GSA water budgets.

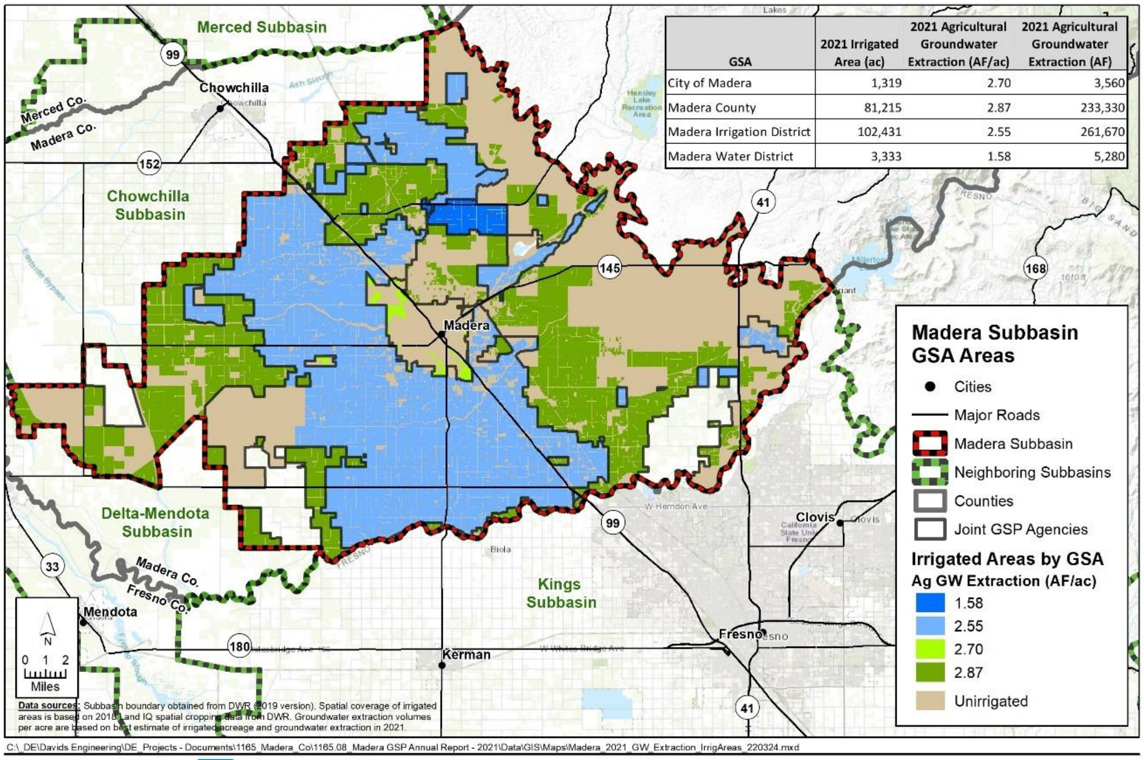
3.2.2 Estimated Groundwater Extraction

Estimated groundwater extraction was calculated as the Land Surface System water budget “closure” term – the difference between all other estimated or measured inflows and outflows from each water use sector. Groundwater extraction was selected as the closure term because groundwater pumping data has generally been unavailable across the Madera Subbasin (except where indicated in **Table 3-2**). Also, groundwater extraction serves as a relatively large inflow to the Land Surface System, resulting in lower relative uncertainty when calculated as a closure term compared to smaller flow paths following the procedure outlined by Clemmens and Burt (1997).

Table 3-1. Groundwater Extraction Volumes and Measurement Methods by Water Use Sector, and Uncertainty (2021).

Joint GSP GSA	Water Use Sector	Groundwater Extraction, 2021 (acre-feet)	Measurement Method	Description
All (except Madera Water District GSA)	Agricultural	498,560	Estimate	Water use sector closure
Madera Water District GSA	Agricultural	5,284	Direct	Flowmeter records
All	Managed Recharge	0	Estimate	No groundwater extraction for managed recharge
All	Native Vegetation	0	Estimate	Water use sector closure
All (except CM GSA)	Urban	30,120	Estimate	Water use sector closure
CM GSA	Urban	8,801	Direct	Flowmeter records

Joint GSP Area	Groundwater Extraction, 2021 (acre-feet)	Average Uncertainty	Uncertainty Source
Total	**542,760**	**20%**	Typical uncertainty when calculated for Land Surface System water balance closure, combined with uncertainty of measurement devices for MWD GSA and CM urban sector



GSA	2021 Irrigated Area (ac)	2021 Agricultural Groundwater Extraction (AF/ac)	2021 Agricultural Groundwater Extraction (AF)
City of Madera	1,319	2.70	3,560
Madera County	81,215	2.87	233,330
Madera Irrigation District	102,431	2.55	261,670
Madera Water District	3,333	1.58	5,280

Figure 3-1. Agricultural Groundwater Extraction Volumes and Depths over Irrigated Areas*, by GSA.

**Irrigated areas shown are based on the 2018 Land IQ spatial cropping data available from DWR. Irrigated areas listed in the inset table and considered in the calculation of agricultural groundwater extraction are based on 2021 crop data from District records or determined through land use analyses. The groundwater extraction volumes per acre are based on measured or estimated groundwater extraction in 2021, quantified using the IDC root zone water budget methodology used in the Joint GSP. In subsequent Annual Reports, results from the IrriWatch demand measurement project may be used to quantify groundwater extraction in MC GSA.*

Table 3-2. Joint GSP Groundwater Extractions, by Water Use Sector (acre-feet, rounded).

Water Year (Type)	Agricultural	Managed Recharge	Native Vegetation	Urban and Industrial	Total
1989 (C)	366,250	0	0	16,920	383,170
1990 (C)	412,050	0	0	17,940	429,990
1991 (C)	405,240	0	0	16,890	422,130
1992 (C)	466,510	0	0	22,400	488,910
1993 (W)	352,910	0	0	17,670	370,580
1994 (C)	387,840	0	0	20,610	408,450
1995 (W)	297,030	0	0	11,070	308,100
1996 (W)	347,820	0	0	16,810	364,630
1997 (W)	408,960	0	0	26,930	435,890
1998 (W)	314,700	0	0	14,510	329,210
1999 (AN)	361,860	0	0	21,220	383,080
2000 (AN)	394,490	0	0	20,100	414,590
2001 (D)	408,070	0	0	18,640	426,710
2002 (D)	448,330	0	0	24,330	472,660
2003 (BN)	424,440	0	0	23,830	448,270
2004 (D)	475,970	0	0	30,860	506,830
2005 (W)	353,550	0	0	19,550	373,100
2006 (W)	348,440	0	0	18,990	367,430
2007 (C)	430,360	0	0	30,260	460,620
2008 (C)	427,160	0	0	30,250	457,410
2009 (BN)	407,860	0	0	29,580	437,440
2010 (AN)	312,280	0	0	17,430	329,710
2011 (W)	326,960	0	0	19,780	346,740
2012 (D)	470,750	0	0	31,200	501,950
2013 (C)	471,430	0	0	32,910	504,340
2014 (C)	529,790	0	0	32,020	561,810
2015 (C)	601,440	0	0	36,810	638,250
2016 (D)	443,550	0	0	31,070	474,620
2017 (W)	402,830	0	0	31,380	434,210
2018 (BN)	457,920	0	0	31,810	489,730
2019 (W)	382,410	0	0	28,620	411,030
2020 (D)	464,210	0	0	36,560	500,770
2021 (C)	503,840	0	0	38,920	542,760
Average (1989-2014)	398,130	0	0	22,410	420,540
Average (1989-2021)	412,340	0	0	24,790	437,130
W	353,570	0	0	20,540	374,110
AN	356,210	0	0	19,580	375,790
BN	430,070	0	0	28,400	458,470
D	451,820	0	0	28,780	480,600
C	454,720	0	0	26,900	481,620

3.3 GROUNDWATER RECHARGE

As mandated under 23 CCR §354.24, GSAs within the Madera Subbasin have established a *"sustainability goal for the [sub]basin that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline."* The expressed sustainability goal for the Joint GSP area is "to implement a package of projects and management actions that will, by 2040, balance long-term groundwater system inflows with outflows." (pg. 3-2 of the Joint GSP). To track the GSAs' progress toward meeting this sustainability goal, both the groundwater system inflows and outflows must be quantified.

As shown in **Figure 2-1**, GWS outflows to the SWS include groundwater extraction (quantified above) and groundwater discharge (assumed to be negligible in the Madera Subbasin, given the substantial depth to groundwater). GWS inflows from the SWS include infiltration of precipitation, infiltration of applied water, and infiltration of surface water. While these GWS inflows are not required to be reported in this Annual Report, the Madera Subbasin GSAs feel that they are necessary to understanding the total contribution of the SWS to sustainability in the Madera Subbasin.

Table 3-3 summarizes the total annual groundwater recharge from the SWS in the Joint GSP area. The components of recharge are useful for understanding and analyzing the combined effects of land surface processes on the underlying GWS. The data sources and calculations used to develop each recharge component are described in Section 2.2.3.3 (pages 2-64 through 2-80 of the Joint GSP).

Table 3-3. Joint GSP Groundwater Recharge (acre-feet, rounded).

Water Year (Type)	Infiltration of Applied Water	Infiltration of Precipitation	Infiltration of Surface Water[1]	Total Groundwater Recharge
1989 (C)	132,000	88,800	107,000	327,800
1990 (C)	129,100	74,800	93,800	297,700
1991 (C)	143,400	114,000	100,400	357,800
1992 (C)	136,600	57,900	99,900	294,400
1993 (W)	147,300	150,400	249,700	547,400
1994 (C)	129,200	53,800	96,700	279,700
1995 (W)	131,600	199,100	245,800	576,500
1996 (W)	124,500	93,600	199,100	417,200
1997 (W)	173,700	160,600	218,500	552,800
1998 (W)	131,000	161,300	190,200	482,500
1999 (AN)	115,000	39,900	116,700	271,600
2000 (AN)	127,600	69,900	136,500	334,000
2001 (D)	128,200	61,800	108,200	298,200
2002 (D)	134,800	58,000	102,400	295,200
2003 (BN)	119,700	43,400	105,900	269,000

Water Year (Type)	Infiltration of Applied Water	Infiltration of Precipitation	Infiltration of Surface Water[1]	Total Groundwater Recharge
2004 (D)	126,000	33,700	97,500	257,200
2005 (W)	122,700	68,100	154,500	345,300
2006 (W)	115,300	92,800	173,700	381,800
2007 (C)	112,000	26,700	155,000	293,700
2008 (C)	114,600	42,900	113,800	271,300
2009 (BN)	102,200	31,300	93,800	227,300
2010 (AN)	102,400	82,300	120,900	305,600
2011 (W)	116,900	94,200	186,100	397,200
2012 (D)	116,400	26,100	67,000	209,500
2013 (C)	122,400	43,600	95,800	261,800
2014 (C)	105,400	16,700	81,600	203,700
2015 (C)	118,400	22,000	81,600	222,000
2016 (D)	125,900	80,500	133,800	340,200
2017 (W)	126,400	105,900	286,300	518,600
2018 (BN)	119,400	42,200	136,000	297,600
2019 (W)	121,800	61,000	152,700	335,500
2020 (D)	105,600	29,000	125,800	260,400
2021 (C)	106,700	10,500	101,400	218,700
Average (1989-2014)	125,400	76,400	135,000	336,800
Average (1989-2021)	123,800	70,800	137,200	331,800
W	131,100	118,700	205,700	455,500
AN	115,000	64,000	124,700	303,700
BN	113,800	39,000	111,900	264,600
D	122,800	48,200	105,800	276,800
C	122,700	50,200	102,500	275,300

[1] Infiltration of Surface Water includes infiltration of surface water in the rivers, streams, and canals within the Joint GSP area, plus boundary seepage from the San Joaquin River.

4 Surface Water Supplies (§356.2.b.3)

This section summarizes the annual volumes and data sources for surface water supplies used, or available for use, by the Joint GSP GSAs through the current reporting year (2021).

4.1 QUANTIFICATION BY WATER SOURCE TYPE

Surface water supplies available to the Joint GSP GSAs include surface water deliveries and surface water flowing across GSA boundaries. In this Annual Report, surface water supplies used or available for use are assumed to be the difference between surface water inflows and surface water outflows through the Joint GSP area.

Per the GSP Regulations, surface water supplies must be reported by water source type. According to the Regulations:

> *"Water source type" represents the source from which water is derived to meet the applied beneficial uses, including groundwater, recycled water, reused water, and surface water sources identified as Central Valley Project, the State Water Project, the Colorado River Project, local supplies, and local imported supplies.*

Table 4-1 summarizes the total surface water supplies used or available for use in the Joint GSP area, by water source type. The supplies included in these totals are described below.

4.1.1 Local Supplies

Local supplies available to the Joint GSP GSAs include natural surface water flows along Berenda Creek, Dry Creek, Cottonwood Creek, and Chowchilla Bypass. Much of this water passes through the Madera Subbasin or infiltrates into the GWS. Local supplies also include MID's Pre-1914 water rights, as well as riparian deliveries from the San Joaquin River and the Fresno River to water rights users in MC GSA and MID GSA. This water is applied to irrigated land and is assumed to be completely used within the Madera Subbasin.

4.1.2 CVP Supplies

Agencies with CVP contracts can receive CVP supplies in the Madera Subbasin. CVP supplies received via the Madera Canal include Millerton irrigation releases and flood releases. Other supplies are also received from Hidden Dam releases to the Fresno River, which in most years are intermingled with CVP releases from Madera Canal to the Fresno River. These intermingled supplies are accounted as CVP supplies in **Table 4-1**, though they typically include supplies from both sources. Outflows of CVP supplies from the Joint GSP area include MID deliveries to growers outside the Joint GSP area (GFWD, RCWD, and Chowchilla Water District), MID conveyance system spillage to the San Joaquin River, MID releases to Cottonwood Creek (for delivery to GFWD), and pass-through flood releases along Fresno River.

4.1.3 Local Imported Supplies

The Joint GSP GSAs do not receive local imported supplies, though the Joint GSP GSAs are working on projects to import supplies in the future (see **Section 7**).

4.1.4 Recycling and Reuse

Recycling and reuse are not a significant source of supply within Madera Subbasin. However, urban wastewater treated by the CM, as well as water associated with private septic systems, returns to the groundwater system within the Madera Subbasin and is included in the water budgets.

4.2 SURFACE WATER SUPPLIES AVAILABLE TO EACH GSA

The surface water supplies available to each GSA are summarized below.

4.2.1 City of Madera GSA

The majority of irrigated agricultural lands in CM GSA are located within the boundaries of MID and have the ability to receive surface water in accordance with MID's normal operating practices. Some owners have utilized surface water from MID to meet a portion of their agricultural water needs, while others have chosen to rely solely on groundwater. In water year 2021, the CM GSA jointly operated the Berry Basin with the MID GSA.

4.2.2 Madera County GSA

Surface water supplies available for agriculture in MC GSA include riparian deliveries to water rights users along the San Joaquin River, the Fresno River, and other minor streams. Based on estimates from prior year SWRCB eWRIMS records, water rights holders within MC GSA diverted an estimated 1,200 AF from San Joaquin River (eWRIMS reports on a calendar year basis and 2021 records are not yet available). In water year 2021, the MC GSA jointly operated the Ellis Basin with the MID GSA.

4.2.3 Madera Irrigation District GSA

The MID GSA receives substantial surface water supplies to support agriculture. MID receives CVP supplies under contract with Reclamation from the Madera Canal. MID's Friant Class 1 contract amount is 85,000 AF and Class 2 contract amount is 186,000 AF. MID also has access to Hidden Dam contract supplies, Pre-1914 water rights supplies, and other types of surface water made available to the District. The actual supplies received by MID in water year 2021 were lower than the contracted amounts, as 2021 was a dry year. Based on estimates from prior year SWRCB eWRIMS records, water rights holders along the San Joaquin River diverted 1,300 AF from the San Joaquin River.

4.2.4 Madera Water District GSA

To support agriculture, the MWD GSA receives surface water supplies from MID via Dry Creek. In water year 2021 (October 2020 through September 2021), the MWD GSA received approximately 800 AF of surface water at their turnout along Dry Creek (all received in July 2021).

4.2.5 All GSAs

As defined above, the volume of surface water supplies used or available for use is assumed to be the difference between surface water inflows and outflows from each Joint GSP GSA. This total volume encompasses all surface water that is diverted and applied to land within each Joint

GSP GSA (from the water sources described above), as well as all surface water that is lost through seepage and evaporation along the waterways that cross the Joint GSP GSA boundaries.

Table 4-1. Joint GSP Surface Water Supplies Used (Surface Water Inflows – Surface Water Outflows), by Water Source Type (acre-feet, rounded).[3]

Water Year (Type)	Local Supplies	CVP Supplies	Total
1989 (C)	11,700	104,400	116,100
1990 (C)	17,500	62,500	80,000
1991 (C)	14,300	104,600	118,900
1992 (C)	11,700	91,400	103,100
1993 (W)	49,500	253,500	303,000
1994 (C)	9,200	137,400	146,600
1995 (W)	72,900	196,300	269,200
1996 (W)	46,500	238,900	285,400
1997 (W)	89,400	211,900	301,300
1998 (W)	67,300	154,000	221,300
1999 (AN)	12,000	188,000	200,000
2000 (AN)	18,000	175,800	193,800
2001 (D)	11,200	156,600	167,800
2002 (D)	9,900	134,200	144,100
2003 (BN)	12,300	132,400	144,700
2004 (D)	13,400	139,400	152,800
2005 (W)	38,900	161,600	200,500
2006 (W)	60,800	183,300	244,100
2007 (C)	18,500	186,300	204,800
2008 (C)	11,300	148,100	159,400
2009 (BN)	18,100	108,700	126,800
2010 (AN)	15,900	161,800	177,700
2011 (W)	65,300	196,700	262,000
2012 (D)	13,700	95,300	109,000
2013 (C)	10,100	89,600	99,700
2014 (C)	7,900	17,700	25,600
2015 (C)	9,200	8,400	17,600
2016 (D)	17,200	128,300	145,500
2017 (W)	85,500	217,300	302,800

[3] Water Year Type is defined by DWR and is classified as C: critical, D: dry, BN: below normal, AN: above normal, and W: wet.

Water Year (Type)	Local Supplies	CVP Supplies	Total
2018 (BN)	4,200	168,800	173,000
2019 (W)	24,100	176,300	200,400
2020 (D)	36,100	92,800	128,900
2021 (C)	22,900	22,600	45,500
Average (1989-2014)	28,100	140,800	168,800
Average (1989-2021)	60,000	199,000	259,000
W	15,300	175,200	190,500
AN	11,500	136,600	148,200
BN	16,900	124,400	141,400
D	13,100	88,500	101,600
C	28,100	140,800	168,800

4.3 DATA SOURCES

Table 4-2 summarizes the data sources and estimation procedures for all water budget components that are used to quantify surface water supplies available to the Joint GSP GSAs. Additional detail is given below for each water budget component. The data sources for surface water inflows and outflows along the Fresno River, Chowchilla Bypass and the Berenda, Cottonwood, and Dry Creeks within the Madera Subbasin are described in Section 2.2.3.3, pages 2-66 through 2-70 of the Madera Subbasin Joint GSP. For each waterway, a boundary water budget was computed first by following the procedure described for each waterway in the Joint GSP. Unless otherwise specified, all missing and inaccurate data were replaced by estimates equal to the average monthly value of available data, computed by water year type.

Table 4-2. Detailed Water Budget Components and Estimation Techniques Related to Surface Water Supplies (Rivers and Streams System and Conveyance System Water Budgets).

Detailed Component	Associated Waterway	Water Source Type	Calculation/Estimation Technique	Information Sources
Surface Inflows	Berenda Creek	Local Supplies	Calculated from MID recorder measurements adjusted upstream to the Madera Subbasin boundary for estimated seepage and evaporation	MID Recorder 13, NRCS soil survey, Fresno State/Madera/Madera II CIMIS Stations
	Cottonwood Creek	Local Supplies	Calculated from MID recorder measurements adjusted upstream to the Madera Subbasin boundary for estimated seepage and evaporation	MID Recorder 14, NRCS soil survey, Fresno State/Madera/Madera II CIMIS Stations
	Chowchilla Bypass	Local Supplies	Calculated from SLDMWA CBP station measurements adjusted downstream to	SLDMWA CBP station, NRCS soil survey, Fresno

Detailed Component	Associated Waterway	Water Source Type	Calculation/Estimation Technique	Information Sources
			the Madera Subbasin boundary for estimated seepage and evaporation	State/Madera/Madera II CIMIS Stations
	Dry Creek	Local Supplies	Estimated as equal to Berenda Creek recorder measurements adjusted upstream to the Madera Subbasin boundary for estimated seepage and evaporation	MID Recorder 13, NRCS soil survey, Fresno State/Madera/Madera II CIMIS Stations
	Fresno River	Other Supplies (intermingled with CVP Supplies)	Estimated as equal to USGS measurement site along Fresno River below Hidden Dam	USGS Site 11258000 (FRESNO R BL HIDDEN DAM NR DAULTON CA)
Surface Outflows	Berenda Creek	Local Supplies	Calculated from MID recorder measurements adjusted downstream to the Madera Subbasin boundary for estimated seepage and evaporation	MID Recorder 2, NRCS soil survey, Fresno State/Madera/Madera II CIMIS Stations
	Cottonwood Creek	Local Supplies	Calculated from MID recorder measurements adjusted downstream to the Madera Subbasin boundary for estimated seepage and evaporation	MID Recorder 10, NRCS soil survey, Fresno State/Madera/Madera II CIMIS Stations
	Chowchilla Bypass	Local Supplies	Calculated from SLDMWA CBP station measurements adjusted downstream to the Madera Subbasin boundary for estimated seepage and evaporation	SLDMWA CBP station, NRCS soil survey, Fresno State/Madera/Madera II CIMIS Stations
	Fresno River	CVP Supplies	Calculated from MID recorder measurements (downstream of convergence with Dry Creek) adjusted downstream to the Madera Subbasin boundary for estimated seepage and evaporation	MID Recorder 4, NRCS soil survey, Fresno State/Madera/Madera II CIMIS Stations
Riparian Deliveries[1]	San Joaquin River	Local Supplies	Reported riparian deliveries and estimated riparian deliveries based on estimated consumptive use of riparian parcels during streamflow	eWRIMS, Fresno State/Madera/Madera II CIMIS Stations, land use data
Madera Canal Releases to Fresno River	Madera Canal	CVP Supplies	Reported in USBR CVP irrigation delivery records at Madera Canal Mile 18.8	USBR CVP delivery records

Detailed Component	Associated Waterway	Water Source Type	Calculation/Estimation Technique	Information Sources
MID Diversions from Madera Canal	Madera Canal	CVP Supplies	Reported in USBR CVP irrigation delivery records at Madera Canal Miles 6.1, 13.06, 22.95, 24.1, 26.8, 27.5, 28.38, 28.39, 28.64, 30.4, 30.5, 32.2	USBR CVP delivery records
MID Flood Diversions from Madera Canal	Madera Canal	CVP Supplies	Reported in USBR CVP flood delivery records at Madera Canal Miles 6.1, 13.06, 22.95, 24.1, 26.8, 27.5, 28.38, 28.39, 28.64, 30.4, 30.5, 32.2	USBR CVP delivery records
MID Diversions from Fresno River[2]	Fresno River	CVP Supplies	Closure of Fresno River Balance	USGS Site 11258000 (FRESNO R BL HIDDEN DAM NR DAULTON CA), USBR CVP delivery records, IDC root zone water budget, NRCS soils characteristics, CIMIS precipitation data, MID recorders
Spillage[3]	San Joaquin River	CVP Supplies	Measured by MID recorders at spillage sites	MID Recorders 9, 11
MID Conveyance System to Cottonwood Creek	Cottonwood Creek	CVP Supplies	Estimated from MID Recorder 10, GFWD reports	MID Recorder 10, GFWD reports
MID Deliveries to Other Districts	MID Conveyance System	CVP Supplies	Measured by MID, or reported from other districts' records	MID STORM[4] delivery database, GFWD reports, MWD reports, RCWD reports

1 Riparian deliveries along Fresno River within the Madera Subbasin are included in the "MID Diversions from Fresno River."

2 Total diversions from Fresno River includes riparian deliveries from Fresno River.

3 Spillage to Fresno River (MID Recorders 15-20) are accounted in the Fresno River outflows.

4 The water ordering and delivery management software used by Madera Irrigation District.

5 Total Water Use (§356.2.b.4)

This section summarizes the annual volumes and data sources for total water use by the Joint GSP GSAs through the current reporting year (2021).

5.1 QUANTIFICATION BY WATER USE SECTOR AND WATER SOURCE TYPE

Water use is defined by ASCE (2016) as "water that is used for a specific purpose such as domestic use, irrigation, or industrial processing." This definition includes both consumptive and non-consumptive components.

In the context of agriculture, consumptive water use is defined as "the part of water withdrawn that is evaporated, transpired, incorporated into products or crops, consumed by humans or livestock, or otherwise removed from the immediate water environment" (ASCE, 2016). As most field crops dry to a very low moisture content approaching harvest, total consumptive water use is generally equivalent to the combined evaporation (E) and crop transpiration (T), together referred to as crop evapotranspiration (ET_c). ET_c encompasses evapotranspiration of all water available to crops, including primarily evapotranspiration of precipitation (ET_{pr}) and evapotranspiration of applied water (ET_{aw}). Non-consumptive water use is generally equal to the volume of precipitation and applied water less ET_c.

Accordingly, the total water use reported below is assumed to be equal to the total combined precipitation, agricultural applied water, managed recharge applied water, and urban water use from all sources within the Joint GSP area.

In addition to reporting the total water use in the Joint GSP GSAs, the total consumptive water use (the sum of ET_{aw} and ET_{pr}) is also reported below, as this represents the volume of water that is no longer available for use within the Joint GSP area (i.e., unavailable for reuse or future groundwater extraction).

Water sources available for use in the Joint GSP area include applied water (surface water and groundwater) and precipitation. **Table 5-1** summarizes the total water use by the Joint GSP GSAs, by water use sector and water source type from 1989 through 2021 (the current reporting year). **Table 5-2** summarizes the consumptive water use by the Joint GSP GSAs, by water use sector and water source type from 1989 through 2021.The methodology and data sources used to develop these tables are provided below.

Table 5-1. Joint GSP Total Water Use, by Water Use Sector and Water Source Type (acre-feet, rounded).

Water Year (Type)	Agricultural				Managed Recharge				Native Vegetation				Urban				Total			
	Total	Surface Water	Ground-water	Precip-itation	Total	Surface Water	Ground-water	Precip-itation	Total	Surface Water	Ground-water	Precip-itation	Total	Surface Water	Ground-water	Precip-itation	Total	Surface Water	Ground-water	Precip-itation
1989 (C)	629,880	68,580	366,250	195,050	0	0	0	0	104,290	0	0	104,290	39,830	0	16,900	22,930	774,010	68,580	383,160	322,270
1990 (C)	647,360	53,310	412,060	181,990	0	0	0	0	96,810	0	-10	96,820	39,570	0	17,940	21,630	783,750	53,310	429,990	300,450
1991 (C)	682,370	86,860	405,250	190,260	0	0	0	0	100,800	0	0	100,800	39,740	0	16,880	22,860	822,920	86,860	422,130	313,930
1992 (C)	691,420	69,150	466,510	155,760	0	0	0	0	81,890	0	0	81,890	41,300	0	22,400	18,900	814,600	69,150	488,910	256,540
1993 (W)	747,760	130,690	352,900	264,170	0	0	0	0	138,140	0	0	138,140	50,030	0	17,670	32,360	935,930	130,690	370,570	434,670
1994 (C)	654,180	116,390	387,840	149,950	0	0	0	0	77,830	0	-10	77,840	39,150	0	20,610	18,540	771,150	116,390	408,440	246,320
1995 (W)	726,610	107,200	297,020	322,390	0	0	0	0	166,160	0	0	166,160	51,300	0	11,060	40,240	944,070	107,200	308,080	528,790
1996 (W)	704,080	159,100	347,820	197,160	0	0	0	0	101,150	0	0	101,150	41,670	0	16,810	24,860	846,910	159,100	364,640	323,170
1997 (W)	798,000	163,590	408,960	225,450	0	0	0	0	115,120	0	0	115,120	55,650	0	26,920	28,730	968,770	163,590	435,890	369,290
1998 (W)	691,980	106,050	314,700	271,230	0	0	0	0	137,850	0	0	137,850	49,410	0	14,500	34,910	879,230	106,050	329,200	443,980
1999 (AN)	607,290	135,340	361,860	110,090	0	0	0	0	55,690	0	0	55,690	35,540	0	21,230	14,310	698,520	135,340	383,090	180,090
2000 (AN)	696,540	122,440	394,500	179,600	0	0	0	0	90,420	0	0	90,420	43,680	0	20,100	23,580	830,640	122,440	414,600	293,600
2001 (D)	688,850	113,100	408,060	167,690	0	0	0	0	84,020	0	0	84,020	40,860	0	18,630	22,230	813,730	113,100	426,690	273,940
2002 (D)	701,760	101,800	448,320	151,640	0	0	0	0	76,220	0	0	76,220	45,010	0	24,320	20,690	822,990	101,800	472,640	248,550
2003 (BN)	661,810	104,630	424,430	132,750	0	0	0	0	66,940	0	0	66,940	42,460	0	23,830	18,630	771,210	104,630	448,260	218,320
2004 (D)	701,220	115,350	475,970	109,900	0	0	0	0	55,600	0	0	55,600	46,720	0	30,870	15,850	803,540	115,350	506,830	181,360
2005 (W)	660,010	117,560	353,540	188,910	0	0	0	0	95,890	0	0	95,890	47,550	0	19,550	28,000	803,460	117,560	373,090	312,810
2006 (W)	682,960	127,150	348,440	207,370	0	0	0	0	105,600	0	0	105,600	50,550	0	18,990	31,560	839,100	127,150	367,420	344,530
2007 (C)	626,540	112,500	430,360	83,680	0	0	0	0	42,760	0	0	42,760	43,320	0	30,250	13,070	712,620	112,500	460,610	139,510
2008 (C)	659,760	105,920	427,160	126,680	0	0	0	0	64,940	0	0	64,940	50,550	0	30,250	20,300	775,260	105,920	457,420	211,920
2009 (BN)	619,610	97,720	407,860	114,030	0	0	0	0	58,650	0	0	58,650	48,320	0	29,580	18,740	726,580	97,720	437,440	191,420
2010 (AN)	634,330	126,940	312,280	195,110	0	0	0	0	100,690	0	0	100,690	50,290	0	17,430	32,860	785,320	126,940	329,720	328,660
2011 (W)	672,870	142,440	326,950	203,480	0	0	0	0	105,350	0	0	105,350	54,890	0	19,780	35,110	833,110	142,440	346,730	343,940
2012 (D)	641,160	100,440	470,750	69,970	0	0	0	0	35,110	0	0	35,110	43,200	0	31,200	12,000	719,460	100,440	501,940	117,080
2013 (C)	667,180	76,330	471,420	119,430	0	0	0	0	58,030	0	0	58,030	53,250	0	32,900	20,350	778,470	76,330	504,330	197,810
2014 (C)	608,670	19,960	529,790	58,920	0	0	0	0	27,730	0	10	27,720	42,000	0	32,020	9,980	678,390	19,960	561,810	96,620
2015 (C)	696,770	13,990	601,430	81,350	0	0	0	0	36,830	0	0	36,830	50,500	0	36,810	13,690	784,100	13,990	638,240	131,870
2016 (D)	742,550	94,670	443,540	204,340	0	0	0	0	90,990	0	0	90,990	71,560	0	31,070	40,490	905,100	94,670	474,610	335,820
2017 (W)	728,640	125,160	402,840	200,640	0	0	0	0	85,930	0	0	85,930	70,870	0	31,380	39,490	885,440	125,160	434,220	326,060
2018 (BN)	712,090	131,670	457,920	122,500	0	0	0	0	50,010	0	0	50,010	55,760	0	31,800	23,960	817,860	131,670	489,710	196,480
2019 (W)	719,280	141,630	382,400	195,250	620	620	0	0	76,360	0	0	76,360	66,490	0	28,610	37,880	862,760	142,250	411,020	309,490
2020 (D)	659,400	95,740	464,220	99,440	0	0	0	0	43,080	0	0	43,080	57,180	0	36,560	20,620	759,660	95,740	500,780	163,140
2021 (C)	557,500	27,820	503,850	25,830	0	0	0	0	11,050	0	0	11,050	44,320	0	38,920	5,400	612,870	27,820	542,770	42,280
Average (1989-2014)	673,240	106,940	398,120	168,180	0	0	0	0	86,300	0	0	86,300	45,610	0	22,410	23,200	805,140	106,940	420,520	277,680
Average (1989-2021)	676,380	103,370	412,340	160,670	20	20	0	0	79,940	0	0	79,940	48,560	0	24,780	23,780	804,890	103,390	437,120	264,380
W	713,230	132,060	353,560	227,610	60	60	0	0	112,750	0	0	112,750	53,840	0	20,530	33,310	879,880	132,120	374,090	373,670
AN	646,060	128,240	356,220	161,600	0	0	0	0	82,270	0	0	82,270	43,170	0	19,590	23,580	771,490	128,240	375,800	267,450
BN	664,500	111,340	430,070	123,090	0	0	0	0	58,540	0	0	58,540	48,840	0	28,400	20,440	771,880	111,340	458,470	202,070
D	689,160	103,520	451,810	133,830	0	0	0	0	64,170	0	0	64,170	50,760	0	28,780	21,980	804,080	103,520	480,580	219,980
C	647,430	68,260	454,720	124,450	0	0	0	0	63,910	0	0	63,910	43,960	0	26,900	17,060	755,290	68,260	481,620	205,410

Table 5-2. Joint GSP Consumptive Water Use, by Water Use Sector and Water Source Type (acre-feet, rounded).

Water Year (Type)	Agricultural				Managed Recharge				Native Vegetation				Urban				Total			
	Total	Surface Water	Ground-water	Precip-itation	Total	Surface Water	Ground-water	Precip-itation	Total	Surface Water	Ground-water	Precip-itation	Total	Surface Water	Ground-water	Precip-itation	Total	Surface Water	Ground-water	Precip-itation
1989 (C)	432,040	44,970	266,490	120,580	0	0	0	0	78,270	0	10	78,260	26,890	0	12,340	14,550	537,210	44,970	278,840	213,400
1990 (C)	456,420	34,280	296,630	125,510	0	0	0	0	75,960	0	0	75,960	28,280	0	12,970	15,310	560,670	34,280	309,610	216,780
1991 (C)	445,400	55,960	288,830	100,610	0	0	0	0	68,210	0	0	68,210	24,890	0	12,000	12,890	538,490	55,960	300,820	181,710
1992 (C)	509,580	46,920	351,930	110,730	0	0	0	0	81,570	0	0	81,570	30,750	0	15,220	15,530	621,890	46,920	367,150	207,820
1993 (W)	488,170	87,200	255,780	145,190	0	0	0	0	80,740	0	0	80,740	29,860	0	13,010	16,850	598,760	87,200	268,780	242,780
1994 (C)	484,450	80,810	296,120	107,520	0	0	0	0	63,440	0	0	63,440	29,410	0	15,480	13,930	577,290	80,810	311,600	184,880
1995 (W)	458,010	72,010	217,220	168,780	0	0	0	0	78,300	0	0	78,300	27,450	0	9,400	18,050	563,760	72,010	226,620	265,130
1996 (W)	510,640	111,180	261,000	138,460	0	0	0	0	81,240	0	0	81,240	29,670	0	10,750	18,920	621,540	111,180	271,740	238,620
1997 (W)	515,660	108,230	293,800	113,630	0	0	0	0	70,950	0	0	70,950	31,890	0	15,430	16,460	618,500	108,230	309,230	201,040
1998 (W)	453,130	71,300	231,190	150,640	0	0	0	0	67,960	0	0	67,960	28,040	0	11,990	16,050	549,130	71,300	243,180	234,650
1999 (AN)	470,150	96,900	283,410	89,840	0	0	0	0	58,790	0	0	58,790	28,260	0	14,160	14,100	557,200	96,900	297,570	162,730
2000 (AN)	513,160	87,580	307,820	117,760	0	0	0	0	66,840	0	0	66,840	30,640	0	15,630	15,010	610,640	87,580	323,450	199,610
2001 (D)	513,980	79,790	316,570	117,620	0	0	0	0	71,910	0	0	71,910	30,280	0	13,850	16,430	616,170	79,790	330,420	205,960
2002 (D)	525,190	70,900	346,980	107,310	0	0	0	0	68,010	0	0	68,010	33,560	0	17,630	15,930	626,750	70,900	364,600	191,250
2003 (BN)	512,100	75,460	336,410	100,230	0	0	0	0	54,710	0	0	54,710	33,040	0	18,920	14,120	599,850	75,460	355,330	169,060
2004 (D)	553,000	83,810	381,790	87,400	0	0	0	0	60,290	0	0	60,290	37,780	0	22,890	14,890	651,070	83,810	404,680	162,580
2005 (W)	492,880	85,130	278,040	129,710	0	0	0	0	67,490	0	0	67,490	33,610	0	16,380	17,230	593,980	85,130	294,420	214,430
2006 (W)	499,450	91,200	272,850	135,400	0	0	0	0	72,850	0	0	72,850	34,750	0	15,570	19,180	607,050	91,200	288,410	227,440
2007 (C)	501,580	82,430	348,320	70,830	0	0	0	0	54,170	0	0	54,170	35,260	0	20,180	15,080	591,010	82,430	368,500	140,080
2008 (C)	513,180	77,480	343,900	91,800	0	0	0	0	57,330	0	0	57,330	39,100	0	23,380	15,720	609,600	77,480	367,280	164,840
2009 (BN)	496,220	72,350	335,090	88,780	0	0	0	0	47,170	0	0	47,170	38,890	0	24,460	14,430	582,270	72,350	359,540	150,380
2010 (AN)	482,710	94,570	252,260	135,880	0	0	0	0	66,560	0	0	66,560	35,460	0	15,970	19,490	584,730	94,570	268,230	221,930
2011 (W)	497,250	105,340	258,950	132,960	0	0	0	0	72,250	0	0	72,250	36,580	0	14,670	21,910	606,070	105,340	273,620	227,110
2012 (D)	508,280	72,540	376,710	59,030	0	0	0	0	41,240	0	0	41,240	33,800	0	20,300	13,500	583,330	72,540	397,020	113,770
2013 (C)	520,270	55,610	382,590	82,070	0	0	0	0	51,980	0	0	51,980	40,440	0	25,080	15,360	612,680	55,610	407,670	149,400
2014 (C)	497,980	14,380	431,090	52,510	0	0	0	0	26,860	0	0	26,860	34,150	0	24,670	9,480	558,990	14,380	455,760	88,850
2015 (C)	564,380	9,700	494,070	60,610	0	0	0	0	29,940	0	0	29,940	38,950	0	28,680	10,270	633,260	9,700	522,750	100,810
2016 (D)	562,270	72,650	353,120	136,500	0	0	0	0	67,530	0	0	67,530	48,350	0	24,370	23,980	678,150	72,650	377,490	228,010
2017 (W)	544,580	98,840	318,560	127,180	0	0	0	0	59,440	0	0	59,440	44,290	0	19,950	24,340	648,310	98,840	338,510	210,960
2018 (BN)	559,620	104,090	366,820	88,710	0	0	0	0	42,780	0	0	42,780	39,820	0	22,110	17,710	642,230	104,090	388,930	149,210
2019 (W)	577,490	109,220	320,930	147,340	440	440	0	0	60,440	0	0	60,440	48,150	0	21,920	26,230	686,510	109,660	342,850	234,000
2020 (D)	536,250	70,350	384,060	81,840	130	130	0	0	42,650	0	0	42,650	43,950	0	25,110	18,840	622,980	70,480	409,170	143,330
2021 (C)	456,840	20,420	413,750	22,670	0	0	0	0	17,650	0	0	17,650	34,340	0	26,210	8,130	508,840	20,420	439,960	48,460
Average (1989-2014)	494,260	75,320	308,140	110,800	0	0	0	0	64,810	0	0	64,810	32,410	0	16,630	15,780	591,480	75,320	324,770	191,390
Average (1989-2021)	504,610	73,560	323,610	107,440	20	20	0	0	60,770	0	0	60,770	34,560	0	18,200	16,360	599,970	73,580	341,810	184,580
W	503,720	93,280	271,510	138,930	40	40	0	0	71,170	0	0	71,170	34,430	0	14,910	19,520	609,350	93,320	286,420	229,610
AN	488,670	93,020	281,160	114,490	0	0	0	0	64,070	0	0	64,070	31,460	0	15,260	16,200	584,200	93,020	296,420	194,760
BN	522,640	81,870	348,200	92,570	0	0	0	0	48,220	0	0	48,220	37,250	0	21,830	15,420	608,110	81,870	370,020	156,220
D	533,170	74,400	360,480	98,290	20	20	0	0	58,600	0	0	58,600	37,950	0	20,690	17,260	629,740	74,420	381,170	174,150
C	489,290	47,600	355,740	85,950	0	0	0	0	55,030	0	0	55,030	32,960	0	19,660	13,300	577,270	47,600	375,390	154,280

5.2 DATA SOURCES

ET_{aw} and ET_{pr} volumes were calculated by water use sector and water source type using a root zone water balance model as described in Section 2.2.3.3, pages 2-62 through 2-65 of the Madera Subbasin Joint GSP.

Daily ET_o values were computed based on weather data in the study area (**Table 5-3**) and were provided as inputs to the root zone model for calculating crop consumptive use requirements. Daily precipitation inflows to each Land Surface System water use sector were calculated as the daily precipitation depth derived from weather station data (**Table 5-3**) applied over the total area of each water use sector within the Madera Subbasin (in acres). Daily precipitation depths were provided as inputs to the root zone model to compute the fraction of ET_c that is represented by ET_{pr}. The Madera II CIMIS station last day with reported data was June 23, 2018. Beginning June 24, 2018, PRISM data was used for precipitation. Beginning June 24, 2018, spatial CIMIS data was used for reference ET when available.

Table 5-3. Madera Subbasin Weather Data Sources.

Weather Station	Station Type	Start Date	End Date	Comment
Fresno State	CIMIS	Oct. 2, 1988	May 12, 1998	CIMIS Station #80. Used before Madera CIMIS station was installed.
Madera	CIMIS	May 13, 1998	Apr. 2, 2013	CIMIS Station #145. Moved eastward 2 miles in 2013 and renamed "Madera II."
Madera II	CIMIS	Apr. 3, 2013	Jun. 23, 2018	CIMIS Station #188.
Spatial CIMIS	Spatial CIMIS	Jun. 24, 2018	Sep. 30, 2021	Used for developing ET_o time series in 2018-2021 (except water year 2020) after CIMIS station data was available.
Fresno State	CIMIS	Oct. 1, 2019	Sep. 30, 2020	Used for developing ET_o time series in 2019-2021 after Madera CIMIS station data was unavailable.
PRISM	PRISM	Jun. 24, 2018	Sep. 30, 2021	Used for developing precipitation time series in 2018-2021 after CIMIS station data was available.
Madera	NOAA NCEI	Jan. 1, 1928	Oct. 1, 1988	Used for developing ET_o time series for projected water budget period before CIMIS station data was available.

6 Change in Groundwater Storage (§356.2.b.5)

6.1 CHANGE IN GROUNDWATER STORAGE MAPS

Consistent with §354.18.b, based on a comparison of the annual spring groundwater elevation contour maps representing seasonal high groundwater conditions, changes in groundwater elevation were calculated for individual aquifers between Spring 2020 and Spring 2021. To calculate annual change in groundwater storage from the groundwater level contour maps, the difference in groundwater elevation between annual spring contour maps was calculated for each of the principal aquifers (Upper and Lower Aquifers). Both confined and unconfined groundwater conditions occur within the Madera Subbasin. To accurately estimate change in groundwater storage from changes in groundwater levels, it is important to differentiate areas of confined groundwater conditions from unconfined conditions. Accordingly, the groundwater elevation data were reviewed to estimate an area over which the Lower Aquifer exhibits confined conditions and where the groundwater levels are representative of a potentiometric surface. This was done by comparing groundwater elevations to the elevation of the bottom of the Corcoran Clay confining geologic unit. The extent of the area where groundwater elevations in the Lower Aquifer occur above the bottom of the Corcoran Clay was delineated as the area of confined groundwater conditions for the purpose of calculating change in groundwater storage.

Outside of the delineated confined area, changes in groundwater levels (in both the Upper and Lower Aquifers) were multiplied by representative specific yield values to estimate change in groundwater storage. Within the delineated area of confinement in the Lower Aquifer, groundwater potentiometric surface changes in the Lower Aquifer were multiplied by a much smaller storage coefficient value to calculate annual changes in groundwater storage in the Lower Aquifer. The specific yield and storage coefficient values used in the analysis are derived from values in the calibrated integrated groundwater flow model (MCSim) developed and applied during the preparation of the Joint GSP. The specific yield values in MCSim are lower than previous values estimated for the Madera Subbasin; however, recent test hole drilling and associated subsurface geologic and geophysical logging conducted at seven monitoring well sites across the Madera Subbasin indicate a high fraction of fine-grained sediments in many parts of the Madera Subbasin, which is consistent with the relatively low specific yield values in MCSim.

Figures 6-1 and 6-2 show the spatial distribution of calculated annual change in groundwater level for the most recent reporting year between Spring 2020 and Spring 2021 for the Upper Aquifer/undifferentiated unconfined groundwater zone and the Lower Aquifer. Maps of change in groundwater levels for each of the years between Spring 2016 and 2020, separated by principal aquifer, are presented in **Appendix C**. Because there was incomplete spatial coverage of groundwater elevation data within the Joint GSP area, it was not deemed appropriate to extend groundwater elevation contours into some parts of the Joint GSP area. In these areas without contour data, the average change in groundwater elevation value calculated for the area with data was applied to areas without data to estimate change in storage amounts for the entire Joint GSP area. **Tables 6-1 through 6-3** summarize the calculated annual change in groundwater storage volumes for 2021 by principal aquifer for the Joint GSP area. The discussion of estimated change

in storage values presented below is based on the aquifer parameter values derived from MCSim as presented in **Tables 6-1 through 6-3**. The change in storage value in the Upper Aquifer/undifferentiated unconfined groundwater zone is presented in **Table 6-1**. Maps of the spatial distribution of change in storage in the principal aquifers for the most recent period from Spring 2020 to Spring 2021 are presented in **Figures 6-3 and 6-4**. All maps of change in groundwater storage utilize specific yield and storage coefficient values derived from MCSim. Maps of change in groundwater storage for each of the years between Spring 2016 and 2020, separated by aquifer, are presented in **Appendix C**.

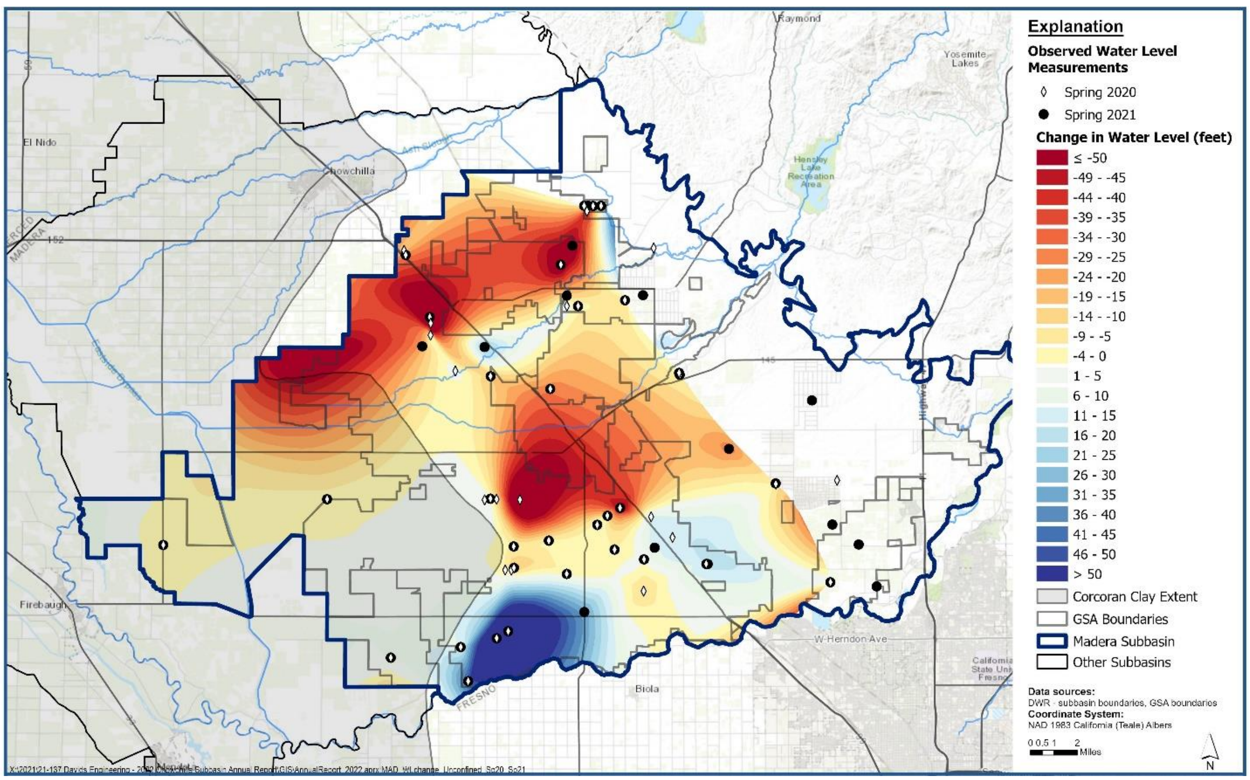


Figure 6-1. Change in Groundwater Level in the Upper Aquifer/Undifferentiated Unconfined Zone – Spring 2020 through Spring 2021.

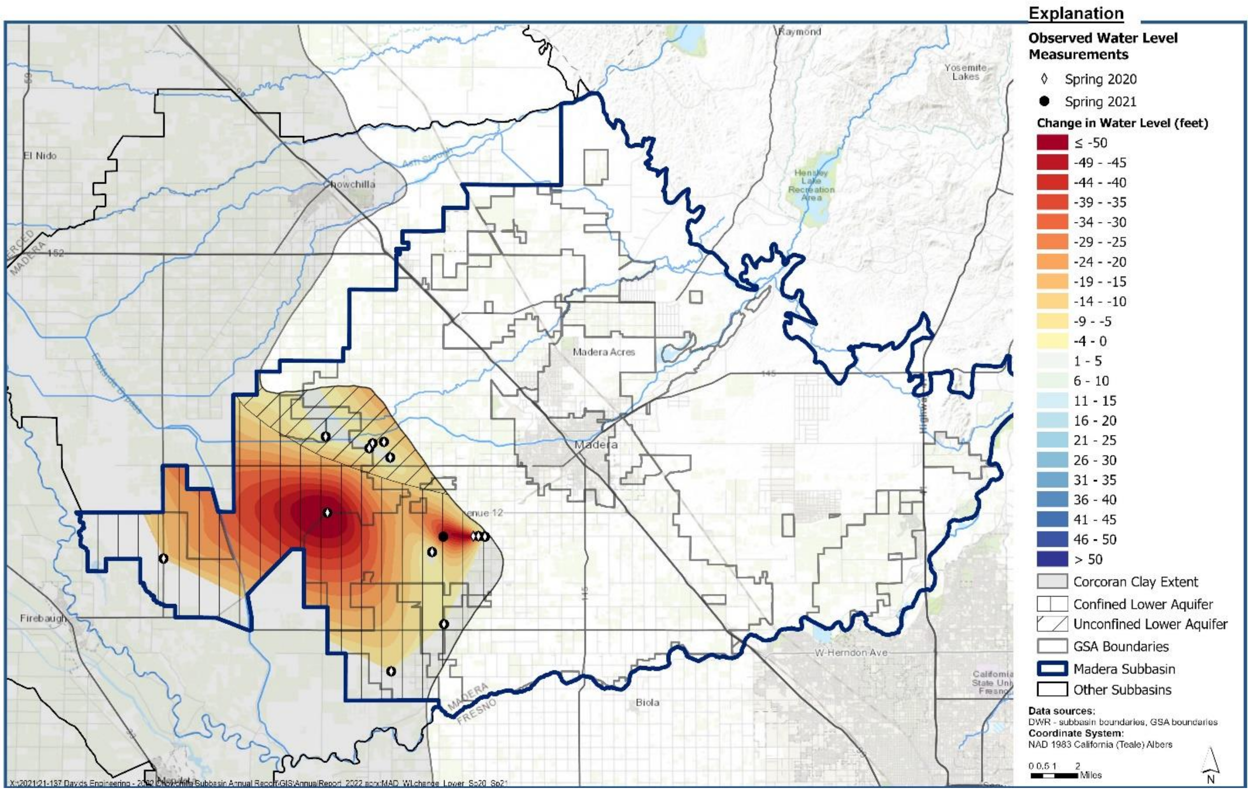


Figure 6-2. Change in Groundwater Level in the Lower Aquifer – Spring 2020 through Spring 2021.

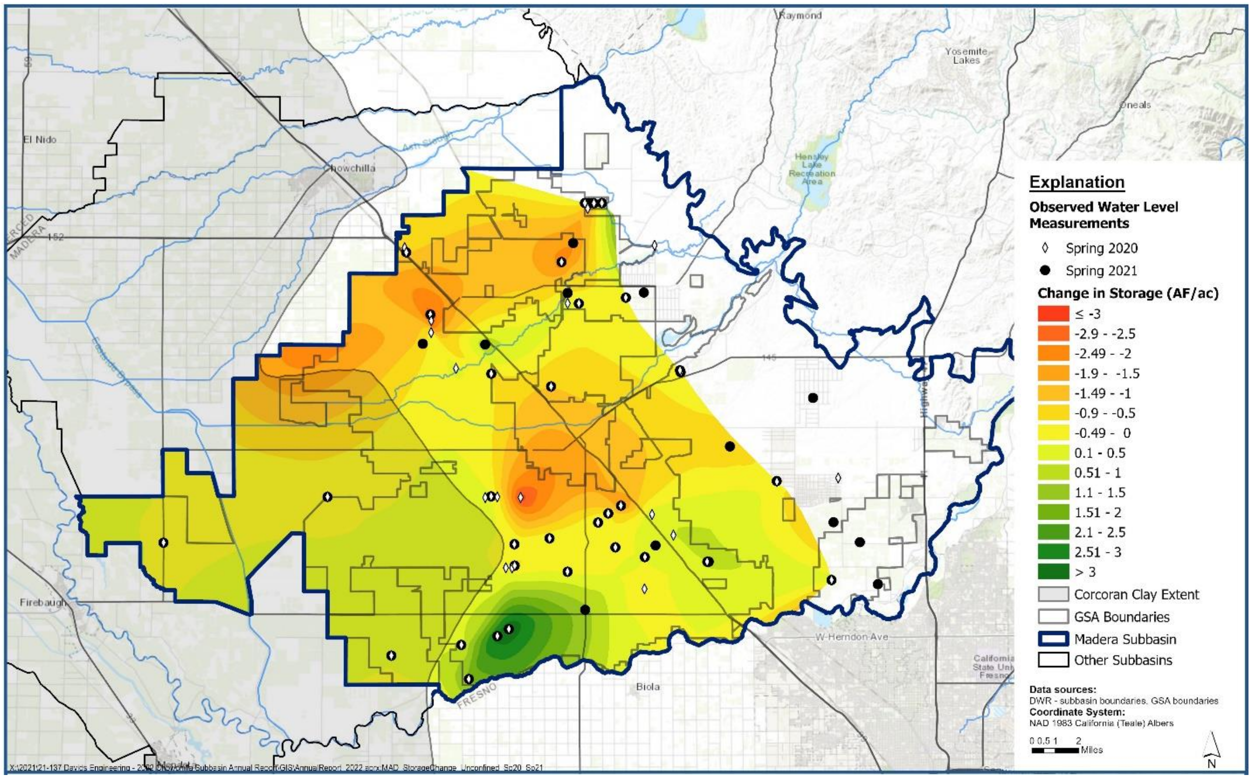


Figure 6-3. Change in Groundwater Storage in the Upper Aquifer/Undifferentiated Unconfined Zone – Spring 2020 through Spring 2021.

