ANNUAL REPORT | APRIL 2023

VINA SUBBASIN (5-021.57) GROUNDWATER SUSTAINABILITY PLAN ANNUAL REPORT – 2022

SUBMITTED BY

VINA AND ROCK CREEK RECLAMATION DISTRICT GROUNDWATER SUSTAINABILITY AGENCIES

PREPARED UNDER CONTRACT WITH

BUTTE COUNTY DEPARTMENT OF WATER AND RESOURCE CONSERVATION

PREPARED BY

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
°F	Degrees Fahrenheit
AF	Acre-Feet
AFY	Acre-Feet per Year
BBGM	Butte Basin Groundwater Model
Cal Water Chico	California Water Service, Chico
CFS	Cubic Feet per Second
Drought Plan	Butte County Drought Preparedness and Mitigation Plan
DTF	Drought Task Force
DWR	Department of Water Resources
EH	Butte County Environmental Health Division of the Public Health Department
ET	Evapotranspiration
ft	Feet
GPCD	Gallons per Capita per Day
GSP	Groundwater Sustainability Plan
GSA	Groundwater Sustainability Agency
MA	Management Area
MO	Measurable Objective
MT	Minimum Threshold
OEM	Office of Emergency Management
OSWCR	Online System of Well Completion Reports
PID	Paradise Irrigation District
PMAs	Projects and Management Actions
RCRD	Rock Creek Reclamation District
RMS	Representative Monitoring Site
SGMA	Sustainable Groundwater Management Act
SMC	Sustainable Management Criteria
SRSC	Sacramento River Settlement Contractors
Subbasin	Vina Subbasin

Acronym	Meaning
°F	Degrees Fahrenheit
SWP	State Water Project
SWRCB	State Water Resources Control Board
USBR	United States Bureau of Reclamation