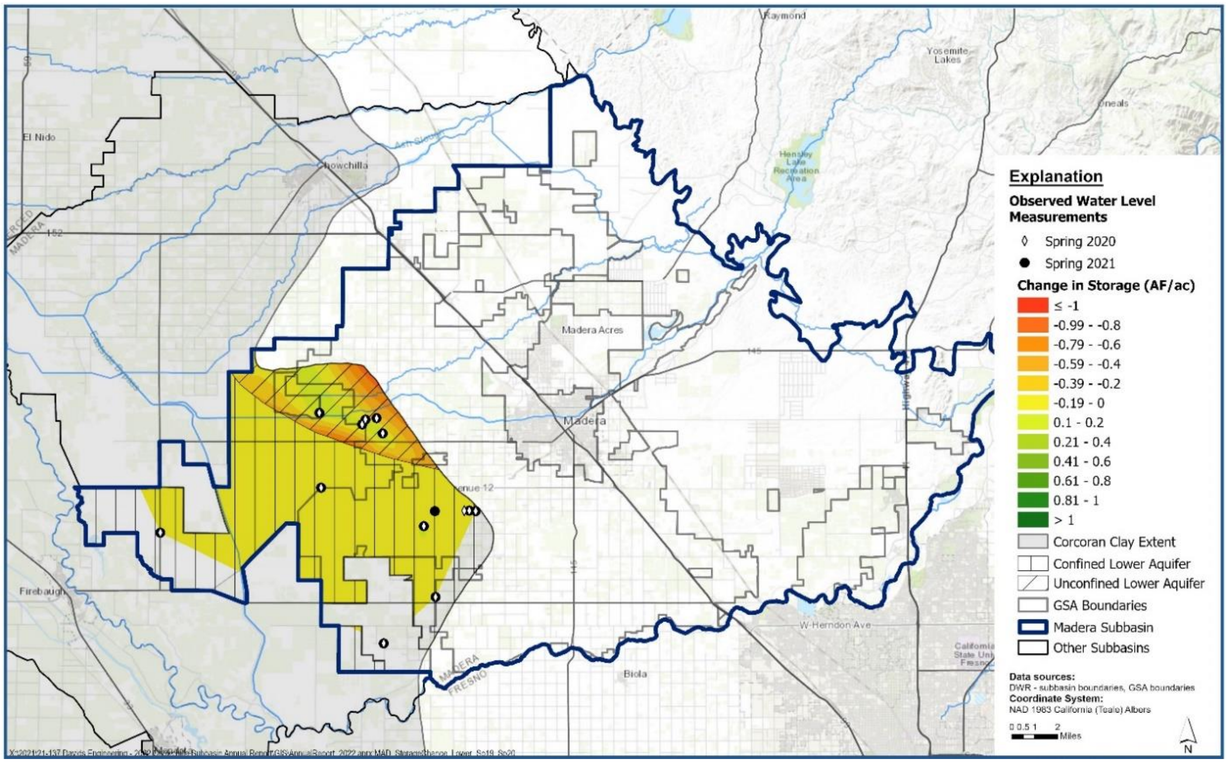


Figure 6-4. Change in Groundwater Storage in the Lower Aquifer – Spring 2020 through Spring 2021.

Using representative aquifer parameter values derived from the calibrated groundwater flow model MCSim, the calculated changes in groundwater levels in the combined Upper Aquifer and undifferentiated unconfined zone translate to annual change in groundwater storage of about -107,145 AF from Spring 2020 to 2021 (**Table 6-1**). Negative change in storage values indicate depletion of groundwater storage, whereas positive change in storage values represent accretion of groundwater in storage. In the Lower Aquifer, changes in groundwater levels translated to substantially smaller changes in groundwater storage where confined conditions exist due to the smaller overall area and application of a storage coefficient value in these areas. The portion of the Lower Aquifer treated as unconfined, while smaller in overall areal extent, can result in greater storage changes due to application of a specific yield value. Between Spring 2020 and Spring 2021, the change in groundwater storage in the Lower Aquifer was about -5,120 AF (**Table 6-2**), with the majority of that decrease occurring in the unconfined portion of the Lower Aquifer. The combined change in groundwater storage for the entire Joint GSP area was a decrease of about -112,265 AF from Spring 2020 to 2021, indicating a net depletion of groundwater storage (**Table 6-3**). Notably, there is uncertainty in this estimate, and there are also other processes that contribute to the net change in groundwater storage besides groundwater pumping (e.g., subsurface inflows and outflows). These contributing factors were considered in the MCSim groundwater model used in development of the Joint GSP, and will be further evaluated in future updates to the MCSim model.

Table 6-1. Calculated Change in Groundwater Storage in the Combined Upper Aquifer and Undifferentiated Unconfined Zone.

Analysis Time Period	Specific Yield	Average Groundwater Elevation Change (ft)	Average Groundwater Storage Change Per Acre (AF/acre)	Area Applied for Estimating Groundwater Storage Change (acres)	Total Groundwater Storage Change in Joint GSP Area (AF)[1]	Notes on Specific Yield Basis
Spring 2020-2021	0.04	-9.35	-0.33	325,834	-107,145	Representative value from MCSim model

Table 6-2. Calculated Change in Groundwater Storage in the Lower Aquifer Zone.

Analysis Time Period	Lower Aquifer Zone	Storage Coefficient[1]	Specific Yield[2]	Average Change in Groundwater Elevation Surface (ft)	Average Groundwater Storage Change Per Acre (AF/acre)	Area Used for Estimating Groundwater Storage Change (acres)	Total Groundwater Storage Change in Joint GSP Area (AF)[3] (AF)	Notes on Storage Coefficient Basis
Spring 2020-2021	Confined	1.24E-03		-25.99	-0.03	56,545	-1,816	Representative value from MCSim model
	Unconfined		0.049	-5.40	-0.26	12,474	-3,303	
	TOTAL				-0.07	69,019	-5,120	

[1] Storage Coefficient value applies to those areas under the Corcoran Clay considered to be confined (56,545 acres).

[2] Specific Yield value applies to those areas under the Corcoran Clay considered to be unconfined (12,474 acres).

[3] Total Lower Aquifer within Joint GSP area is 69,019 acres and includes only those areas of the Madera Subbasin outside of RCWD GSA, GFWD GSA, and NSWD GSA.

Table 6-3. Total Calculated Change in Groundwater Storage in the Joint GSP Area.

Analysis Time Period	Average Groundwater Storage Change Per Acre (AF/acre)	Total Joint GSP Area (acres)	Total Groundwater Storage Change in Joint GSP Area (AF)
Spring 2020-2021	-0.34	325,800	-112,265

6.2 GROUNDWATER USE AND CHANGE IN GROUNDWATER STORAGE

Annual groundwater extractions and change in groundwater storage in the Joint GSP area is shown in **Figure 6-5** for water years 2015 to 2021. Groundwater extractions are estimated or directly measured following the procedures described in the corresponding section above. Change in groundwater storage is estimated based on an annual comparison of spring groundwater elevations. Change in groundwater storage is not provided for water years 2015 and 2016, as there was insufficient historical data to accurately calculate change in storage those years. Historical groundwater extractions in water years 1989 through 2014 are shown in Figure 2-88 of the Joint GSP (page 2-89). Historical annual changes in groundwater storage and cumulative changes in storage are also shown in the Joint GSP (Joint GSP Appendix D.1.b, pages A6.D-D-15 and A6.D-D-16). Historical changes in groundwater storage between 1989 and 2014 were calculated based on a water balance of the Madera Subbasin groundwater system using the MCSim numerical groundwater flow model (described in the Joint GSP). Total annual groundwater extraction decreases in wet years and increases in dry years, while the annual change in groundwater storage has fluctuated between approximately -19,000 AF and -112,000 AF since water year 2017 (**Figure 6-5**).

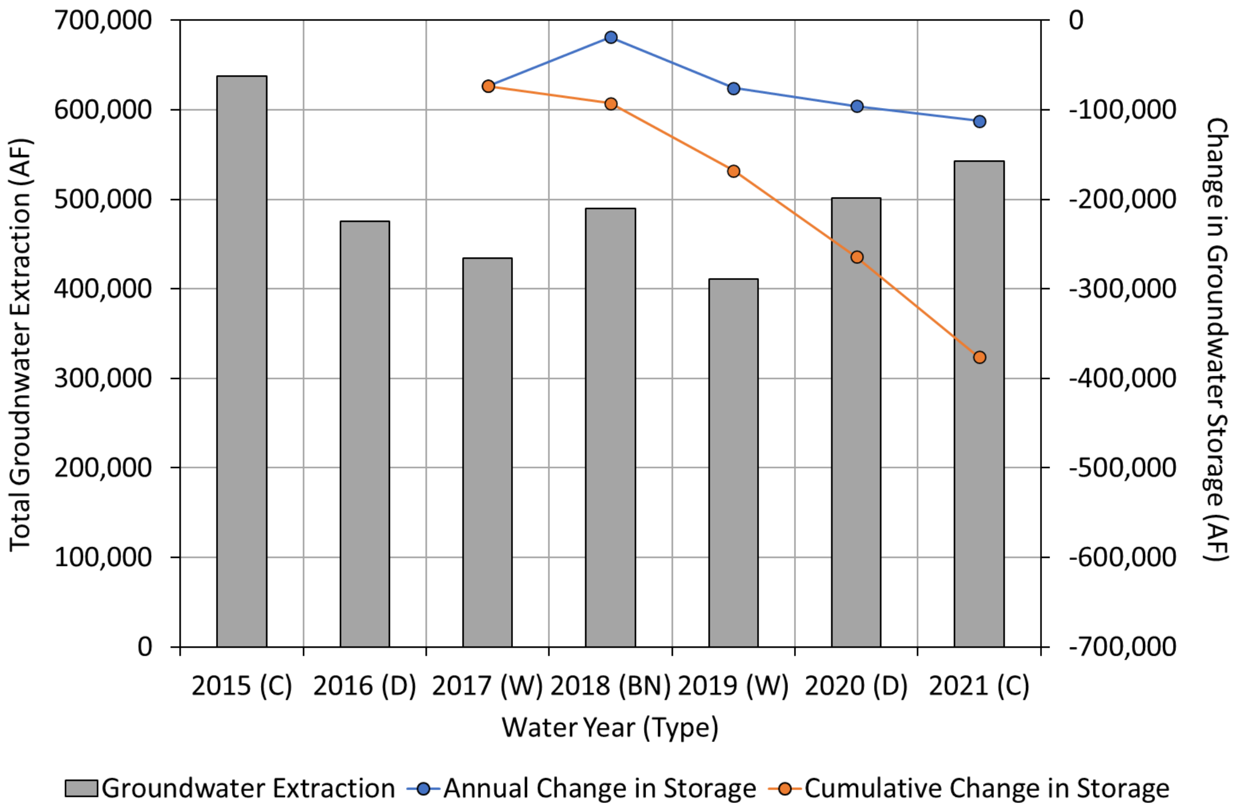


Figure 6-5. Annual Change in Groundwater Storage and Total Groundwater Extractions in the Joint GSP Area*.

**Information in 2021 is summarized from Table 6-3 (Total Groundwater Storage Change in Joint GSP Area) and Table 3-2 (Total Groundwater Extractions). Cumulative change in storage is calculated from 2021 data and information from earlier years, documented in prior Annual Reports.*

7 Groundwater Sustainability Plan Implementation Progress (§356.2.c)

7.1 IMPLEMENTATION OF PROJECTS AND MANAGEMENT ACTIONS (§356.2.C)

The implementation of projects and management actions (PMAs) is critical for achieving and maintaining groundwater sustainability, as described in the Madera Subbasin Joint GSP. PMAs are scheduled for implementation throughout the 2020 through 2040 implementation period, with different timelines anticipated for implementation of each PMA. The estimated annual costs and benefits (i.e., increased groundwater recharge or reduced groundwater use) of PMAs proposed by the GSAs vary across this implementation period, as described in the Joint GSP.

This section describes progress that has been made toward implementation of the Joint GSP and specific PMAs since the previous Annual Report. First, a brief overview is given regarding the progress that has been made toward implementation of the Domestic Well Mitigation Program as of spring 2022. The remainder of this section describes the progress made for PMAs proposed by each Joint GSP GSA. Additionally, the Joint GSP GSAs developed a Stakeholder Communication and Engagement Plan (**Appendix D**) with recommendations for outreach during implementation to involve the public during project development and implementation. The Joint GSP GSAs are engaging stakeholders during development of projects and management actions, and plan to continue such outreach and engagement activities through the remainder of Joint GSP implementation.

7.1.1 Domestic Well Mitigation Program

The first step in development of the Domestic Well Mitigation Program is to inventory the domestic wells in the Madera Subbasin. To accomplish this, the GSAs in the Madera Subbasin applied for and were awarded a Proposition 68 grant from DWR to conduct a domestic well inventory and install six new monitoring wells at two sites in the Madera Subbasin. The MC GSA applied for the grant on behalf of the Madera Subbasin and has led the project since its inception. The MC GSA issued an RFP and selected a consultant for the study in 2020. In 2021-2022, the domestic well inventory was conducted. Installation of new nested monitoring wells is pending. As of spring 2022, the project is nearing completion and final documentation is being prepared. In addition to an updated and more accurate domestic well inventory, information collected during this project from the drilling, geologic and geophysical logging, groundwater quality sampling, and automated groundwater level monitoring will aid further in filling data gaps in the monitoring and conceptualization of the Madera Subbasin hydrogeology. The project will also improve understanding and management of groundwater in the Madera Subbasin.

As of spring 2022, the Joint GSP GSAs continue to meet to advance focused plans for creating and administering the Domestic Well Mitigation Program within the Madera Subbasin. The Joint GSP GSAs do not represent all of the GSAs within the Subbasin and as such, they recognize the importance of working to ensure that the Domestic Well Mitigation Program covers the entire Subbasin. To date, the Joint GSP GSAs have developed and are circulating a draft Memorandum of Understanding (MOU) that describes, among other things, the responsibilities and principles that will guide administration of the program. It is anticipated that the existing draft MOU will be revised and expanded over the coming months with the clear intent of having a fully executed MOU be the end of 2022 that will serve as the basis for implementation of the Domestic Well Mitigation Program. The MOU and any updates on implementation of the Domestic Well Mitigation Program will be reported in subsequent Annual Reports.

7.1.2 Projects and Management Actions

PMAs described in the GSP and in previous Annual Reports are listed and described in **Tables 7-1 through 7-4**, followed by a more detailed description of individual PMAs being implemented by each Joint GSP GSA. **Tables 7-1 and 7-2** provide an overview of each PMA from the Joint GSP, its implementation status, a description of activities planned to occur as part of that PMA, and updates on actual activities and actual benefits since implementation. The status of projects and management actions is generally defined as follows:

- Implemented: Active efforts to operate the project or management action have begun, though benefits may or may not have been achieved to date.
- In Progress: Active efforts needed to initiate the project or management action have begun (e.g., permitting), though development has not reached the point of operability.
- Planned: Early conceptual development is still in progress, though active efforts needed to initiate or operate the project or management action have not begun.

Tables 7-3 and 7-4 summarize the actual project costs incurred through the current reporting year (2021) and the estimated overall project costs. All estimated benefits and costs are summarized from the Joint GSP, while actual benefits and costs are presented only for those projects already in implementation. These tables provide a comparison of the actual and estimated costs and benefits of PMAs, as well as a measure of the degree of implementation for PMAs that will take multiple years to fully implement. It should be noted that the estimated benefits and costs were developed for full project implementation, not partial implementation.

Since GSP adoption, the GSAs have considered additional PMAs that may be implemented during the GSP implementation period. All additional PMAs will support the GSP sustainability goal and align with other GSP implementation efforts. Additional PMAs that are not described in the GSP or previous Annual Reports will be described in **Section 7.2** as they are identified.

This Annual Report covers the second full year of project implementation under the Joint GSP. Progress on some projects and stakeholder outreach have slowed since the start of Joint GSP implementation as a result of the health and safety concerns associated with COVID-19 and its repercussions on both public agencies and private parties (e.g., challenges of conducting effective outreach exclusively by online meetings and phone calls). Due to dry conditions in 2021, recharge was also lower than would occur in a wetter year. In spite of these setbacks and dry conditions, the GSAs continued to make significant progress in implementing existing projects as well as being awarded additional grants for new projects.

The GSAs in the Madera Subbasin are committed to adaptive management of groundwater resources through this suite of identified projects and management actions. As projects are

implemented and monitored, the project timelines and amount of demand management necessary will be reviewed. If adjustments are needed to meet the sustainability objectives identified in the Joint GSP, project timelines will be evaluated and adjusted. In addition to continuous monitoring and review of project and management action implementation, each Annual Report represents an opportunity to review the status of Joint GSP implementation efforts.

Table 7-1. Project and Management Actions: Summary.

Groundwater Sustainability Agency (GSA)	Project / Management Action Name	Mechanism	First Year Implemented	Status	General Description
MID	Rehab Recharge Basins	Increase Recharge	2016	Implemented	Rehabilitate and upgrade recharge facilities, including metering.
MID/MC	Ellis Basin	Increase Recharge	2016	Implemented	Cooperatively operate Ellis Basin for recharge.
MID/CM	Berry Basin	Increase Recharge	2018	Implemented	Cooperatively operate Berry Basin for recharge.
MID	Allende Basin	Increase Recharge	2019	Implemented	Operate Allende Basin for recharge.
MID and MID/CM	Additional Recharge Basins Phase 1	Increase Recharge	2030	In Progress	Construct and operate additional recharge basins.
MID	Additional Recharge Basins Phase 2	Increase Recharge	2040	Planned	Construct and operate 260 acres of additional recharge basins.
MID	On-Farm Recharge	Increase Recharge	2015	Implemented	Deliver available flood water to agricultural or other suitable land for recharge.
MID	Phase 2 On-Farm Recharge	Increase Recharge	2025	Implemented	Expand delivery of available flood water to agricultural or other suitable land for recharge.
MID	MID Pipeline	Reduce evaporation and GW Pumping	2016	Implemented	Rehabilitate aging pipelines to reduce losses.
MID	WaterSMART Pipeline	Reduce evaporation and GW Pumping	2019	Implemented	Rehabilitate additional pipelines to reduce losses and allow MID to deliver water later in the irrigation season.
MID	WaterSMART SCADA	Reduce evaporation and GW Pumping	2019	Implemented	Expand SCADA to improve water management, reduce losses, and deliver water later in the irrigation season.
MID	Water Supply Partnerships	Purchase water from willing partners outside of the basin to increase recharge or reduce GW pumping	2025	Implemented	Identify and purchase or exchange additional water supplies from partnering districts.
MID	Incentive Program	Encourage more use of district SW; Reduce GW pumping	2022	Implemented	Develop incentive structures to encourage MID growers to utilize surface water supplies instead of groundwater.
MID	Demand Reduction[1]	Reduce demand	2019	Implemented	Detach from MID or remove agricultural land from production.
MID	Grazing Land Annexation[1]	Increase Sustainable Yield	2020	Implemented	Annexation of grazing land to increase sustainable yield for the MID GSA.
MID	Water User Software Platform (UI)[1]	Education / Outreach	2020	Implemented	Software platform for MID landowners that provides information on current and historic water use. *This PMA was added since adoption of the Joint GSP.*
MID	Intensive Groundwater Use Policy[1]	Reduce GW Pumping	2019	Implemented	Policy related to intensive groundwater use for a purpose other than ag, the growing of crops. *This PMA was added since adoption of the Joint GSP.*
MWD	Expanded Surface Water Purchase	Purchase water from in-basin partners to reduce GW pumping	2023	Planned	Expand ability to purchase additional surface water supply, including upgrades to conveyance infrastructure.
CM	Meters and Volumetric Pricing	Reduce evaporation and GW Pumping	2015	Implemented	Install water meters and implement volumetric billing for single-family users to promote water conservation.
CM/MID	Berry Basin	Increase Recharge	2018	Implemented	Cooperatively operate Berry Basin for recharge.
CM/MID	Golf Course Basin[1]	Increase Recharge	2021	Implemented	Cooperatively operate Golf Course Basin for recharge. *This PMA was added since adoption of the Joint GSP.*
MC/MID	Ellis Basin	Increase Recharge	2016	Implemented	Cooperatively operate Ellis Basin for recharge.
MC	Water Imports Purchase	Purchase water from willing partners outside of the basin to increase recharge or reduce GW pumping	2025	Planned	Develop partnerships and import additional water into Madera County for direct or in-lieu recharge.
MC	Millerton Flood Release Imports	Purchase water from willing partners outside of the basin to increase recharge or reduce GW pumping	2025	In Progress	Request CVP Section 215 flood water when available for recharge.
MC	Chowchilla Bypass Flood Flow Recharge Phase 1	Increase Recharge	2025	Implemented	Construct and operate diversion and conveyance facilities/basins to recharge an average of 12,700 AF/year.
MC	Chowchilla Bypass Flood Flow Recharge Phase 2	Increase Recharge	2040	Planned	Construct and operate diversion and conveyance facilities/ basins to recharge an average of 25,000 AF/year.
MC	Demand Management	Reduce demand by limiting groundwater pumping	2020	Implemented	Reduce consumptive water use through actions such as water-stressing crops, shifting to lower water-using crops, reducing evaporation losses, and reducing irrigated acreage.
GFWD	Recharge Basin and Canals	Increase Recharge	2020	Implemented	Operate an existing basin to recharge surface water, from either purchased supplies or available as excess flow.
NSWD	Water Right Utilization	Divert flood flow from Chowchilla Bypass, existing water right	2020	Implemented	Utilize existing appropriative water right on Chowchilla Bypass to divert up to 15,700 AF/year of surface water.
RCWD	Purchase Water for In-Lieu Storage	Purchase water from in-basin partners to reduce GW pumping	2019	Implemented	Construct and operate conveyance facilities to import purchased surface water for irrigation.
RCWD	Holding Contracts	Divert flood flow from San Joaquin River, existing water right	2020	Implemented	Utilize holding contract right to divert an average of 9,840 AF of surface water per year from San Joaquin River.

Notes:

1. This PMA was added since adoption of the Joint GSP. It is expected that updates to this PMA will be moved to Section 7.2 in future Annual Reports.

Table 7-2. Projects and Management Actions: Implementation Updates and Benefits.

Groundwater Sustainability Agency (GSA)	Project / Management Action Name	First Year Implemented	Updates	2021 Annual Benefit (acre-feet/year)	Total Benefit to Date (acre-feet)	Estimated Average Annual Benefit at 2040[1] (acre-feet/year)
MID	Rehab Recharge Basins	2016	MID expanded capacity of recharge basins by approximately 60,000 cubic yards (approximately 40 af), resulting in higher recharge potential in wet years.	0	3,912	5,030
MID/MC	Ellis Basin	2016	No water delivered for recharge due to drought conditions and limited water availability.	0	153	240
MID/CM	Berry Basin	2018	No water delivered for recharge due to drought conditions and limited water availability.	0	465	20
MID	Allende Basin	2019	No water delivered for recharge due to drought conditions and limited water availability.	0	3,119	1,050
MID and MID/CM	Additional Recharge Basins Phase 1	2030	MID acquired three (3) parcels for future development of recharge basins, with a total area of approximately 73 acres. MID and CM are jointly developing the Golf Course Basin. In 2021, MID facilities were connected to one golf course basin in the CM for future groundwater recharge benefiting MID and CM.	-	-	5,470
MID	On-Farm Recharge	2015	No water delivered for recharge due to drought conditions and limited water availability.	0	3,000	510
MID	Phase 2 On-Farm Recharge	2025	-	-	-	1,690
MID	MID Pipeline	2016	MID replaced 5,350 feet of pipeline in 2021.	420	1,260	420
MID	WaterSMART Pipeline	2019	Ongoing implementation.	880	2,640	880
MID	WaterSMART SCADA	2019	MID submitted a WaterSMART grant application in 2021 that would fund installation of additional SCADA, automated gates, and new meters. Other improvements are still in use.	1,230	3,690	1,230
MID	Water Supply Partnerships	2025	MID is currently working with other districts with Friant contracts to develop water supply partnerships.	0	50	3,990
MID	Incentive Program	2022	In wet years, MID implements the Incentive Program as part of the On-Farm Recharge Program. In 2021, MID conducted outreach to educate growers on the benefits of surface water use and to encourage landowners to use available surface water through existing turnouts or installation of new turnouts.	0	22,900	5,010
MID	Demand Reduction[2]	2019	In 2021, MID acquired approximately 73 acres of irrigated parcels, taking those out of production for future conversion to recharge basins. Benefits of the detachment of 320 acres from MID GSA are ongoing.	1,020	3,060	1,020
MID	Grazing Land Annexation[2]	2020	MID annexed basin parcel APN 044-192-009 into the District area, increasing sustainable yield for the MID GSA. Benefits are ongoing.	206	412	206
MID	Water User Software Platform (UI)[2]	2020	Ongoing implementation.	-	-	-
MID	Intensive Groundwater Use Policy[2]	2019	Ongoing implementation.			
MWD	Expanded Surface Water Purchase	2023	MWD purchased surface water in 2021. In early 2022, MWD applied for and was awarded Proposition 68 funding for development and construction of the Madera Lake Project.		-	2,810
CM	Meters and Volumetric Pricing	2015	Ongoing implementation.	3,350	10,050	3,350
CM/MID	Berry Basin	2018	No water delivered for recharge due to drought conditions and limited water availability.	0	465	20
CM/MID	Golf Course Basin[2]	2021	MID and CM are jointly developing the Golf Course Basin. In 2021, MID facilities were connected to one golf course basin in the CM for future groundwater recharge benefiting MID and CM.	-	-	
MC/MID	Ellis Basin	2016	No water delivered for recharge due to drought conditions and limited water availability.	0	153	240
MC	Millerton Flood Release Imports	2025	MC requested a change in place of use in 2019 and have had multiple meetings with USBR. As of spring 2022, USBR is still considering this request.	-	-	7,060

Groundwater Sustainability Agency (GSA)	Project / Management Action Name	First Year Implemented	Updates	2021 Annual Benefit (acre-feet/year)	Total Benefit to Date (acre-feet)	Estimated Average Annual Benefit at 2040[1] (acre-feet/year)
MC	Chowchilla Bypass Flood Flow Recharge Phase 1[3]	2025	MC is conducting additional planning and coordinating with a group of farmers and other agencies in western Madera Subbasin that have applied for a water right on the Chowchilla Bypass. MC GSA applied for and was awarded grant funding from DWR in 2021 and 2022 to fund development and construction of the first and second phases of project development. Construction is expected to begin in 2022-2023, pending successful completion of CEQA and permitting.	-	-	3,900
MC	Chowchilla Bypass Flood Flow Recharge Phase 2[3]	2040	MC has begun early planning for Phase 2, resulting in refined costs and benefits that have been considered as part of the rate study. Additional planning and refinement is expected in the future.			36,500
MC	Demand Management	2020	The MC GSA completed numerous actions toward implementation of demand management in 2020-2021, including: development of a groundwater allocation framework and adoption of three resolutions establishing allocations and rules for credits; implementation of a demand measurement program with IrriWatch; outreach efforts related to Sustainable Agricultural Land Conservation (SALC) and land repurposing strategies; completion of a WaterSMART water market simulation; and development of a rate study with Raftelis to fund program implementation.	-	-	90,000
GFWD	Recharge Basin and Canals	2020	*See GFWD Annual Report*			2,620
NSWD	Water Right Utilization	2020	*See NSWD Annual Report*			5,540
RCWD	Purchased Water for In-Lieu Storage	2019	*See RCWD Annual Report*			4,380
RCWD	Holding Contracts	2020	*See RCWD Annual Report*			9,840
Total				**7,106**	**55,328**	**193,026**

Notes:

1. Estimates developed for full project implementation. For PMAs described in the Joint GSP, the estimated average annual benefit at 2040 is summarized from the Joint GSP. Some PMAs have been modified since the Joint GSP was adopted, so these totals may not equal the totals reported in the GSP.
2. This PMA was added since adoption of the Joint GSP. It is expected that updates to this PMA will be moved to Section 7.2 in future Annual Reports.
3. Since the Joint GSP was adopted, the Chowchilla Bypass Flood Flow Recharge Project Phases 1 and 2 have been further refined into a series of five recharge projects that are expected to undergo planning/design and construction between 2021 and 2030. Phase 1 now corresponds to Project 1, with a revised estimated average annual benefit at 2040 of approximately 3,900 AF per year (11,200 AF in years water is available). Phase 2 now corresponds to Projects 2 through 5, with a revised combined estimated average annual benefit at 2040 of 36,500 AF per year (104,400 AF in years water is available). These anticipated benefits are for full project implementation, and have been refined from the initial benefits identified during GSP development.

Table 7-3. Projects and Management Actions: Cost Summary, 2021.

Groundwater Sustainability Agency (GSA)	Project	First Year Implemented	Status	2021 Capital Cost ($)	Capital Cost to Date ($)	2021 Annual Operating Cost ($)
MID	Rehab Recharge Basins	2016	Implemented		$60,000	
MID/MC	Ellis Basin	2016	Implemented		$20,000	
MID/CM	Berry Basin	2018	Implemented		$20,000	
MID	Allende Basin	2019	Implemented		$200,000	
MID and MID/CM	Additional Recharge Basins Phase 1	2030	In Progress	$2,208,000	$2,208,000	
MID	Additional Recharge Basins Phase 2	2040	Planned			
MID	On-Farm Recharge	2015	Implemented			
MID	Phase 2 On-Farm Recharge	2025	Implemented			
MID	MID Pipeline	2016	Implemented	$320,000	$320,000	
MID	WaterSMART Pipeline	2019	Implemented			
MID	WaterSMART SCADA	2019	Implemented			
MID	Water Supply Partnerships	2025	Implemented			
MID	Incentive Program	2022	Implemented			
MID	Demand Reduction[1]	2019	Implemented		$12,000	
MID	Grazing Land Annexation[1]	2020	Implemented			
MID	Water User Software Platform (UI)[1]	2020	Implemented			
MID	Intensive Groundwater Use Policy[1]	2019	Implemented			
MWD	Expanded Surface Water Purchase	2023	Planned			
CM	Meters and Volumetric Pricing	2015	Implemented			
CM/MID	Berry Basin	2018	Implemented			
CM/MID	Golf Course Basin[1]	2021	Implemented		-[2]	-[2]
MC/MID	Ellis Basin	2016	Implemented			
MC	Water Imports Purchase	2025	Planned			
MC	Millerton Flood Release Imports	2025	In Progress			
MC	Chowchilla Bypass Flood Flow Recharge Phase 1	2025	Planning		$9,000	
MC	Chowchilla Bypass Flood Flow Recharge Phase 2	2040	Planned			
MC	Demand Management	2020	Planning			
GFWD	Recharge Basin and Canals		Implemented	*See GFWD Annual Report*		
NSWD	Water Right Utilization		Implemented	*See NSWD Annual Report*		
RCWD	Purchased Water for In-Lieu Storage		Implemented	*See RCWD Annual Report*		
RCWD	Holding Contracts		Implemented	*See RCWD Annual Report*		

Notes:

1. This PMA was added since adoption of the Joint GSP. It is expected that updates to this PMA will be moved to Section 7.2 in future Annual Reports.
2. Capital costs reported by MID. CM will maintain the Golf Course Basin, which will be reported in future annual operating costs.

Table 7-4. Projects and Management Actions: Cost Summary, Estimated Average.

Groundwater Sustainability Agency (GSA)	Project	First Year Implemented	Status	Estimated Capital Cost[1] ($)	Estimated Average Annual Operating Cost[1] ($/year)
MID	Rehab Recharge Basins	2016	Implemented	$60,000	$430,000
MID/MC	Ellis Basin	2016	Implemented	$20,000	$20,000
MID/CM	Berry Basin	2018	Implemented	$20,000	$0
MID	Allende Basin	2019	Implemented	$200,000	$70,000
MID and MID/CM	Additional Recharge Basins Phase 1	2030	In Progress	$1,000,000	$240,000
MID	Additional Recharge Basins Phase 2	2040	Planned	$14,200,000	$3,750,000
MID	On-Farm Recharge	2015	Implemented	$0	$50,000
MID	Phase 2 On-Farm Recharge	2025	Implemented	$0	$190,000
MID	MID Pipeline	2016	Implemented	$560,000	$0
MID	WaterSMART Pipeline	2019	Implemented	$1,300,000	$0
MID	WaterSMART SCADA	2019	Implemented	$1,200,000	$0
MID	Water Supply Partnerships	2025	Implemented	$0	$2,500,000
MID	Incentive Program	2022	Implemented	$0	$3,080,000
MID	Demand Reduction[2]	2019	Implemented	$12,000	$110,000
MID	Grazing Land Annexation[2]	2020	Implemented		
MID	Water User Software Platform (UI)[2]	2020	Implemented		
MID	Intensive Groundwater Use Policy[2]	2019	Implemented		
MWD	Expanded Surface Water Purchase	2023	Planned	$14,900,000	$900,000
CM	Meters and Volumetric Pricing	2015	Implemented	$11,000,000	$0
CM/MID	Berry Basin	2018	Implemented	$20,000	$0
CM/MID	Golf Course Basin[2]	2021	Implemented	$0	
MC/MID	Ellis Basin	2016	Implemented	$20,000	$20,000
MC	Water Imports Purchase	2025	Planned	$300,000	$2,490,000
MC	Millerton Flood Release Imports	2025	In Progress	$31,900,000	$450,000
MC	Chowchilla Bypass Flood Flow Recharge Phase 1[3]	2025	Implemented	$6,600,000[3]	$800,000[3]
MC	Chowchilla Bypass Flood Flow Recharge Phase 2[3]	2040	Planned	$103,600,000[3]	$700,000[3]
MC	Demand Management	2020	Implemented	$0	$53,900,000[4]
GFWD	Recharge Basin and Canals	2020	Implemented	*See GFWD Annual Report*	
NSWD	Water Right Utilization	2020	Implemented	*See NSWD Annual Report*	
RCWD	Purchased Water for In-Lieu Storage	2019	Implemented	*See RCWD Annual Report*	
RCWD	Holding Contracts	2020	Implemented	*See RCWD Annual Report*	
Total				**$186,912,000**	**$69,700,000**

Notes:

1. Estimates developed for full project implementation. Projects have been added to this list since the Joint GSP was adopted, so these totals may not equal the totals reported in the GSP. The estimated costs of new projects are estimated to be equal to the costs in the Annual Report, if specified.
2. This PMA was added since adoption of the Joint GSP. It is expected that updates to this PMA will be moved to Section 7.2 in future Annual Reports.
3. Since the Joint GSP was adopted, the Chowchilla Bypass Flood Flow Recharge Project Phases 1 and 2 have been reconfigured into a series of five recharge projects that are expected to undergo planning/design and construction between 2021 and 2030. Phase 1 now corresponds to Project 1, with a revised total capital cost of $6.6 million and an estimated annual operating cost of $800,000. Phase 2 now corresponds to Projects 2 through 5, with a revised total capital cost of $103.6 million and an estimated annual operating cost of $700,000. The total combined capital cost of these projects is $110.2 million, which is the cost that is being considered during development of the rate study. These costs have been refined from the initial costs identified during GSP development.
4. Costs represent the estimated average annual direct economic costs of demand management, based on the economic impact analysis of the demand management program (see Section 4.4.4.5 of the Joint GSP).

7.1.3 Madera Irrigation District GSA Projects

The majority of projects in the Madera Subbasin that are currently being implemented are being implemented by the MID GSA, which is the second largest GSA in the Madera Subbasin (by area, behind the MC GSA) and contains the largest irrigated area. The average annual benefits of projects currently implemented by MID are shown in **Table 7-2** for water year (WY) 2021, during which recharge was monitored and quantified. In total, at the current stage of implementation, the suite of projects and management actions by MID result in a gross average annual benefit of more than 3,700 AF in 2021.

7.1.3.1 Recharge Basins and On-Farm Recharge

Nine dedicated recharge basins are already being utilized by MID. Of the nine basins in operation, two are operated jointly with other Joint GSP GSAs: Ellis Basin is operated in partnership with MC GSA, and Berry Basin is operated in partnership with the CM GSA. Recharge occurred in the Ellis and Berry Basins in 2019, but not in 2020 or 2021 due to drought conditions. MID operates the remaining seven basins, including the Allende Basin, Madera Lake, and other dedicated recharge facilities. While significant recharge occurred in 2019 and some recharge occurred in 2020, no surface water was delivered to these basins for recharge in 2021 due to drought conditions and surface water supply constraints. Due to these conditions, it is expected that recharge volumes in 2021 are less than the overall estimated average annual benefits reported in the Joint GSP. However, in 2021 MID worked to expand the existing recharge basins by approximately 60,000 cubic yards, expanding their overall capacity by approximately 40 AF. This additional capacity results in much higher recharge potential for the basins in future years when surface water is available for recharge.

MID has also begun work on the phase 1 project to construct additional recharge basins. MID acquired three (3) parcels in 2021 as sites for future recharge basins, with a total capital cost of $2,158,000 incurred in 2021. Acquisition of these parcels has had immediate benefits to the Madera Subbasin by taking 73 acres out of production. Further benefits will accrue in future years when those additional recharge basins are operational. Phase 2 of this project is planned for future years, as needed.

MID and the CM have also worked cooperatively to develop the Golf Course Basin. In 2021, MID facilities were connected to a golf course basin in the CM GSA for future groundwater recharge benefits to both MID and the CM GSAs. A total of $50,000 in associated capital costs were incurred by MID in 2021. The CM will pay to operate and maintain the Golf Course Basin in the future.

In past years when sufficient water is available, MID has also administered an on-farm recharge program. Due to drought conditions, water was not available for this program in 2021.

7.1.3.2 Infrastructure Upgrades

MID continued upgrading MID infrastructure in 2021, including replacement of 5,350 feet of aging pipeline to reduce losses at a total cost of $320,000. MID's WaterSMART pipeline project is still in progress, providing additional means of rehabilitating pipelines to reduce losses and allow

greater flexibility for surface water deliveries to growers who would otherwise use groundwater. Infrastructure improvements have resulted in cumulative average annual benefits to date of more than 2,500 AF per year. In 2021, MID submitted a WaterSMART grant application. If successful, this grant would fund installation of additional SCADA equipment, automated gates, and new meters.

7.1.3.3 Water Supply Partnerships

MID has also begun work to develop water supply partnerships with partners outside of the Madera Subbasin. Efforts to import surface water supplies are being coordinated with other districts that have contracts for supplies from Friant Dam.

7.1.3.4 Demand Reduction

In addition to these projects and management actions, MID has continued with demand reduction through: annexation of rangeland (parcel APN 044-192-009) into MID; acquisition of 73 acres of vineyard and irrigated pasture for new recharge basins (described above), removing those lands from production; and detachment of 320 acres from the GSA.

7.1.3.5 Other Activities

As part of On-Farm Recharge Program, MID has also begun developing an incentive program to encourage growers to use surface water. Outreach has been the main component of the incentive program this far. MID has encouraged landowners to install and use new turnouts by educating and explaining the benefits of surface water use. Since 2019, MID has also implemented an intensive groundwater use policy that supports the goals of the incentive program and the overall sustainability goal established in the Joint GSP.

Other tools and policies reported in previous Annual Reports, including the Water User Software Platform (UI) and the Intensive Groundwater Use Policy are still in effect with ongoing benefits.

7.1.4 Madera Water District GSA Projects

MWD GSA has continued work toward the expanded surface water purchase project proposed in the Joint GSP, which is scheduled for implementation beginning in 2023. In 2021, despite dry conditions, MWD was able to purchase nearly 800 AF of surface water for in-lieu recharge as part of their efforts to preserve groundwater supplies. MWD also continues to move forward on the Madera Lake Project. Since the last Annual Report, the project plans have progressed to a 60% level of design. An administrative draft of California Environmental Quality Act (CEQA) documents have been prepared. In early 2022, the MWD GSA applied for and was awarded Proposition 68 funding to support further development and construction of this project by 2025.

7.1.5 City of Madera GSA Projects

The CM is implementing a project to install water meters and a volumetric billing process. The installation of water meters is roughly 98% complete. To date, the average annual benefits have been 3,350 AF per year. The CM applied as a Local Project Sponsor in cooperation with Madera's Proposition 1 Round 1 IRWM grant for funding to install meters on the remaining unmetered

services and to replace failing meters on higher volume services. The final grant agreement was approved in 2021. The CM is moving forward with investigation and installation of remaining missing meter locations.

As described above, MID and the CM have also worked cooperatively to develop the Golf Course Basin. In 2021, MID facilities were connected to a golf course basin in the CM GSA for future groundwater recharge benefits to both MID and the CM GSAs. A total of $50,000 in associated capital costs were incurred by MID in 2021. The CM will pay to operate and maintain the Golf Course Basin in the future.

7.1.6 Madera County GSA Projects

Since adoption of the Joint GSP, MC GSA has conducted three planning studies in support of a rate study to fund Joint GSP implementation, and has begun implementation of a recharge program and a substantial demand management program that will collectively support achievement of the GSP sustainability goal. Progress that has been made in each of these efforts is described below.

7.1.6.1 Rate Studies

In November 2019, prior to GSP adoption, the MC GSA adopted a Proposition 26 exempt administrative fee for irrigated acres within the County GSA of approximately $24 per irrigated acre; however, this fee can only be used for SGMA-related administration and planning efforts. While the administrative fee is useful, these funds cannot be used for projects, such as purchases of water for irrigation of crops, recharge, or domestic well mitigation.

In 2021, the MC GSA continued development of a rate study that will result in a water rate for extraction of groundwater within the MC GSA. A penalty for groundwater extraction above the allocation is also being considered separately.

7.1.6.2 Recharge Projects

In addition to operating the Ellis Basin in a partnership with MID, MC has initiated a recharge planning study to refine the costs, benefits, and schedule for recharge projects described in the GSP. The recharge planning study will also refine the costs and schedule to construct additional basins and to conduct additional flood managed aquifer recharge (Flood-MAR) of winter floodwater diverted from the Eastside Bypass. A description of the recharge project has been prepared and is available at: https://www.maderacountywater.com/recharge/.

Since 2020, this study has yielded two grant proposals to DWR. In 2021, the first grant proposal was awarded more than $4 million total from Proposition 68 funds. A portion of these funds are being used to design and build recharge infrastructure and turnouts on the MID distribution system to supply flood managed aquifer recharge (Flood-MAR) on farmland in MC GSA. As of April 2022, work has begun to plan, design, and construct the planned recharge infrastructure. The recharge sites were surveyed in March 2022. Further designs are anticipated to be completed later in 2022, and construction is anticipated to begin in 2022-2023, pending successful completion of CEQA and permitting. This project was developed in close coordination with MID and RCWD GSAs and landowners in the MC GSA who offered their farmland for recharge. When completed, this project

will utilize flood flows from Millerton Reservoir and purchased water to provide direct or in-lieu recharge benefits to the Madera Subbasin.

The second grant proposal – a spending plan that would fund implementation of phase 2 of the recharge program – was submitted to DWR and approved for funding in early 2022 as part of Round 1 of the 2022 SGMA Implementation Grant program. The rate studies are also anticipated to include costs for phase 2 of the recharge program.

7.1.6.3 Demand Management

As a primary element of its efforts toward groundwater sustainability, MC GSA has begun implementation of a demand management program that would oversee a managed reduction in the volume of groundwater consumed by irrigated agriculture over the 20-year GSP implementation period. By 2040, this program is expected to result in approximately 50% reduction of estimated current consumptive use quantities as of 2015. An economic impact analysis for the planned demand management program is appended to the 2020 Joint GSP Annual Report. At this point, the actual costs and benefits of demand management efforts completed to date have not been quantified, but they will be in future years.

To implement this overall demand management program, MC GSA has developed an allocation framework, has begun implementing a demand measurement program, and is conducting two studies: a water market study and a sustainable agricultural land conservation study. The allocation framework was developed primarily by MC GSA staff through a series of public meetings with the MC GSA Advisory Committee. The demand measurement program is being implemented in partnership with IrriWatch, providing satellite-based estimates of evapotranspiration of applied water (ET_{aw}) and irrigation scheduling advice for farmers in the MC GSA. The following sections briefly describe the progress and results of the allocation framework, the demand measurement program, and the studies.

Water Market Study. The MC GSA applied for and was awarded a WaterSMART grant from the United States Bureau of Reclamation (USBR) to develop a comprehensive water marketing strategy. A team of technical experts was selected to conduct the program, and has worked closely with Madera County and stakeholders to develop a comprehensive water marketing strategy that is acceptable to stakeholders and maximizes economic benefits to the regional economy. Three partner workshops and follow-up interviews with local stakeholders were held in 2020 to define opportunities, understand concerns, and develop solutions for the potential water market. A virtual pilot water market simulation then occurred between January 2021 and November 2021, with the goal of testing the effectiveness and implications of the potential market rules over a multi-year time period. The simulation was jointly implemented by the MC GSA in both the Madera and Chowchilla Subbasins. A total of 57 unique participants from the Madera and Chowchilla Subbasins were enrolled in in the overall simulation, with about 25 regular participants each month. The goal of the pilot program is to test effectiveness and implications of the potential market rules over a multi-year time period. Results are expected to be presented in 2022. Additional information on the water market study and pilot project is available at: https://www.maderacountywater.com/water-markets/.

<u>Sustainable Agricultural Lands Conservation (SALC) Study</u>. The MC GSA received a grant to fund a planning project to explore the feasibility of adopting a sustainable agricultural land conservation (SALC) easement program within the MC GSA. The goal of this project is to develop two primary items:

1. Criteria for identifying and prioritizing agricultural land for protection. These criteria will be based on the land's potential to be farmed or temporarily rested (not used as irrigated farmland), permanently retired, retired and restored, or (when appropriate) permanently protected.
2. An incentive structure for agricultural landowners to rest, retire, restore, or permanently protect their land via various types of water-centric conservation easements.

In 2020-2021, Madera conducted stakeholder interviews to provide feedback on the structure of the SALC program and conducted outreach with conservation groups as land repurposing strategies were developed. Interviews were conducted with individuals representing the following groups:

- California Milk Producers Council
- Madera County Cattlemen's Association
- Leadership Counsel for Justice and Accountability
- Self-Help Enterprises
- Madera County Farm Bureau
- Madera Ag Water Association (MAWA)

The feedback from these groups was summarized into an SALC Assessment Interview Summary, available on the Madera County website. This feedback has been used to inform GSA and County decisions about the timing, flexibility, incentives, and areas for the program. It is anticipated that the rate studies will include costs for land repurposing. Additional information on SALC is available on the Madera County website: https://www.maderacountywater.com/land-conservation/.

<u>Allocation Framework.</u> The MC GSA has developed an allocation framework through a series of public meetings with the MC GSA Advisory Committee. Following discussions in these meetings, the Advisory Committee recommended that the MC GSA Board of Directors adopt the allocation framework. Subsequently, the MC GSA Board of Directors adopted resolutions in December 2020, June 2021, and August 2021 that describe "per-acre" allocations and rules for credits. Links to the resolution documents are provided below:

- **Resolution 2020-166:** https://www.maderacountywater.com/wp-content/uploads/2021/09/RES-NO.-2020-166-Allocation-Approach.pdf
- **Resolution 2021-069:** https://www.maderacountywater.com/wp-content/uploads/2021/08/Resolution-No.-2021-069.pdf
- **Resolution 2021-113:** https://www.maderacountywater.com/wp-content/uploads/2021/08/21.08-Updated-Groundwater-Allocation-Reso.pdf

<u>Demand Measurement Program.</u> In 2020, the MC GSA selected the IrriWatch program to measure consumptive water use (demand) on irrigated acres in the GSA. IrriWatch is a daily irrigation scheduling and crop production information service that uses Surface Energy Balance

Algorithm for Land (SEBAL) model outputs to quantify actual consumptive water use from satellite imagery. The main objective of the demand measurement program is to use the IrriWatch program to track evapotranspiration of applied water (ET_{aw}) against an allocation of ET_{aw} established in the MC GSA area. Through the IrriWatch program portal, the MC GSA can track grower ET_{aw} against an ET_{aw} allocation. Each grower also has access to the portal and can track their actual ET_{aw} against their allocation of ET_{aw}. IrriWatch provides additional benefits to growers by providing information about the irrigation status of fields and irrigation recommendations. Growers with weekly schedules can check the need for corrective actions. This information, together with the allocation, supports grower decision making on the timing and amounts of irrigation. The data portal is suitable for planning and monitoring. The IrriWatch program includes a cell phone application on which growers can check their field irrigation status. In 2020-2021, the MC GSA hosted SEBAL trainings and IrriWatch trainings to inform growers about the program. Growers completed a test year with IrriWatch in 2021. On January 1, 2021, IrriWatch began calculating and making data available to the MC GSA and growers that enrolled. To date, all irrigated parcels in the Madera County GSA have been auto-enrolled in the program. More than 1,200 irrigated parcels are enrolled as of early 2022, representing nearly 120,000 irrigated acres across the Chowchilla, Madera, and Delta-Mendota Subbasins.

Additional information on the demand measurement program is available on the Madera County website: https://www.maderacountywater.com/measurement/.

Demand Management. Through these many efforts, the MC GSA is also in the initial stages of implementing demand management. This management action is expected to result in a large reduction in groundwater pumping at the cost of reduced crop production and related economic activities in MC GSA. At this point, the actual costs and benefits of demand management efforts completed to date have not been quantified, but they will be in future years.

Additional Roles. Although neither projects nor management actions, there are number of actions that the MC GSA has taken towards sustainability of the Madera Subbasin:

1. MC GSA staff serves as the plan manager for the Joint GSP;
2. MC GSA serves as the grantee and administrator for the current Proposition 1 and multiple Proposition 68 grants (RCWD GSA will serve as the grantee and administrator for the Proposition 68 grant awarded in early 2022); and
3. MC GSA serves as the contractor with the consultant for the data management system, the Annual Report, and the basin point of contract.

7.1.7 Other Projects in Madera Subbasin

GFWD, NWSD, and RCWD are implementing projects in the Madera Subbasin with aggregated gross average annual benefits estimated in their respective GSP Annual Reports. More information about the costs and implementation status of these projects can be found in each of their Annual Reports.

7.2 ADDITIONAL PROJECTS AND MANAGEMENT ACTIONS IDENTIFIED SINCE GSP ADOPTION

Additional information about other GSA projects and management actions will be added to future Annual Reports as they are identified.

7.3 IMPLEMENTATION OF MONITORING AND ADDRESSING DATA GAPS

During the period of GSP development and since the GSP adoption and submittal in January 2020, the GSAs have been conducting monitoring of RMS wells, including coordination with well owners and other monitoring entities. Despite attempts at measurement, some RMS water level data were not available in 2021 due to continued challenges encountered during implementation of the RMS monitoring program. Loss of access to certain RMS sites has persisted for a variety of reasons, such as owners' unwillingness to participate in monitoring, or replacement of a site with another well having slightly different characteristics. The GSAs have worked to resolve these issues where possible, and are continuing to work to resolve these access issues during 2022.

The GSAs have also begun work to install new dedicated nested monitoring wells that may be added to the monitoring network. As part of a Proposition 1 DWR Sustainable Groundwater Management grant award to the Madera Subbasin for the installation of dedicated monitoring wells in the Madera Subbasin, a total of 21 new monitoring wells at seven different sites were constructed. Some additional funds from Proposition 68 have also been allocated toward installation of additional monitoring wells. Information collected from the drilling, geologic and geophysical logging, groundwater quality sampling, and automated groundwater level monitoring is filling data gaps in the monitoring and conceptualization of the hydrogeology and will improve understanding and management of groundwater in the Madera Subbasin. Groundwater level data from these monitoring wells are incorporated into groundwater elevation contour maps prepared for this Annual Report.

Although the various new dedicated monitoring wells are not yet formally included in the Joint GSP RMS well monitoring network, the GSAs may add those new dedicated nested monitoring wells to the Joint GSP monitoring network once more data is collected and site-specific sustainable management criteria can be appropriately established. If added to the monitoring network, these sites may be added in addition to current RMS wells or may be added in place of sites with access issues.

7.4 INTERIM MILESTONE STATUS (§356.2.C)

In the Joint GSP, interim milestones (IMs) for chronic lowering of groundwater levels were established at five-year intervals over the Implementation Period from 2020 to 2040, at years 2025, 2030, 2035, and 2040. IMs for groundwater levels were established through review and evaluation of measured groundwater level data and future projected fluctuations in groundwater levels utilizing the numerical groundwater flow model, which simulated implementation of projects and management actions. Each IM was developed based on the modeled groundwater level for the month of October in the year preceding the interim milestone date (e.g., October 2024 for the

2025 interim milestone). Where necessary, adjustments were made to account for occasional offsets between historically observed and modeled data.

Measurable objectives for groundwater levels were established in accordance with the sustainability goal and to provide estimates of the expected groundwater level variability due to climatic and operational variability. Measurable objectives for groundwater levels were calculated as the model-derived average groundwater levels over the Sustainability Period from 2040 to 2090, modified if necessary, to account for occasional offsets between historically observed and modeled groundwater levels.

The regulations define undesirable results as occurring when significant and unreasonable effects are caused by groundwater conditions occurring throughout the Plan area for a given sustainability indicator. Significant and unreasonable effects occur when minimum thresholds (MTs) are exceeded for one or more sustainability indicators. The GSP Regulations provide that the “minimum thresholds for chronic lowering of groundwater levels shall be the groundwater level indicating a depletion of supply at a given location that may lead to undesirable results.” (354.28.c.1) Chronic lowering of groundwater levels in the Plan area is determined in the Joint GSP to cause significant and unreasonable declines if they are sufficient in magnitude to lower the rate of production of pre-existing domestic groundwater wells below that necessary to meet the minimum required to support overlying beneficial use(s) where alternative means of obtaining sufficient groundwater resources are not technically or financially feasible.

Table 7-5 and **Figures 7-1 and 7-2** present the status of groundwater level RMS wells in relation to the 2025 Interim Milestones, MO, and MTs defined in the GSP. Note that there are some RMS wells that do not have Fall 2021 measurements to compare with IMs, MOs, and MTs. GSA efforts to bring the remaining RMS wells listed in the GSP are ongoing; the status of monitoring efforts to date is provided in **Appendix E**. Review of the Fall 2021 groundwater level measurements that are available for 20 RMS wells indicates that groundwater levels remain well above MTs, with the exception of MID RMS-11, and the majority of groundwater levels are below the 2025 IMs. The IMs developed in the Joint GSP are dependent on the future assumed climatic and surface water hydrology conditions that started with the 2019 water year. Groundwater levels are a function of the sequence and magnitude of wet and dry years applied as part of the projected/future hydrology leading up to 2025 as well as the gradual implementation of projects and management actions. Thus, it is important to understand that groundwater elevations are anticipated to fluctuate above and below the IMs in the years leading up to 2025; and no conclusions should be drawn regarding comparison to 2025 IMs based on only the current year of data. It is notable that 2020 and 2021, the first two years of the Joint GSP implementation period, were very dry years in the Madera Subbasin. Dry conditions have impacted groundwater levels relative to IMs in some areas. Additionally, some measurements may be impacted by local pumping occurring at the time the measurement is collected. A more detailed analysis of observed groundwater levels vs. IMs will be performed for the five-year update report that coincides with the first IMs established in the Joint GSP.

Table 7-5. Summary of RMS Well Groundwater Levels Relative to Interim Milestones, Minimum Thresholds, and Measurable Objectives.

RMS Well I.D.	Estimated Surface Elevation[1] (msl, feet)	Aquifer Designation	2025 Interim Milestone GWEL (feet, msl)	MT GWEL (feet, msl)	MO GWEL (feet, msl)	Fall 2021 GWEL (feet, msl)	Date of Fall Measurement	2025 IM Status (feet)	MT Status (feet)
COM RMS-1	278	Lower	13	-35	70	29.11	11/8/2021	+16.11	+64.11
COM RMS-2	262	Lower	0	-55	65	19.03	11/10/2021	+19.03	+74.03
COM RMS-3	264	Lower	42	-20	75	48.2	11/17/2021	+6.2	+68.2
MCE RMS-1	332	Lower	1	-40	66				
MCE RMS-2	378	Composite	98	25	83	90.95	11/10/2021	-7.05	+65.95
MCE RMS-3	327	Composite	20	-5	78	-4.63	11/10/2021	-24.63	+0.37
MCE RMS-4	404	Lower	174	120	162				
MCE RMS-5	340	Lower	102	35	108	36.88	11/10/2021	-65.12	+1.88
MCE RMS-6	328	Lower	53	-15	77	-1	10/4/2021	-54	+14
MCE RMS-7	388	Lower	150	75	127				
MCE RMS-8	367	Upper	338	310	335				
MCE RMS-9	265	Upper	257	245	254				
MCW RMS-1	169	Lower	47	-85	88				
MCW RMS-2	173	Upper	76	-10	75				
MCW RMS-3	162	Upper	86	5	118				
MCW RMS-4	208	Lower	105	30	115	60.3	10/7/2021	-44.7	+30.3
MCW RMS-5	198	Upper	184	170	179				
MID RMS-1	308	Lower	-33	-75	6				
MID RMS-2	218	Lower	-70	-150	5				
MID RMS-3	241	Lower	-66	-135	10	-95.4	10/13/2021	-29.4	+39.6
MID RMS-4	190	Lower	-1	-100	46	-99.5	10/21/2021	-98.5	+0.5
MID RMS-5	207	Lower	14	-115	52	-58.1	10/12/2021	-72.1	+56.9
MID RMS-6	237	Lower	-29	-65	29	-55	10/20/2021	-26	+10
MID RMS-7	238	Lower	70	-1	106	22.8	10/12/2021	-47.2	+23.8
MID RMS-8	287	Composite	17	0	74				
MID RMS-9	202	Upper	64	10	95				
MID RMS-10	213	Lower	69	0	100	33.7	10/27/2021	-35.3	+33.7
MID RMS-11	232	Upper	99	65	130	62.4	10/7/2021	-36.6	-2.6[2]
MID RMS-12	262	Upper	93	75	130	84.1	10/20/2021	-8.9	+9.1
MID RMS-13	271	Composite	98	75	123				
MID RMS-14	214	Upper	139	95	146				
MID RMS-15	247	Upper	131	115	136	122	10/8/2021	-9	+7
MID RMS-16	308	Lower	-39	-100	15				

RMS Well I.D.	Estimated Surface Elevation[1] (msl, feet)	Aquifer Designation	2025 Interim Milestone GWEL (feet, msl)	MT GWEL (feet, msl)	MO GWEL (feet, msl)	Fall 2021 GWEL (feet, msl)	Date of Fall Measurement	2025 IM Status (feet)	MT Status (feet)
MID RMS-17	225	Upper	200	195	207				
MWD RMS-1	330	Lower	-29	-95	15	-32.67	11/9/2021	-3.67	+62.33
MWD RMS-2	310	Lower	-57	-130	-5	-53.38	11/9/2021	+3.62	+76.62
MWD RMS-3	295	Lower	-87	-140	-15	-73.76	11/9/2021	+13.24	+66.24

[1] Estimated surface elevation and groundwater elevations (GWEL) are expressed in feet above mean sea level (msl).

[2] The Fall 2021 measurement at MID RMS-11 was significantly below previous measurements, and may be related to nearby pumping at the time the measurement was collected. A similar, temporary drop in groundwater elevation was observed at MID RMS-12 in Fall 2020, though the groundwater elevation recovered at the time of the Fall 2021 measurement.

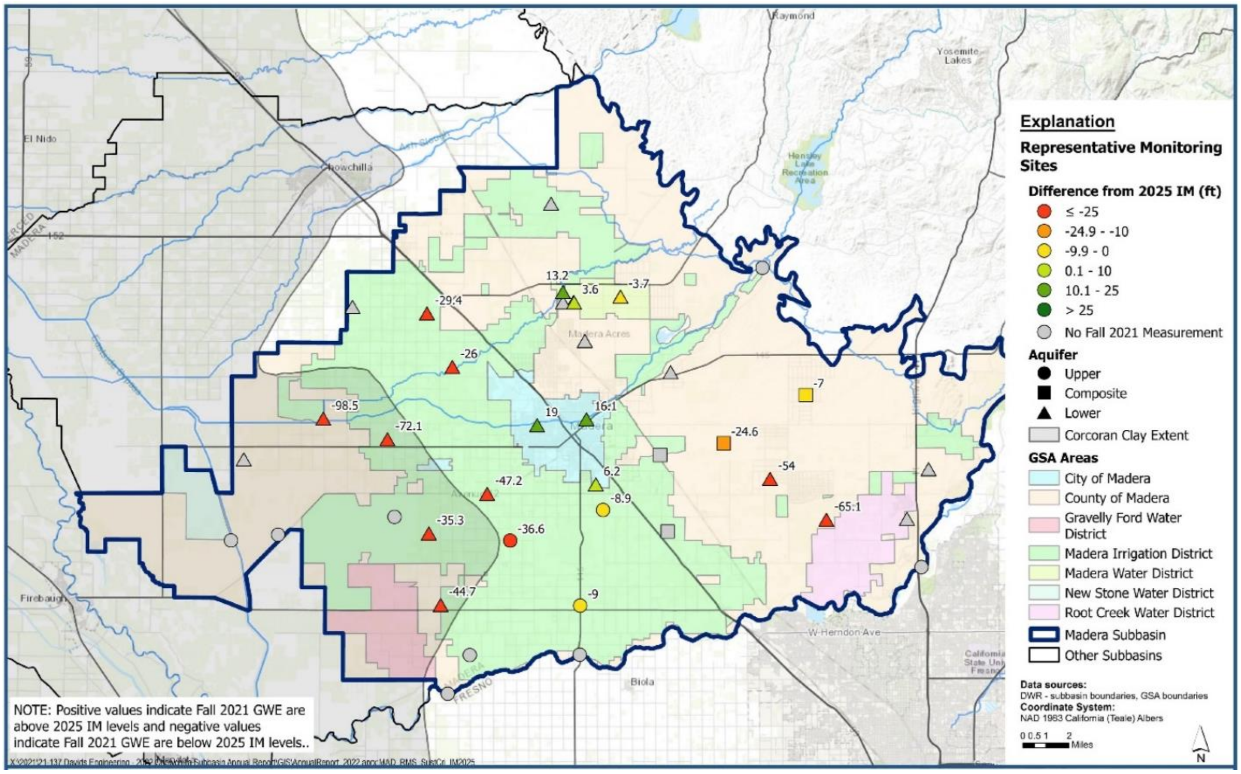


Figure 7-1. Fall 2021 Groundwater Level Measurements at RMS Wells Compared to 2025 Interim Milestone.

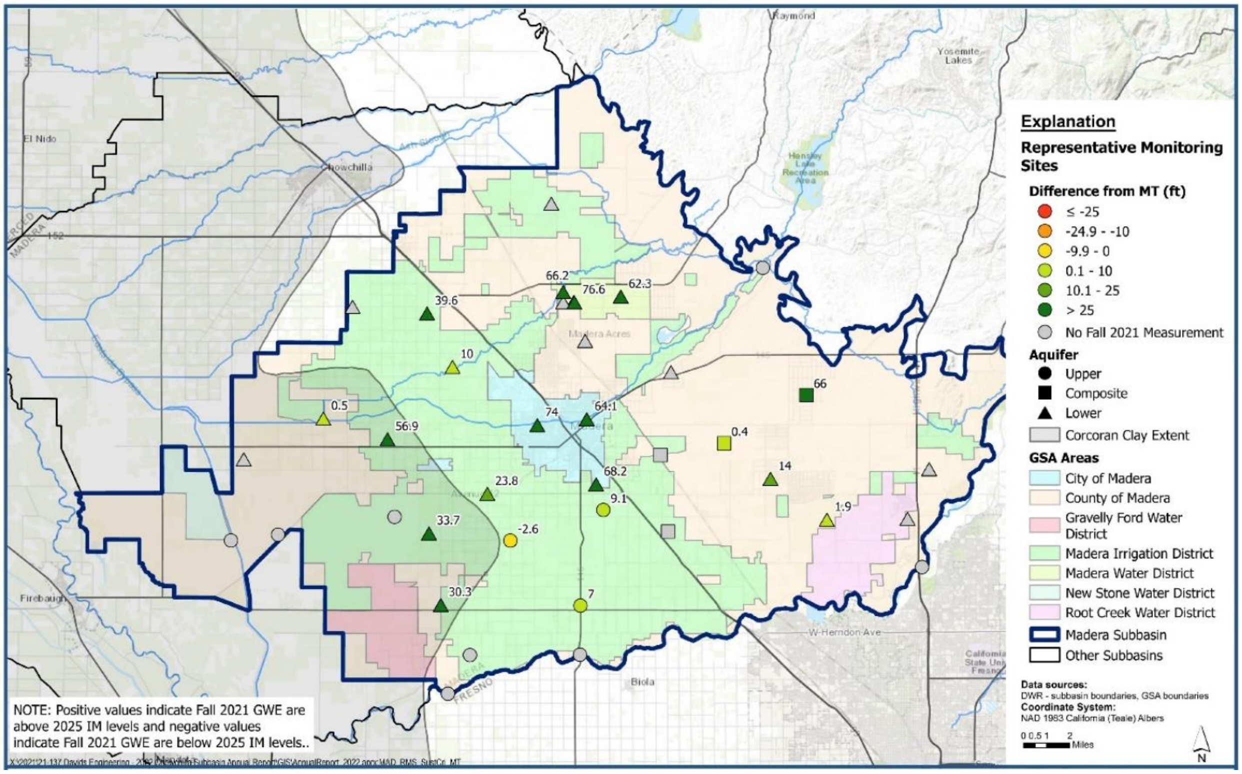


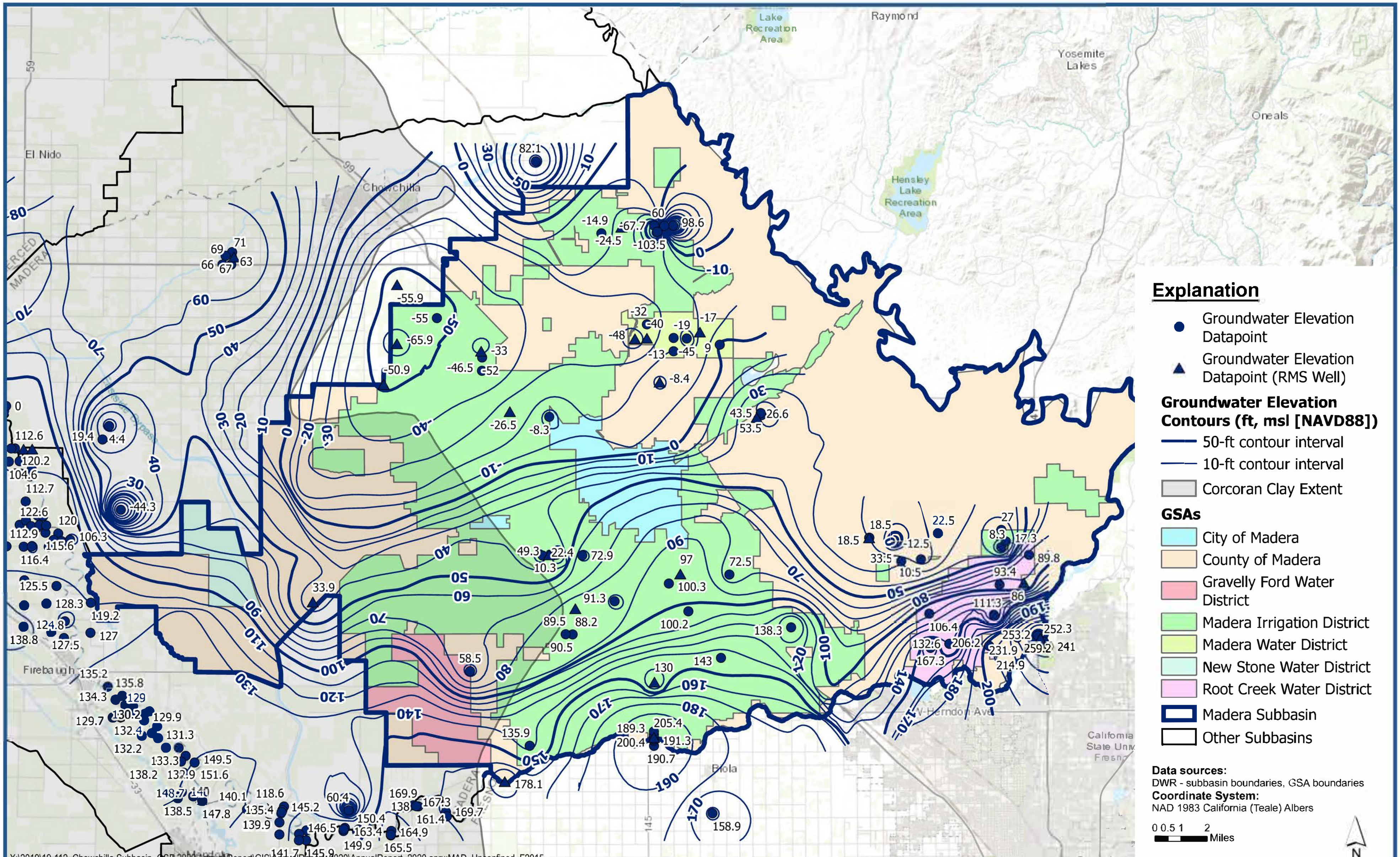
Figure 7-2. Fall 2021 Groundwater Level Measurements at RMS Wells Compared to Minimum Threshold.

8 References

American Society of Civil Engineers (ASCE). 2016. Evaporation, Evapotranspiration and Irrigation Water Requirements. Manual 70. Second Edition. M. E. Jensen and R. G. Allen (eds). Am. Soc. Civ. Engrs.

California Department of Water Resources (DWR). 2016. Best Management Practices for Sustainable Management of Groundwater, Water Budget, BMP.

Appendix A. Contour Maps of the Different Aquifer Units.



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Contours of Equal Groundwater Elevation
Upper Aquifer/Undifferentiated Unconfined Zone - Fall 2015

Madera Subbasin
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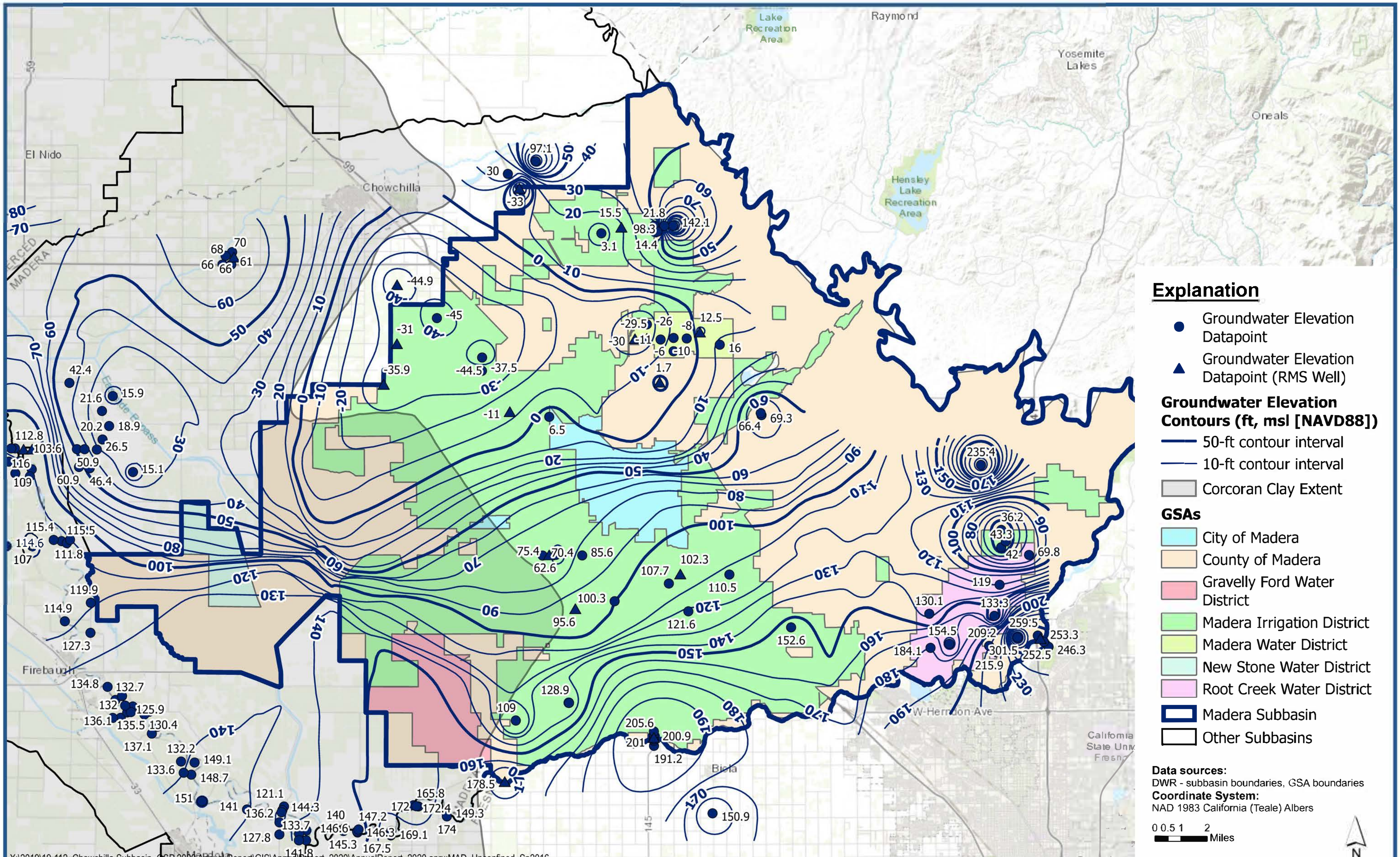
Figure A-1



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Contours of Equal Groundwater Elevation
Upper Aquifer/Undifferentiated Unconfined Zone - Spring 2016

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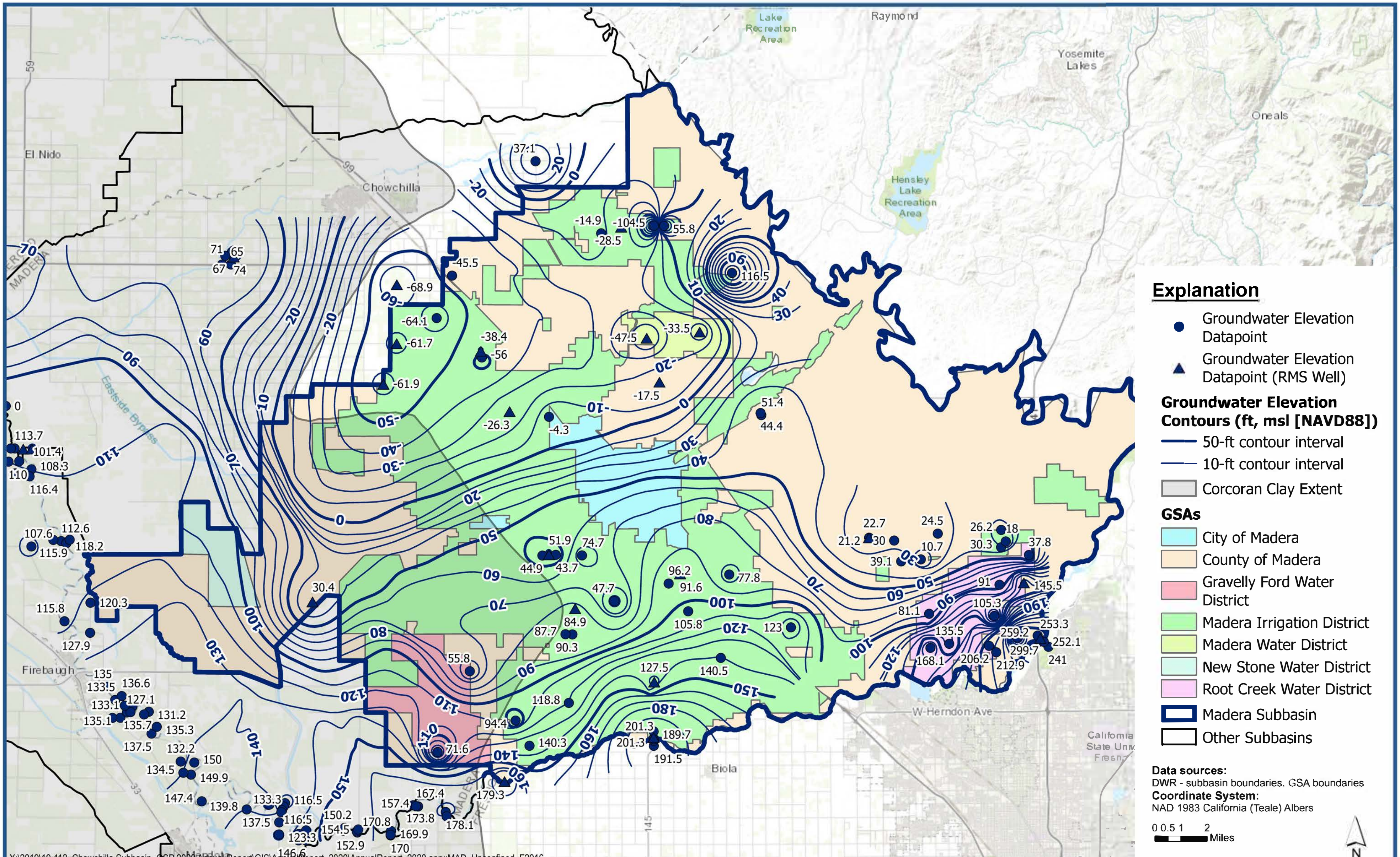
Figure A-2



Contours of Equal Groundwater Elevation
Upper Aquifer/Undifferentiated Unconfined Zone - Fall 2016

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Figure A-3

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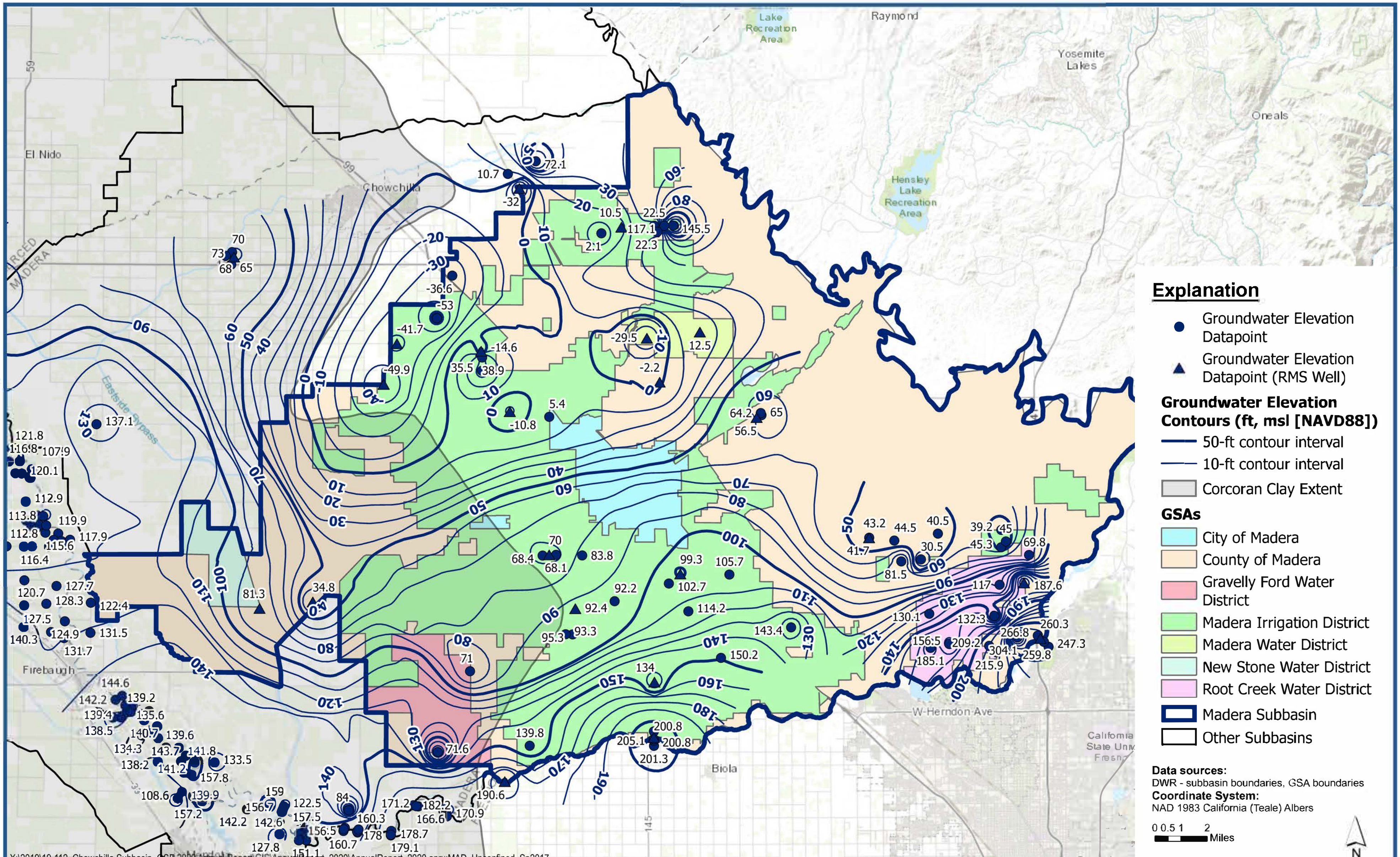

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Contours of Equal Groundwater Elevation
Upper Aquifer/Undifferentiated Unconfined Zone - Spring 2017

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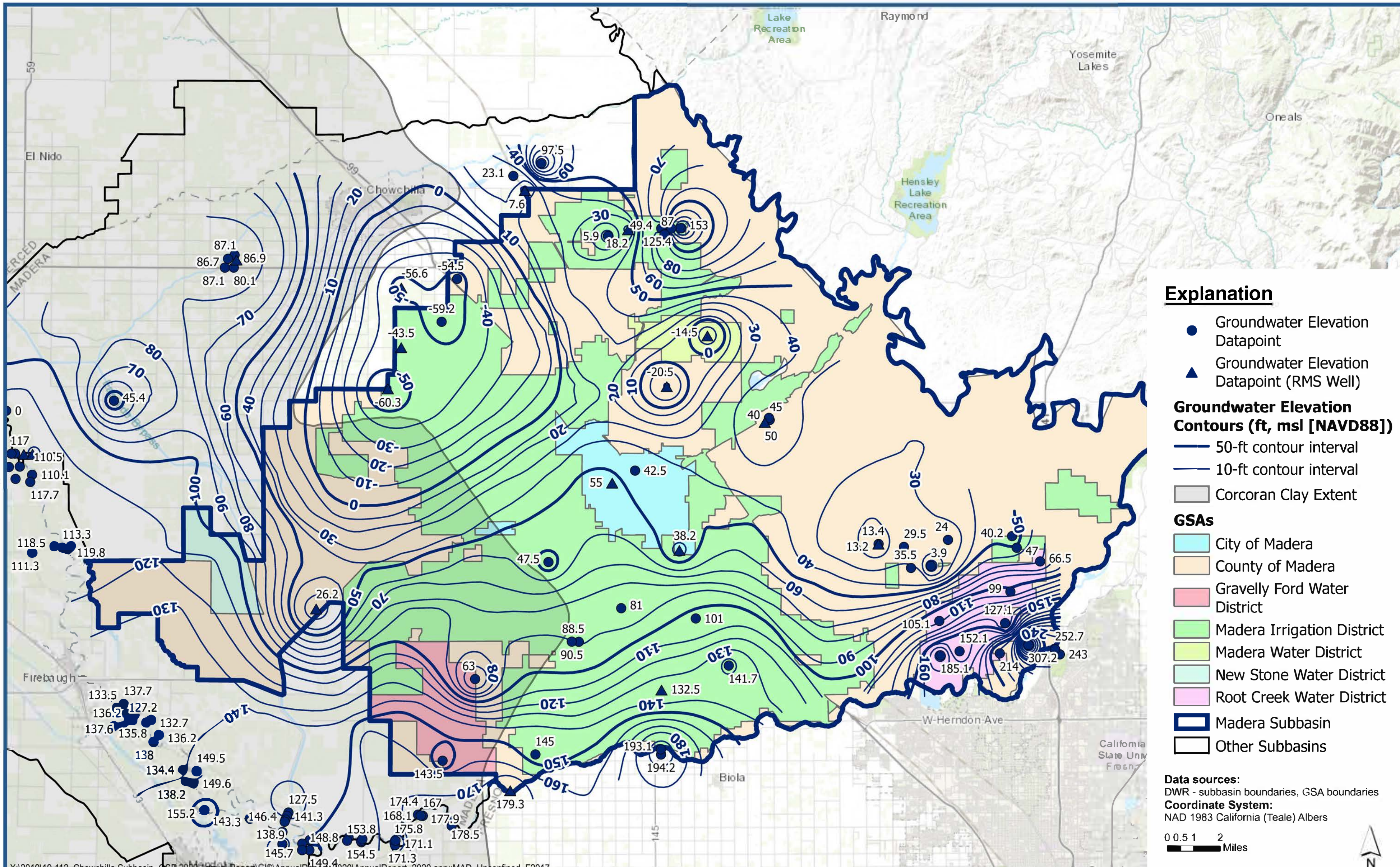
Figure A-4



Contours of Equal Groundwater Elevation
Upper Aquifer/Undifferentiated Unconfined Zone - Fall 2017

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Figure A-5

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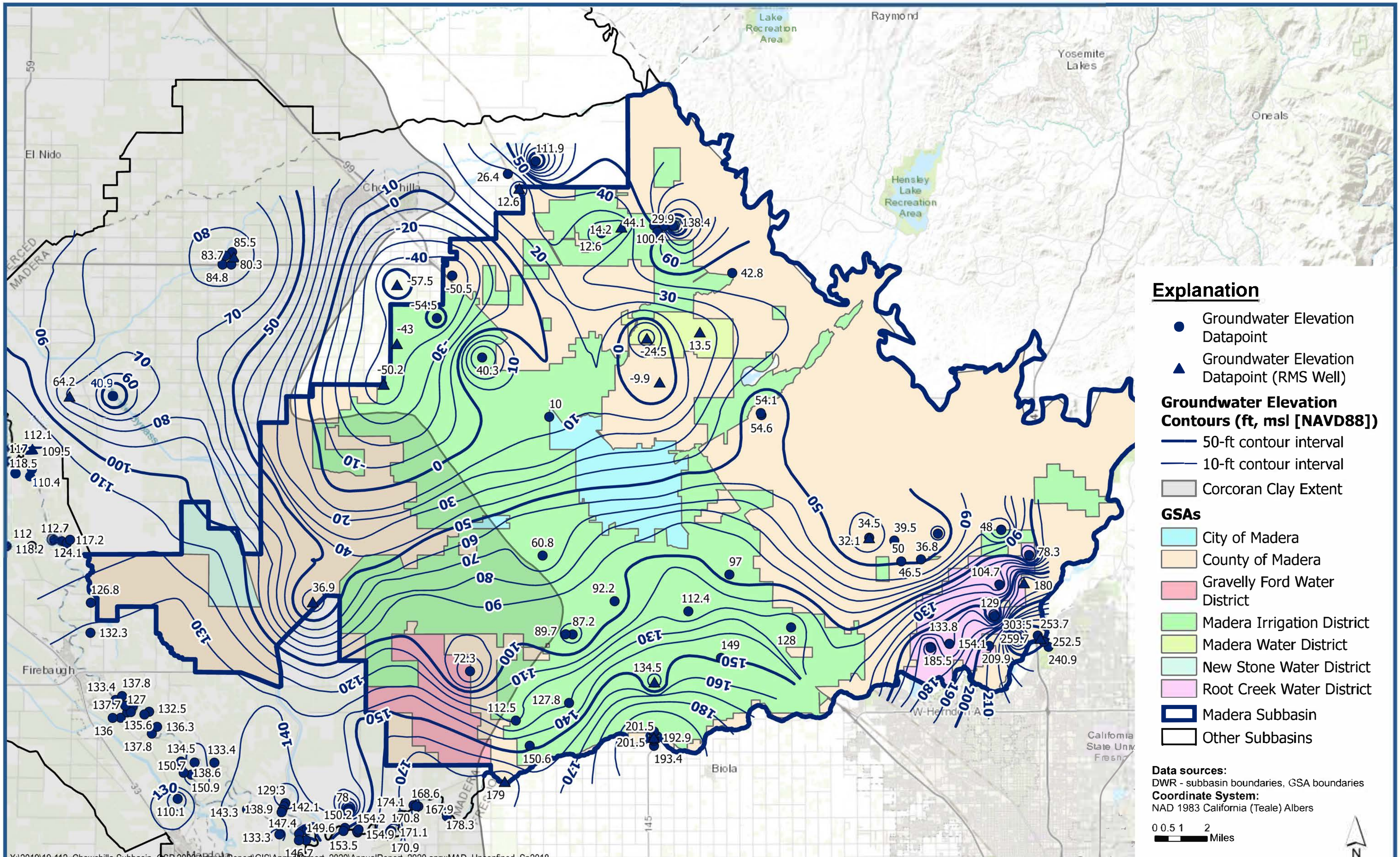

Contours of Equal Groundwater Elevation
Upper Aquifer/Undifferentiated Unconfined Zone - Spring 2018

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Figure A-6

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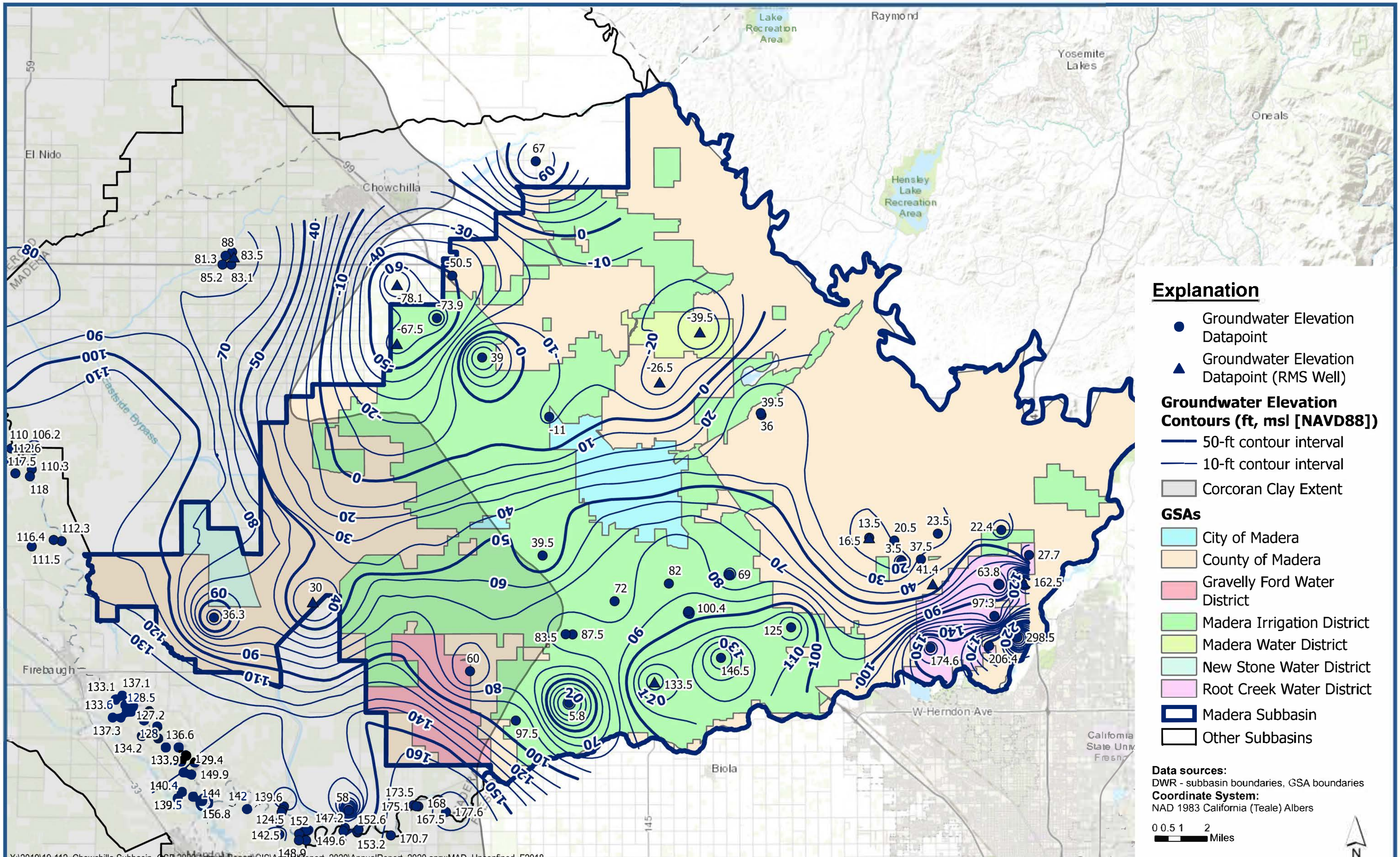

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Contours of Equal Groundwater Elevation
Upper Aquifer/Undifferentiated Unconfined Zone - Fall 2018

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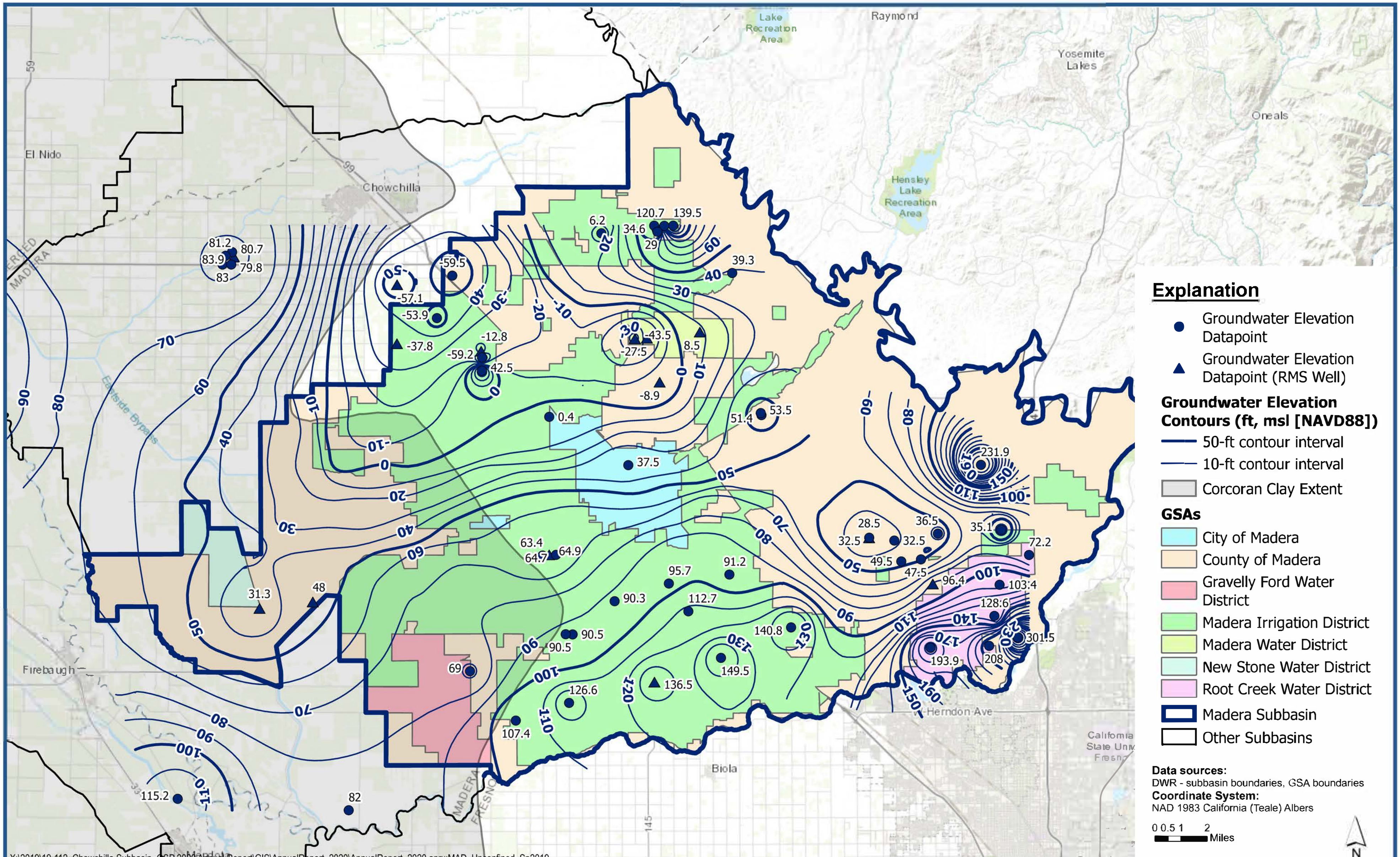
Figure A-7



Contours of Equal Groundwater Elevation
Upper Aquifer/Undifferentiated Unconfined Zone - Spring 2019

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Figure A-8

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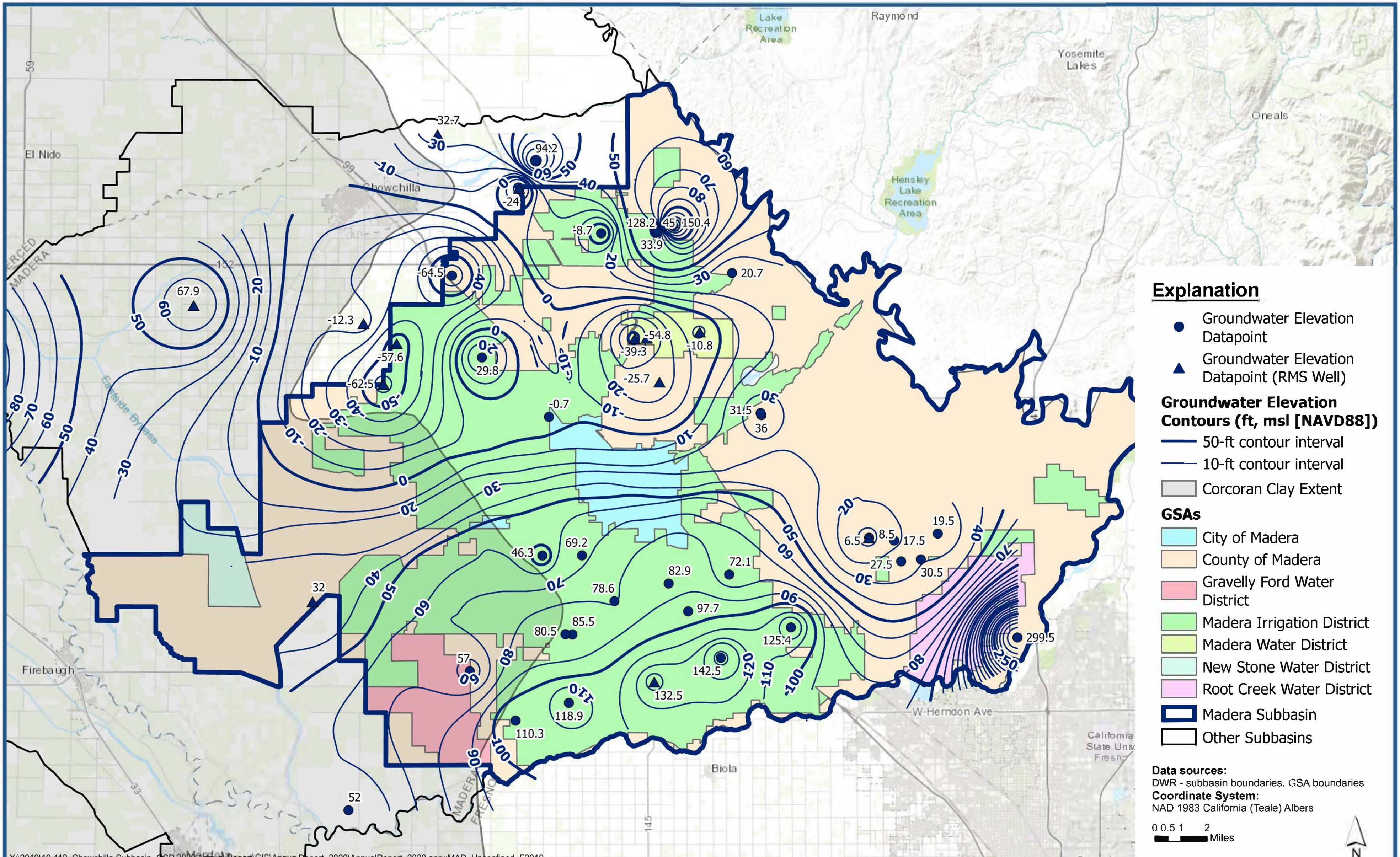
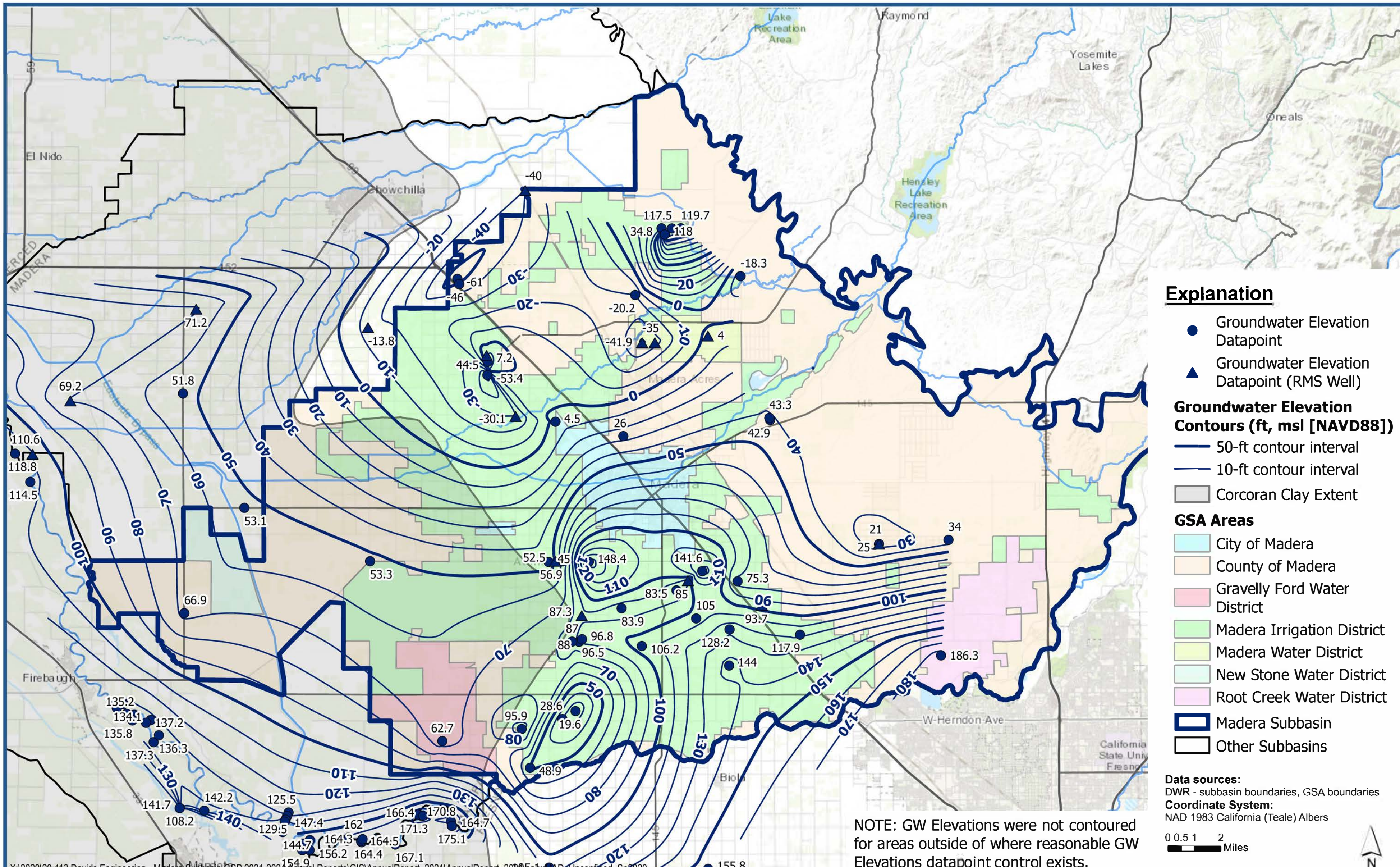


Contours of Equal Groundwater Elevation
Upper Aquifer/Undifferentiated Unconfined Zone - Fall 2019

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure A-9



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Contours of Equal Groundwater Elevation
Upper Aquifer/Undifferentiated Unconfined Zone - Spring 2020

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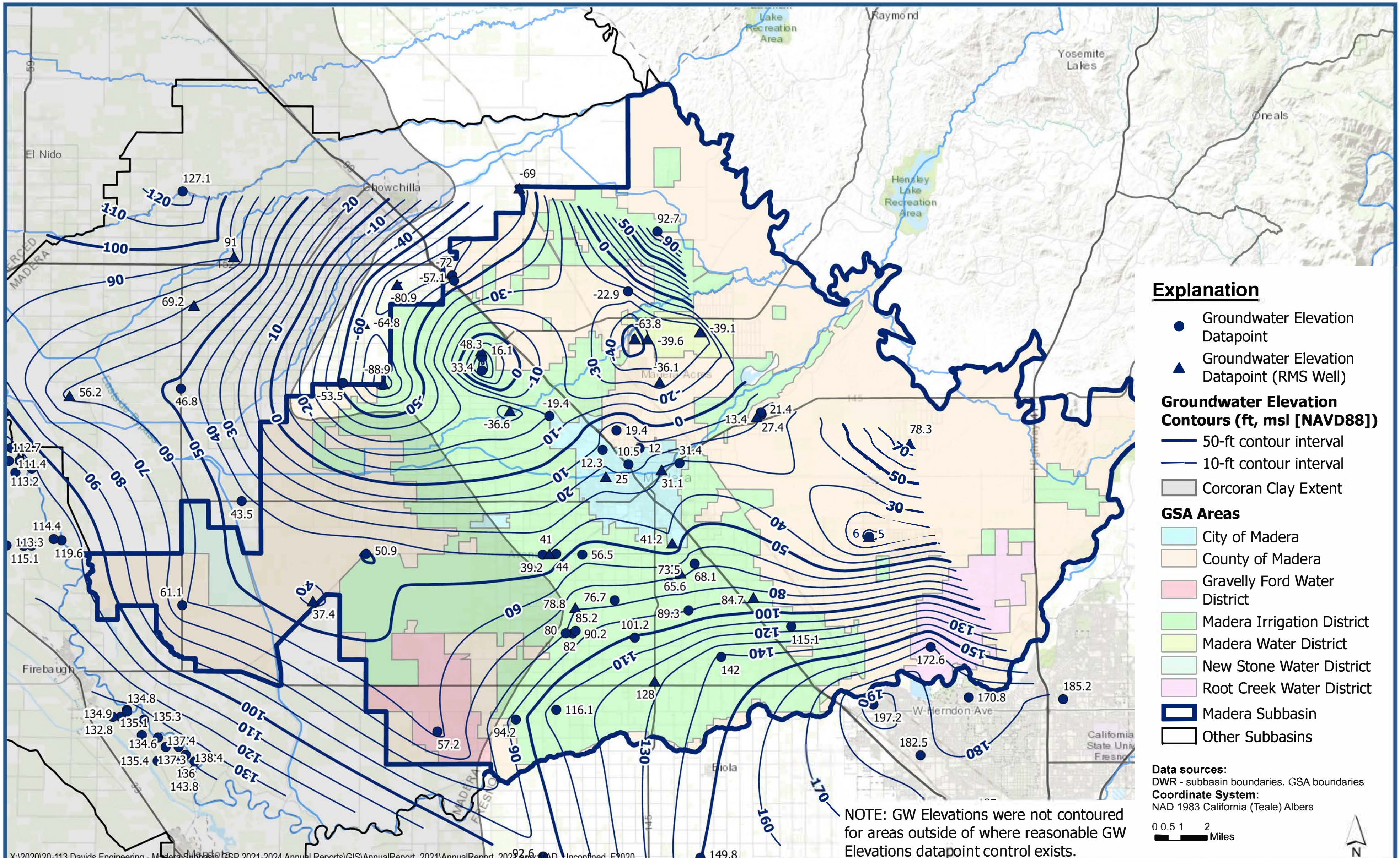
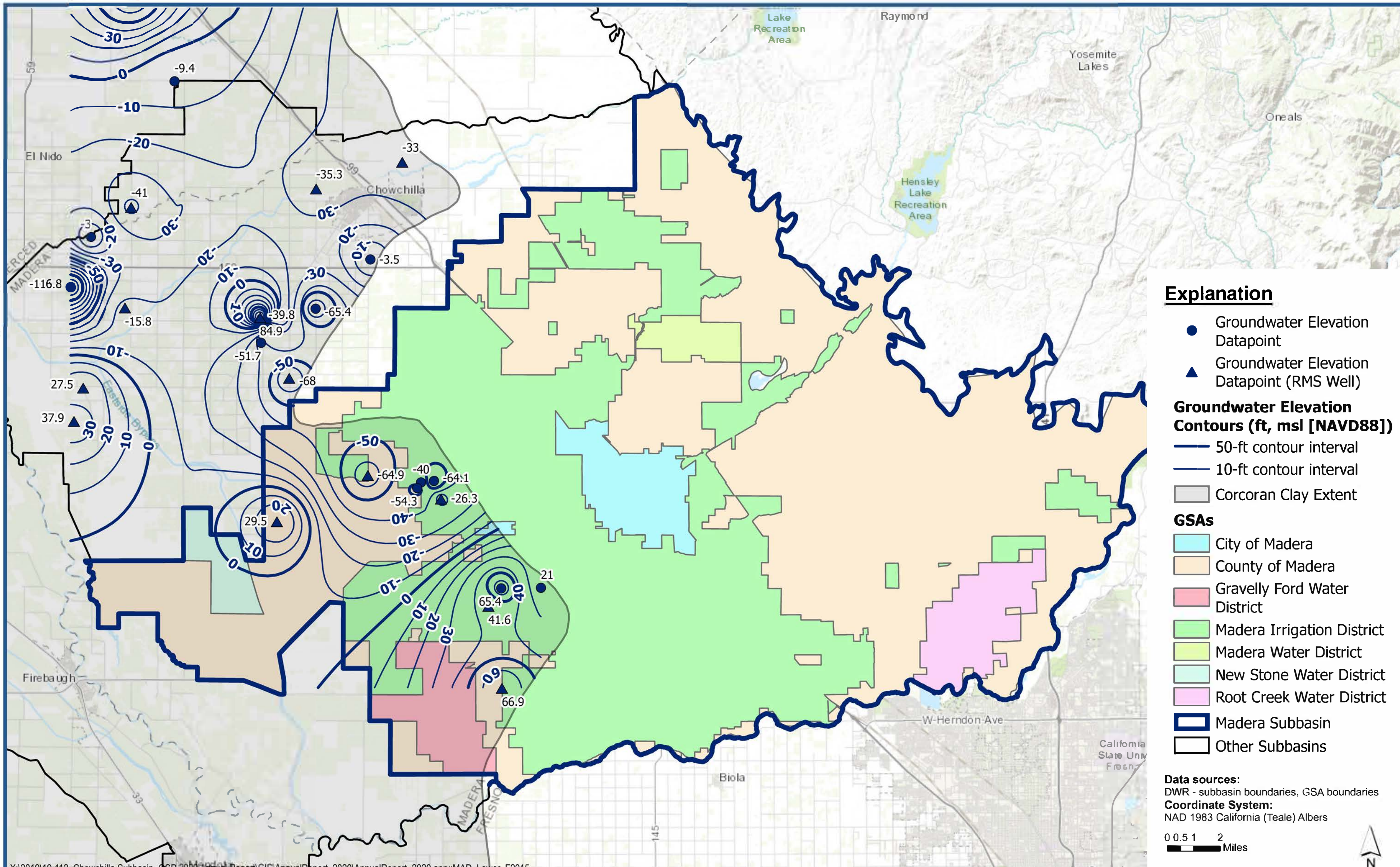
Figure A-10



Contours of Equal Groundwater Elevation
Upper Aquifer/Undifferentiated Unconfined Zone - Fall 2020

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure A-11



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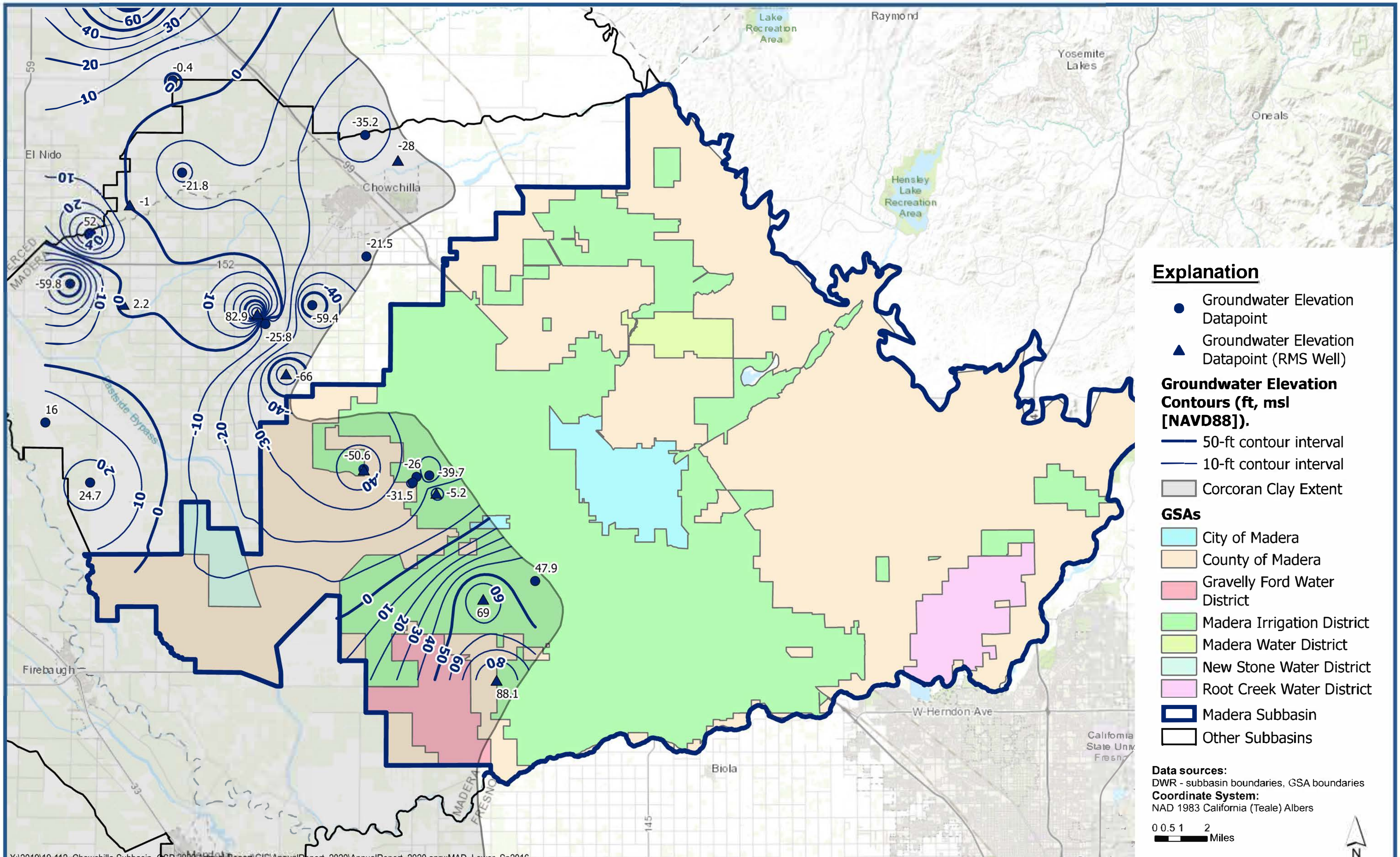
Contours of Equal Groundwater Elevation
Lower Aquifer - Fall 2015

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure A-12



Contours of Equal Groundwater Elevation
Lower Aquifer - Spring 2016

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure A-13

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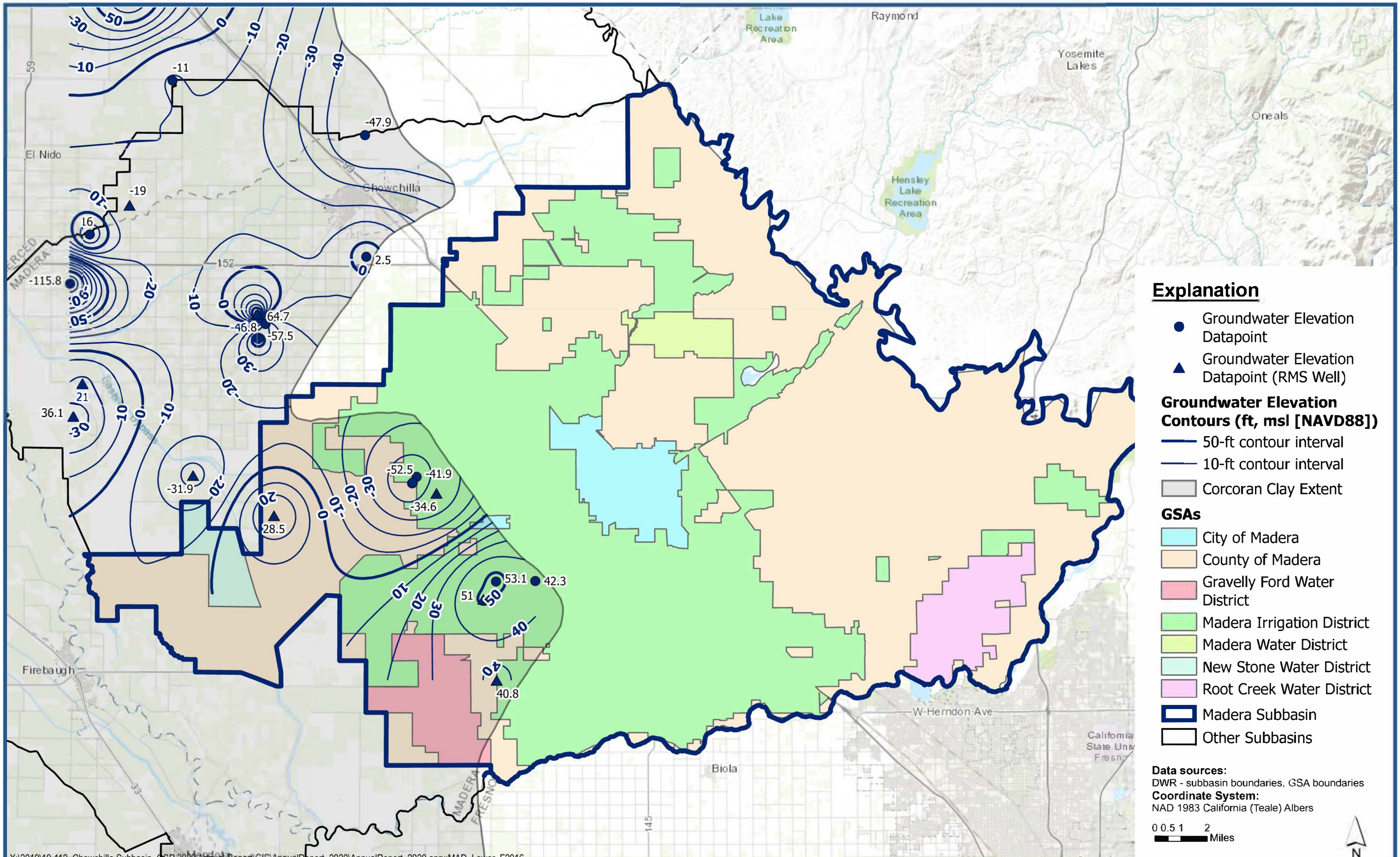

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Contours of Equal Groundwater Elevation Lower Aquifer - Fall 2016

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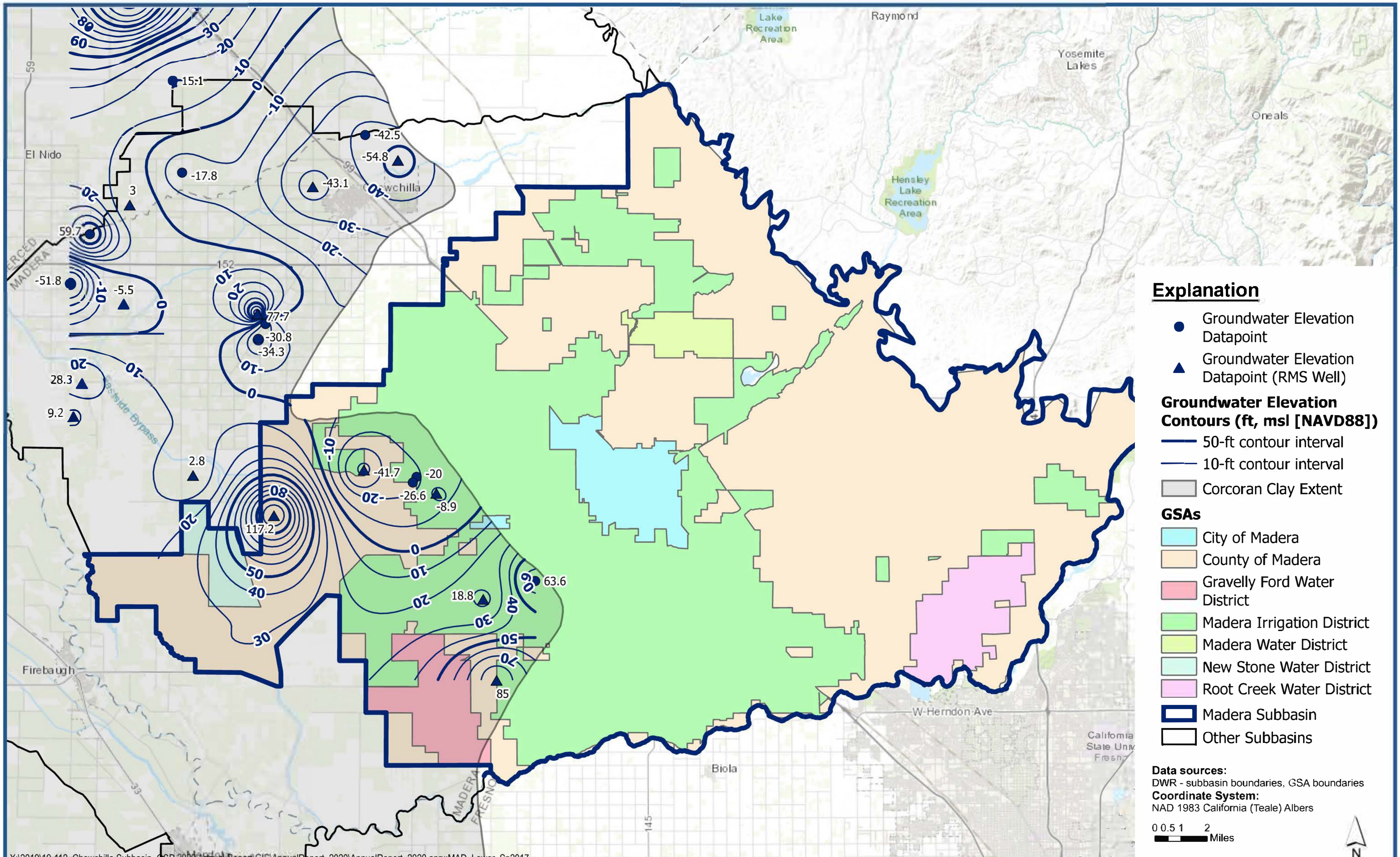
Figure A-14



Contours of Equal Groundwater Elevation
Lower Aquifer - Spring 2017

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure A-15

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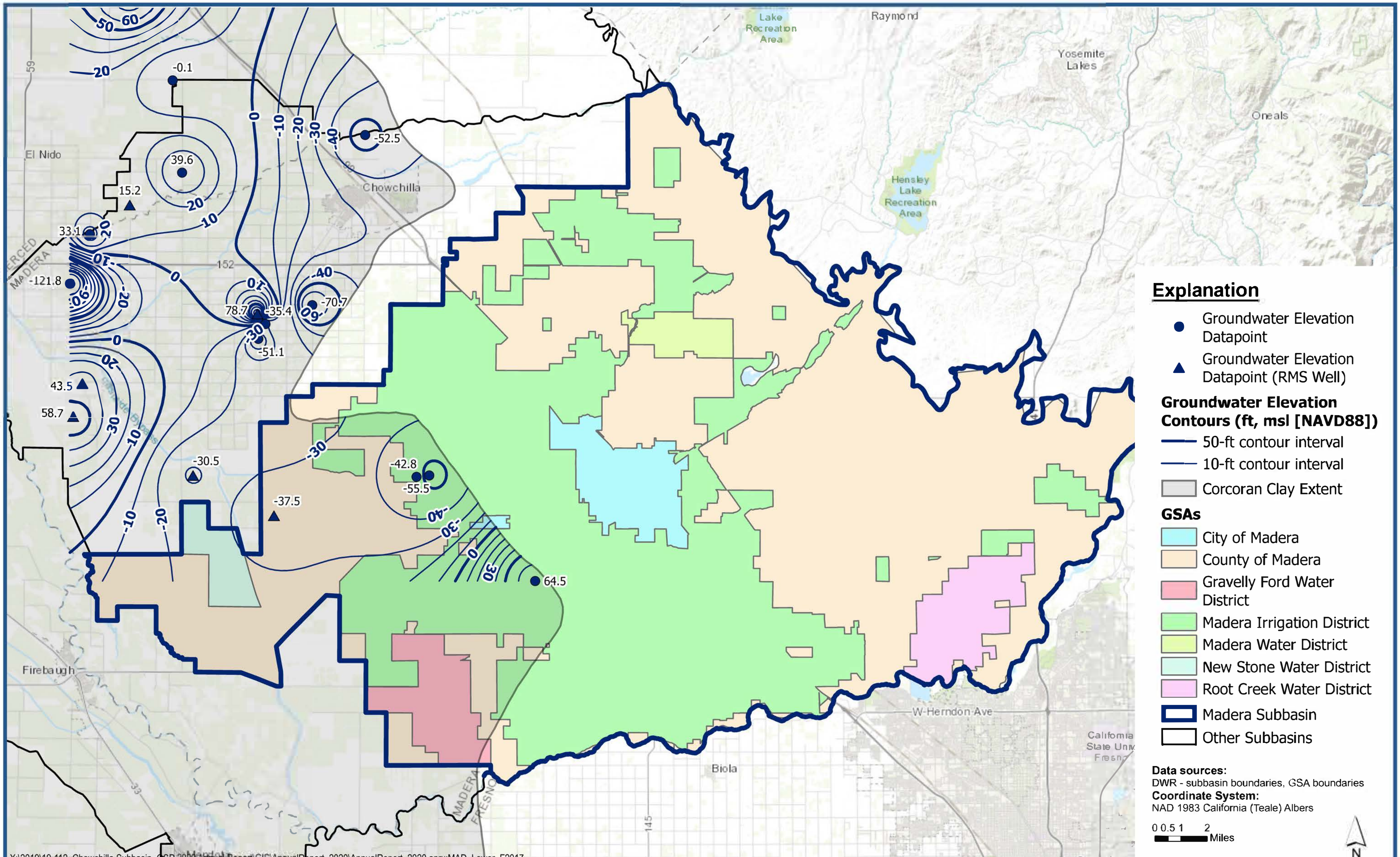

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Contours of Equal Groundwater Elevation
Lower Aquifer - Fall 2017

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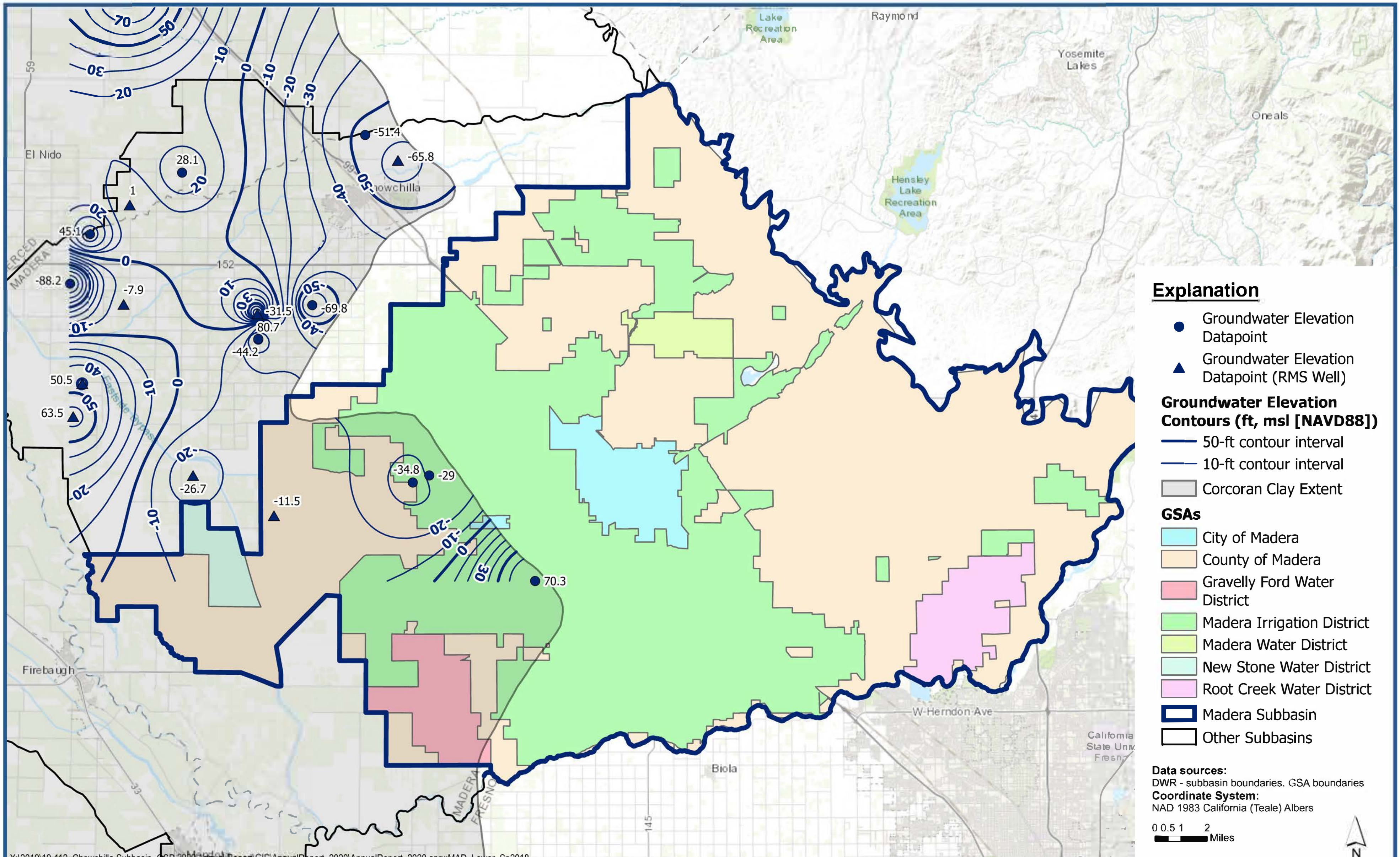
Figure A-16



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Contours of Equal Groundwater Elevation
Lower Aquifer - Spring 2018

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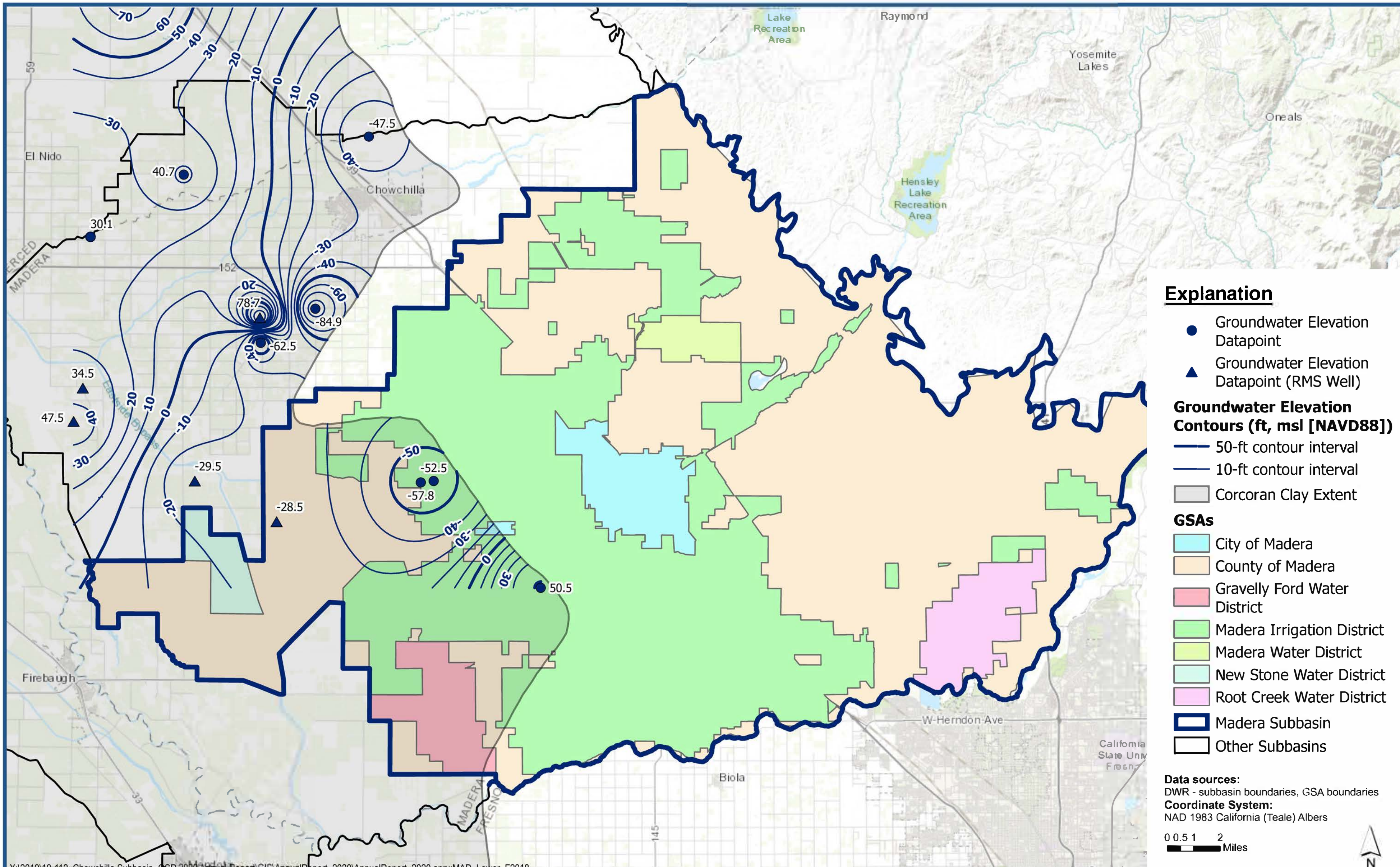
Figure A-17



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Contours of Equal Groundwater Elevation
Lower Aquifer - Fall 2018

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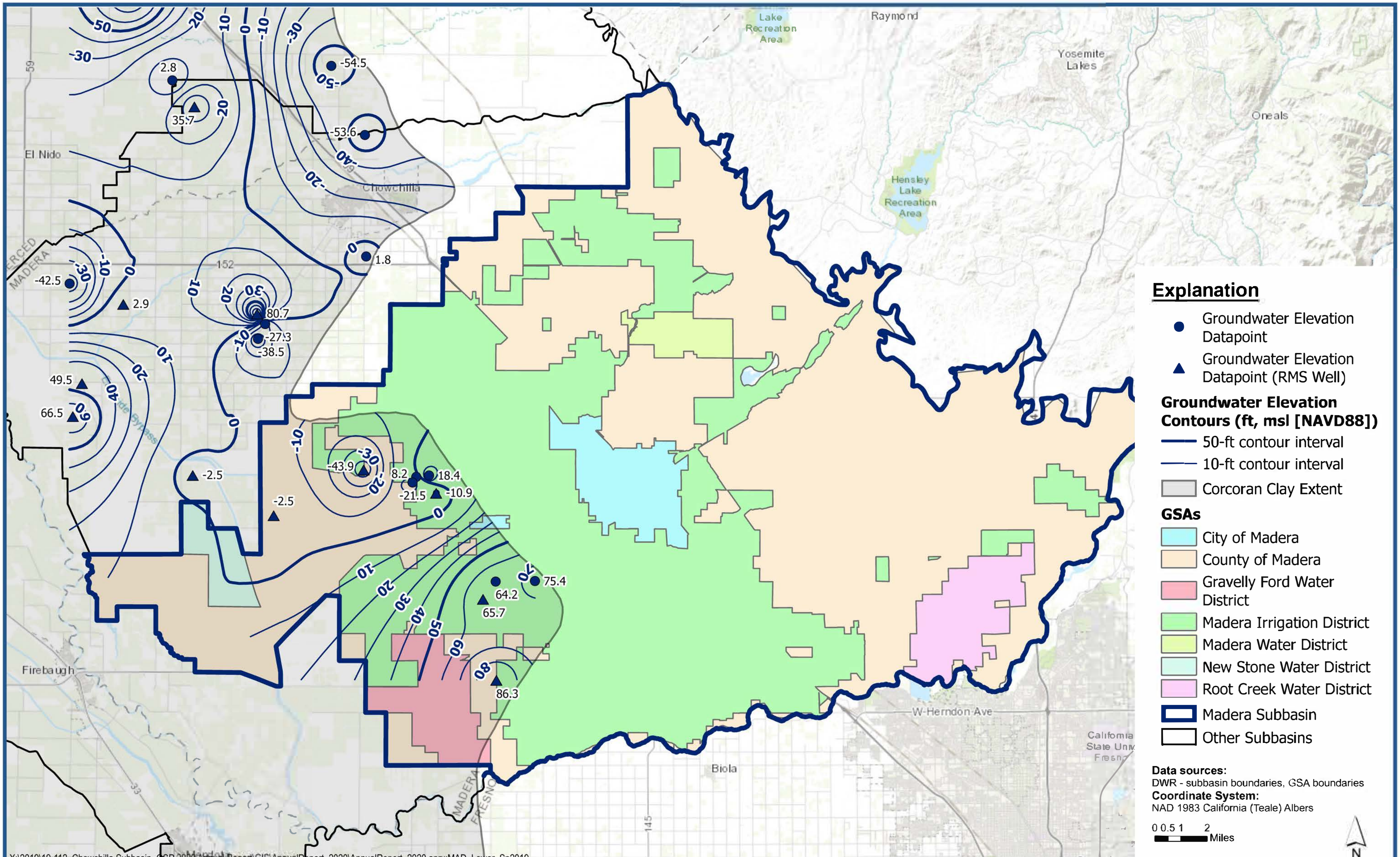
Figure A-18



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Contours of Equal Groundwater Elevation
Lower Aquifer - Spring 2019

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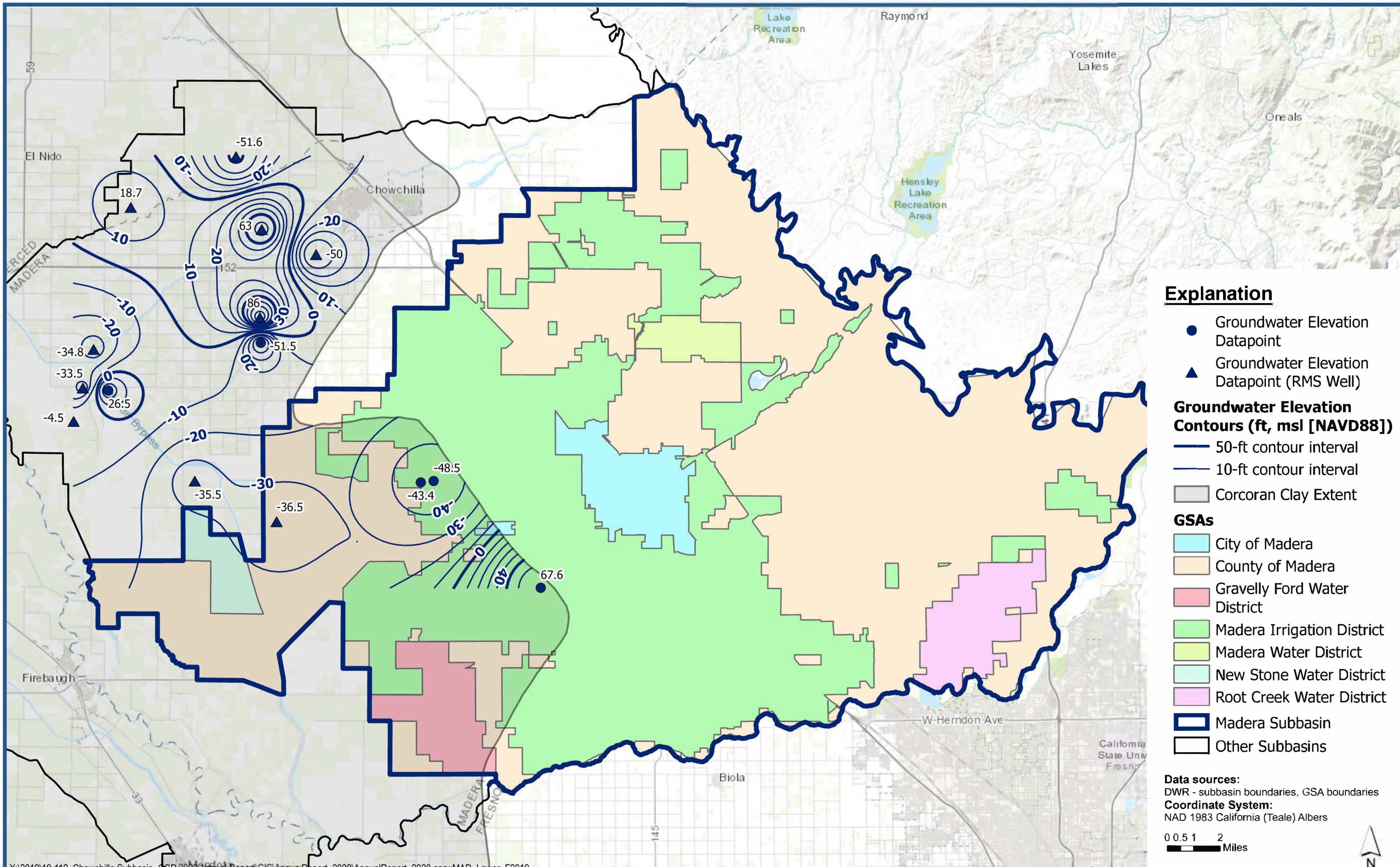
Figure A-19



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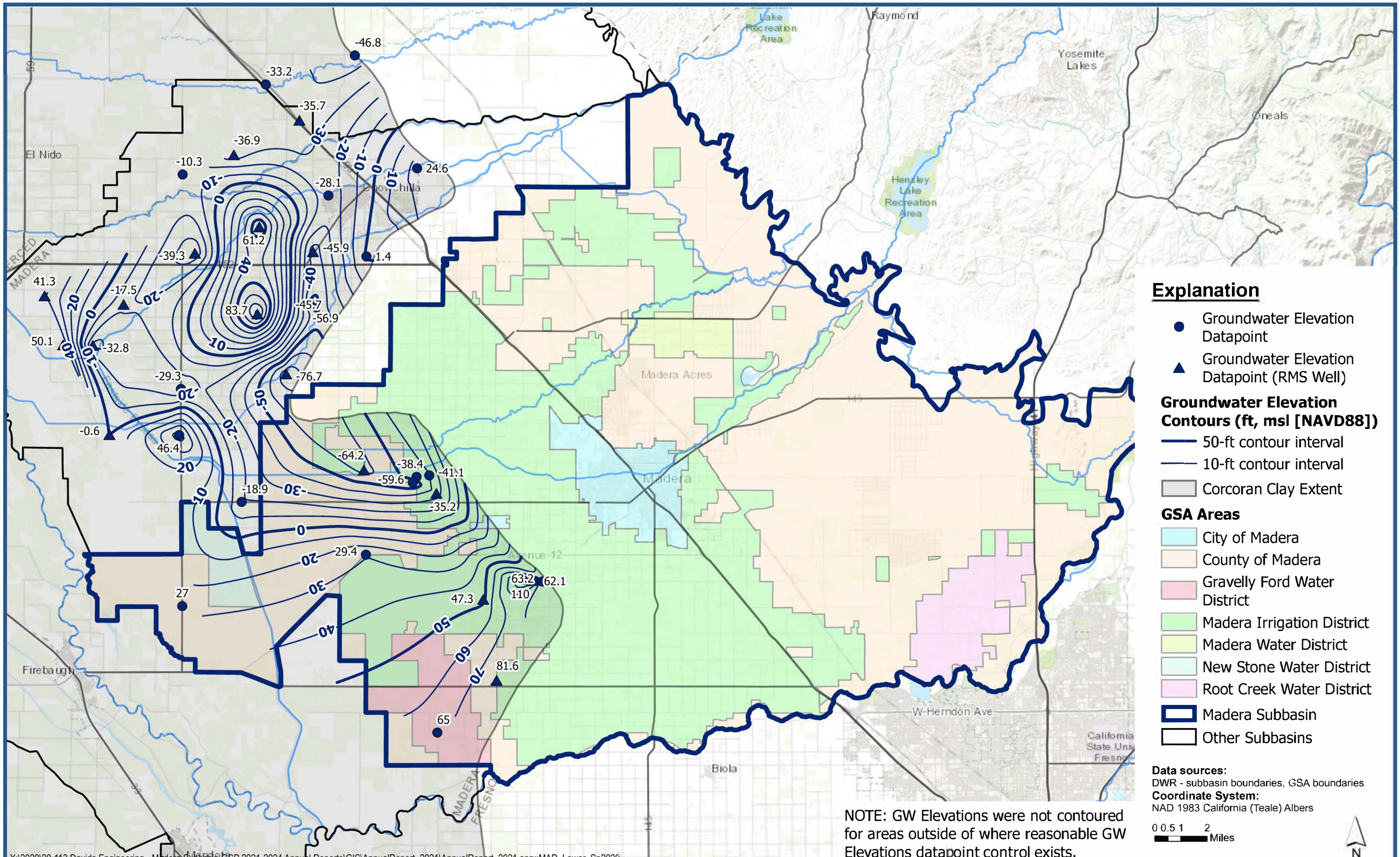
Contours of Equal Groundwater Elevation
Lower Aquifer - Fall 2019

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure A-20



Contours of Equal Groundwater Elevation
Lower Aquifer - Spring 2020

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Figure A-21

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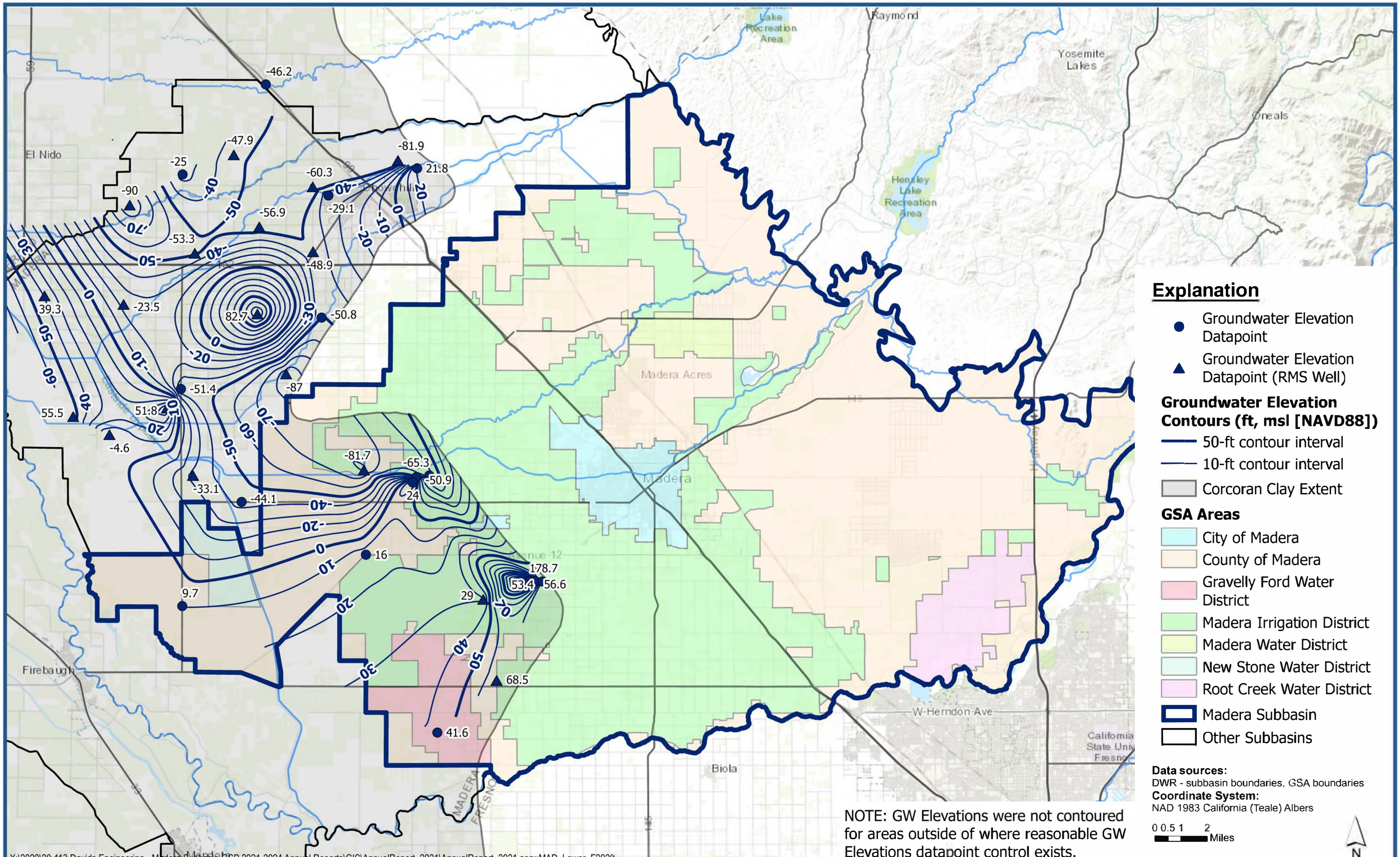

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Contours of Equal Groundwater Elevation
Lower Aquifer - Fall 2020

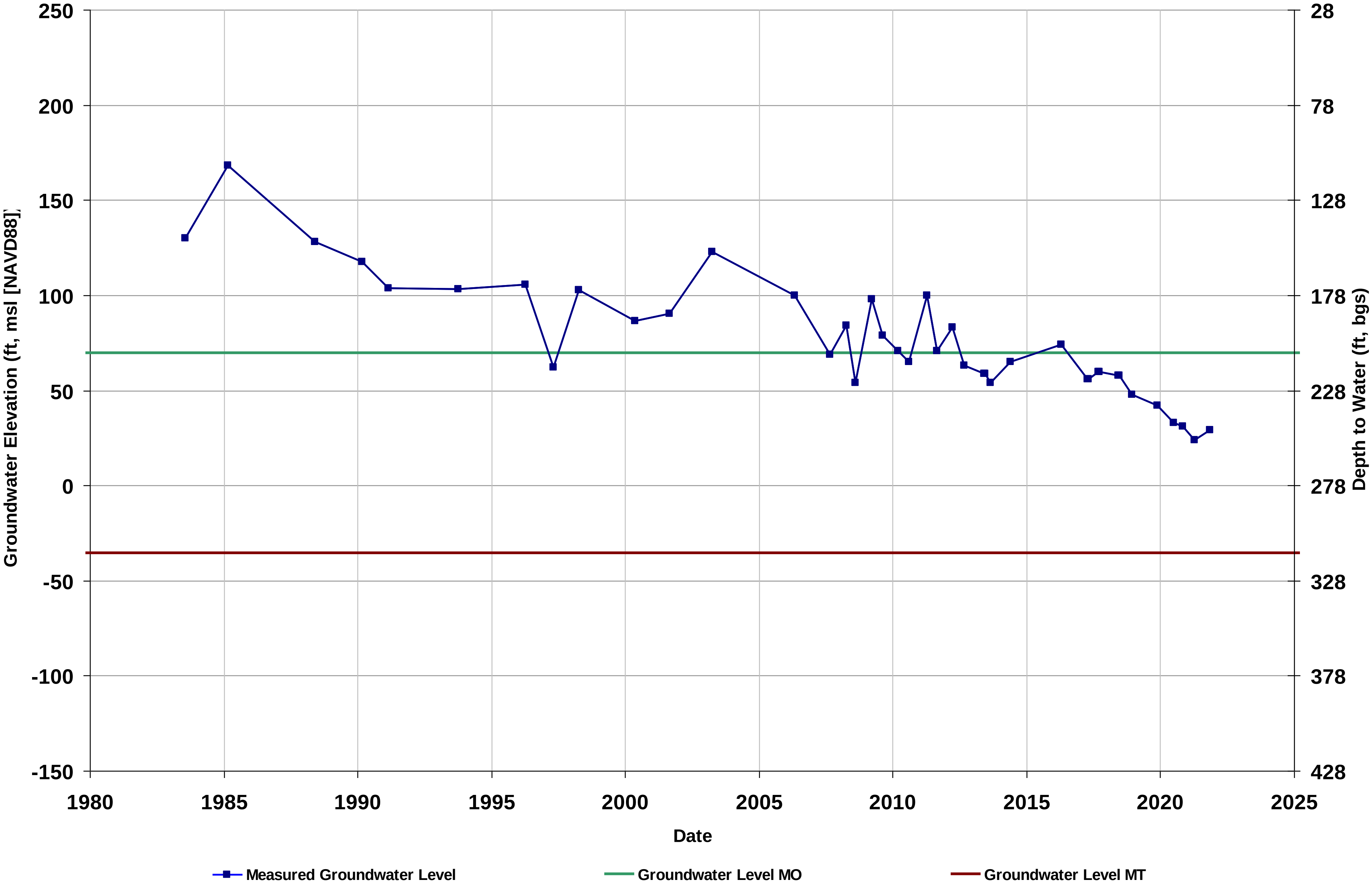
Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure A-22

Appendix B. Hydrographs of Time-Series Groundwater Level Data for Groundwater Level RMS Wells.

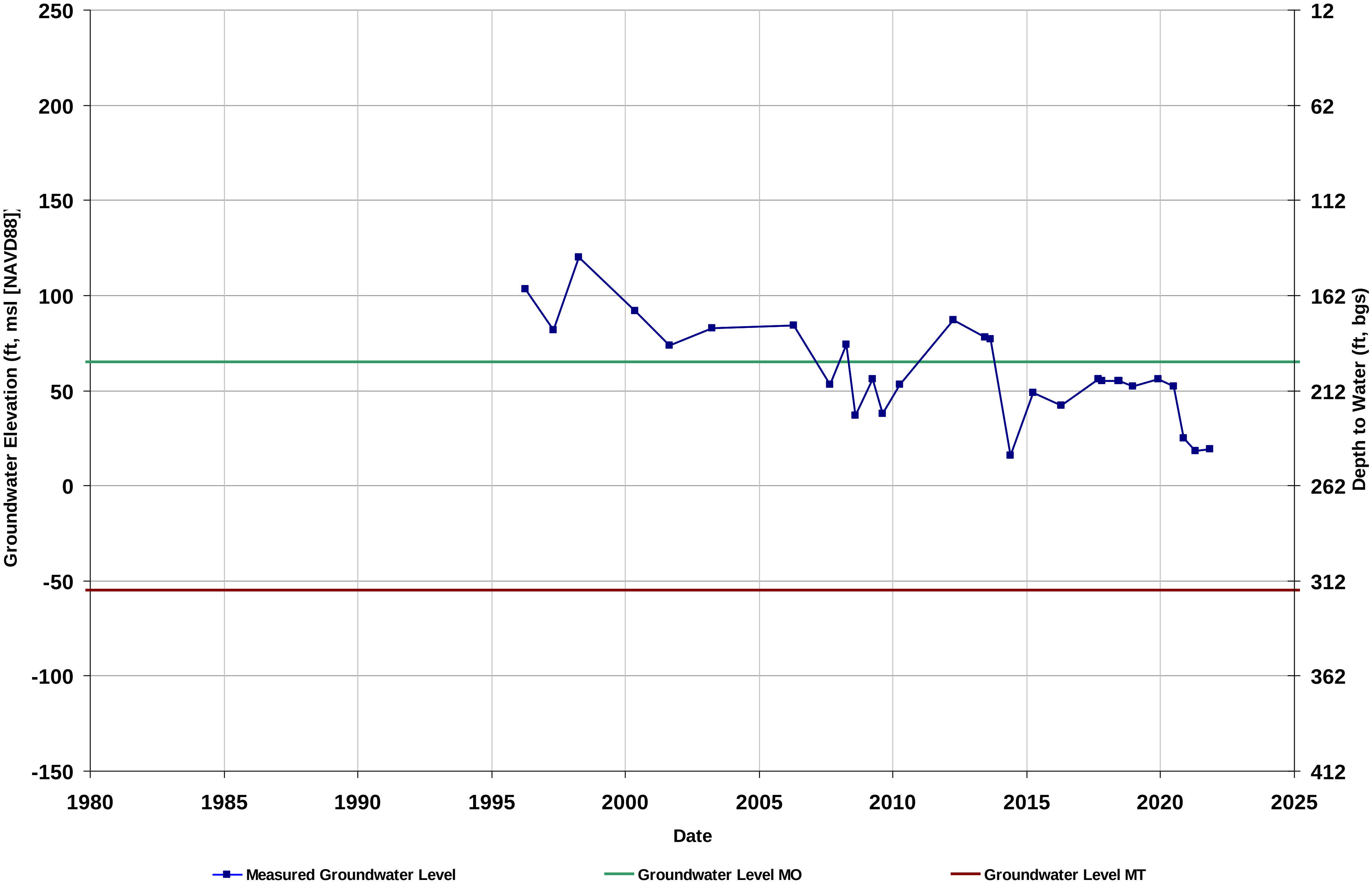
Well Name: COM RMS-1
Depth Zone: Lower
Subbasin: Madera
GSA: City of Madera

Total Depth (ft): 520
Perf Top (ft): 210
Perf Bottom (ft): 510
GSE (ft, msl): 278



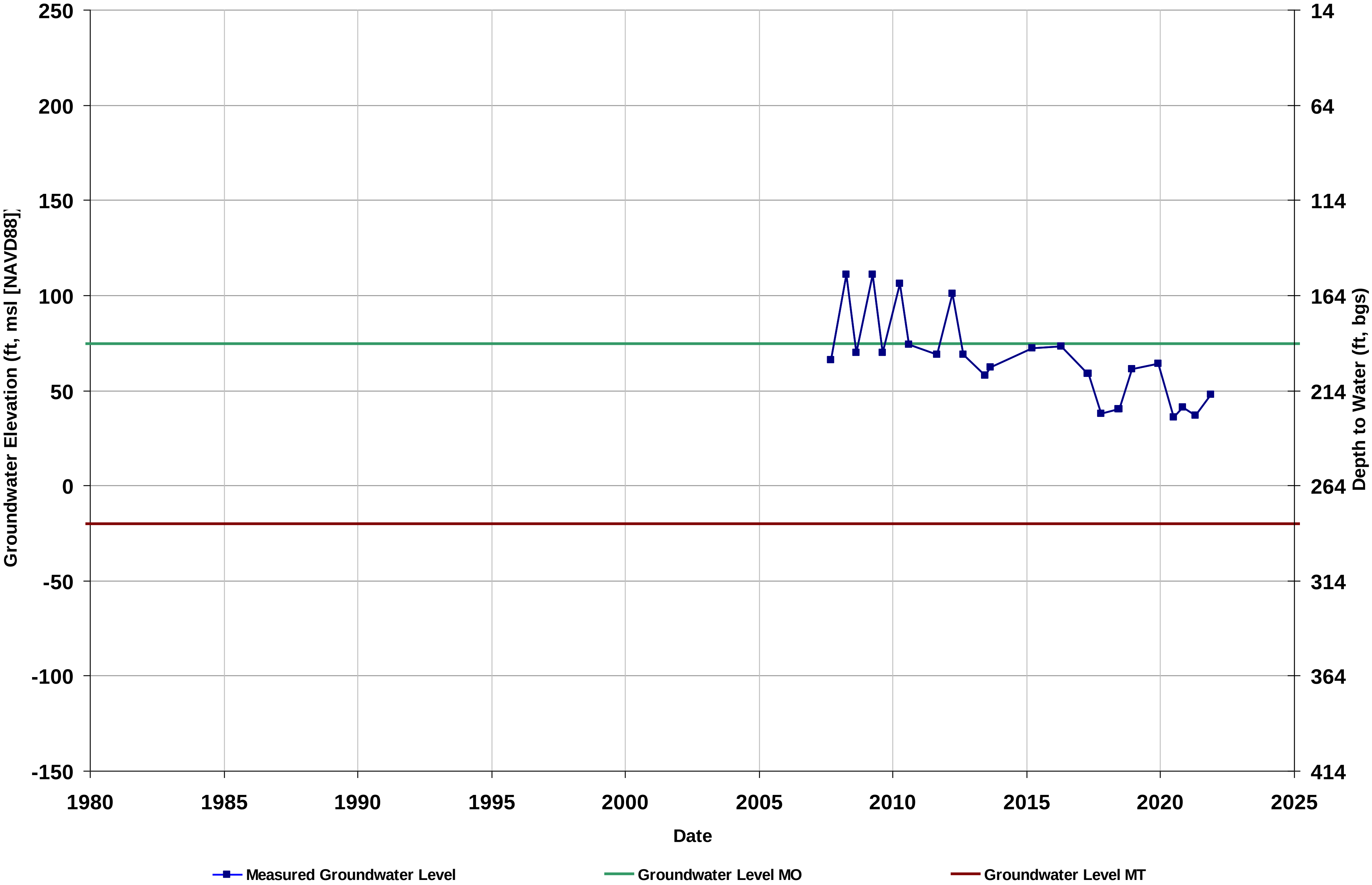
Well Name: COM RMS-2
Depth Zone: Lower
Subbasin: Madera
GSA: City of Madera

Total Depth (ft): 589
Perf Top (ft): 370
Perf Bottom (ft): 590
GSE (ft, msl): 262



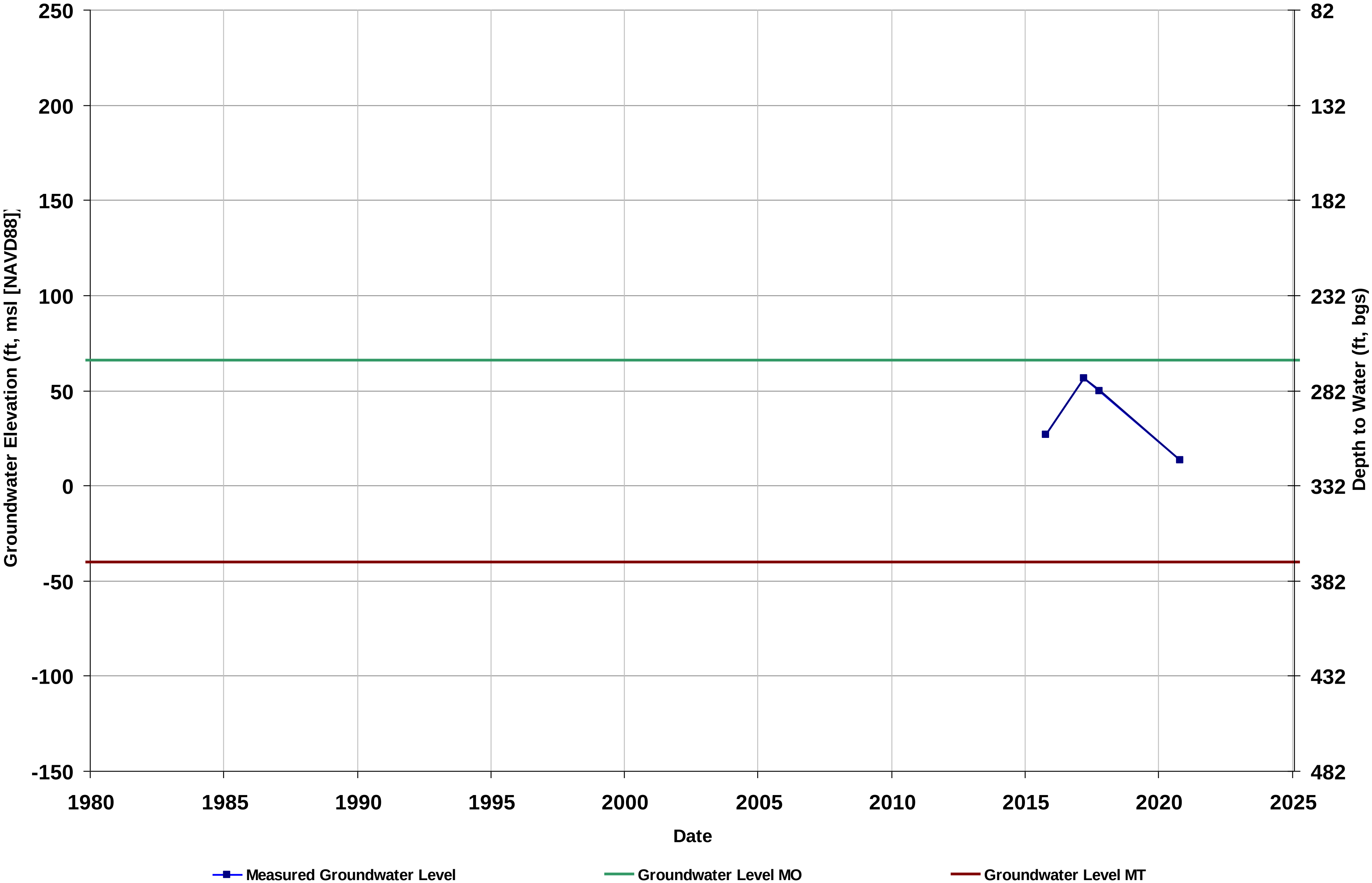
Well Name: COM RMS-3
Depth Zone: Lower
Subbasin: Madera
GSA: City of Madera

Total Depth (ft): 620
Perf Top (ft): 310
Perf Bottom (ft): 600
GSE (ft, msl): 264



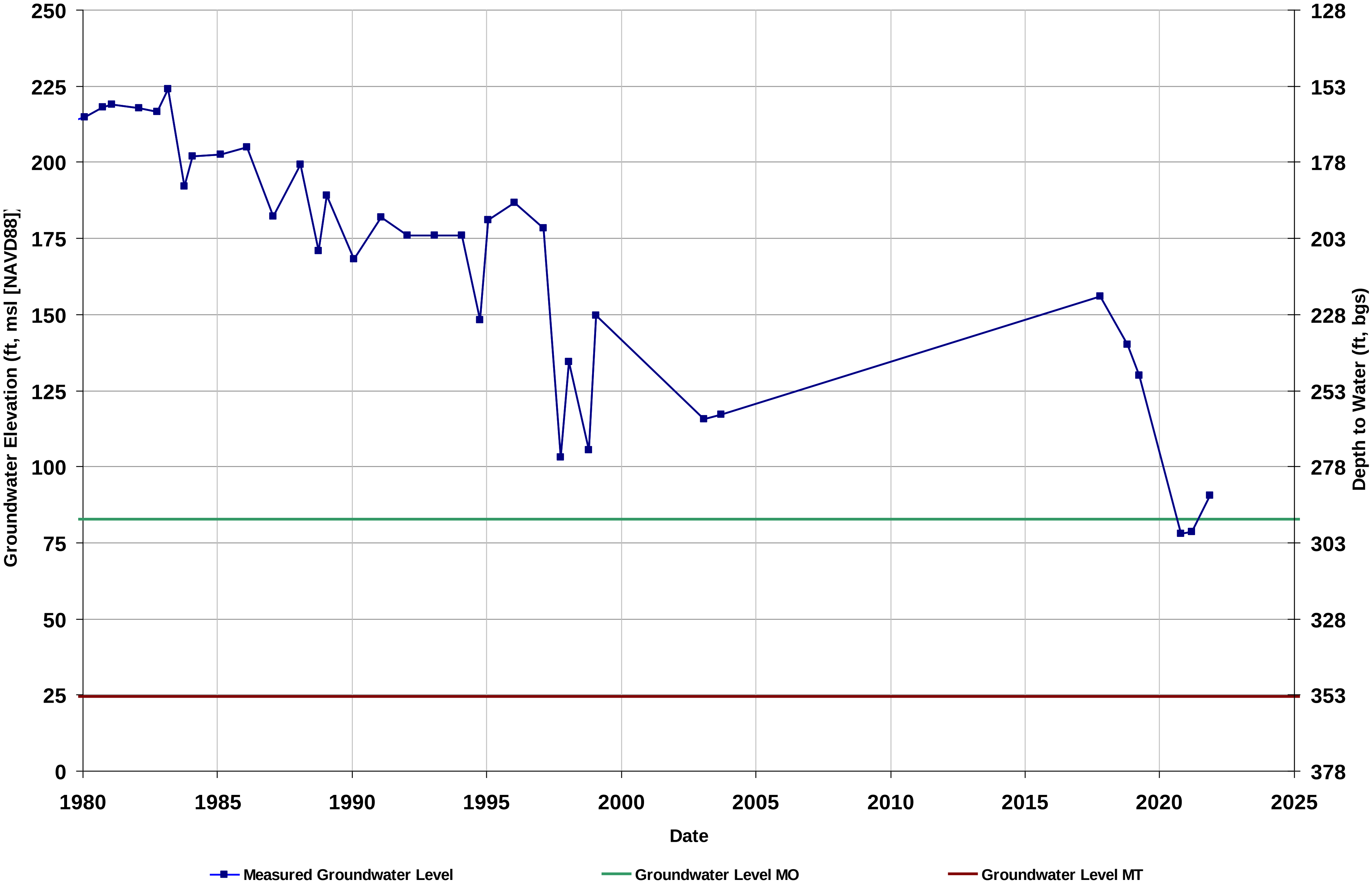
Well Name: MCE RMS-1
Depth Zone: Lower
Subbasin: Madera
GSA: County of Madera

Total Depth (ft): 500
Perf Top (ft): 420
Perf Bottom (ft): 500
GSE (ft, msl): 332



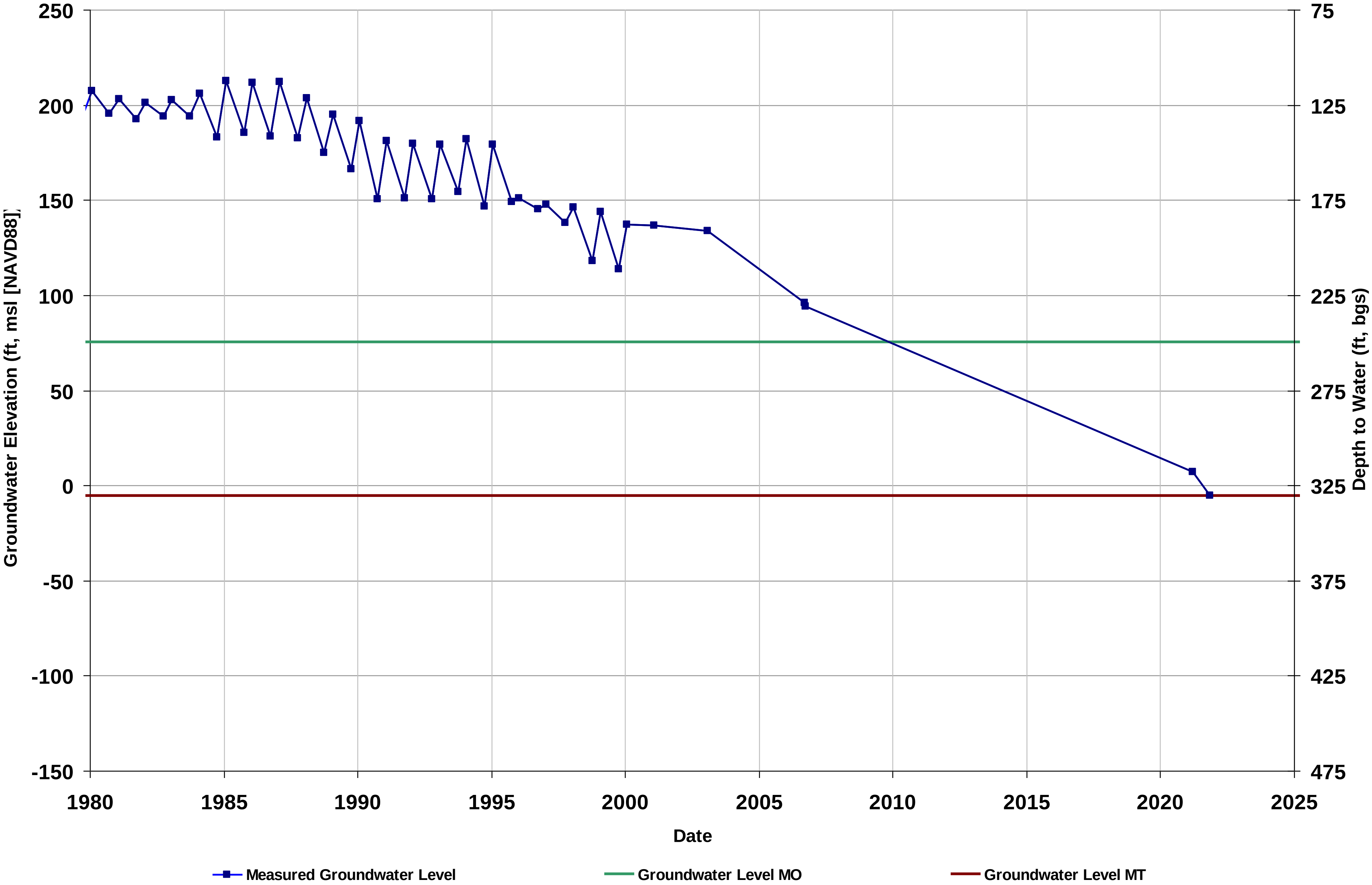
Well Name: MCE RMS-2
Depth Zone: Composite
Subbasin: Madera
GSA: County of Madera

Total Depth (ft):
Perf Top (ft):
Perf Bottom (ft):
GSE (ft, msl): 378



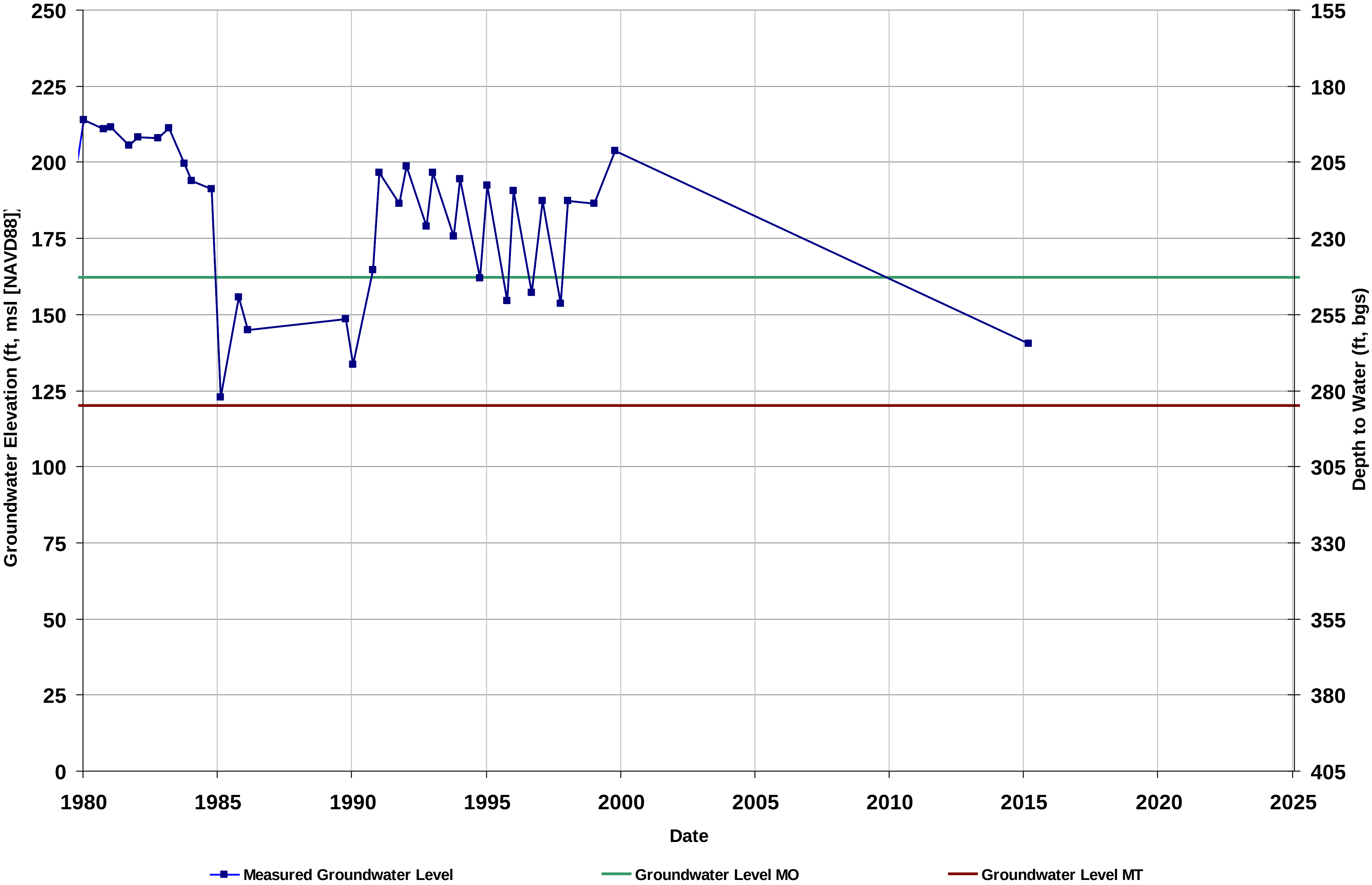
Well Name: MCE RMS-3
Depth Zone: Composite
Subbasin: Madera
GSA: County of Madera

Total Depth (ft):
Perf Top (ft):
Perf Bottom (ft):
GSE (ft, msl): 325



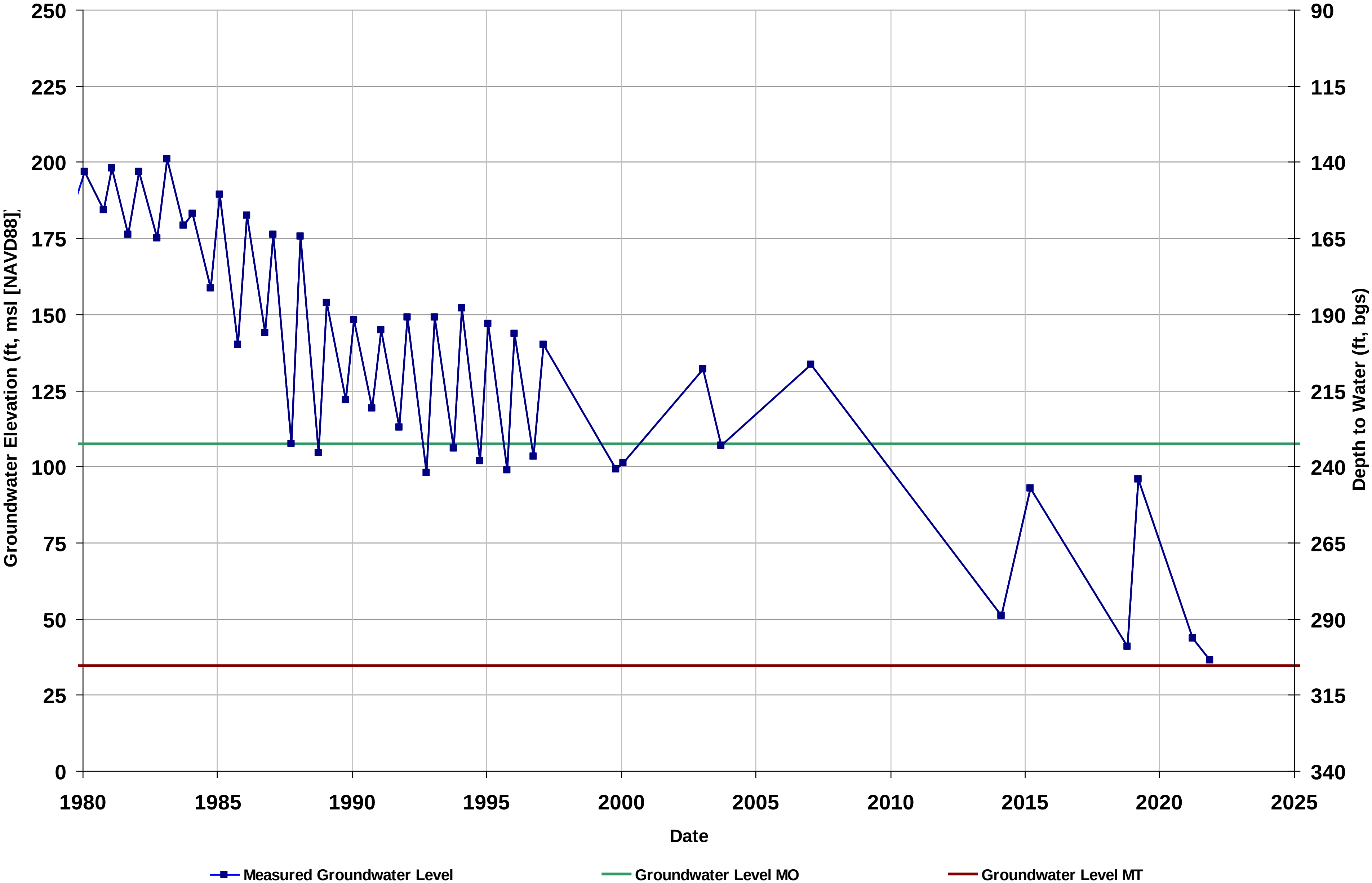
Well Name: MCE RMS-4
Depth Zone: Lower
Subbasin: Madera
GSA: County of Madera

Total Depth (ft):
Perf Top (ft):
Perf Bottom (ft):
GSE (ft, msl): 404



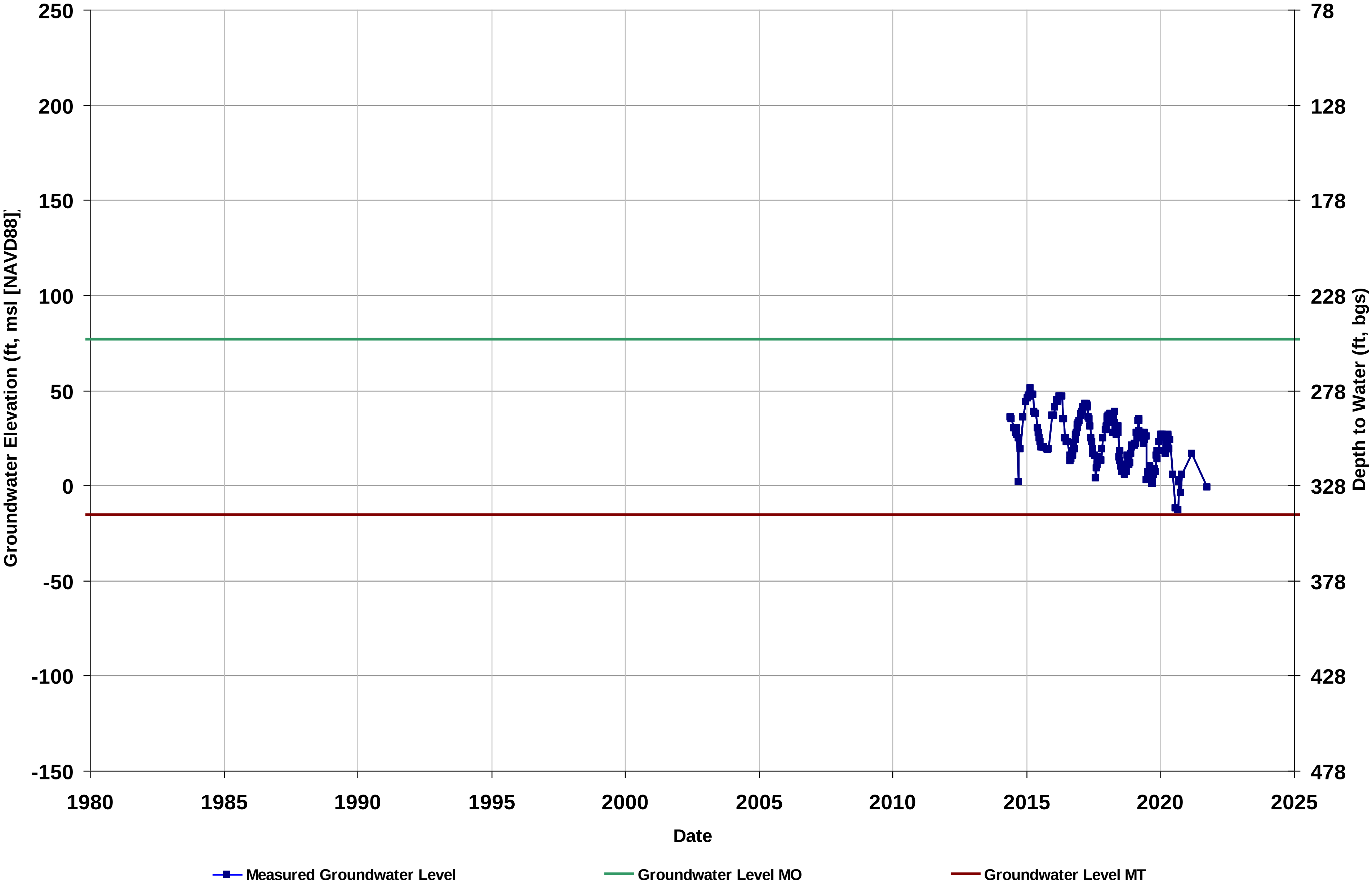
Well Name: MCE RMS-5
Depth Zone: Lower
Subbasin: Madera
GSA: County of Madera

Total Depth (ft):
Perf Top (ft):
Perf Bottom (ft):
GSE (ft, msl): 340



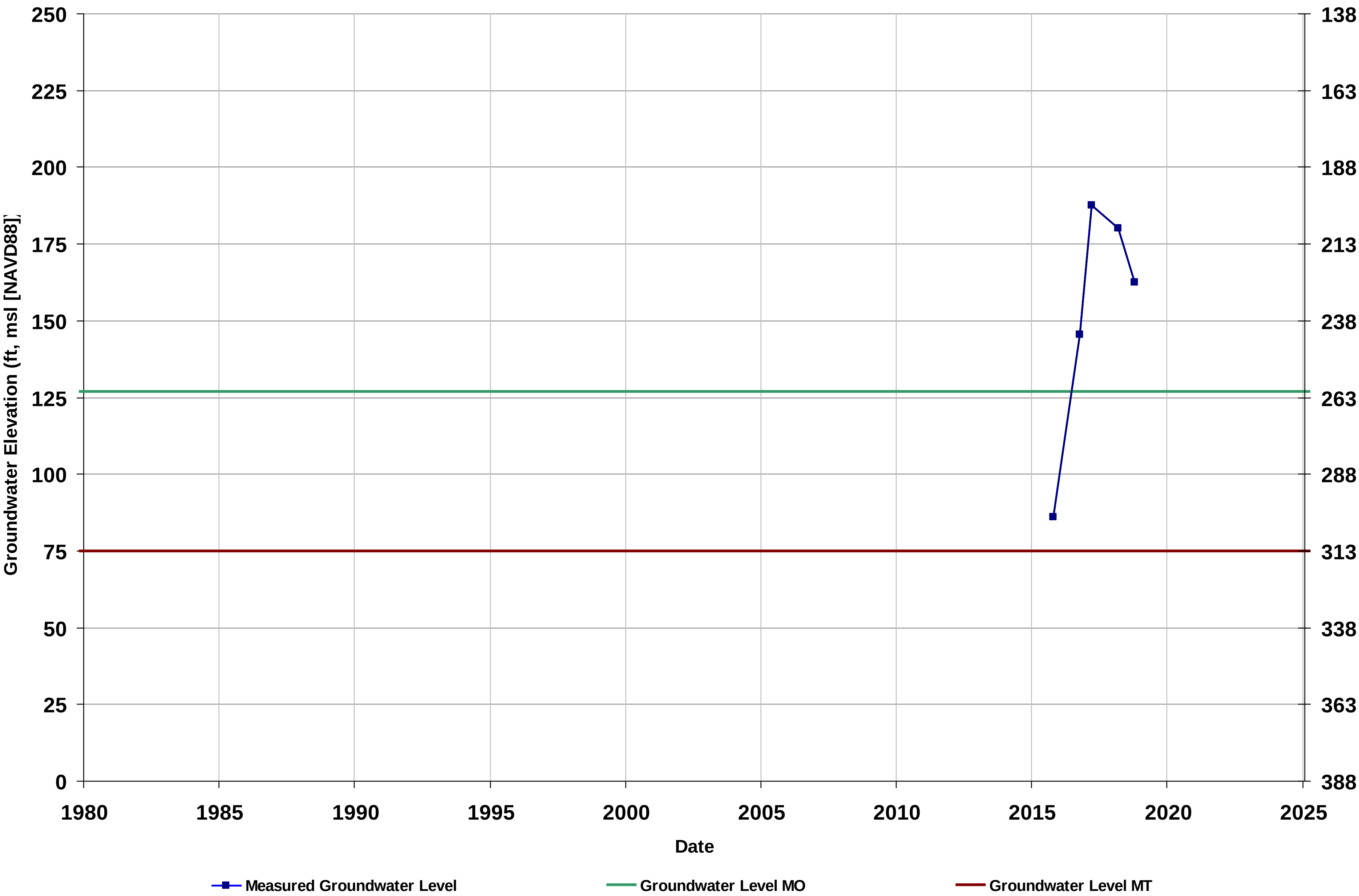
Well Name: MCE RMS-6
Depth Zone: Lower
Subbasin: Madera
GSA: County of Madera

Total Depth (ft): 550
Perf Top (ft): 450
Perf Bottom (ft): 550
GSE (ft, msl): 328



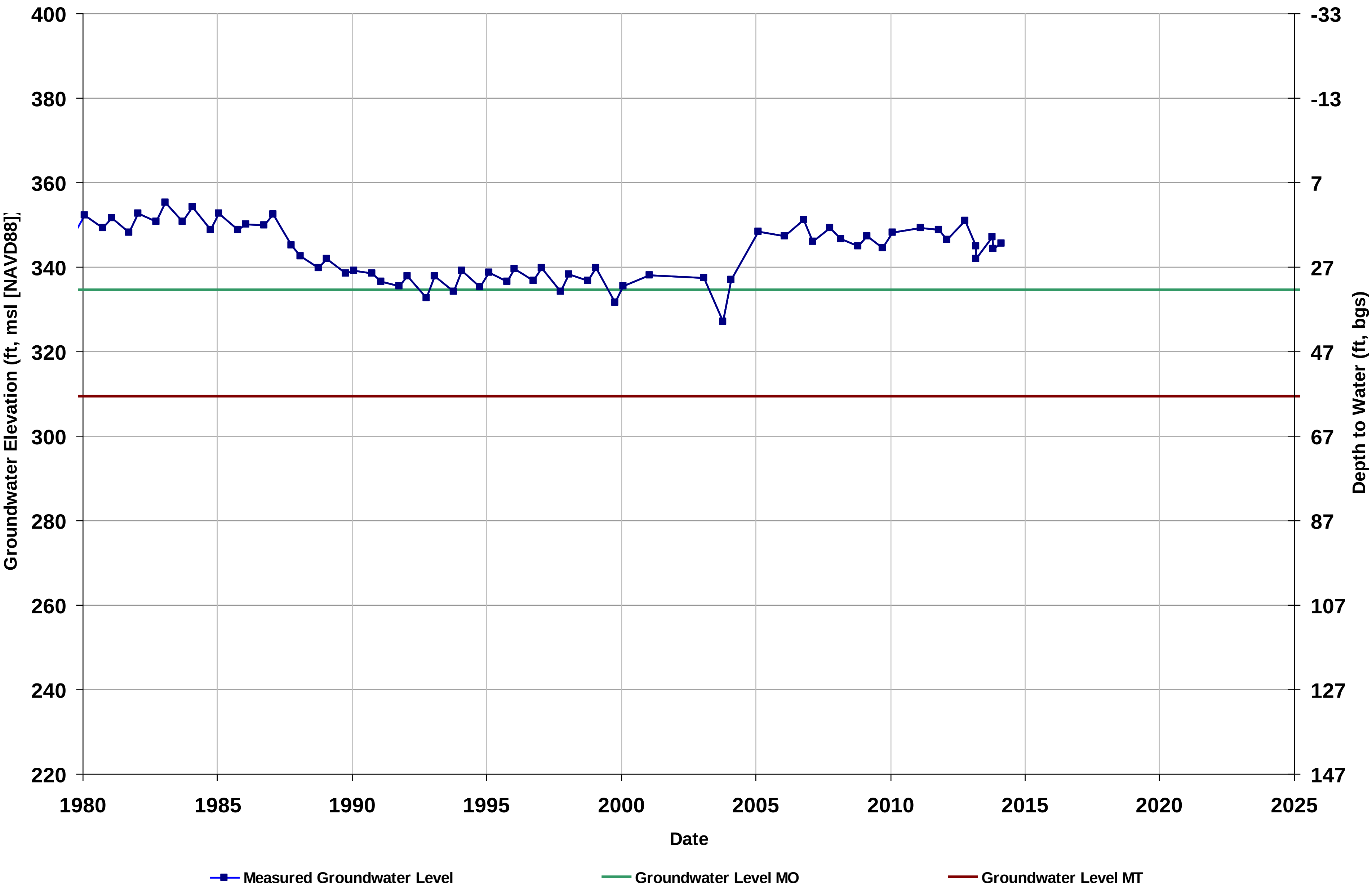
Well Name: MCE RMS-7
Depth Zone: Lower
Subbasin: Madera
GSA: County of Madera

Total Depth (ft): 840
Perf Top (ft): 370
Perf Bottom (ft): 820
GSE (ft, msl): 388



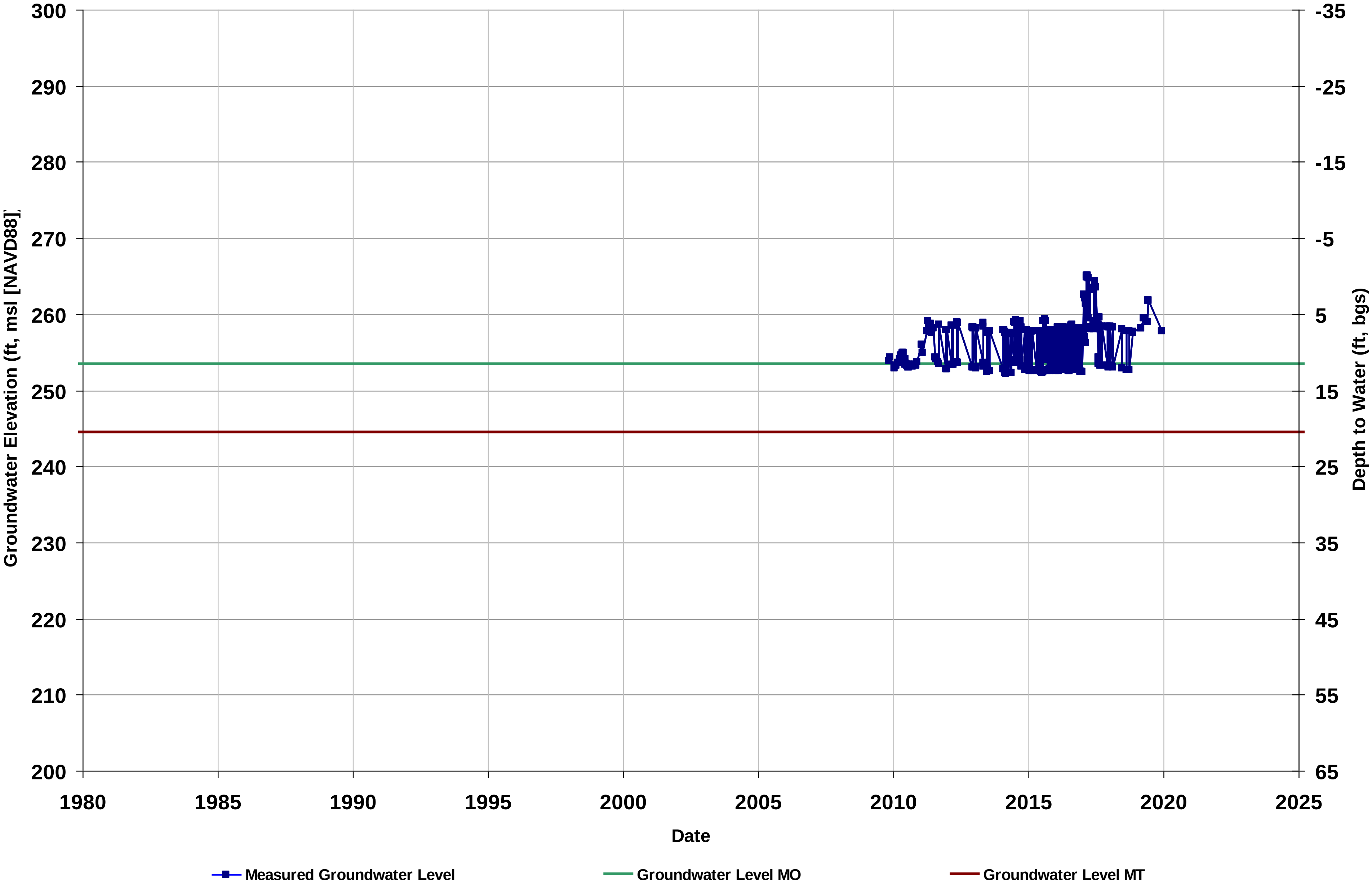
Well Name: MCE RMS-8
Depth Zone: Upper
Subbasin: Madera
GSA: County of Madera

Total Depth (ft): 92
Perf Top (ft): 32
Perf Bottom (ft): 92
GSE (ft, msl): 367



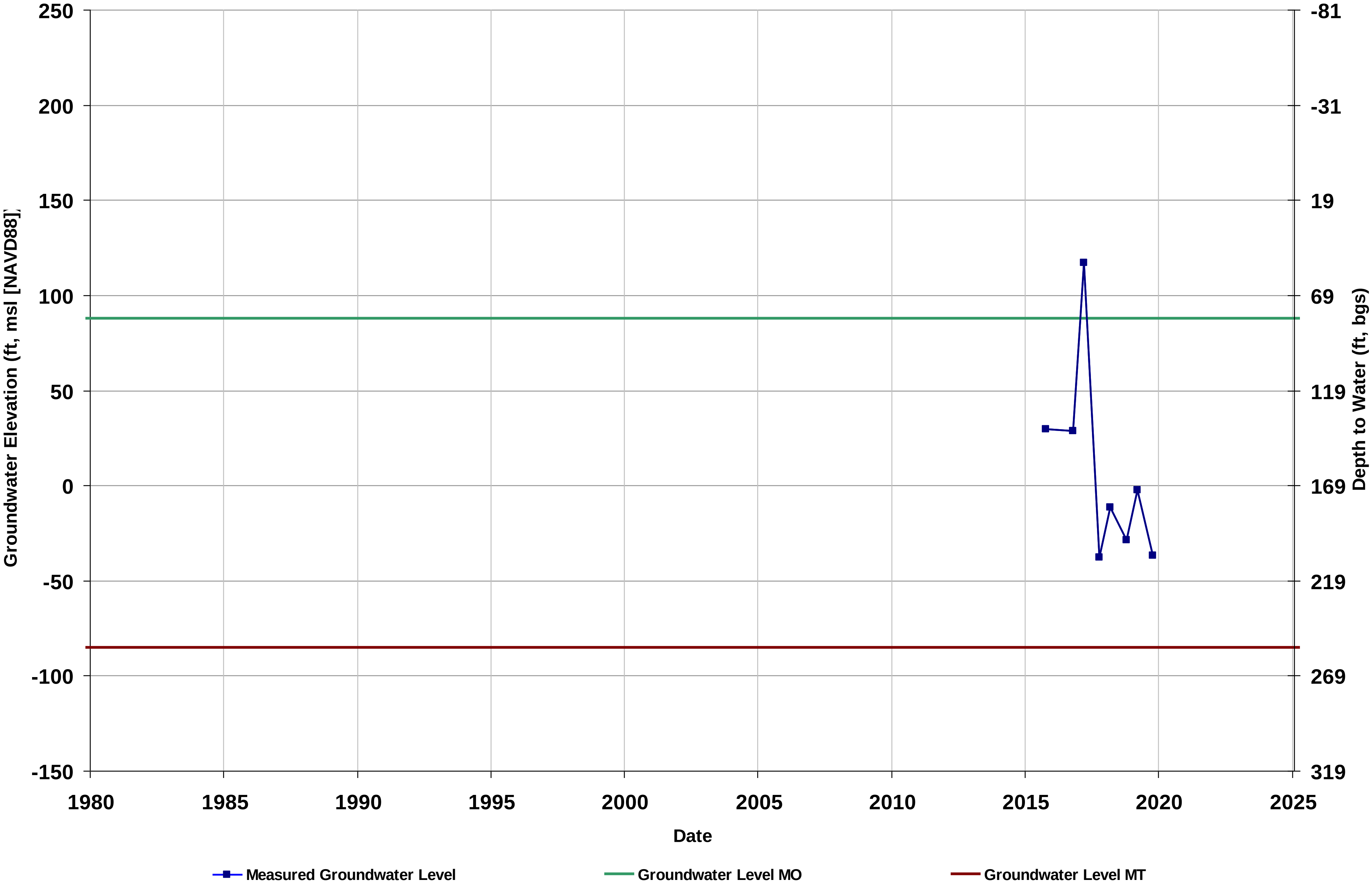
Well Name: MCE RMS-9
Depth Zone: Upper
Subbasin: Madera
GSA: County of Madera

Total Depth (ft): 37
Perf Top (ft): 17
Perf Bottom (ft): 37
GSE (ft, msl): 265



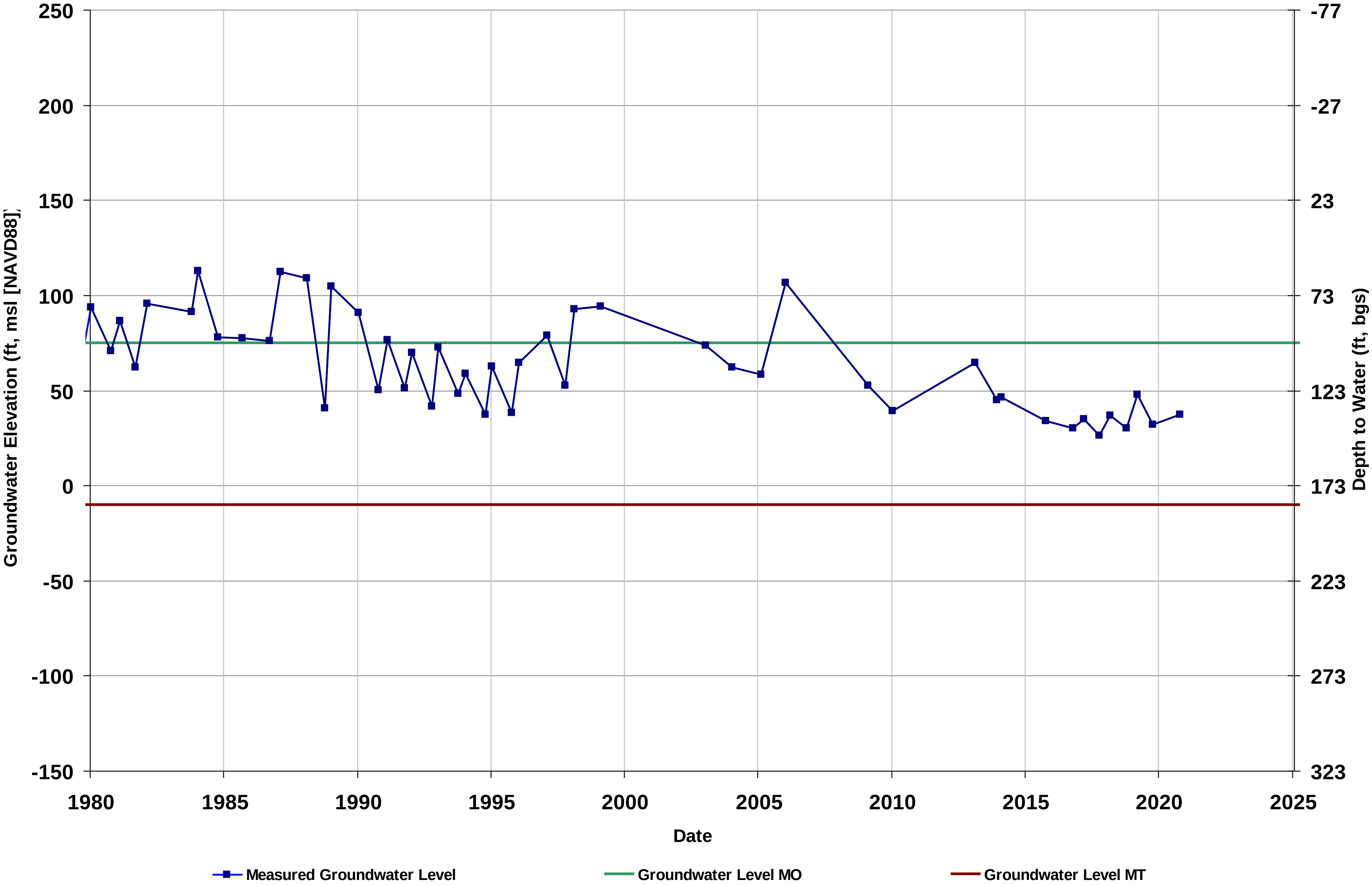
Well Name: MCW RMS-1
Depth Zone: Lower
Subbasin: Madera
GSA: County of Madera

Total Depth (ft): 800
Perf Top (ft):
Perf Bottom (ft):
GSE (ft, msl): 169



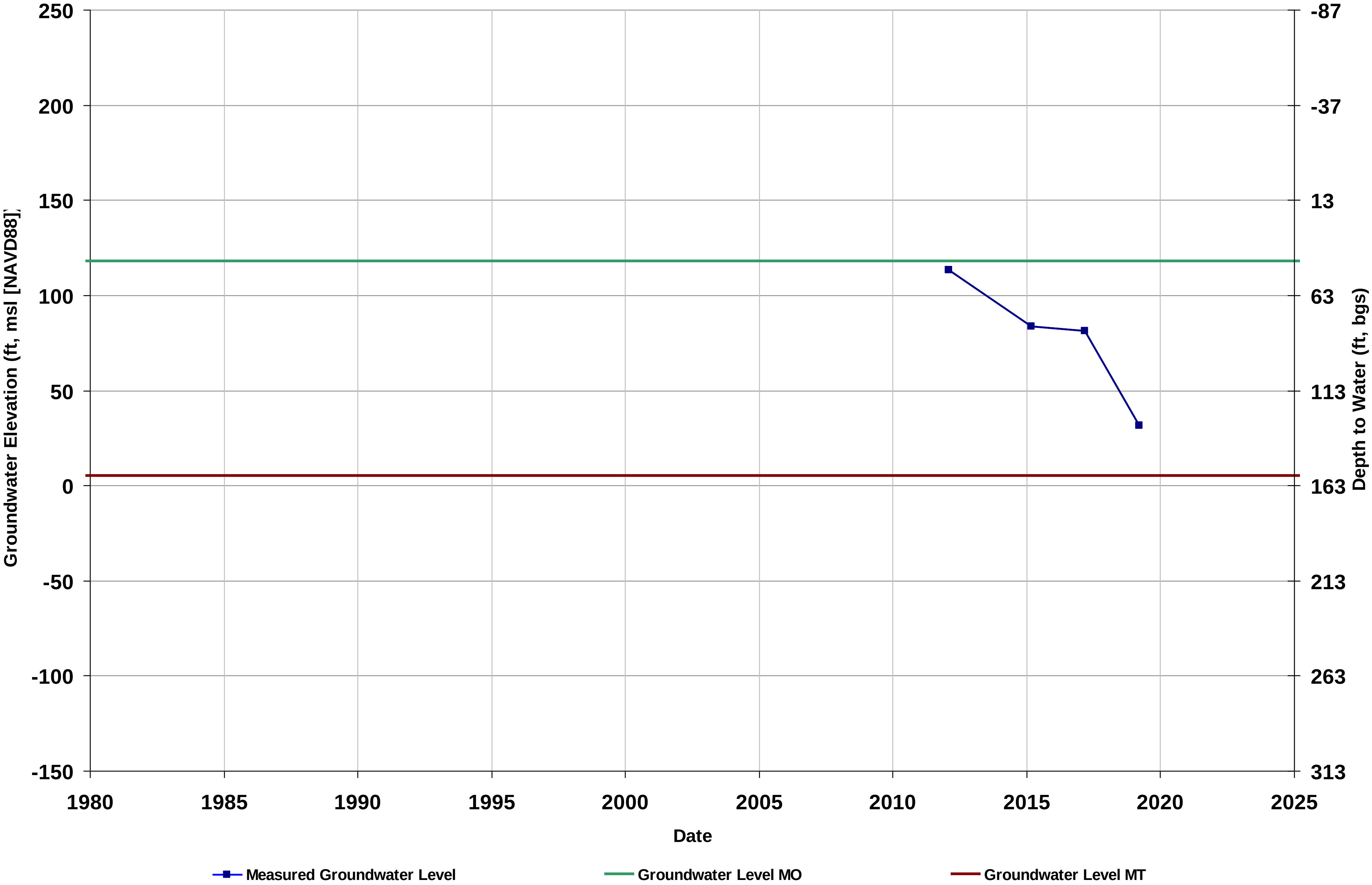
Well Name: MCW RMS-2
Depth Zone: Upper
Subbasin: Madera
GSA: County of Madera

Total Depth (ft): 216
Perf Top (ft): 205
Perf Bottom (ft): 212
GSE (ft, msl): 173



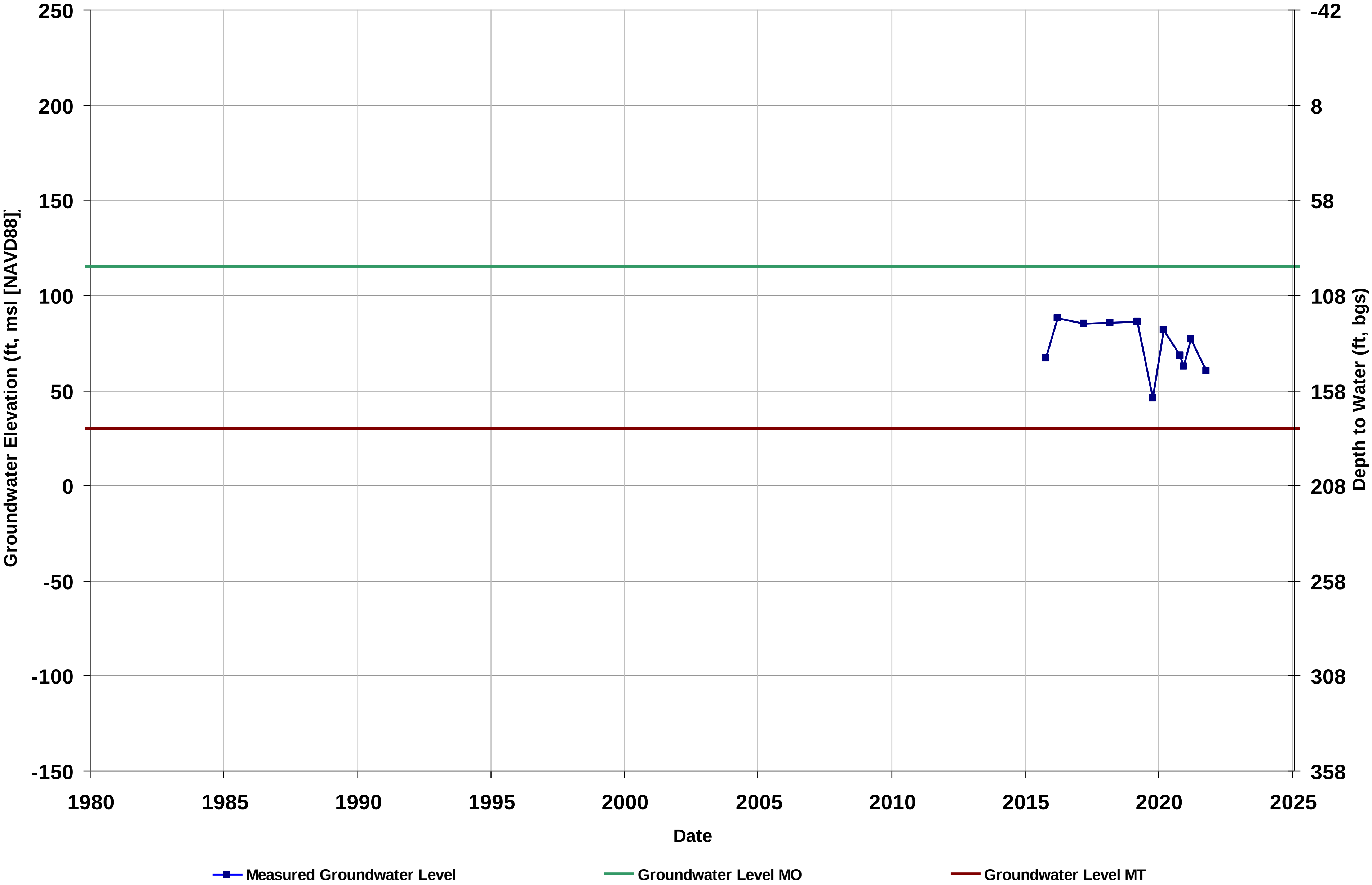
Well Name: MCW RMS-3
Depth Zone: Upper
Subbasin: Madera
GSA: County of Madera

Total Depth (ft):
Perf Top (ft):
Perf Bottom (ft):
GSE (ft, msl): 162



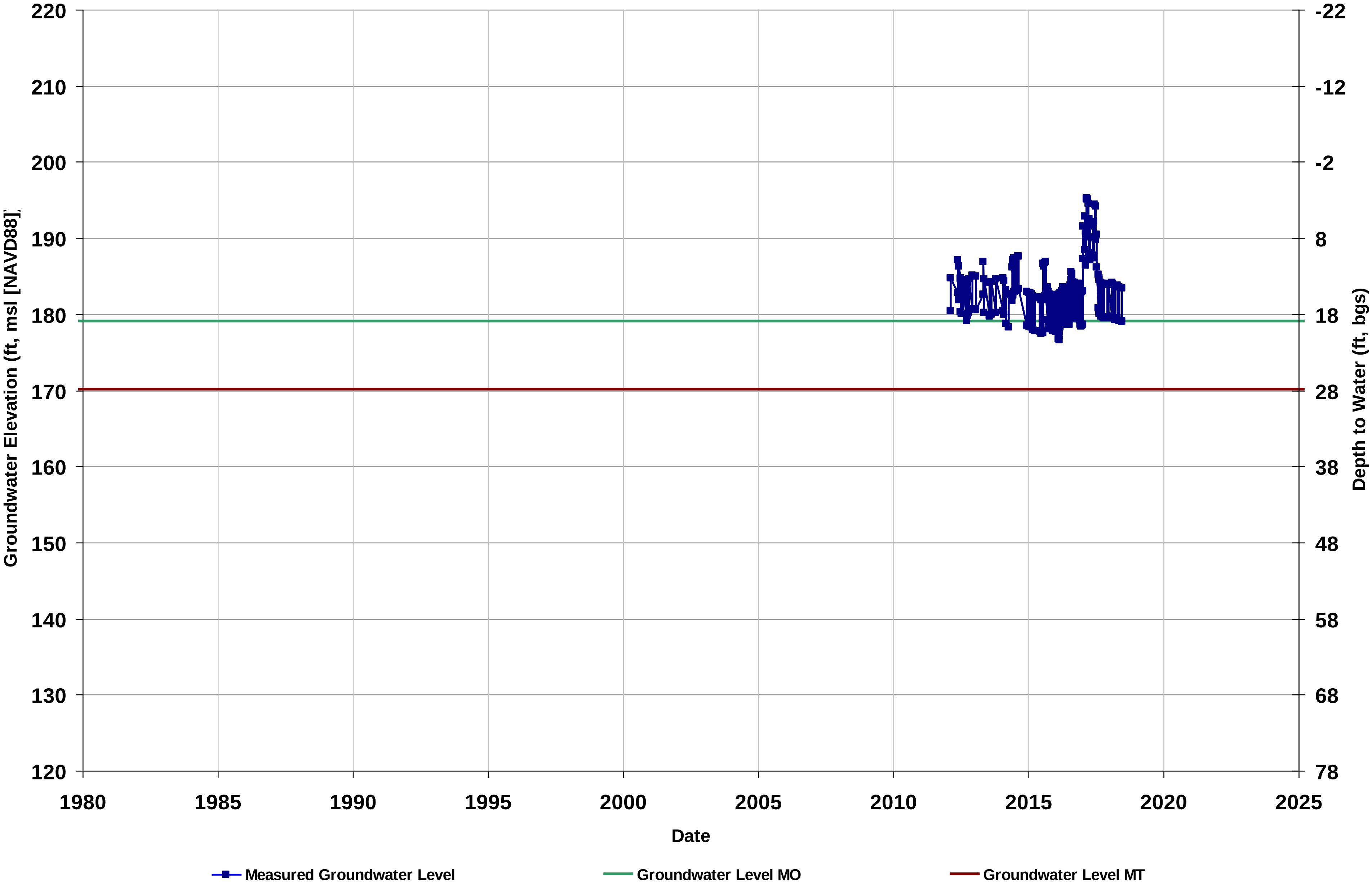
Well Name: MCW RMS-4
Depth Zone: Lower
Subbasin: Madera
GSA: County of Madera

Total Depth (ft): 580
Perf Top (ft): 220
Perf Bottom (ft): 580
GSE (ft, msl): 208



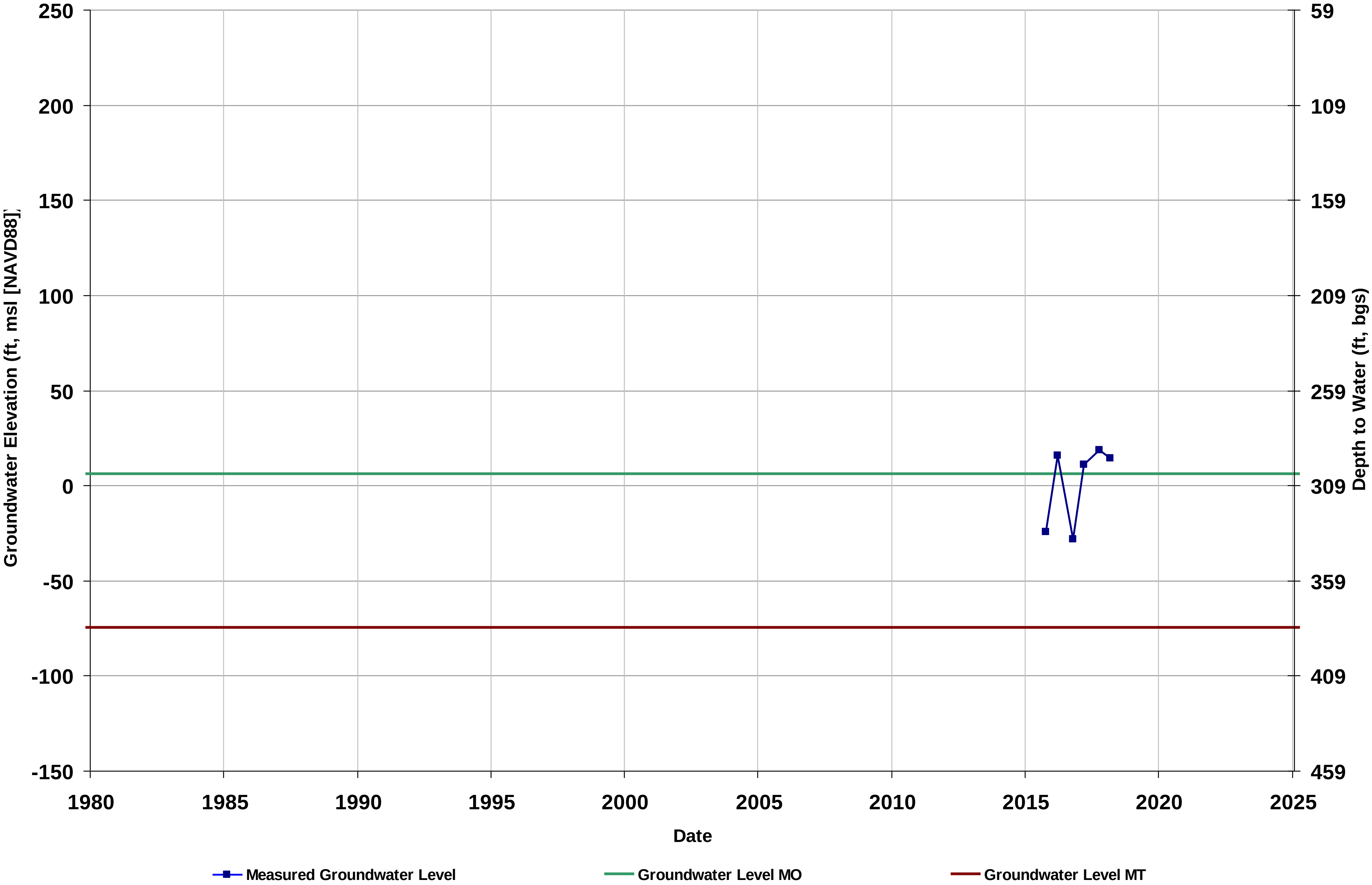
Well Name: MCW RMS-5
Depth Zone: Upper
Subbasin: Madera
GSA: County of Madera

Total Depth (ft): 30
Perf Top (ft):
Perf Bottom (ft):
GSE (ft, msl): 197



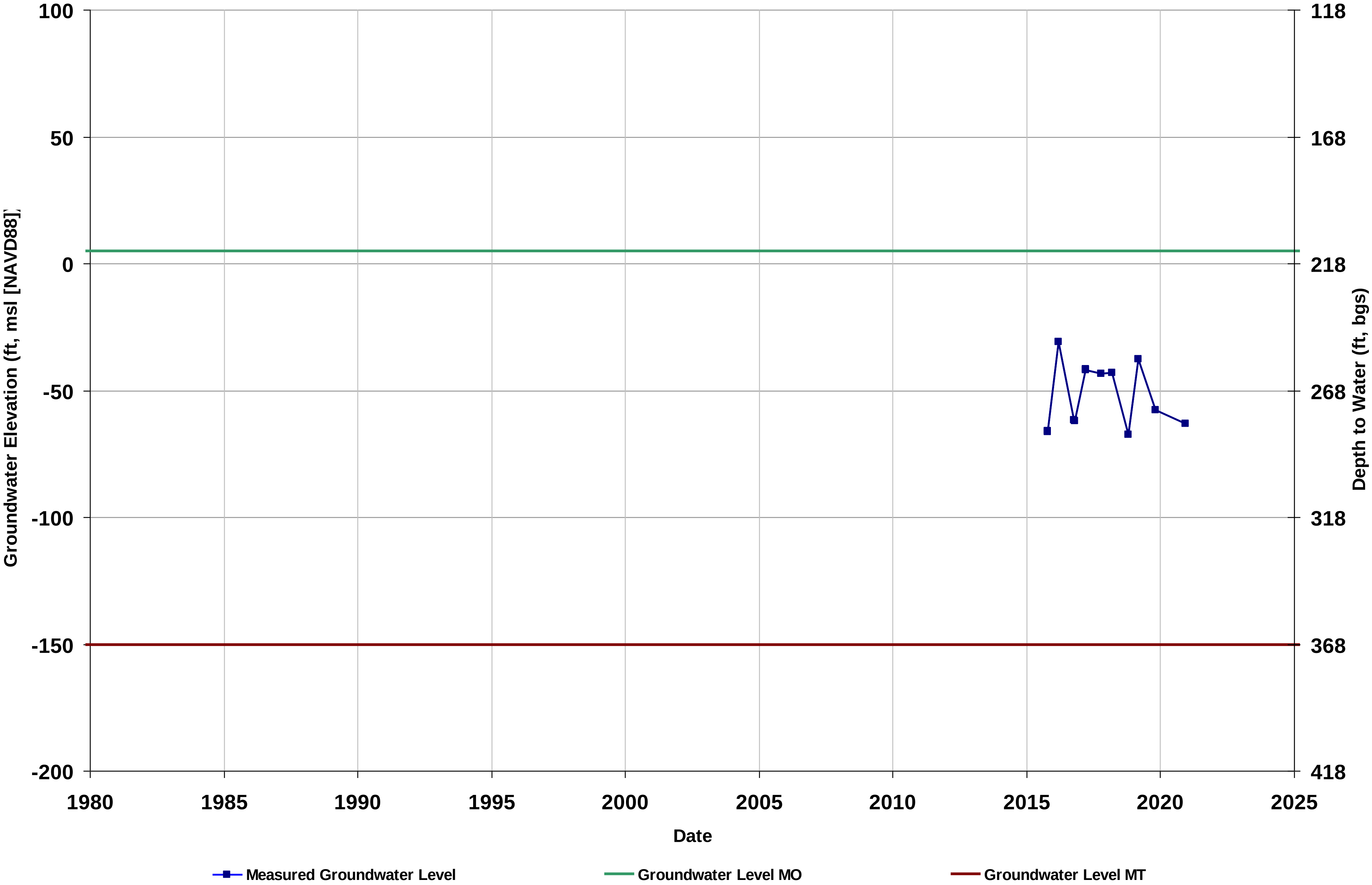
Well Name: MID RMS-1
Depth Zone: Lower
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft): 950
Perf Top (ft): 320
Perf Bottom (ft): 942
GSE (ft, msl): 308



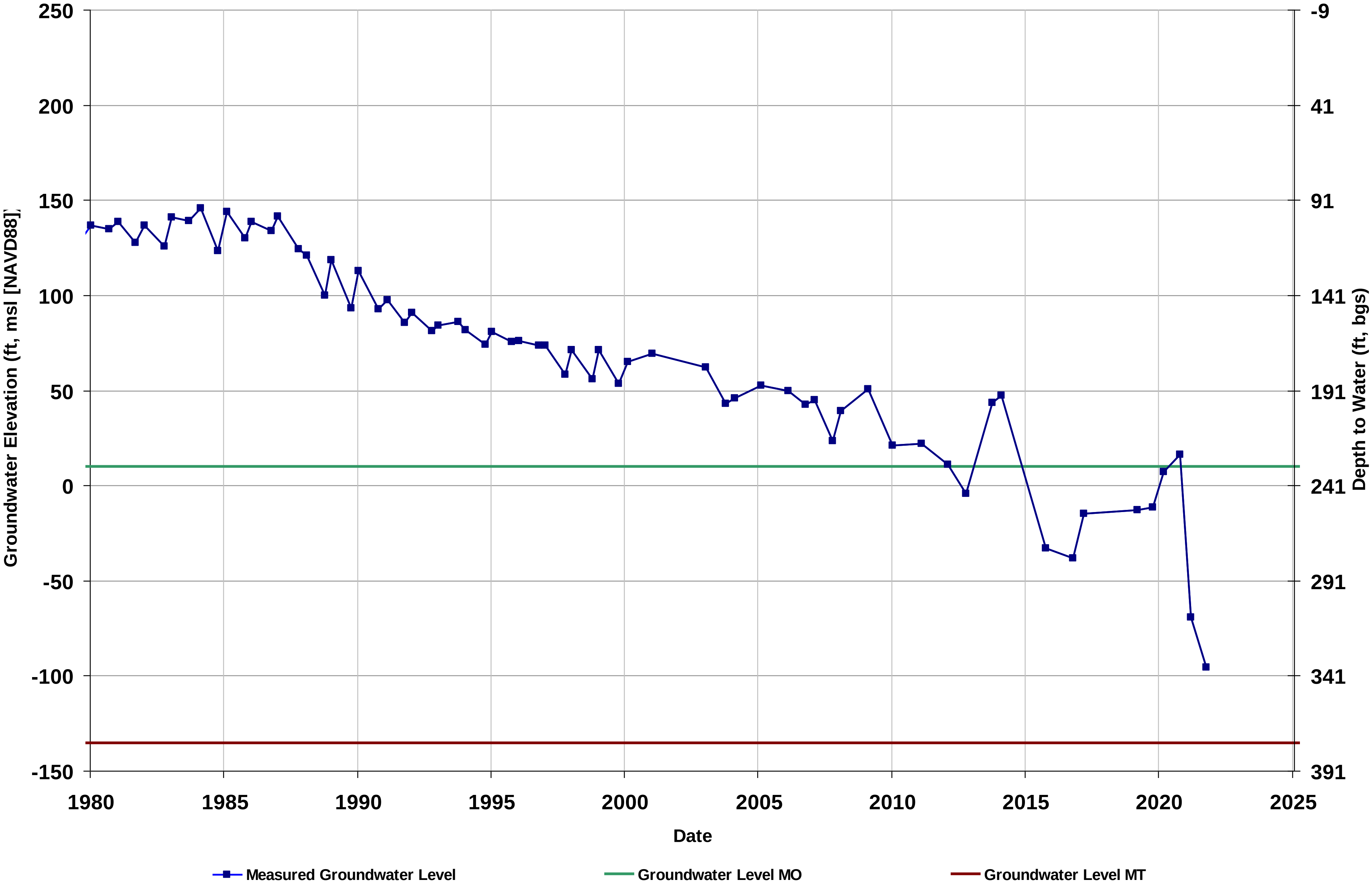
Well Name: MID RMS-2
Depth Zone: Lower
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft): 563
Perf Top (ft): 298
Perf Bottom (ft): 509
GSE (ft, msl): 218



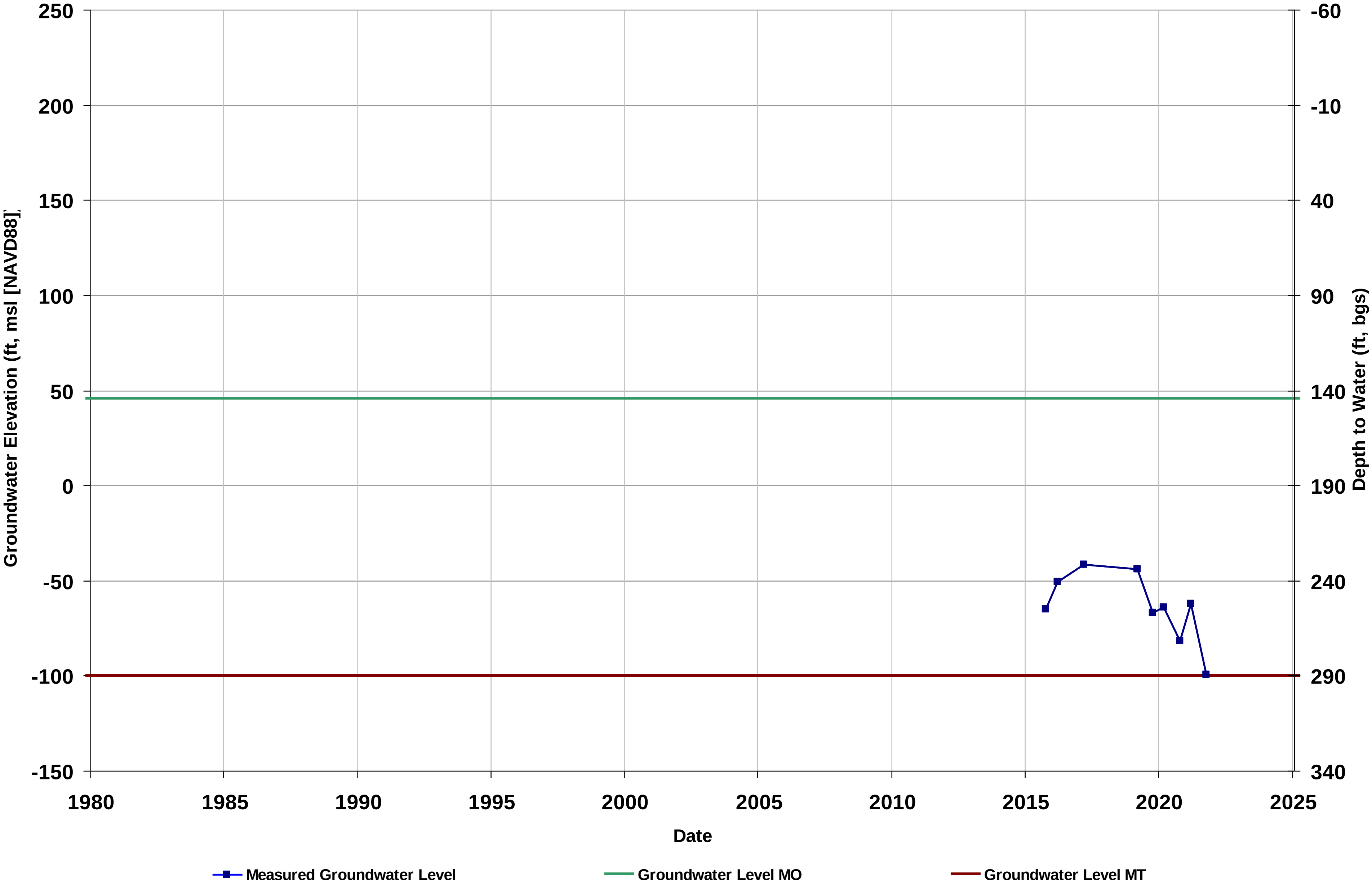
Well Name: MID RMS-3
Depth Zone: Lower
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft): 516
Perf Top (ft): 260
Perf Bottom (ft): 507
GSE (ft, msl): 241



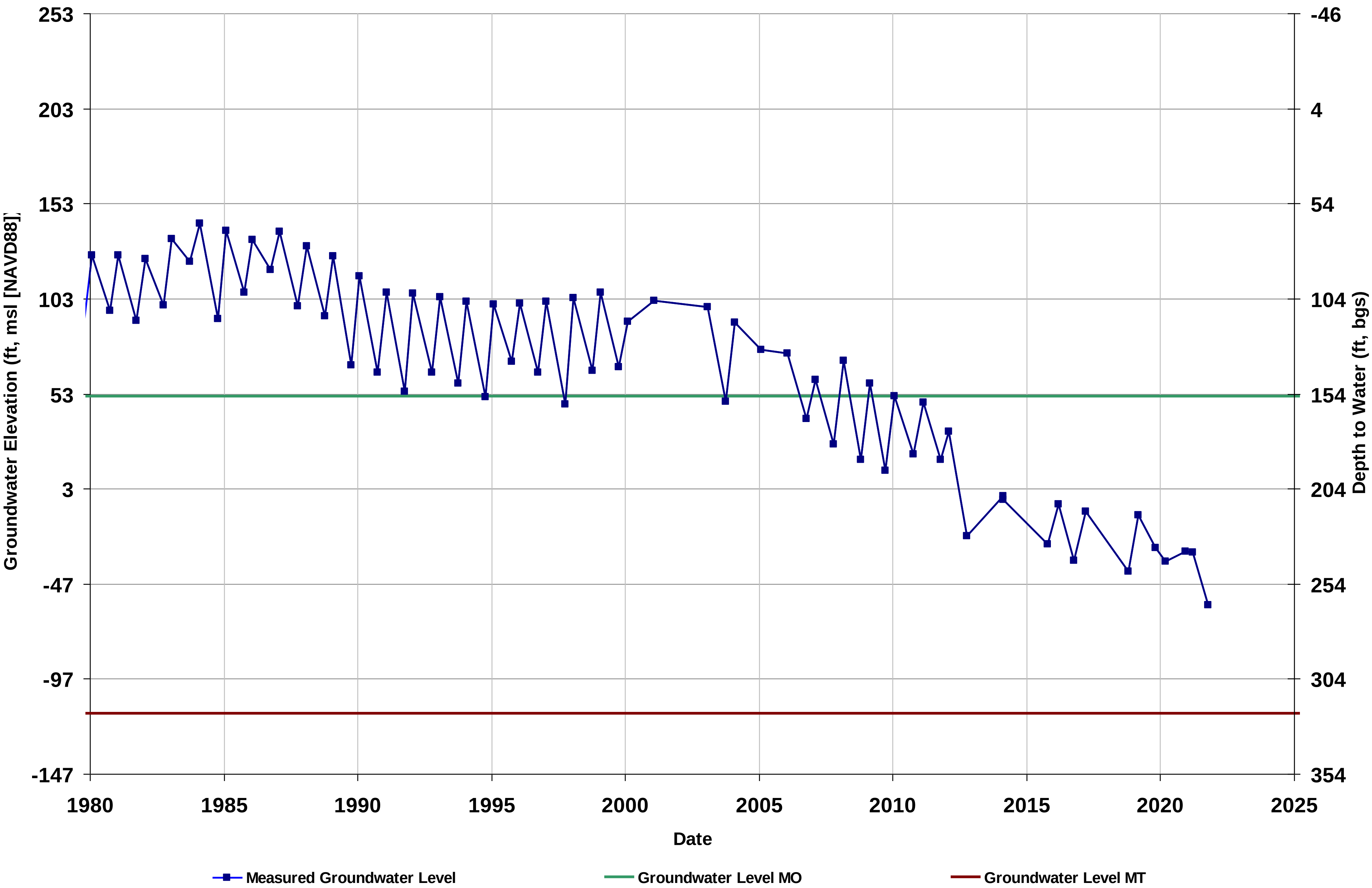
Well Name: MID RMS-4
Depth Zone: Lower
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft): 698
Perf Top (ft): 320
Perf Bottom (ft): 667
GSE (ft, msl): 190



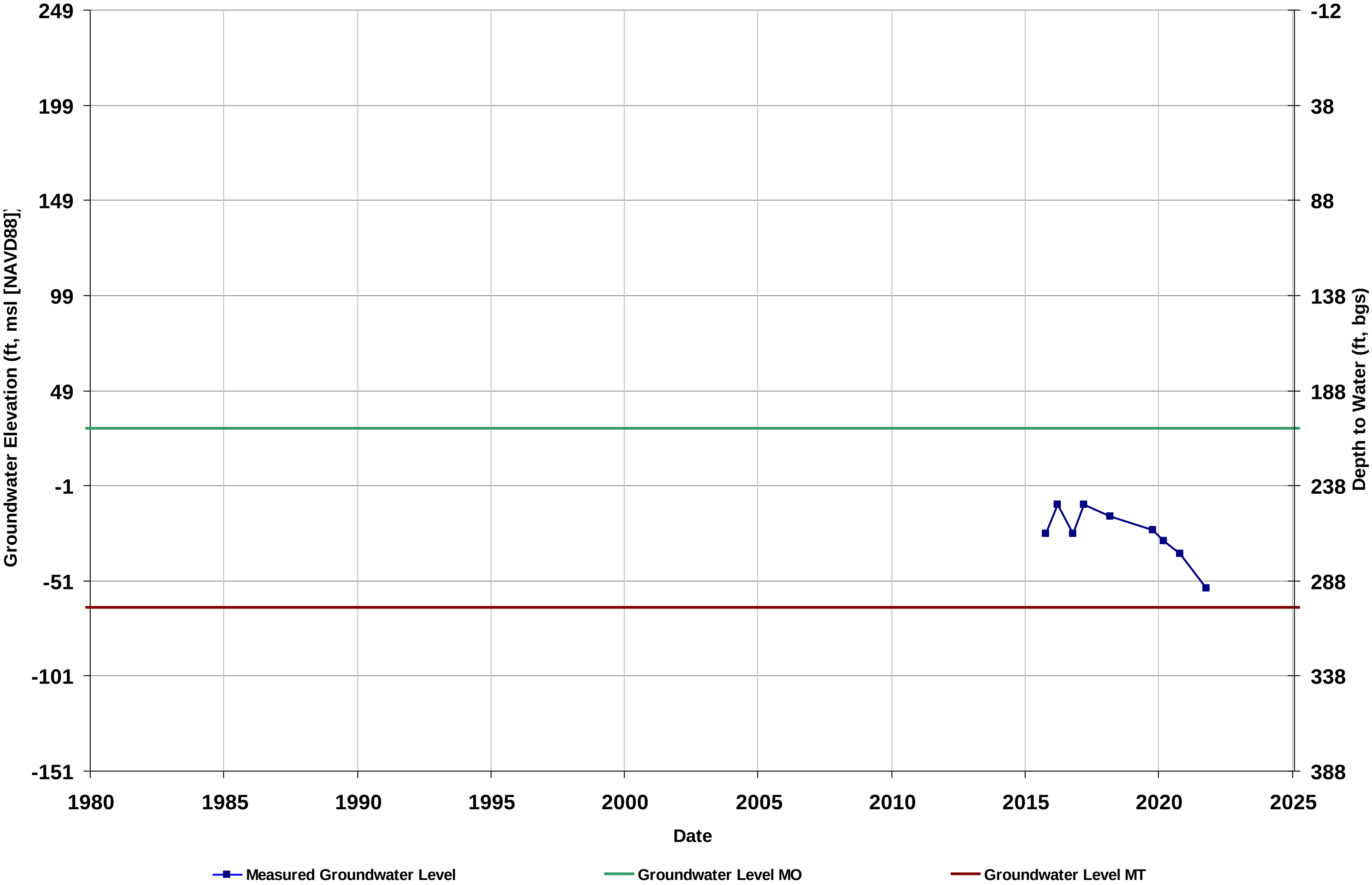
Well Name: MID RMS-5
Depth Zone: Lower
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft): 570
Perf Top (ft): 270
Perf Bottom (ft): 570
GSE (ft, msl): 207



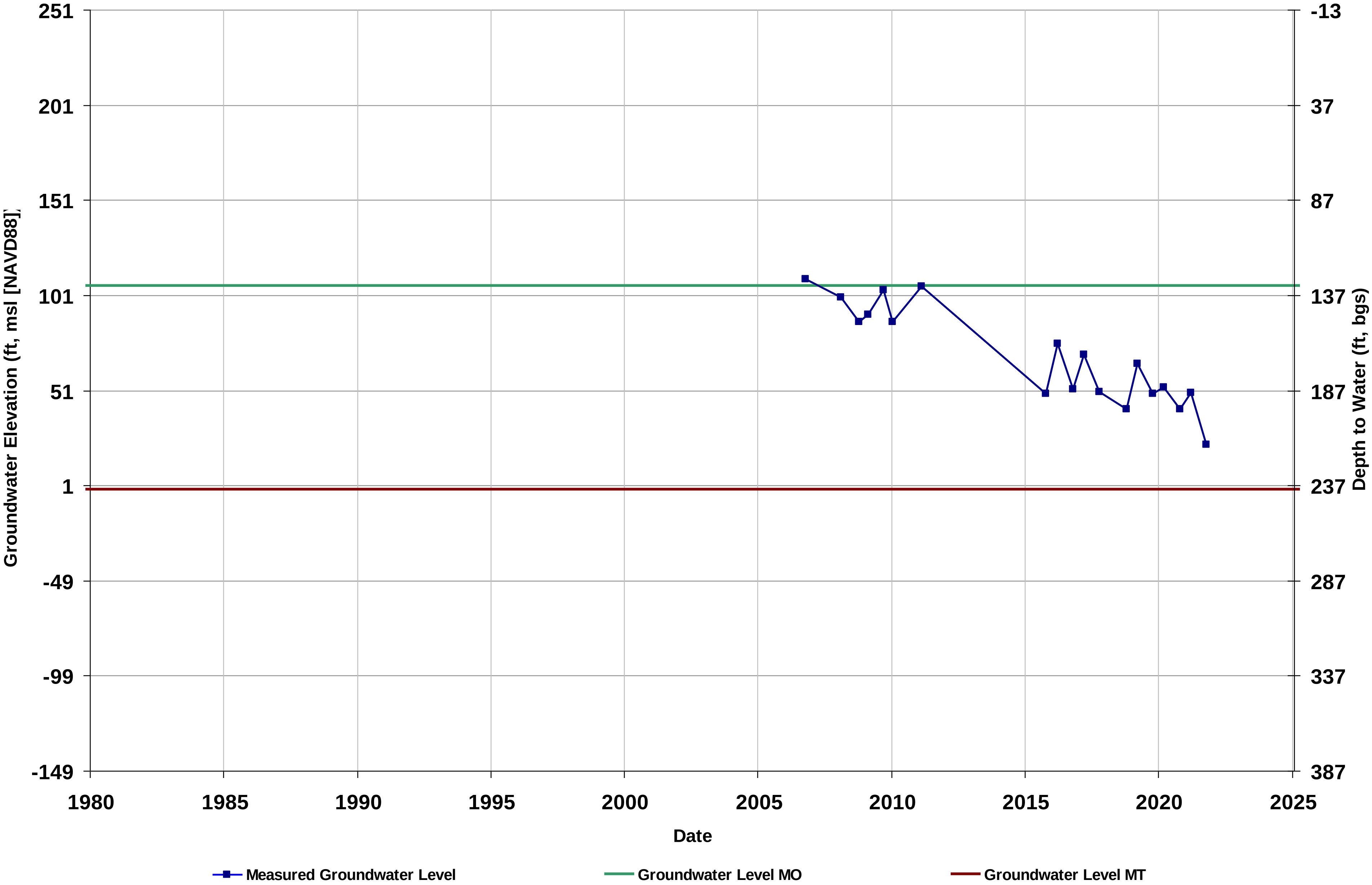
Well Name: MID RMS-6
Depth Zone: Lower
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft): 680
Perf Top (ft): 320
Perf Bottom (ft): 680
GSE (ft, msl): 237



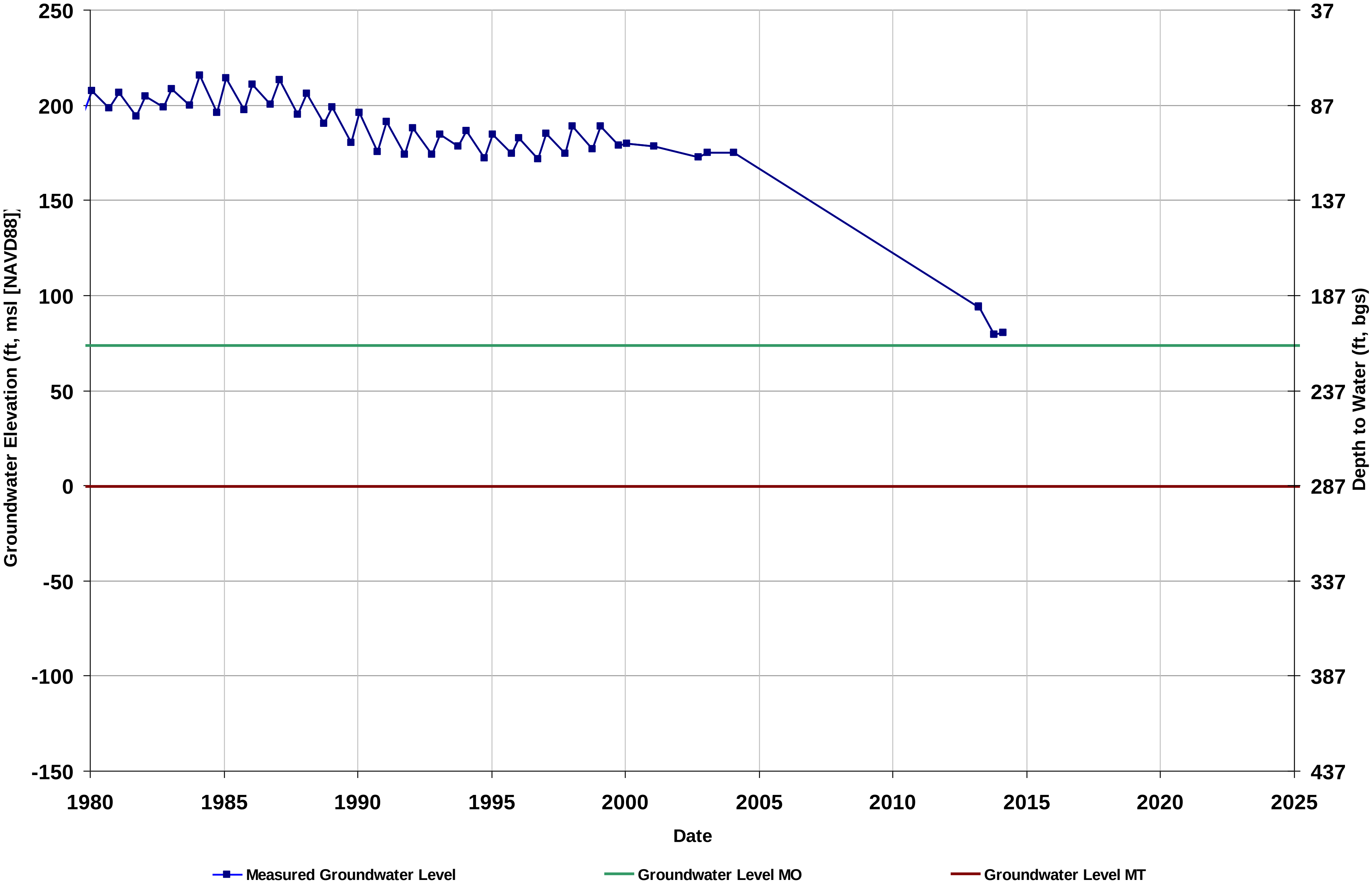
Well Name: MID RMS-7
Depth Zone: Lower
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft): 656
Perf Top (ft): 290
Perf Bottom (ft): 635
GSE (ft, msl): 238



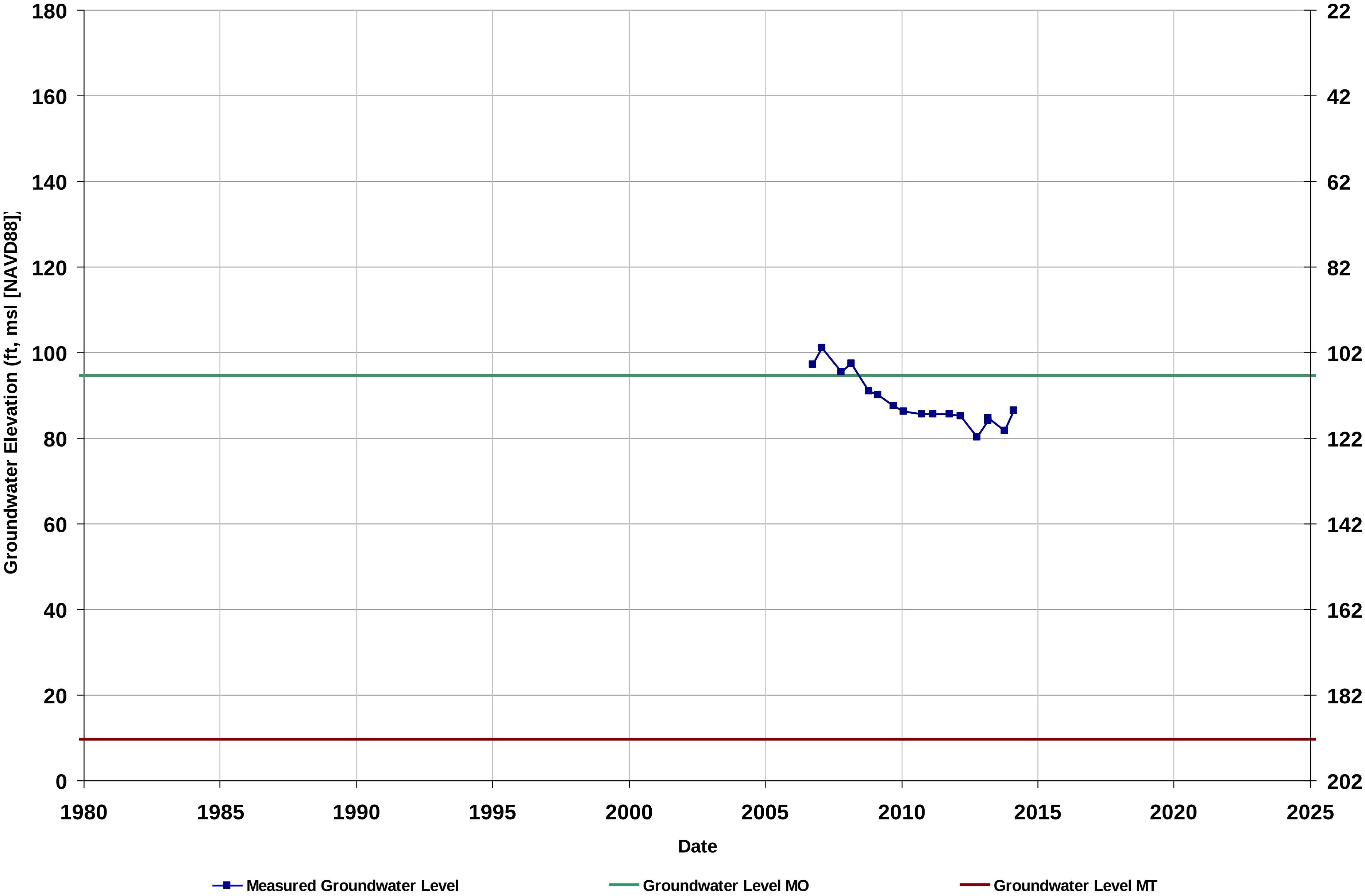
Well Name: MID RMS-8
Depth Zone: Composite
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft):
Perf Top (ft):
Perf Bottom (ft):
GSE (ft, msl): 287



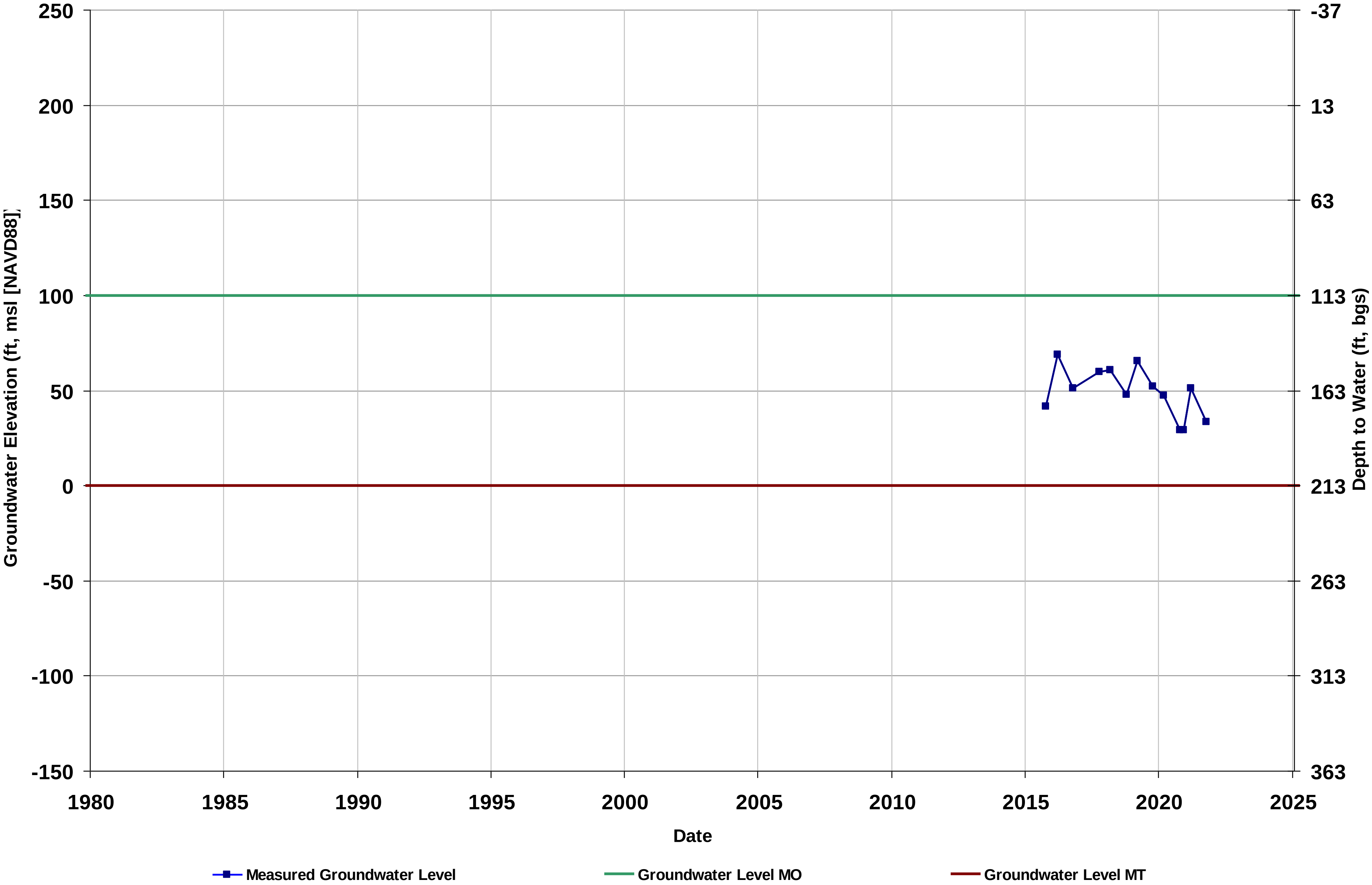
Well Name: MID RMS-9
Depth Zone: Upper
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft): 144
Perf Top (ft):
Perf Bottom (ft):
GSE (ft, msl): 202



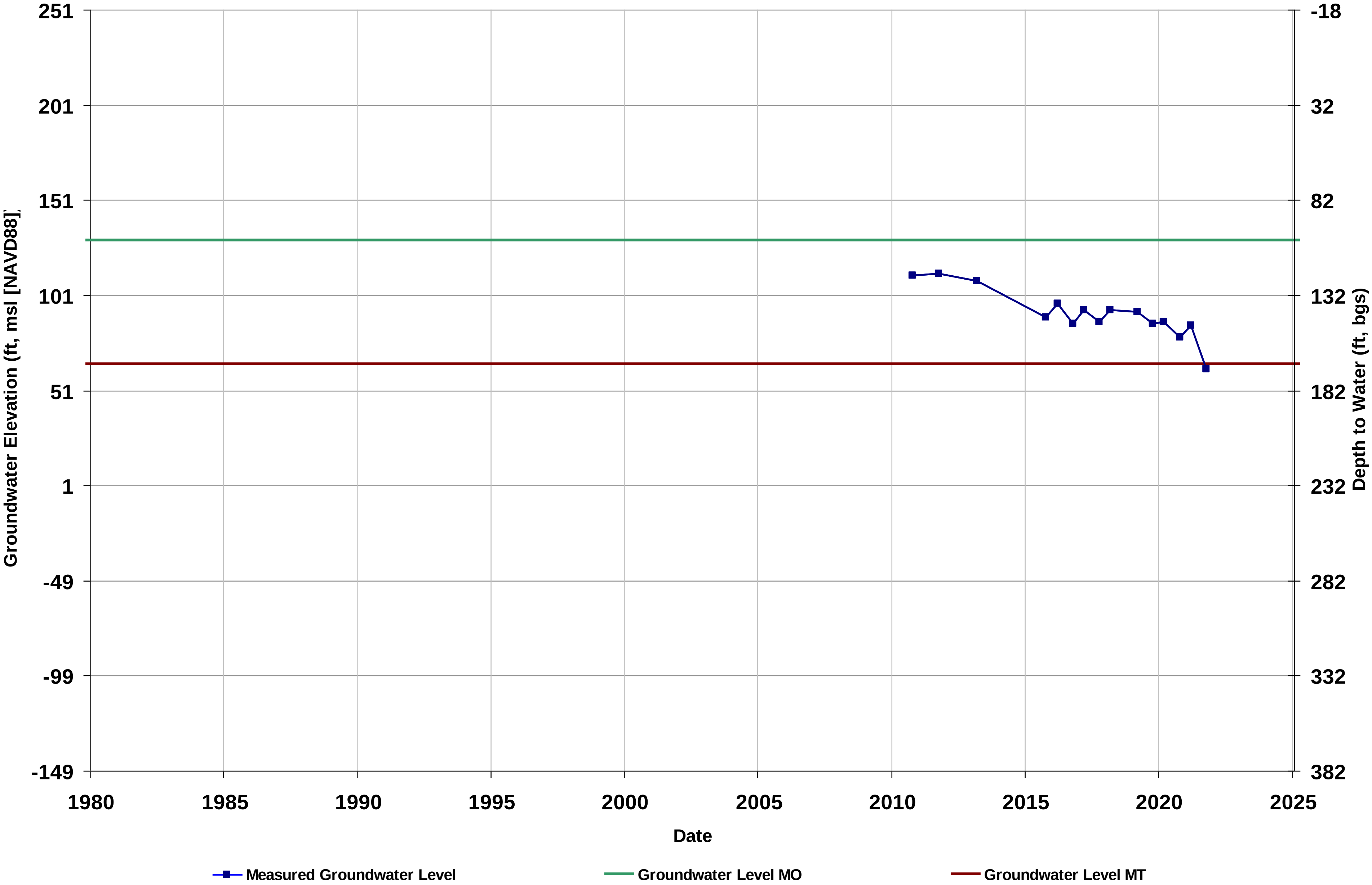
Well Name: MID RMS-10
Depth Zone: Lower
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft): 615
Perf Top (ft): 315
Perf Bottom (ft): 615
GSE (ft, msl): 213



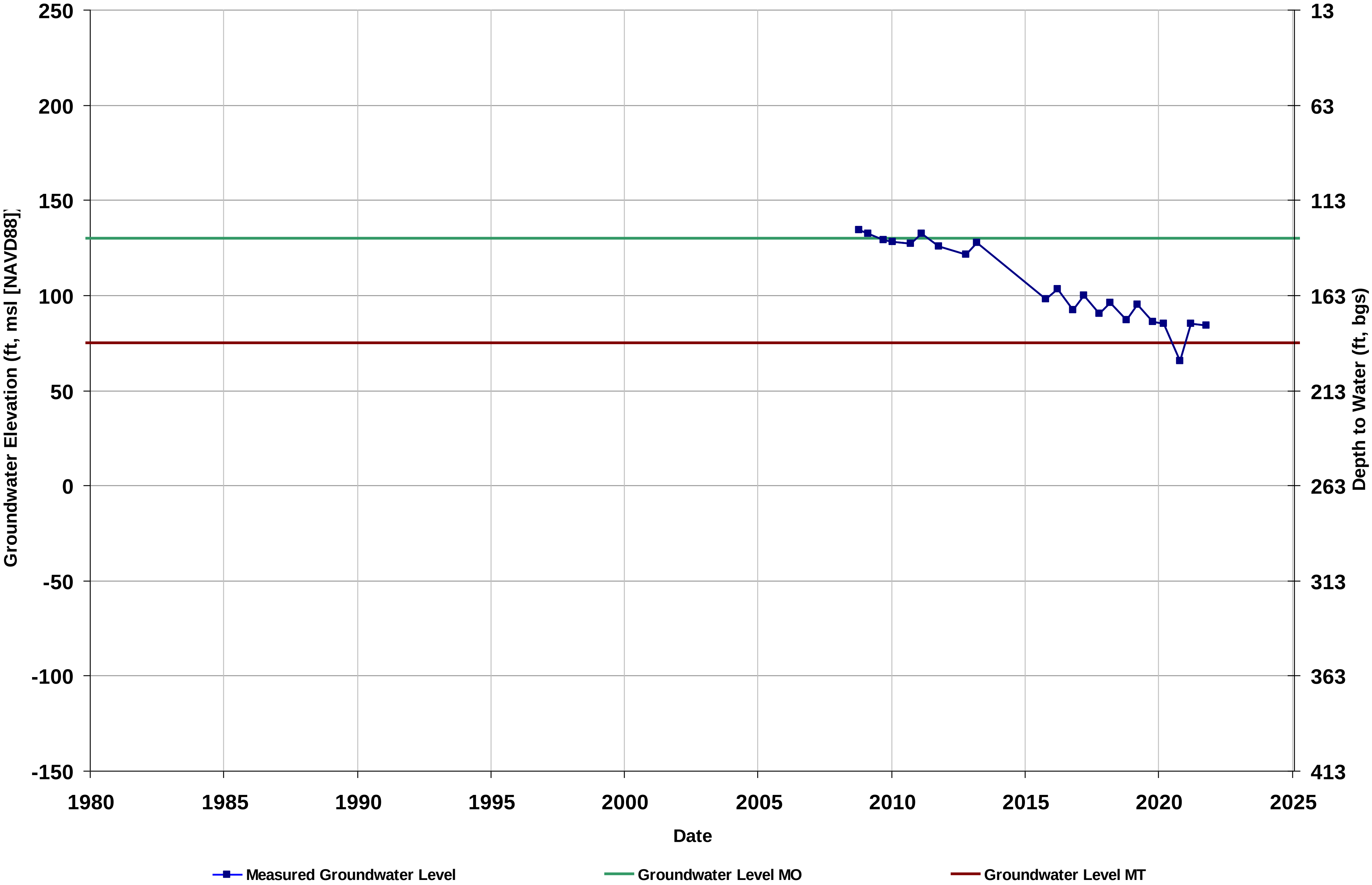
Well Name: MID RMS-11
Depth Zone: Upper
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft): 315
Perf Top (ft):
Perf Bottom (ft):
GSE (ft, msl): 233



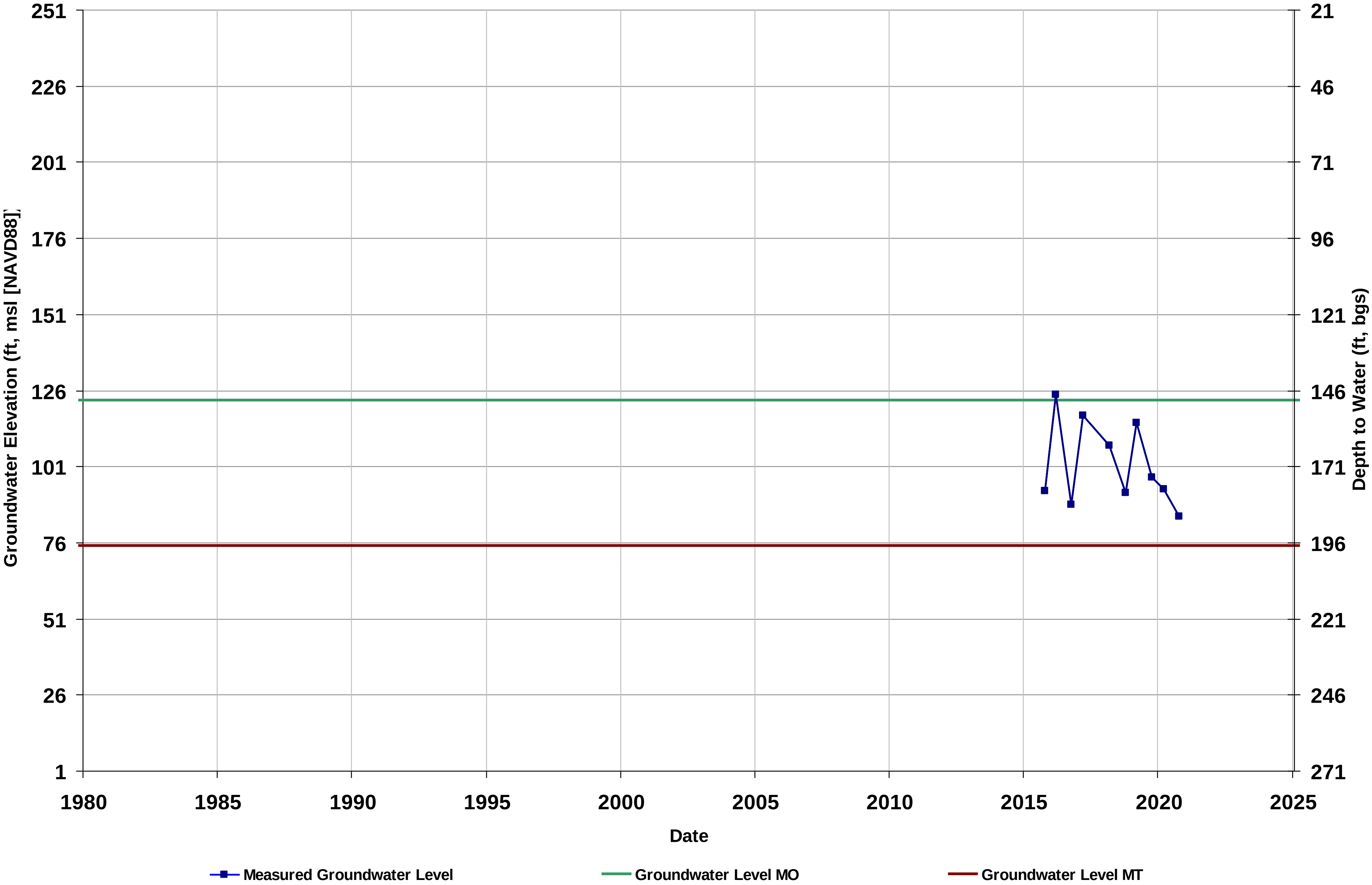
Well Name: MID RMS-12
Depth Zone: Upper
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft): 176
Perf Top (ft):
Perf Bottom (ft):
GSE (ft, msl): 263



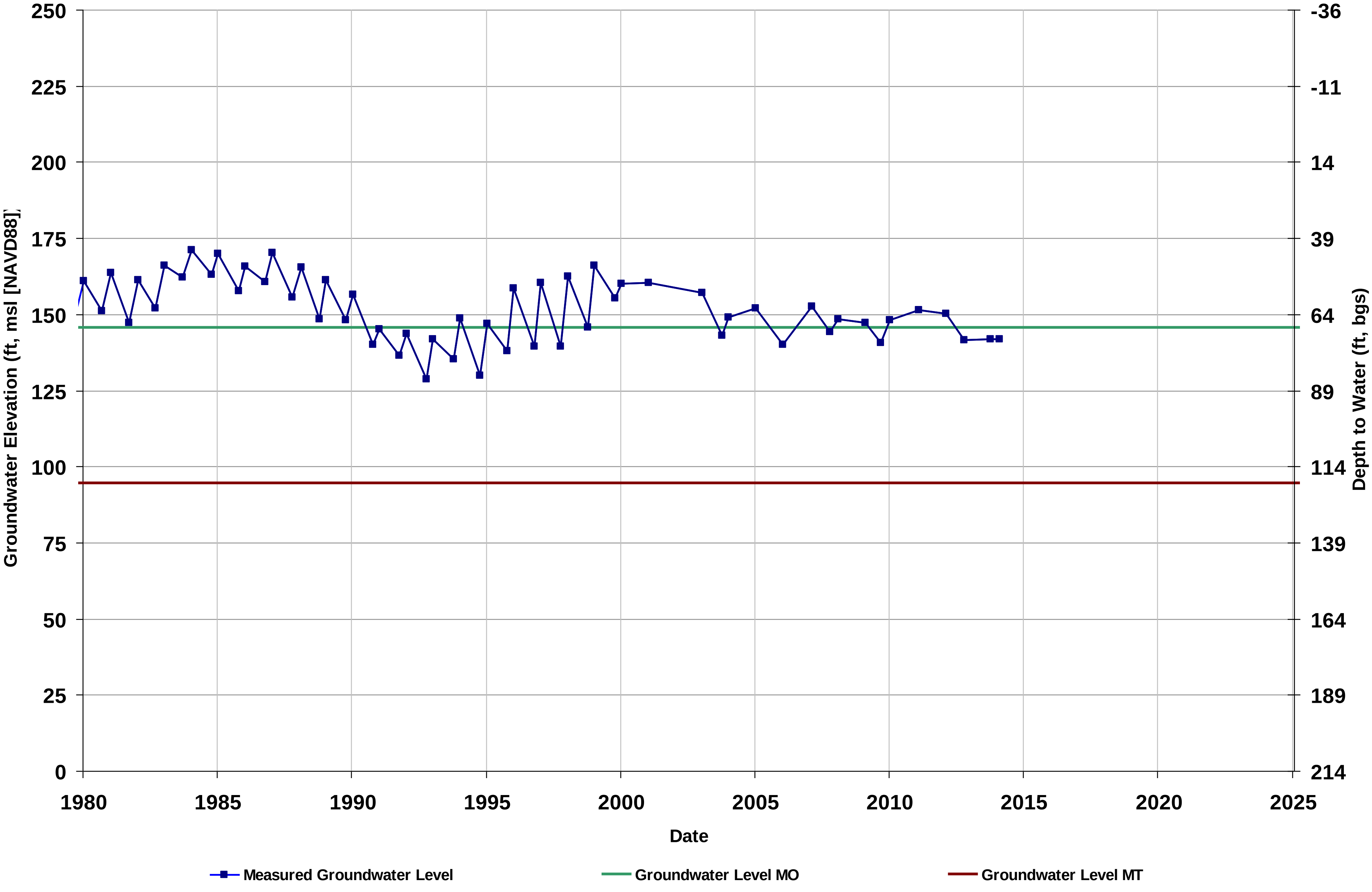
Well Name: MID RMS-13
Depth Zone: Composite
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft): 600
Perf Top (ft): 228
Perf Bottom (ft): 552
GSE (ft, msl): 272



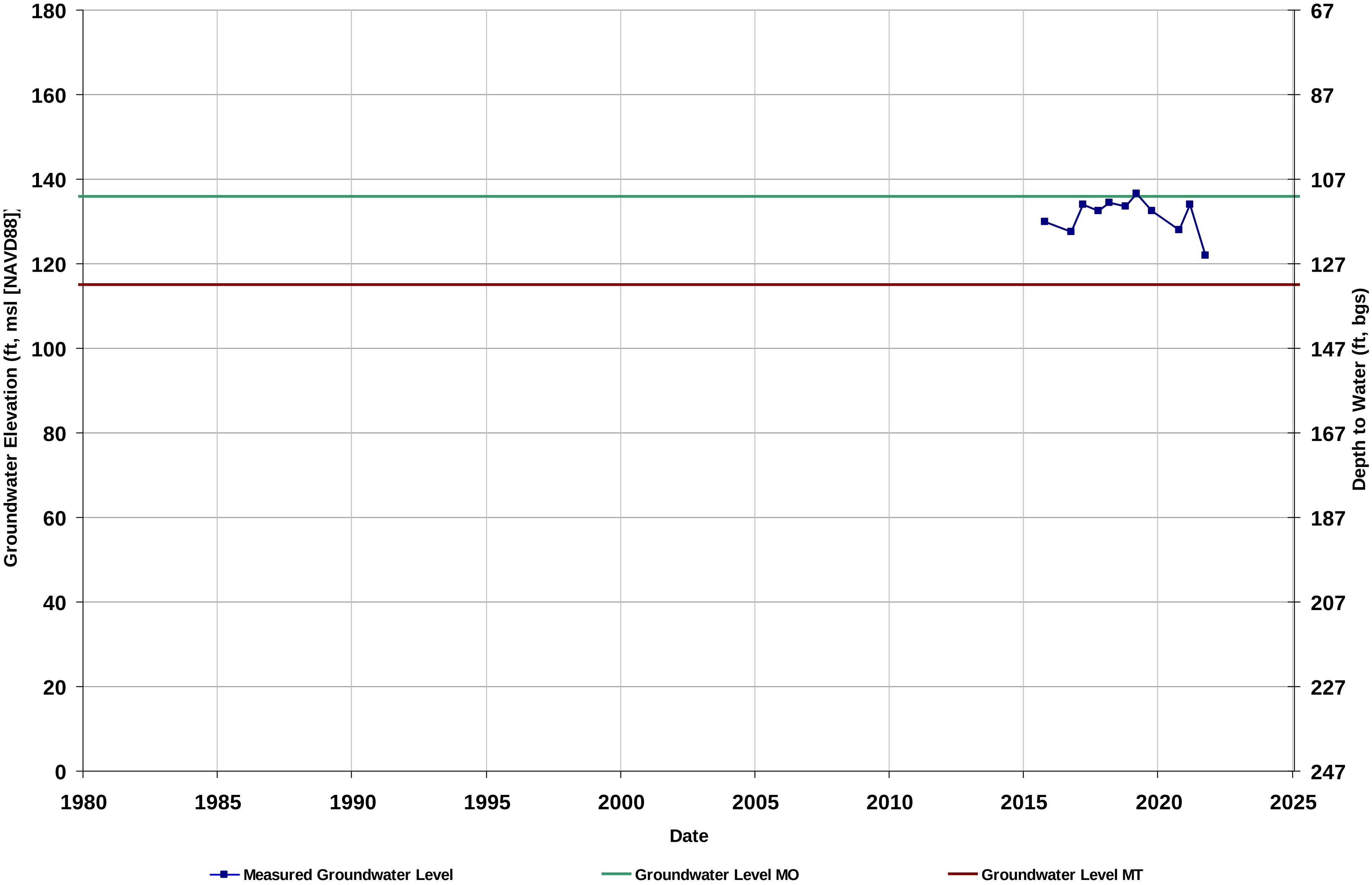
Well Name: MID RMS-14
Depth Zone: Upper
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft):
Perf Top (ft):
Perf Bottom (ft):
GSE (ft, msl): 214



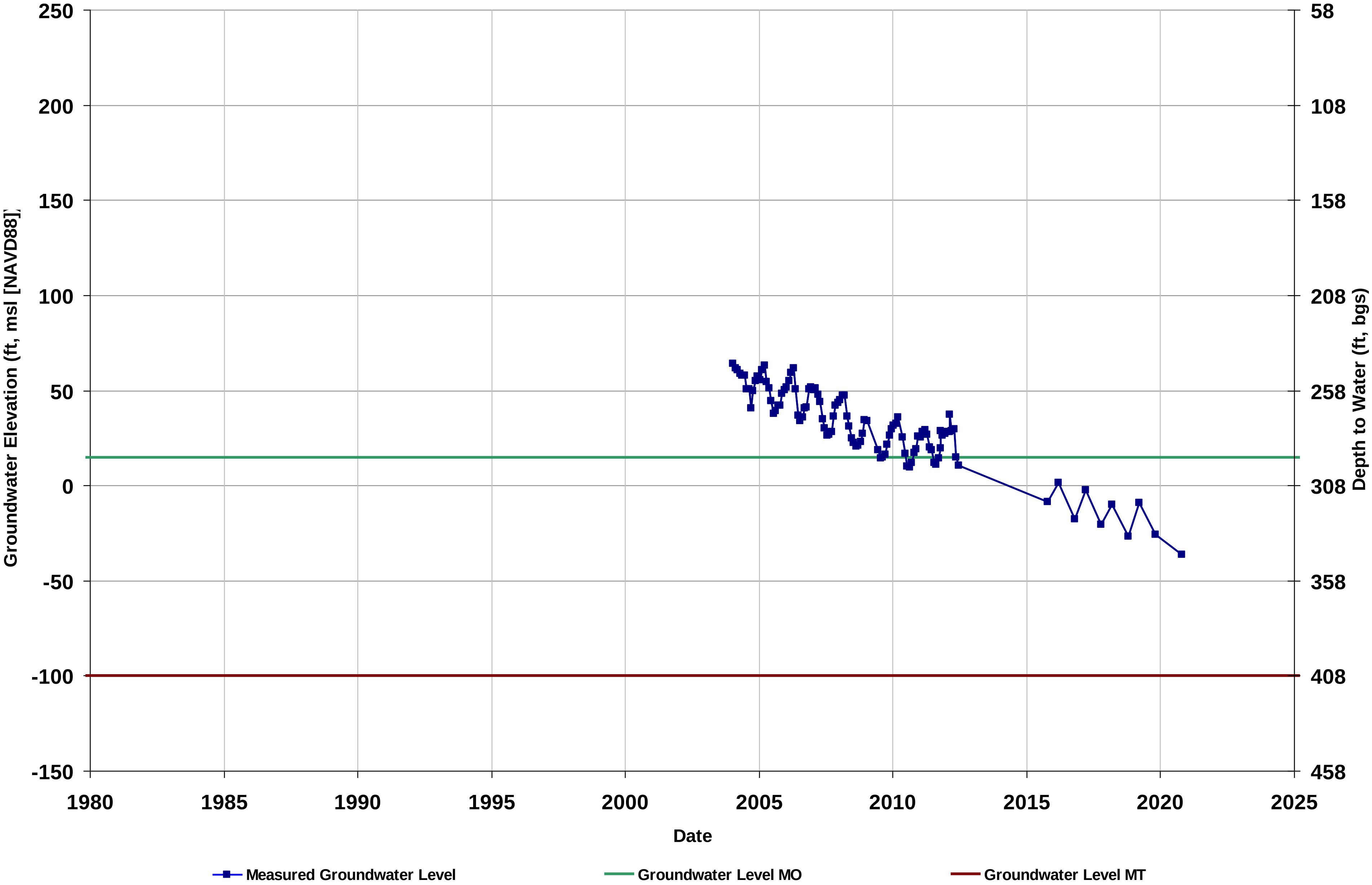
Well Name: MID RMS-15
Depth Zone: Upper
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft): 502
Perf Top (ft): 160
Perf Bottom (ft): 200
GSE (ft, msl): 247



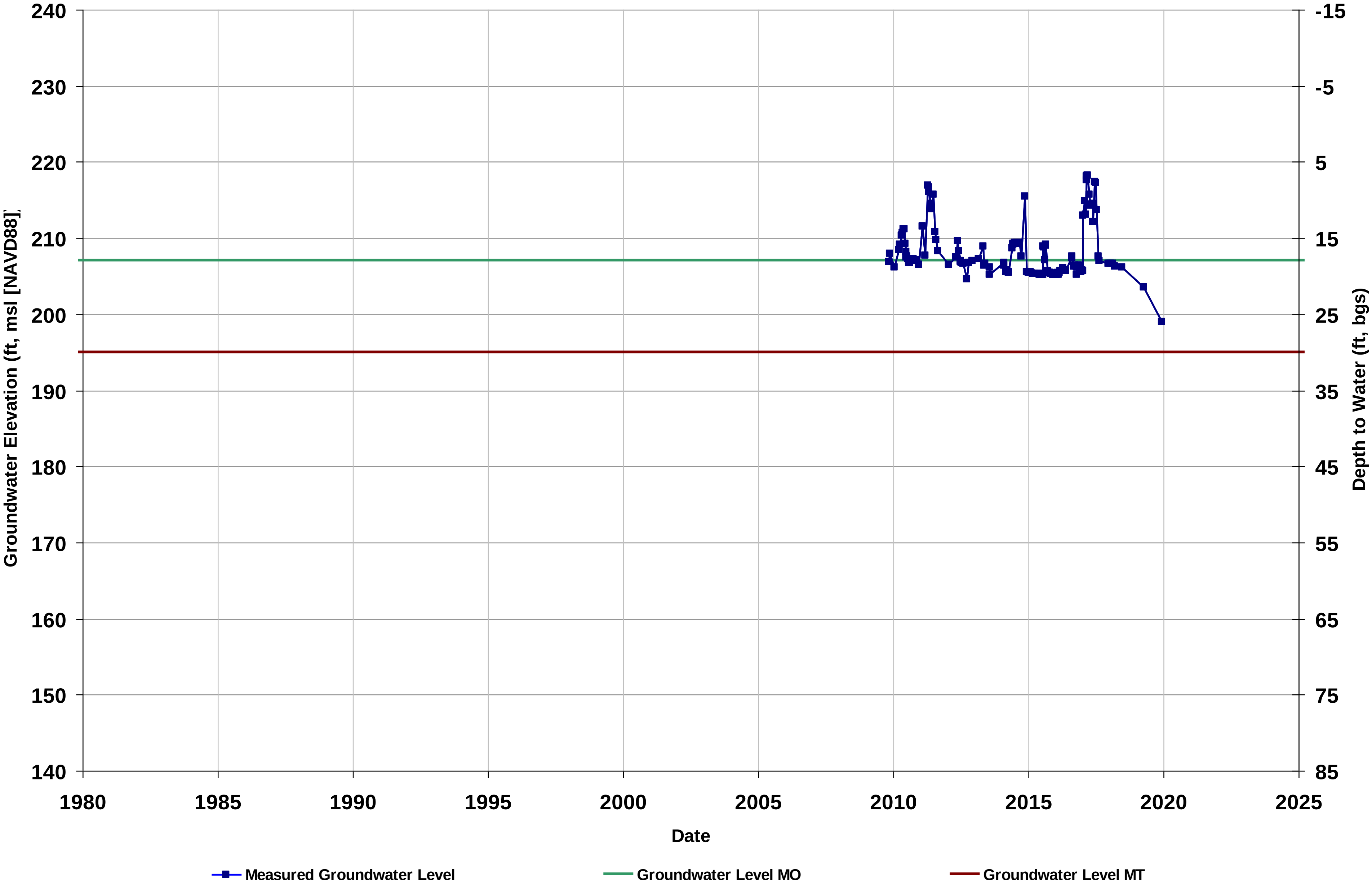
Well Name: MID RMS-16
Depth Zone: Lower
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft): 452
Perf Top (ft): 348
Perf Bottom (ft): 388
GSE (ft, msl): 308



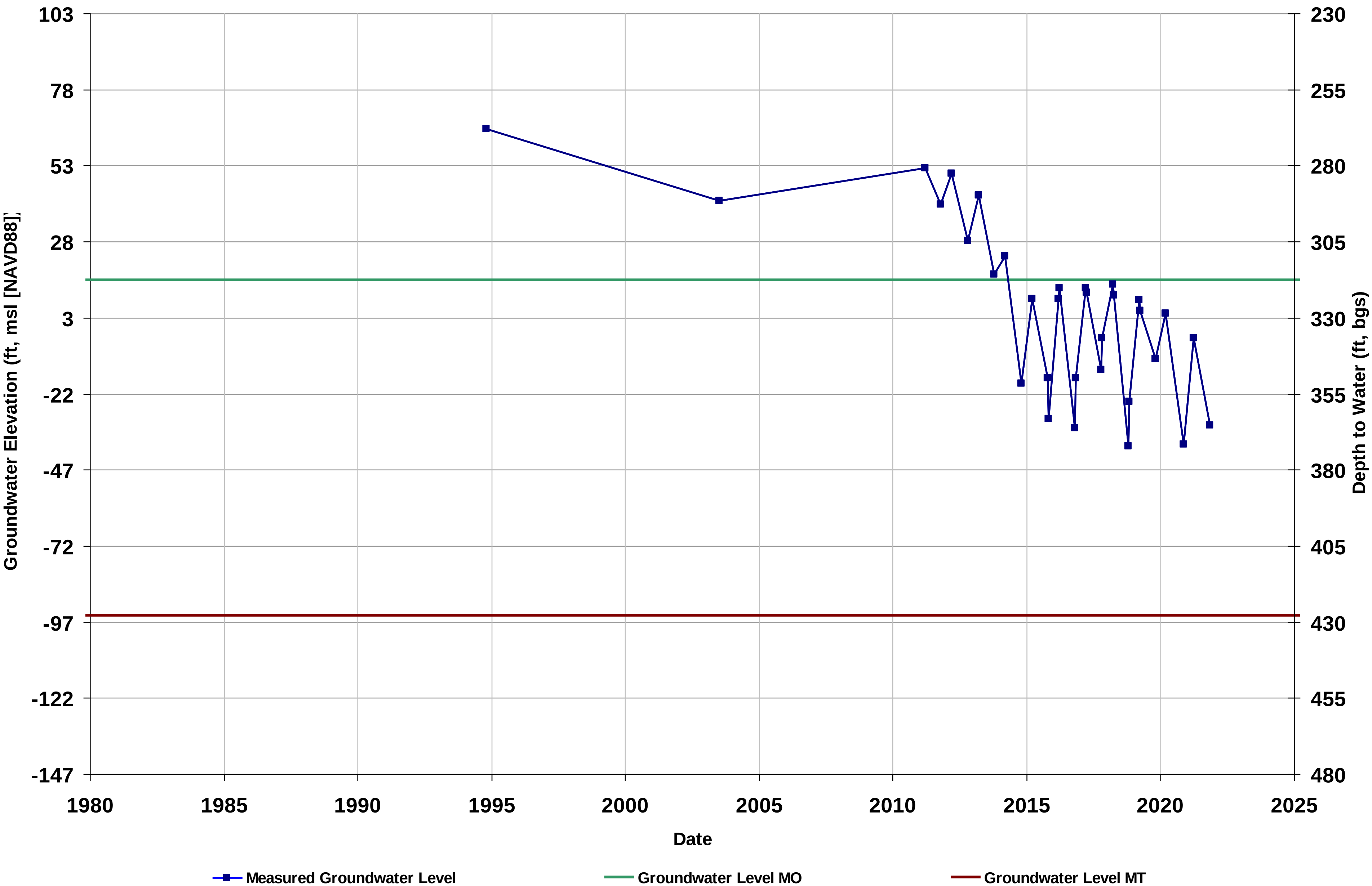
Well Name: MID RMS-17
Depth Zone: Upper
Subbasin: Madera
GSA: Madera Irrigation District

Total Depth (ft): 47
Perf Top (ft): 26.5
Perf Bottom (ft): 46.5
GSE (ft, msl): 224



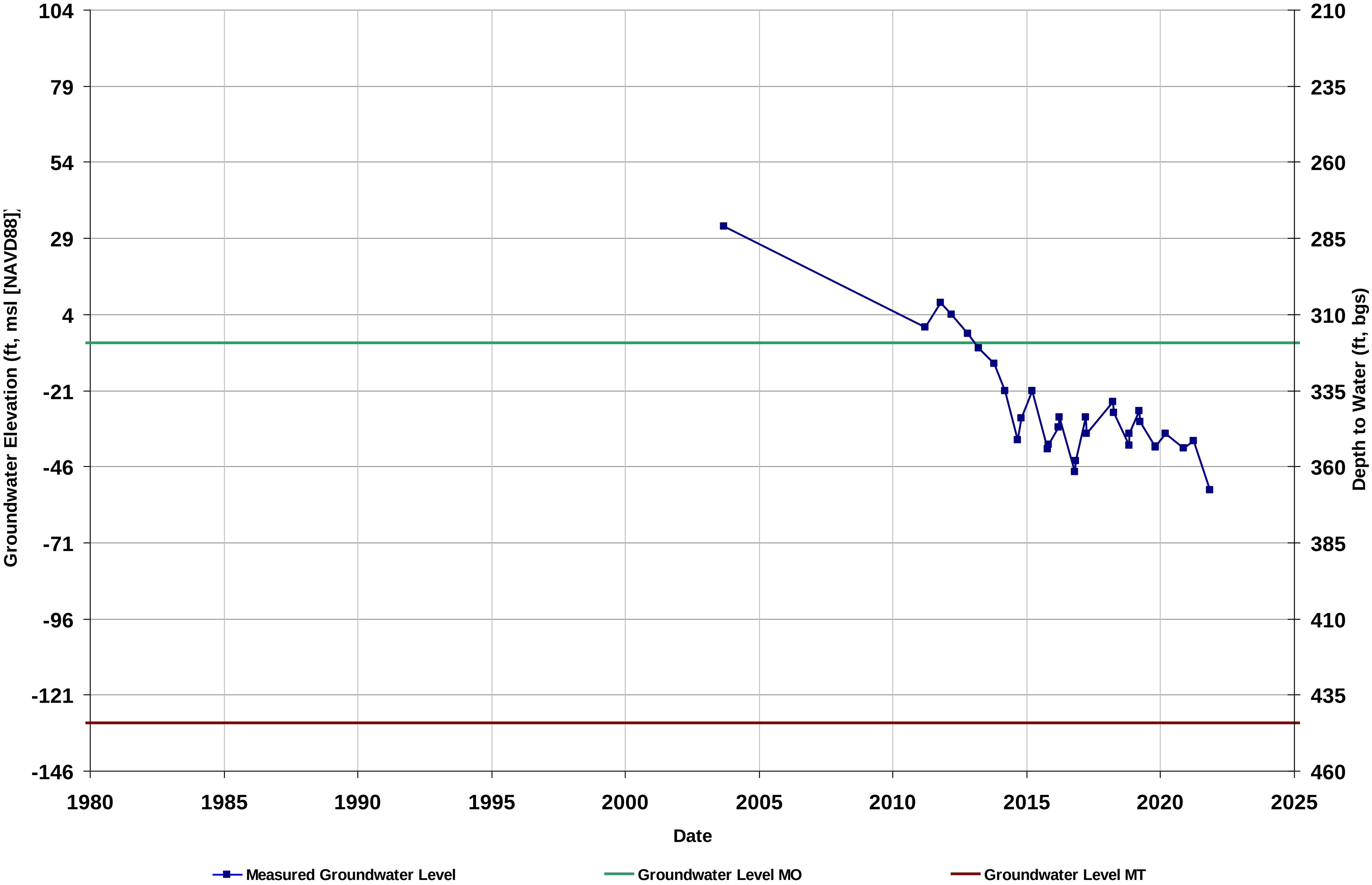
Well Name: MWD RMS-1
Depth Zone: Lower
Subbasin: Madera
GSA: Madera Water District

Total Depth (ft): 500
Perf Top (ft): 200
Perf Bottom (ft): 500
GSE (ft, msl): 332



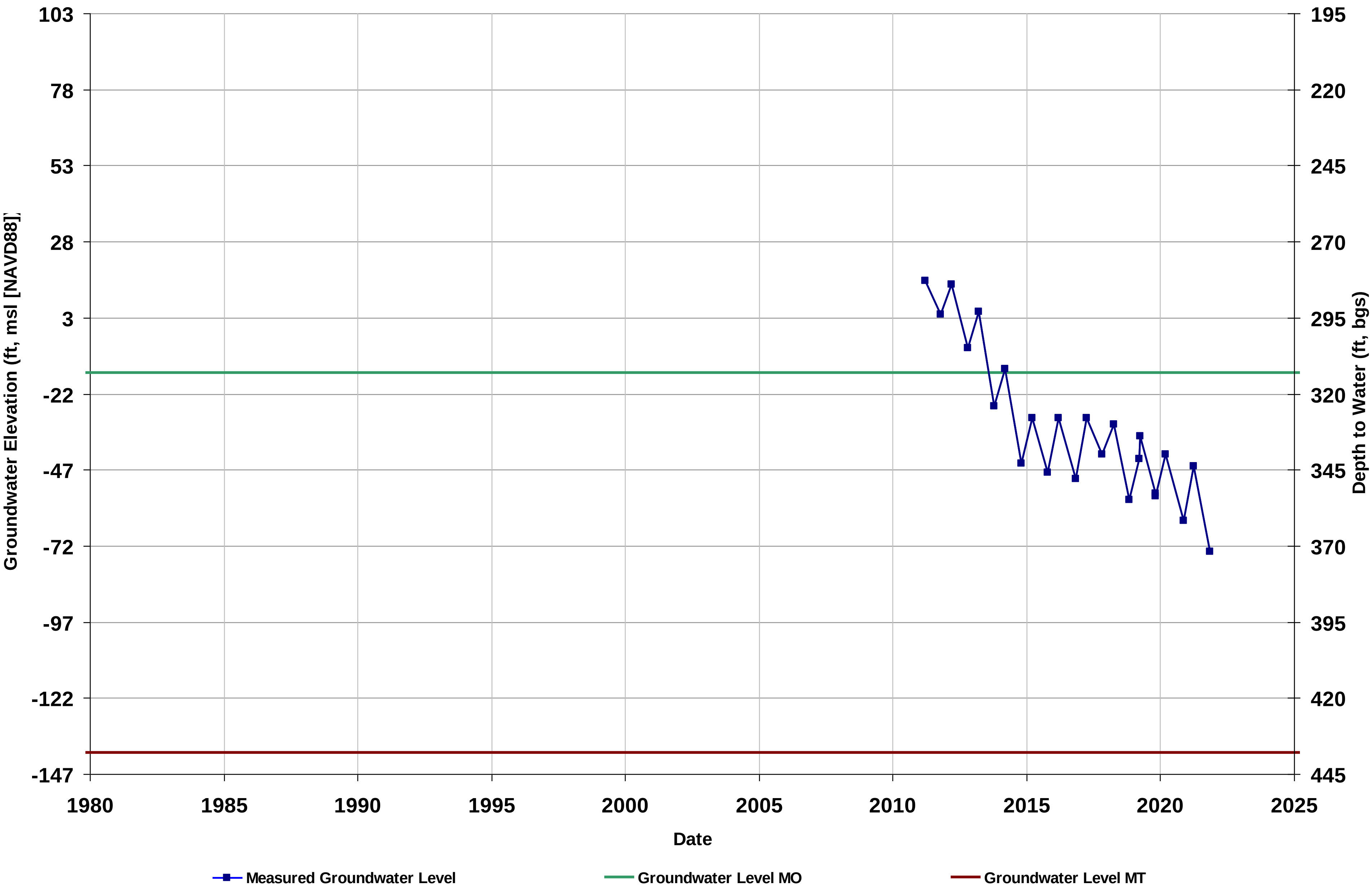
Well Name: MWD RMS-2
Depth Zone: Lower
Subbasin: Madera
GSA: Madera Water District

Total Depth (ft): 537
Perf Top (ft): 200
Perf Bottom (ft): 537
GSE (ft, msl): 314

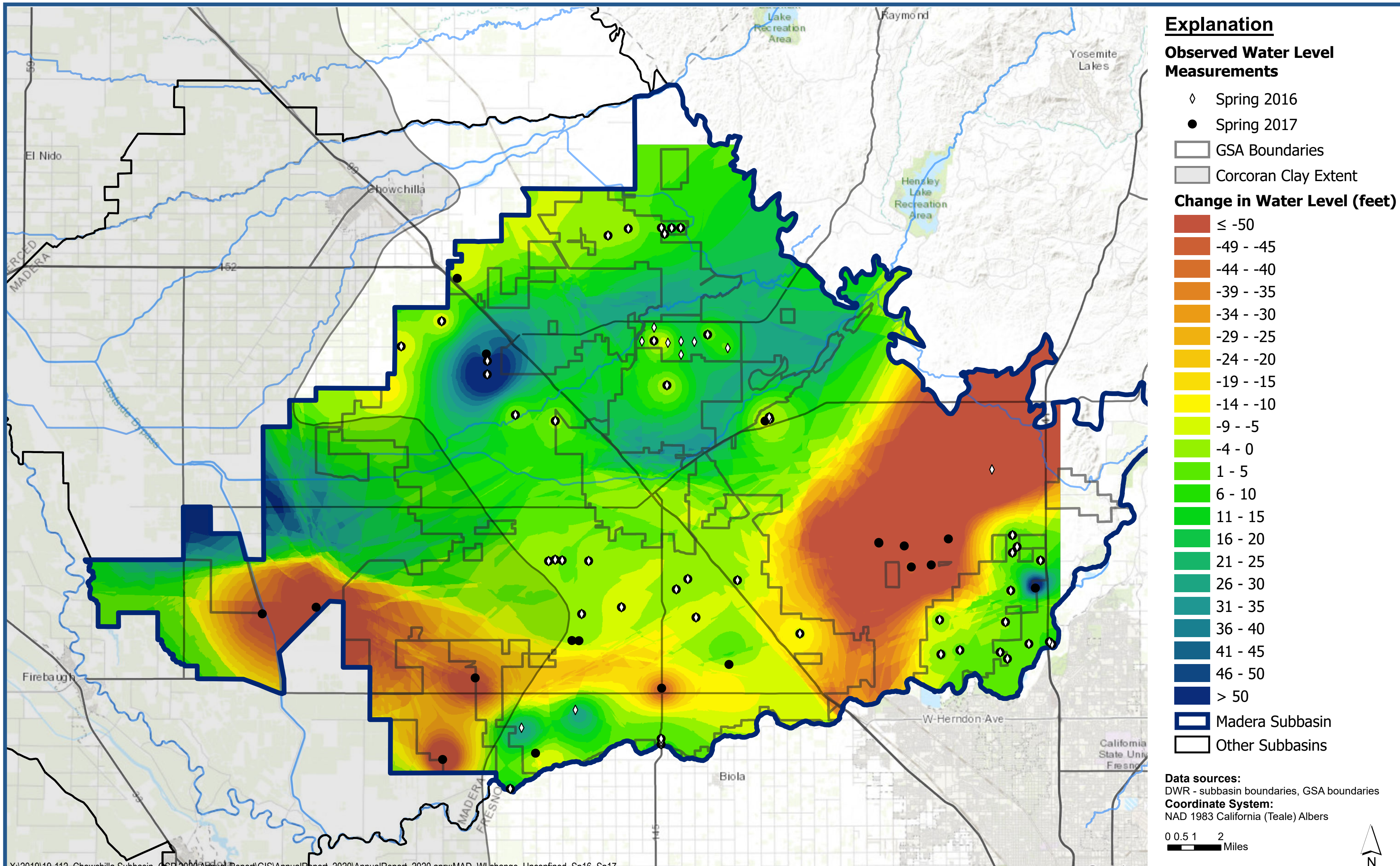


Well Name: MWD RMS-3
Depth Zone: Lower
Subbasin: Madera
GSA: Madera Water District

Total Depth (ft): 800
Perf Top (ft): 380
Perf Bottom (ft): 800
GSE (ft, msl): 297



Appendix C. Maps of Change in Groundwater Levels and Change in Groundwater Storage in 2016 through 2020, Separated by Principal Aquifer.



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Change in Water Level in the Upper Aquifer/Undifferentiated Unconfined Zone - Spring 2016 through Spring 2017

Figure C-1

Madera Subbasin

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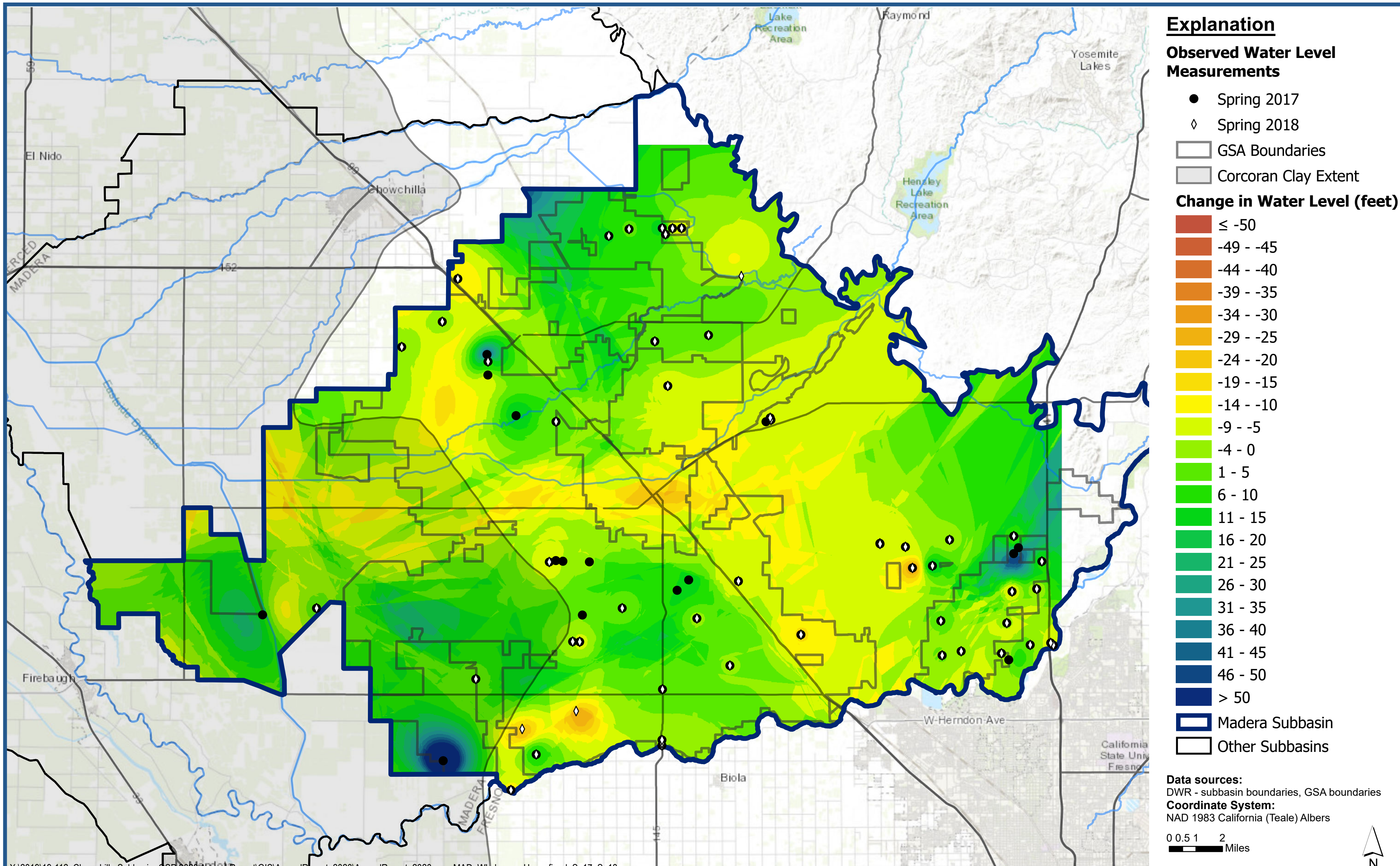

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Change in Water Level in the Upper Aquifer/Undifferentiated Unconfined Zone - Spring 2017 through Spring 2018

Figure C-2

Madera Subbasin
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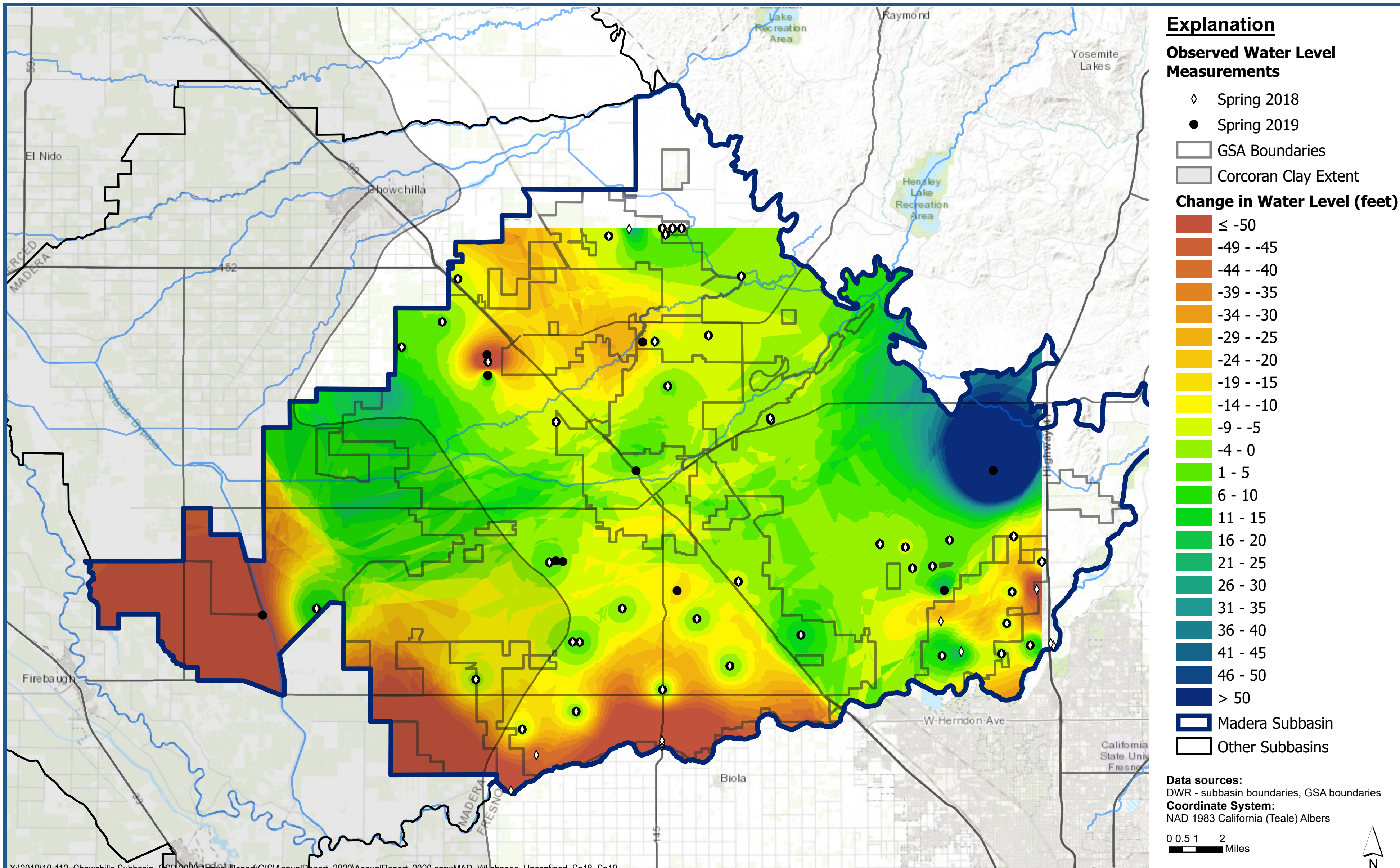

Change in Water Level in the Upper Aquifer/Undifferentiated Unconfined Zone - Spring 2018 through Spring 2019

Madera Subbasin
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Figure C-3

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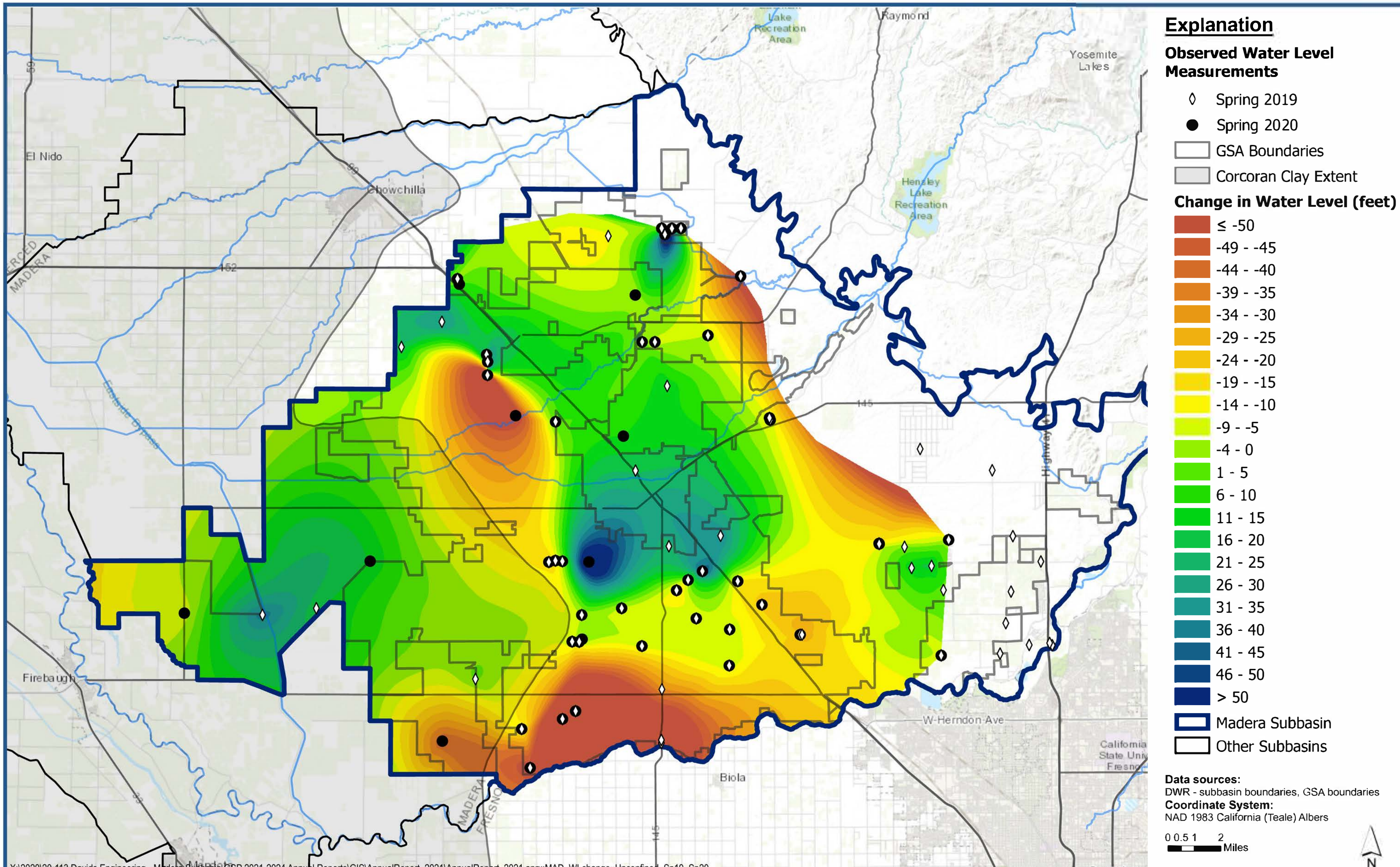

Change in Water Level in the Upper Aquifer/Undifferentiated Unconfined Zone - Spring 2019 through Spring 2020

Madera Subbasin
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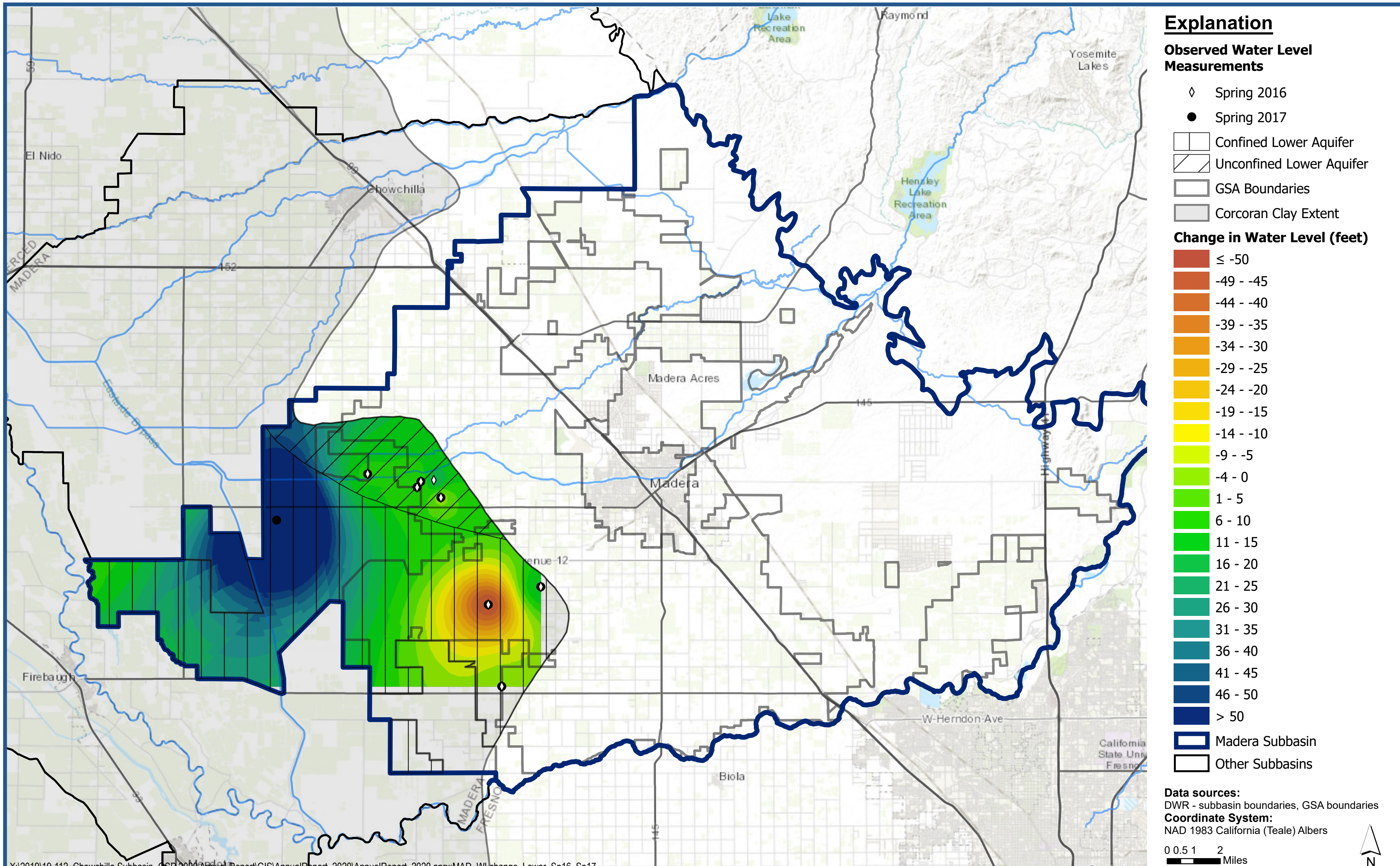
Figure C-4



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Change in Water Level in the Lower Aquifer - Spring 2016 through Spring 2017

Madera Subbasin
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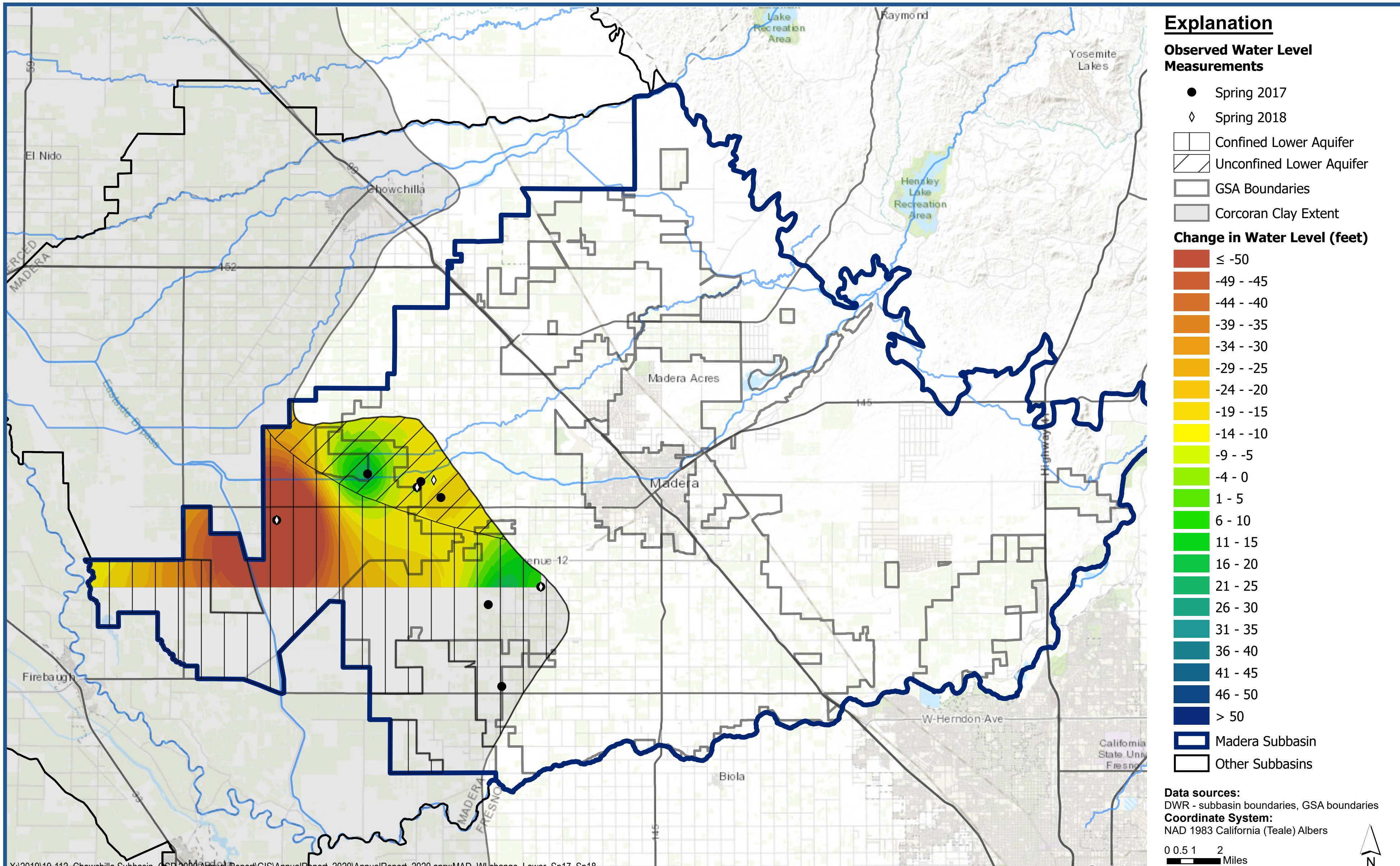
Figure C-5



X:\2019\19-112_Chowchilla Subbasin_GSP\2020 Annual Report\GIS\AnnualReport_2020\AnnualReport_2020.aprx:MAD_WLchange_Lower_Sp17_Sp18

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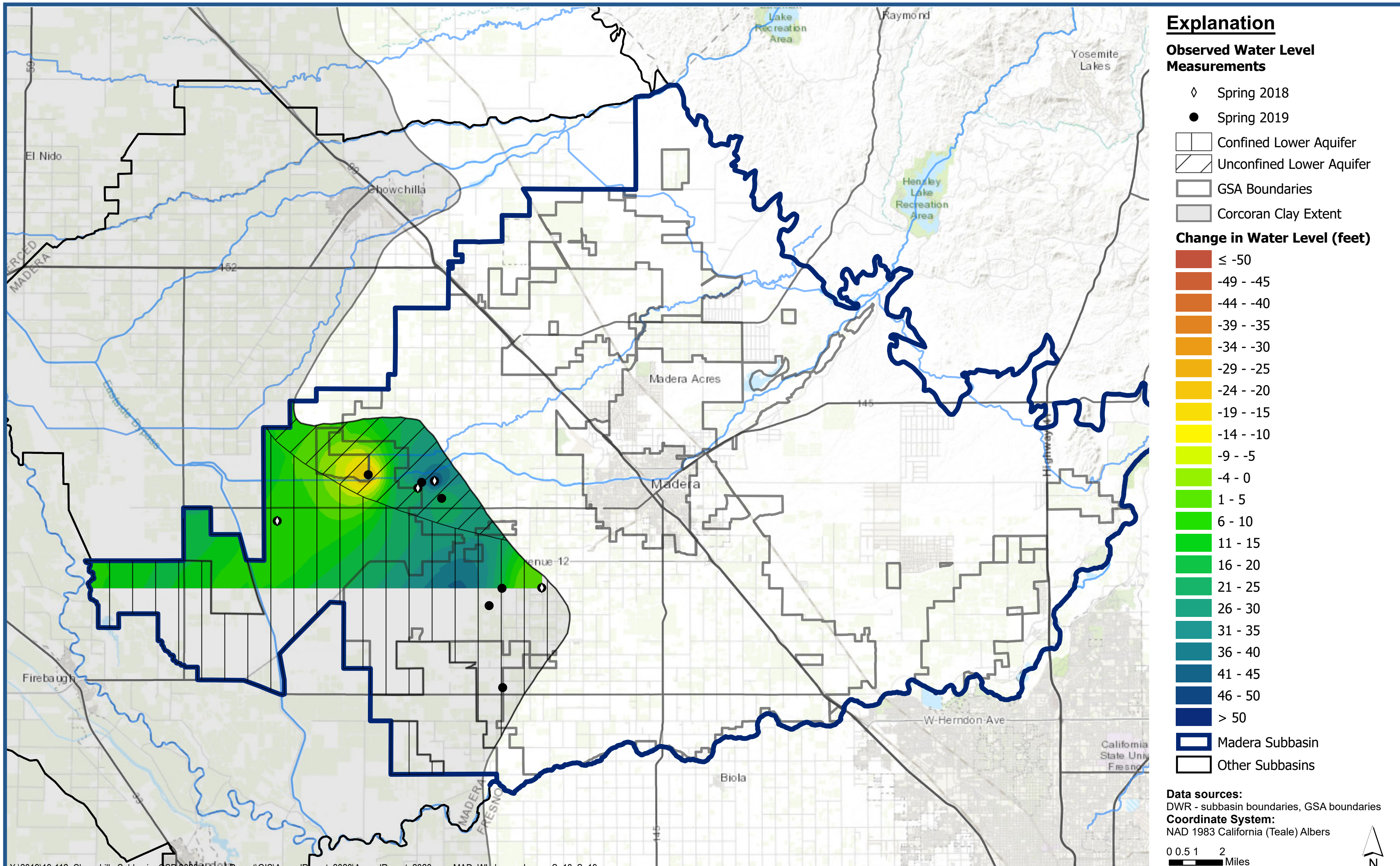
Change in Water Level in the Lower Aquifer - Spring 2017 through Spring 2018

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure C-6



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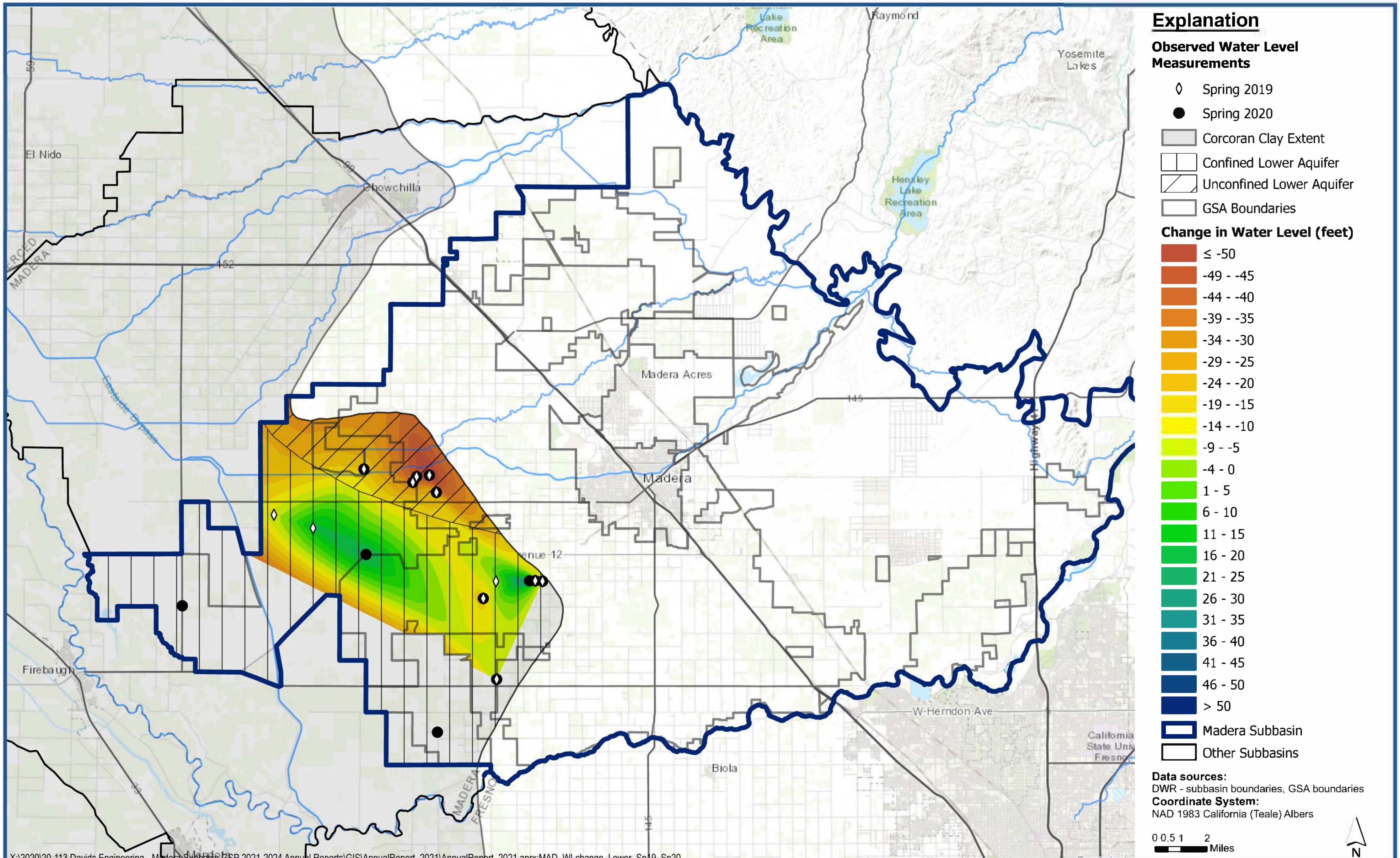
Change in Water Level in the Lower Aquifer - Spring 2018 through Spring 2019

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure C-7



Change in Water Level in the Lower Aquifer - Spring 2019 through Spring 2020

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

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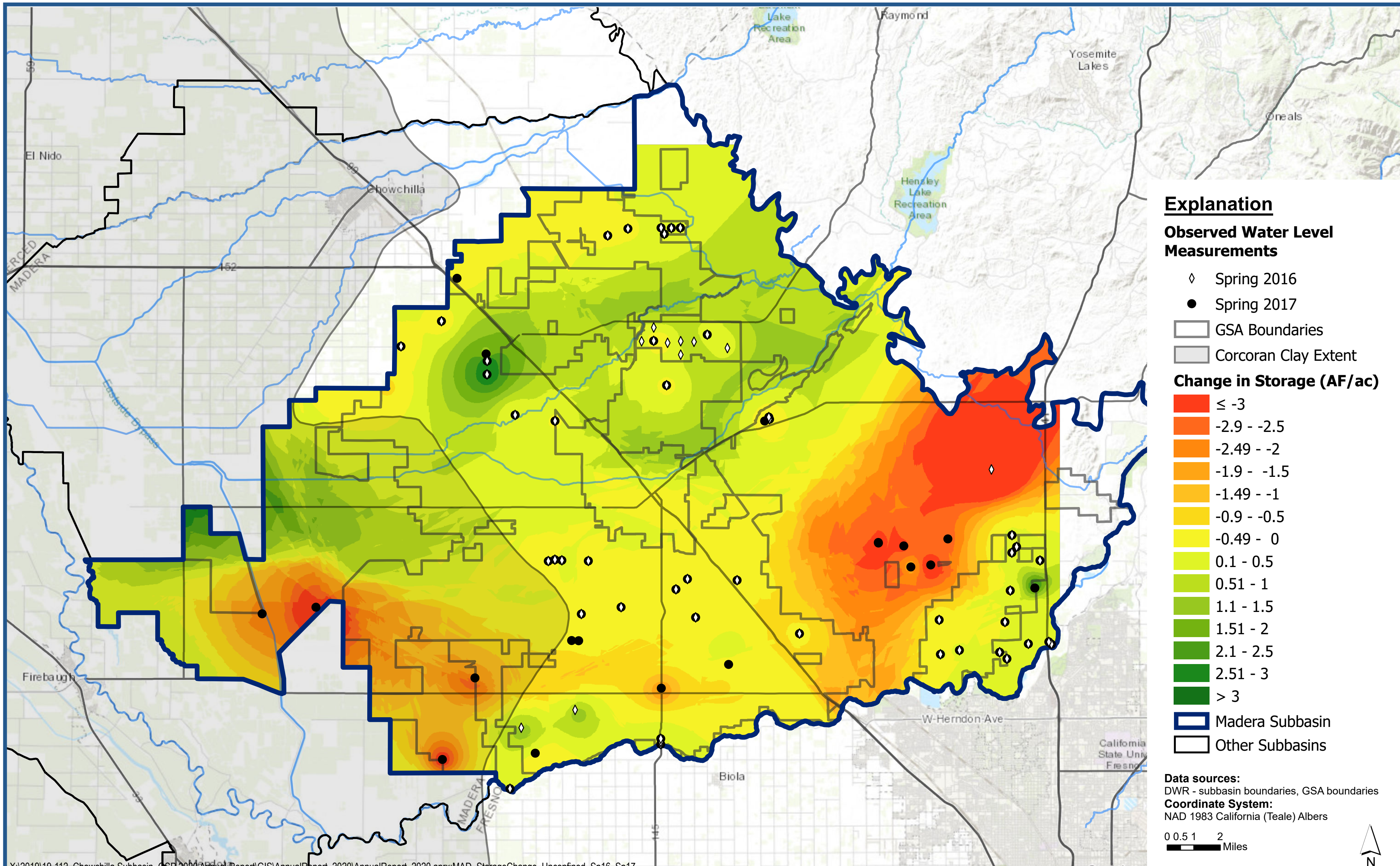
Figure C-8



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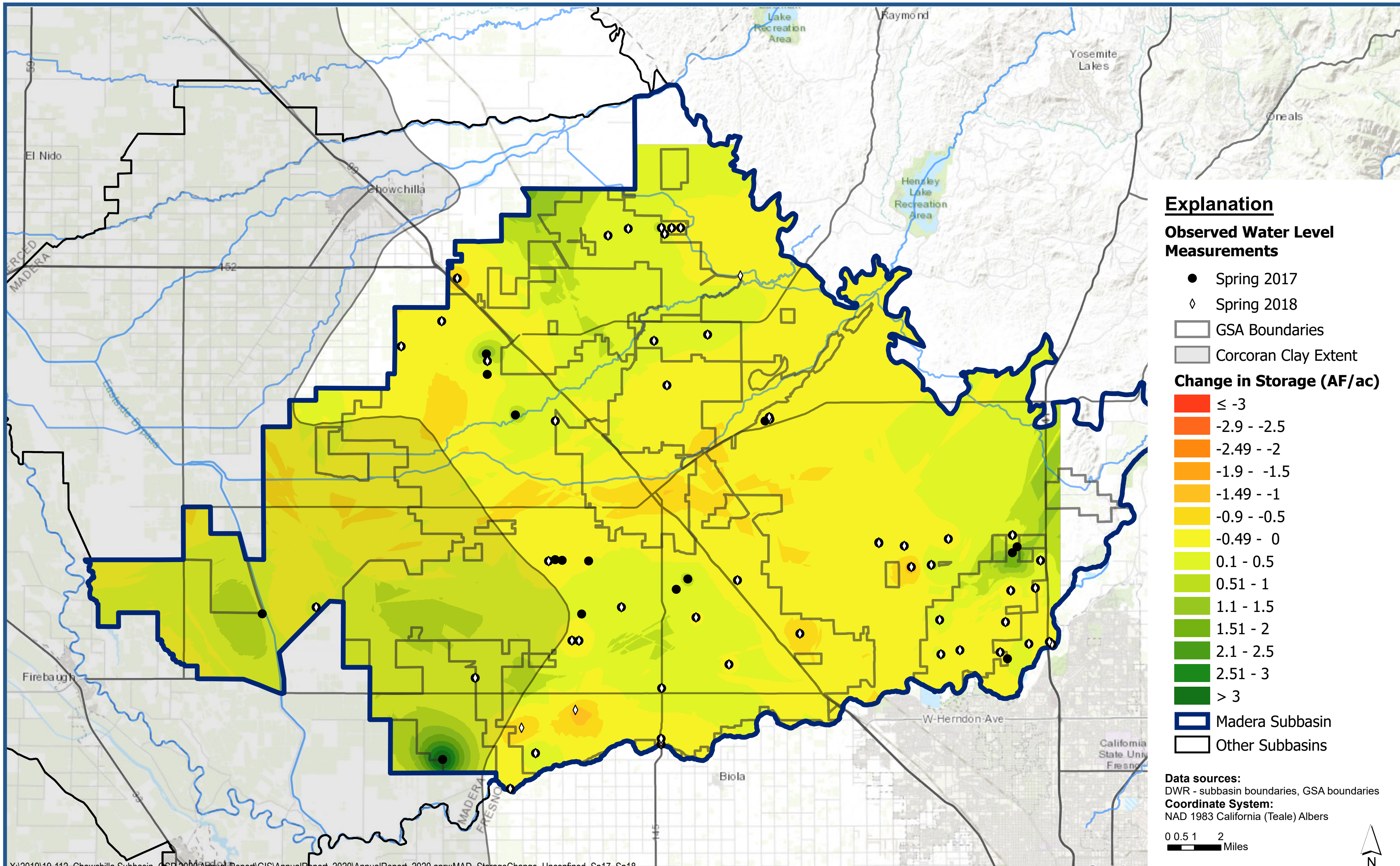
Change in Groundwater Storage in the Upper Aquifer/Undifferentiated Unconfined Zone - Spring 2016 through Spring 2017

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure C-9



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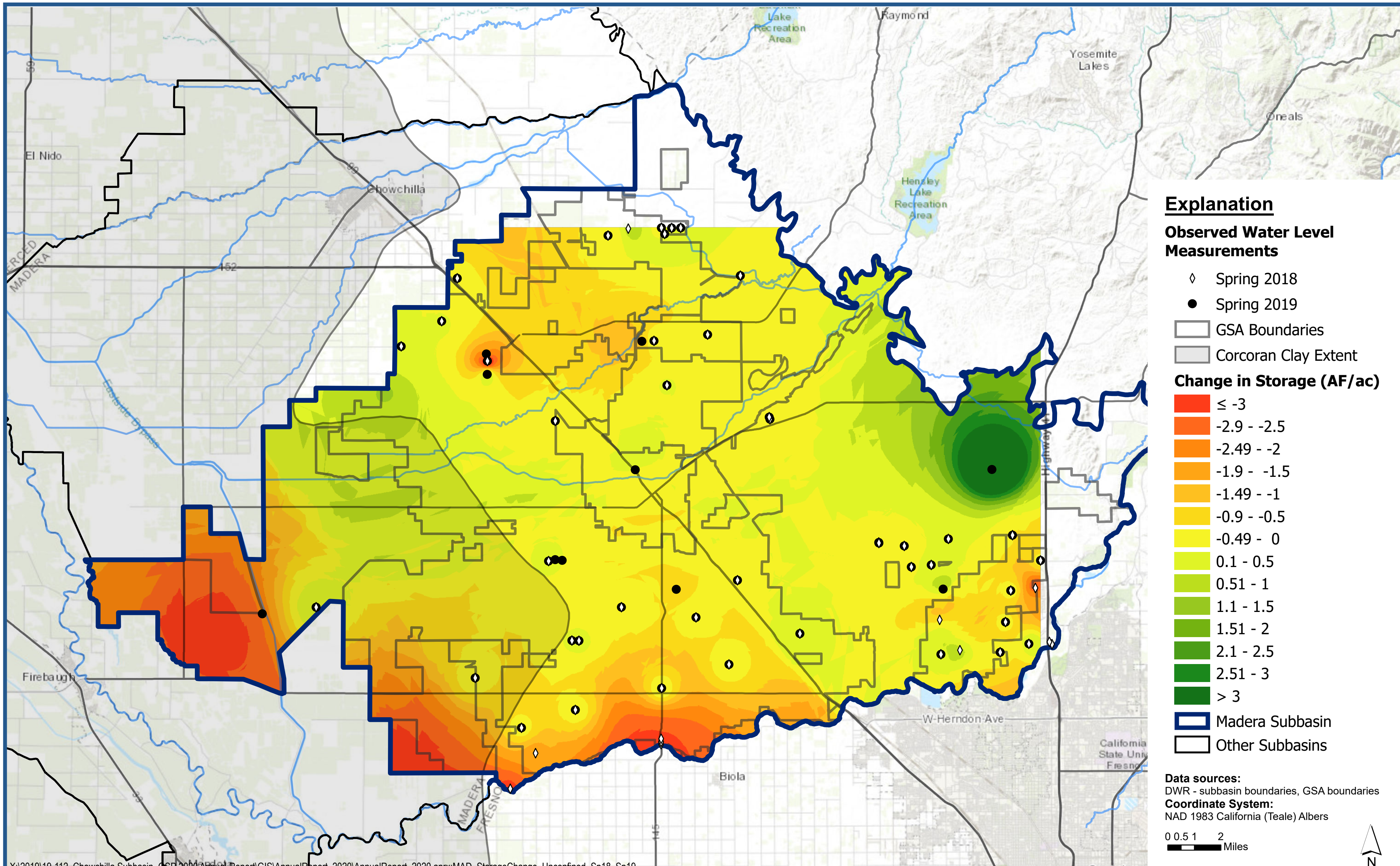
Change in Groundwater Storage in the Upper Aquifer/Undifferentiated Unconfined Zone - Spring 2017 through Spring 2018

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure C-10



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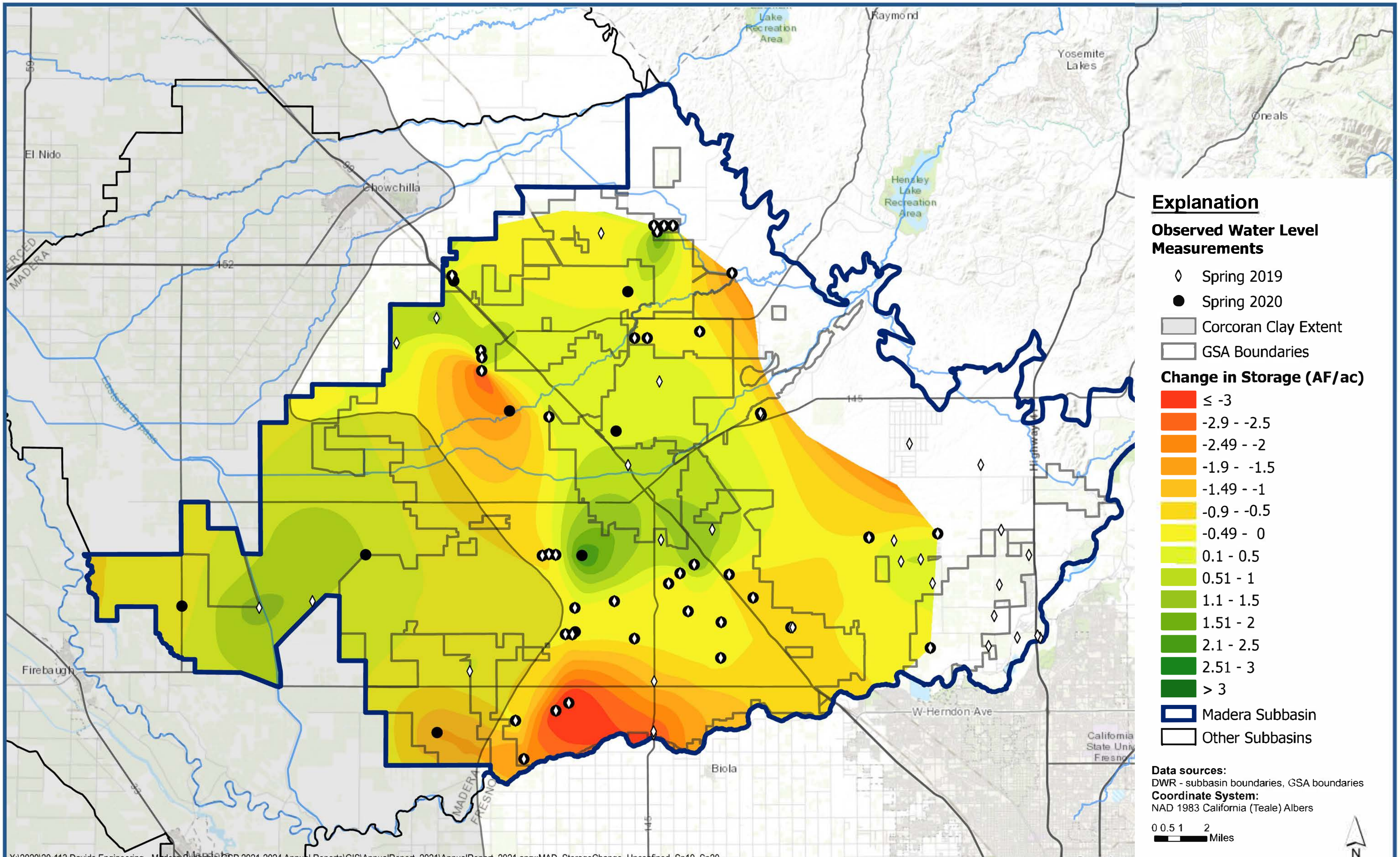
Change in Groundwater Storage in the Upper Aquifer/Undifferentiated Unconfined Zone - Spring 2018 through Spring 2019

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure C-11



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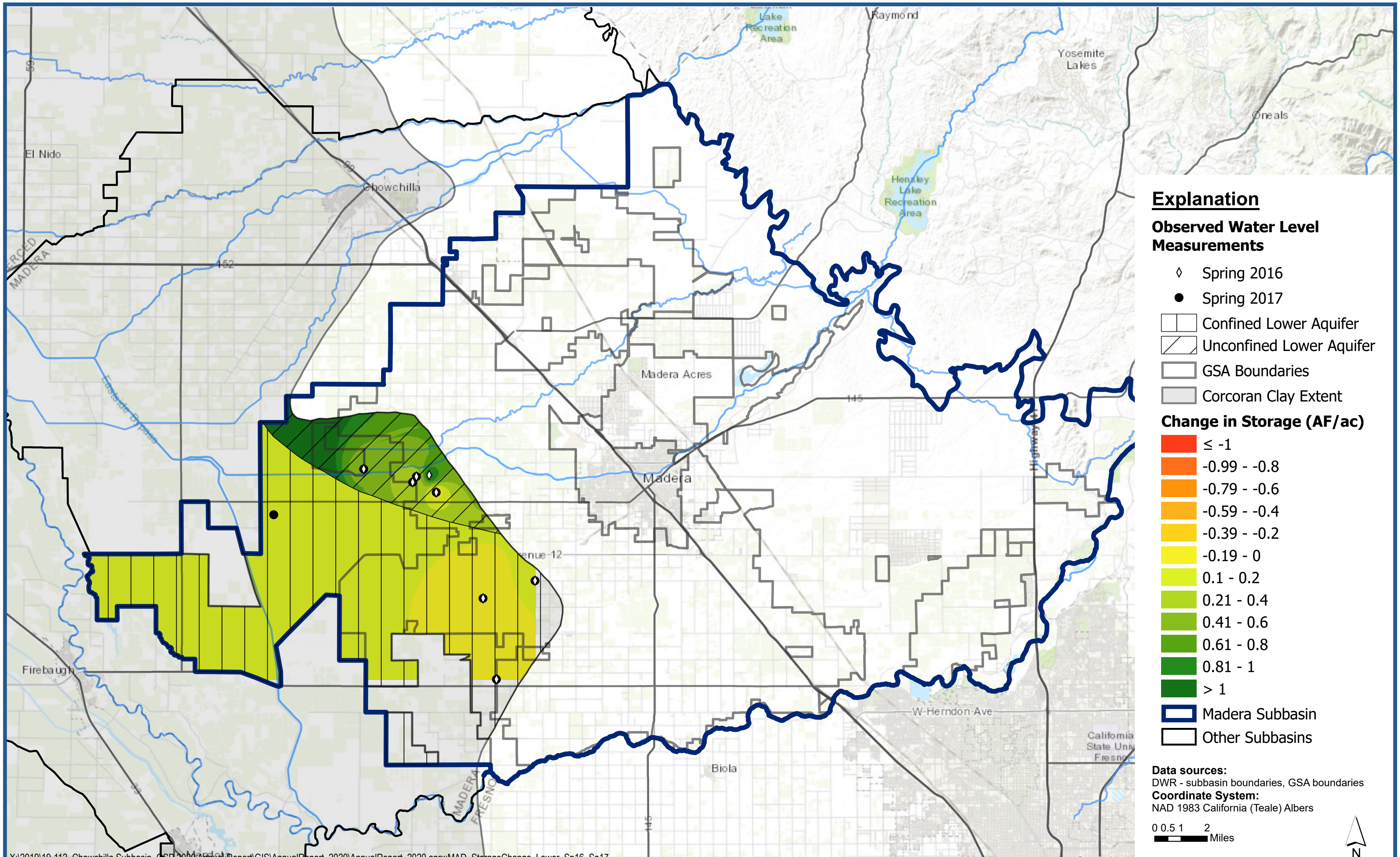
Change in Groundwater Storage in the Upper Aquifer/Undifferentiated Unconfined Zone - Spring 2019 through Spring 2020

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure C-12



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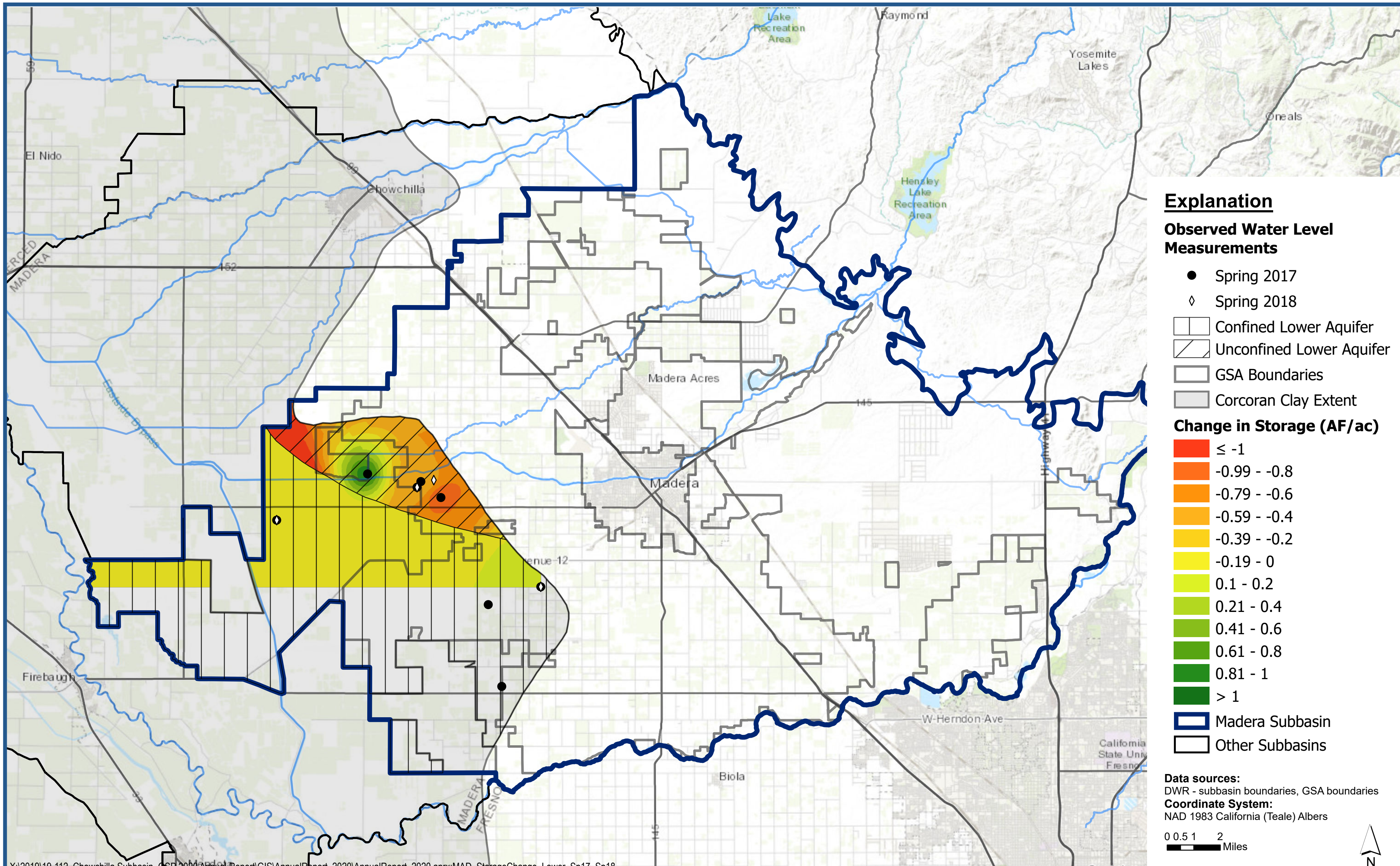
Change in Groundwater Storage in the Lower Aquifer - Spring 2016 through Spring 2017

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure C-13



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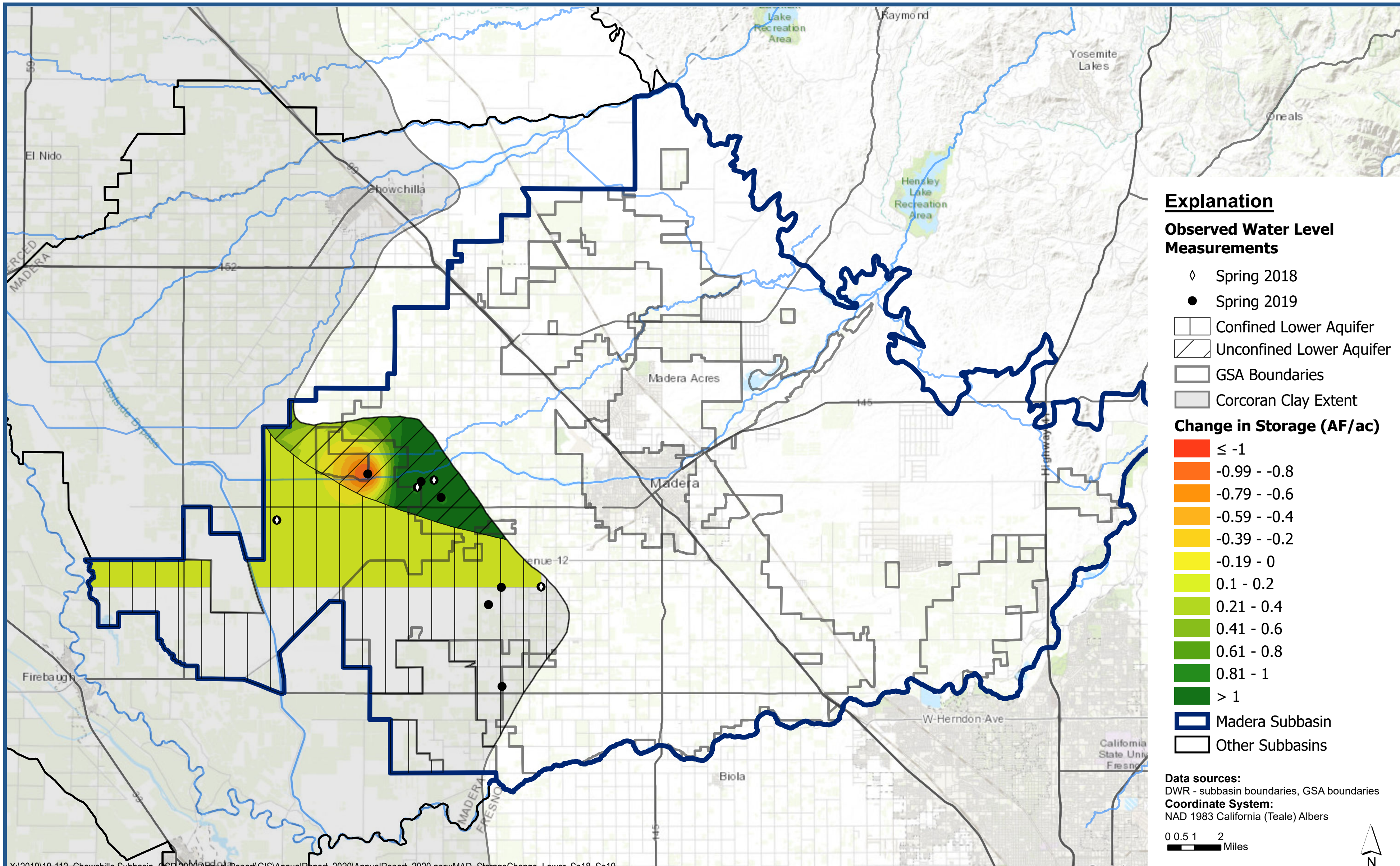
Change in Groundwater Storage in the Lower Aquifer - Spring 2017 through Spring 2018

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure C-14



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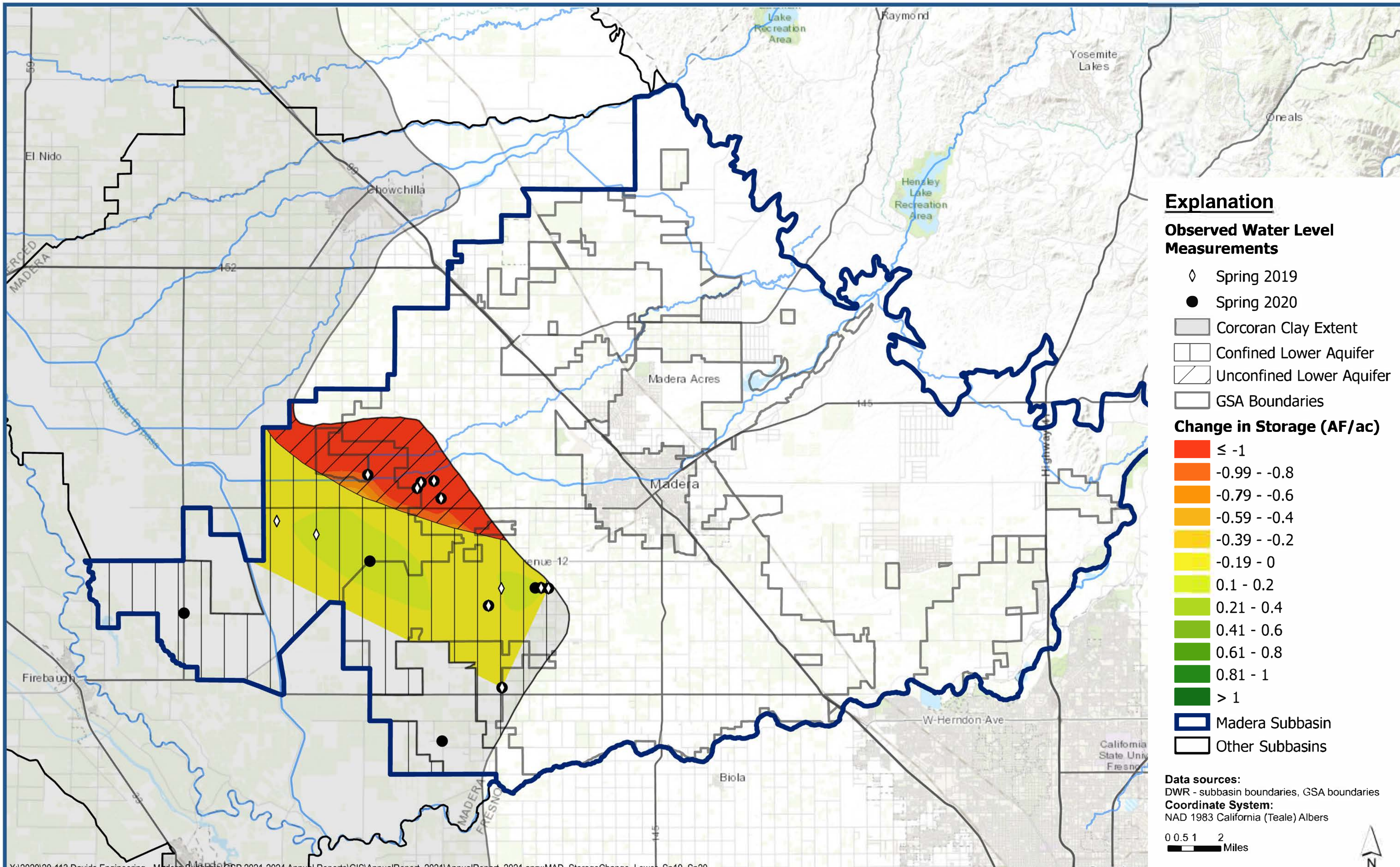
Change in Groundwater Storage in the Lower Aquifer - Spring 2018 through Spring 2019

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure C-15



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Change in Groundwater Storage in the Lower Aquifer - Spring 2019 through Spring 2020

Madera Subbasin
Groundwater Sustainability Plan 2022 Annual Report

Figure C-16

Appendix D. Stakeholder Communication and Engagement During Groundwater Sustainability Plan (GSP) Implementation: Recommendations.

Madera Subbasin

Stakeholder Communication and Engagement During Groundwater Sustainability Plan (GSP) Implementation: Recommendations

January 2020

NOTE: The following recommendations are those of the Consensus and Collaboration Program at California State University, Sacramento. These recommendations incorporate many outreach processes begun during the GSP planning process, but also include some new processes. In order to ensure an adaptive, responsive approach to stakeholder outreach and engagement, similar to during the GSP development, we recommend that any outreach be planned in collaboration with the Madera Subbasin stakeholders, beginning with the GSA managers, board members, and staff.

NOTE: This document was drafted before the COVID-19 pandemic. In that environment, some of the engagement tools would need to be modified.

Prepared by the California State University of Sacramento (CSUS)

Contents

Madera Subbasin Stakeholder Communication and Engagement During GSP Implementation: Recommendations
January 2020

Purpose

The purpose of these recommendations is to assist Madera Subbasin Groundwater Sustainability Agencies (GSAs) in their strategic communication and engagement with stakeholders during implementation of groundwater management activities per their respective GSPs. This document is intended to serve as an initial guide and framework which we expect will be fleshed out and added to as GSP implementation unfolds.

Overview and Background

California's Sustainable Groundwater Management Act (SGMA) of 2014 requires broad and diverse stakeholder involvement in GSA activities and the development and implementation of Groundwater Sustainability Plans (GSPs) for 127 groundwater basins around the state, including the Madera Subbasin. The intent of SGMA is to ensure successful, sustainable management of groundwater resources at the local level. Success will require cooperation by all stakeholders, and cooperation is far more likely if stakeholders have consistent messaging of valid information and are provided with opportunities to help shape the path forward.

For detail regarding communication and engagement during development of the Madera Subbasin GSPs, please consult the *Madera Subbasin Stakeholder Communication and Engagement Plan (see Appendix 2.C.a in the Madera Subbasin Joint GSP)*.

Implementation Communication and Engagement Recommendation Goals

This document seeks to accomplish the following goals:

1. Educate stakeholders about:
    - A. SGMA and its requirements and
    - B. Opportunities to provide input related to the implementation of the Madera Subbasin GSPs.
2. Provide a roadmap to GSAs on ways to effectively and efficiently reach all elements of the population to share information.
3. Articulate strategies and channels for GSAs to use to obtain stakeholder input and feedback to inform GSP implementation.

4. Encourage stakeholder engagement, for example, by continuing to use dedicated SGMA outreach strategies and channels established during the GSP development period and highlighting all opportunities for stakeholders to provide input in GSP implementation decision-making processes.

Primary Stakeholders for Outreach and Engagement

Madera Subbasin stakeholders are "beneficial users" as described by SGMA. Under the requirements of SGMA, all beneficial uses and users of groundwater must be considered in the development and implementation of GSPs, and GSAs must encourage the active involvement of diverse social, cultural, and economic elements of the population. Beneficial users, therefore, are any stakeholders who have an interest in groundwater use and management in the Madera Subbasin community. Their interest may be related to GSA activities, GSP development and implementation, and/or water access and management in general.

To assist in determining who the specific SGMA stakeholders and beneficial users are, the Department of Water Resources (DWR) created a Stakeholder Engagement Chart for GSP development in their 2017 *GSP Stakeholder Communication and Engagement Guidance Document*. The following table (Table 1) is based on the DWR chart, modified to fit the circumstances and stakeholders of the Madera Subbasin. It can continue to be updated during the GSP implementation process.

Table 1. Stakeholder Engagement Chart for GSP Development

Category of Interest	Examples of Stakeholder Groups [1]	Engagement purpose
General Public	• Citizens groups • Community leaders	Inform to improve public awareness of sustainable groundwater management
Land Use	• Municipalities (City, County planning departments) • Regional land use agencies	Consult and involve to ensure land use policies are supporting GSPs
Private Users	• Private pumpers (domestic and agricultural) • Domestic users • Schools and colleges • Hospitals	Inform and involve in assessing impacts to users
Urban/ Agricultural	• Water agencies • Irrigation districts	Collaborate to ensure sustainable management of

[1] The groups and communities referenced are examples identified during initial assessment. GSA Interested Parties lists shall maintain current and more exhaustive lists of stakeholders fitting into these groups.

Category of Interest	Examples of Stakeholder Groups [1]	Engagement purpose
Users	• Municipal water companies • Resource conservation districts • Farmers/Farm bureaus	groundwater
Industrial Users	• Commercial and industrial self-supplier • Local trade association or group	Inform and involve in assessing impacts to users
Environmental and Ecosystem Uses	• Federal and State agencies: CA Dept. of Fish and Wildlife • The Nature Conservancy • Environmental groups	Inform and involve to consider/incorporate potential ecosystem impacts to GSP process
Economic Development	• Chambers of Commerce • Business groups/associations • Elected officials (Board of Supervisors, City Council) • State Assembly members • State Senators	Inform and involve to support a stable economy
Human Right to Water	• Disadvantaged communities: Fairmead Community and Friends, La Vina Residents, etc. • Small water systems • Environmental justice groups/community-based organizations: Leadership Council for Justice and Accountability, Self-Help Enterprises, Community Water Center, etc.	Inform and involve to provide safe and secure groundwater supplies to all communities reliant on groundwater
Tribes	Federally Recognized Tribes and non-Federally Recognized Tribes with lands or potential interests in Madera Subbasin: • Northfork Rancheria of Mono Indians of California • Picayune Rancheria of Chuckchansi Indians • Northfork Band of Mono Indians • Chaushilha Yokuts • Big Sandy Rancheria of Mono Indians of California • Cold Springs Rancheria of Mono Indians of California • Table Mountain Rancheria of	Inform, involve and consult with tribal governments

Category of Interest	Examples of Stakeholder Groups [1]	Engagement purpose
	California • Tule River Indian Tribe of the Tule River Reservation	
Federal Lands	• Bureau of Reclamation (USBR) • Bureau of Land Management	Inform, involve and collaborate to ensure basin sustainability
Integrated Water Management	• Regional water management groups (IRWM regions) • Flood agencies • Recycled water coalition	Inform, involve and collaborate to improve regional sustainability

SGMA and Engagement

SGMA strongly encourages broad stakeholder engagement in development and implementation of GSPs. According to SGMA:

- "The groundwater sustainability agency shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater basin prior to and during the development and implementation of the groundwater sustainability plan." [CA Water Code Sec. 10727.8(a)]
- "The groundwater sustainability agency shall consider the interests of all beneficial uses and users of groundwater." [CA Water Code Sec. 10723.2]

GSAs are given broad discretion in the methods and processes utilized to meet engagement requirements, but the methods are required to "successfully" engage all stakeholders, including elements of the population that are hard to reach. Additionally, SGMA sets forth some required engagement strategies as well as several GSA-specific requirements regarding public notice, public hearings, and public meetings.

SGMA-Required Engagement During Implementation

The table below, from DWR's *GSP Stakeholder Communication and Engagement Guidance Document* (page 13), presents the engagement requirements for Phase 4, implementation and reporting, and those applicable to all phases. Details about these strategies are included in the *How to Engage* section below.

Phase 4 Engagement Requirements
• **Public Notices and Meetings** §10730 › Before amending a GSP › Prior to imposing or increasing a fee • **Encourage Active Involvement** §10727.8

Engagement Requirements Applicable to ALL PHASES

- **Beneficial Uses and Users** §10723.2
  Consider interests of all beneficial uses and users of groundwater
- **Advisory Committee** §10727.8
  GSA may appoint and consult with an advisory committee
- **Public Notices and Meetings** §10730
  - Before electing to be a GSA
  - Before adopting or amending a GSP
  - Prior to imposing or increasing a fee
- **Encourage Active Involvement** §10727.8
  Encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater basin
- **Native American Tribes** §10720.3
  - May voluntarily agree to participate
  - See Engagement with Tribal Government Guidance Document
- **Federal Government** §10720.3
  - May voluntarily agree to participate

When to Engage

As evident from the table above, continuing to share information with and gather feedback from the public and specific stakeholder groups remains important throughout the GSP implementation period, particularly at key junctures, such as:

- when new monitoring information comes to light;
- as fees are being considered;
- during planning and development of projects; and
- whenever input from beneficial users is helpful and/or necessary to move GSP implementation forward.

When deciding how to prioritize efforts, consider when engagement is needed to support relationship building, provide timely information, and gather timely input. Is something new being developed? Is a key decision being made?

As outlined in the *How to Engage* section below, GSA and Subbasin-wide outreach can continue to utilize the communication channels developed during GSP development. Some relationships and structures that were built during GSP development can be maintained, for example monitoring the agendas of other GSAs and attending meetings as relevant. In other cases, it may be appropriate to create new engagement processes for example, during development of new projects. This project-based engagement may be discrete in terms of timing, with a clear beginning and end. And depending on the project, the audience could be broad or focused – for example, targeting particular categories, of relevant beneficial users.

How to Engage

To maximize efficiency and support consistent messaging, it is appropriate that some outreach activities be conducted on a subbasin-wide level. However, it is also important to recognize that under SGMA each GSA has its own responsibility for engagement of the beneficial users within its boundaries. Regional (subbasin-wide) and localized (GSA-specific) strategies should be considered when planning outreach and engagement activities.

Regional Communication and Engagement Strategies

The following are strategies that can be undertaken at the Subbasin-wide level to ensure successful engagement of Madera Subbasin stakeholders during the GSP implementation process. Most of these strategies were developed during the GSP development phase.

1. Develop and Maintain a List of Interested Parties

A contact list of stakeholders and beneficial users was developed during GSP planning and will continue to be updated throughout GSP implementation and enforcement processes. Each GSA is required to maintain its own list, however coordinating these lists into a single Subbasin list will improve stakeholder engagement.

2. Maintain a Centralized Madera Subbasin Website

The Madera Subbasin website (http://www.maderacountywater.com) was built during GSP development. During implementation it should continue to be kept up to date, including the following content:

- Links to external sites (DWR and State Water Resources Control Board)
- Information specific to each GSA, including service areas (if applicable), maps, GSA Board meetings, updates, and opportunities for stakeholder input
- Links to individual GSA websites, relevant blogs, etc.
- Frequently Asked Questions (FAQ) and/or white papers
- GSA documents (MOUs, by-laws, etc.)
- GSP documents (the GSP, notices and meeting calendars for subbasin-wide GSP-related workshops)

3. Newsletter and Other Notices

A Subbasin-wide newsletter was established during GSP development and should continue to be utilized to share information and opportunities for engagement with interested parties.

Newsletters and notices can be sent on a regular schedule, for example bi-monthly or monthly, or as needed. Content should be appropriate to the audience and their interests, ensuring information is articulated in a way that is easily understood. For example:

- Notices to community members with less SGMA or technical experience should be easily understood, with streamlined, relatable, and repetitive information.
- Updates and messages should be condensed to one page when possible, providing a succinct summary of the issues discussed, and including links for further or additional information.
- As applicable, specific items should have an estimated timeline and a designated point of contact, including the person’s position, email and telephone number.

- Updates and information are needed in both English and Spanish.

4. Social Media

The Madera Subbasin centralized social media account (https://www.facebook.com/MaderaCounty/) should continue to be utilized to share information and opportunities for engagement.

5. Coordination Committee

A coordination work group was formed and will continue to meet as needed and at critical junctures for coordination.

6. Regional Meetings and Workshops

As during GSP development, subbasin-wide meetings and workshops should continue to be held on an as-needed basis. For example, if a region-wide issue comes up, a meeting may be held to share information and gather input about it. Additionally, region-wide workshops targeting a specific beneficial user group may be held; see below for details.

Beneficial User-Specific Meetings

There may be occasion to hold region-wide workshops or meetings targeted toward specific beneficial user groups; for example, a subbasin-wide public workshop to encourage and support Resource Conservation Districts to assist with outreach to small farmers. Ad-hoc stakeholder committees may also be created, for example, to provide feedback specific to a project; see *Project-Specific Communication and Engagement Strategies* below.

Disadvantaged communities (DACs) are a beneficial user category that may require additional outreach and engagement efforts. During GSP development, the Madera Subbasin Joint GSP worked with three organizations – Fairmead and Friends, Self-Help Enterprises and Leadership Counsel for Justice and Accountability – to support engagement with DAC communities. These relationships can continue to be leveraged to communicate with DAC communities about opportunities to receive information and share input.

7. Public Meetings of Subbasin-Wide Bodies

In addition to regional meetings and workshops designed to share information and/or gather input from stakeholders, GSA Boards will hold public meetings. These meetings are subject to Brown Act compliance, as outlined below.

Ensure Brown Act Compliance

Meetings subject to the Brown Act, such as GSA Board Meetings, must provide public notice and post an agenda 72 hours in advance of each regularly scheduled meeting. Emergency meetings require 24-hour advance notice. For more information on Brown Act requirements, see https://oag.ca.gov/sites/all/files/agweb/pdfs/publications/2003_Intro_BrownAct.pdf.

8. Project-Specific Communication and Engagement Strategies

As specific projects are developed during GSP implementation, additional communication and engagement will be needed. This increased outreach s likely to include additional workshops and meetings, with associated communication to notice and publicize these. The extra engagement may be discrete in terms of timing, with a clear beginning and end as the project is developed, as well as audience, targeting particular beneficial users relevant to the project. For example, input from DAC beneficial users will be particularly important during development of a mitigation program for impacted drinking water wells and agricultural beneficial users will be particularly important to engage during development of an agricultural land conservation program. In some cases, it could be helpful to create a separate advisory committee to support project development.

9. Meetings of Related Bodies

As during GSP development, coordination with other related bodies, such as Regional Water Management groups, may be beneficial. Meeting agendas may be monitored and meetings attended as relevant.

Localized Communication and Engagement Strategies

As during GSP development, individual GSA representatives and staff will need to continue to engage with their own stakeholders and will be responsible for tracking the needs of their local communities. GSAs should also consider stakeholder input gathered from outreach efforts as they move through GSP implementation processes.

See requirements below:

1. Develop and Maintain a List of Interested Parties

Each GSA must maintain its list of interested parties on an ongoing basis. Anyone who wishes to be put on this list can do so upon making this request in writing. [CA Water Code Section 10730. (b) (2); 10723.2; 10723.4; and 10723.8. (a)].

2. Public Meetings

As noted above, SGMA requires that GSAs hold public meetings prior to adopting or amending a GSP and prior to imposing or increasing fees. These and all GSA meetings are subject to Brown Act requirements; see link above.

When adopting or amending a GSP, SGMA sets forth the following requirements:

- A GSA seeking to adopt or amend a GSP must provide notice to cities and counties within the area encompassed by the proposed plan or amendment, and consider comments provided by the cities and counties. Cities and counties receiving the notice may request consultation with the GSA, in which case the GSA must accommodate that request within 30 days. The GSA also must hold a public hearing prior to adopting or amending a GSP. There must be at least 90 days between the notice issued to cities and counties and the public hearing. [CA Water Code Section 10728.4]

When imposing or increasing fees, SGMA sets forth the following noticing requirements:

- If a GSA intends to impose or increase a fee, it must first hold at least one public meeting, at which attendees may make oral or written comments. See below for requirements for public notice of the meeting:
  - Information about the time and place of the meeting and a general explanation of the topic to be discussed.
  - Public notice must be posted on the GSA's website and mailed to any interested party who submits a written request for mailed notice of meetings on new or increased fees.
  - The public notice must also be consistent with Section 6066 of the Government Code.
  - In addition, the GSA must share with the public the data upon which the proposed fee is based, and this must be done at least ten days before the public meeting takes place. [CA Water Code Section 10730.(b)(1),(2), and (3). (Note: Additional processes are required under Proposition 218 and 26 related to taxes; these processes are not currently referenced in this document but should be followed as relevant.)
  - In addition to complying with the formal meeting notice requirements, in order to maximize participation we recommend informing the public as soon as the meeting is scheduled – if possible, at least 10 business days before.

3. Advisory Committees

SGMA explicitly authorizes GSAs to form Public Advisory Committees if they choose but does not require them to do so. The decision to form an advisory committee is left to the individual GSAs, based on the need and effectiveness of these processes within their communities. For example, the Madera County GSA convenes an Advisory Committee with members representing diverse stakeholders within the GSA.

GSAs that have advisory committees should consider mobilizing members to support outreach. For example, members of GSA advisory committees who are also part of an organization representing a beneficial user group should report out to each about the efforts of the other so that they can remain abreast of appropriate times to share information and input.

Conclusion

SGMA requires that diverse stakeholders be engaged in development as well as implementation of GSPs. Engagement during the implementation phase focuses on sharing information and gathering feedback from the public at key junctures, such as when monitoring information comes to light, projects are being developed, or input from beneficial users is necessary to move implementation forward. These recommendations, including strategies for outreach at the regional/subbasin-wide and the local/GSA levels, will assist the Madera Subbasin GSAs in their strategic communication and engagement during implementation of GSP activities.

Appendix E. Status of Monitoring Efforts for RMS Wells in Madera Subbasin.

Appendix E. Table 1 - Status of Monitoring Efforts for RMS Wells in Madera Subbasin

Subbasin	GSA	RMS ID	Fall 2021 Monitoring Status	Most Recent Successful WL Msmt	Most Recent Successful WL Msmt (Season)
Madera	City of Madera	COM RMS-1	Currently Monitored	11/8/2021	Fall 2021
Madera	City of Madera	COM RMS-2	Currently Monitored	11/10/2021	Fall 2021
Madera	City of Madera	COM RMS-3	Currently Monitored	11/17/2021	Fall 2021
Madera	County of Madera	MCE RMS-1	NM - Temporarily inaccessible	3/16/2021	Spring 2021
Madera	County of Madera	MCE RMS-2	Currently Monitored	11/10/2021	Fall 2021
Madera	County of Madera	MCE RMS-3	Currently Monitored	11/10/2021	Fall 2021
Madera	County of Madera	MCE RMS-4	NM - Tape hung up	3/30/2021	Spring 2021
Madera	County of Madera	MCE RMS-5	Currently Monitored	11/10/2021	Fall 2021
Madera	County of Madera	MCE RMS-6	Currently Monitored	10/4/2021	Fall 2021
Madera	County of Madera	MCE RMS-7	NM - Well has been destroyed	10/18/2018	Fall 2018
Madera	County of Madera	MCE RMS-8	NM - Special/Other	10/16/2015	Fall 2015
Madera	County of Madera	MCE RMS-9	Need to follow up with SJRRP.	12/6/2019	Fall 2019
Madera	County of Madera	MCW RMS-1	NM - Unable to locate well	10/18/2019	Fall 2019
Madera	County of Madera	MCW RMS-2	NM - Can't get tape in casing	3/12/2021	Spring 2021
Madera	County of Madera	MCW RMS-3	NM - Tape hung up	3/13/2019	Spring 2019
Madera	County of Madera	MCW RMS-4	Currently Monitored	10/7/2021	Fall 2021
Madera	County of Madera	MCW RMS-5	Need to follow up with SJRRP.	6/20/2018	Summer 2018
Madera	Madera Irrigation District	MID RMS-1	NM - Special/Other	10/17/2019	Fall 2019
Madera	Madera Irrigation District	MID RMS-2	Need to reengage with well owner.	12/3/2020	Fall 2020
Madera	Madera Irrigation District	MID RMS-3	Currently Monitored	10/13/2021	Fall 2021
Madera	Madera Irrigation District	MID RMS-4	Currently Monitored	10/21/2021	Fall 2021
Madera	Madera Irrigation District	MID RMS-5	Currently Monitored	10/12/2021	Fall 2021
Madera	Madera Irrigation District	MID RMS-6	Currently Monitored	10/20/2021	Fall 2021
Madera	Madera Irrigation District	MID RMS-7	Currently Monitored	10/12/2021	Fall 2021
Madera	Madera Irrigation District	MID RMS-8	Need to reengage with well owner.	2/14/2014	Spring 2014

Appendix E. Table 1 - Status of Monitoring Efforts for RMS Wells in Madera Subbasin

Subbasin	GSA	RMS ID	Fall 2021 Monitoring Status	Most Recent Successful WL Msmt	Most Recent Successful WL Msmt (Season)
Madera	Madera Irrigation District	MID RMS-9	Need to reengage with well owner.	2/12/2014	Spring 2014
Madera	Madera Irrigation District	MID RMS-10	Currently Monitored	10/27/2021	Fall 2021
Madera	Madera Irrigation District	MID RMS-11	Currently Monitored	10/7/2021	Fall 2021
Madera	Madera Irrigation District	MID RMS-12	Currently Monitored	10/20/2021	Fall 2021
Madera	Madera Irrigation District	MID RMS-13	Unknown why this well was not monitored.	10/12/2020	Fall 2020
Madera	Madera Irrigation District	MID RMS-14	Need to reengage with well owner.	2/11/2014	Spring 2014
Madera	Madera Irrigation District	MID RMS-15	Currently Monitored	10/8/2021	Fall 2021
Madera	Madera Irrigation District	MID RMS-16	USBR/SJRRP reported that 2020 monitoring impacted by COVID-19.	10/15/2020	Fall 2020
Madera	Madera Irrigation District	MID RMS-17	Need to follow up with SJRRP.	12/10/2019	Fall 2019
Madera	Madera Water District	MWD RMS-1	Currently Monitored	11/9/2021	Fall 2021
Madera	Madera Water District	MWD RMS-2	Currently Monitored	11/9/2021	Fall 2021
Madera	Madera Water District	MWD RMS-3	Currently Monitored	11/9/2021	Fall 2021

NM = no measurement. Measurement attempted but was unsuccessful.

Appendix E. Table 2 - Status of Monitoring Efforts for Potential RMS Wells in Madera Subbasin

Subbasin	GSA	RMS ID	Fall 2021 Monitoring Status	Most Recent Successful WL Msmt	Most Recent Successful WL Msmt (Season)
Madera	County of Madera	MSB MW-3-139	Currently Monitored	10/21/2021	Fall 2021
Madera	County of Madera	MSB MW-3-295	Currently Monitored	10/21/2021	Fall 2021
Madera	County of Madera	MSB MW-3-430	Currently Monitored	10/21/2021	Fall 2021
Madera	County of Madera	MSB MW-4-375	Currently Monitored	10/20/2021	Fall 2021
Madera	County of Madera	MSB MW-4-695	Currently Monitored	10/20/2021	Fall 2021
Madera	County of Madera	MSB MW-4-905	Currently Monitored	10/20/2021	Fall 2021
Madera	County of Madera	MSB MW-5-210	Currently Monitored	10/21/2021	Fall 2021
Madera	County of Madera	MSB MW-5-375	Currently Monitored	10/21/2021	Fall 2021
Madera	County of Madera	MSB MW-5-590	Currently Monitored	10/21/2021	Fall 2021
Madera	Gravelly Ford Water District	MSB MW-6-350	Currently Monitored	10/21/2021	Fall 2021
Madera	Gravelly Ford Water District	MSB MW-6-520	Currently Monitored	10/21/2021	Fall 2021
Madera	Gravelly Ford Water District	MSB MW-6-715	Currently Monitored	10/21/2021	Fall 2021
Madera	Madera Irrigation District	MSB MW-9-320	Currently Monitored	10/21/2021	Fall 2021
Madera	Madera Irrigation District	MSB MW-9-725	Currently Monitored	10/21/2021	Fall 2021
Madera	Madera Irrigation District	MSB MW-9-955	Currently Monitored	10/21/2021	Fall 2021
Madera	County of Madera	MSB MW-10-330	Currently Monitored	10/20/2021	Fall 2021
Madera	County of Madera	MSB MW-10-510	Currently Monitored	10/20/2021	Fall 2021
Madera	County of Madera	MSB MW-10-880	Currently Monitored	10/20/2021	Fall 2021
Madera	County of Madera	MSB MW-11-345	Currently Monitored	10/20/2021	Fall 2021
Madera	County of Madera	MSB MW-11-695	Currently Monitored	10/20/2021	Fall 2021
Madera	County of Madera	MSB MW-11-880	Currently Monitored	10/20/2021	Fall 2021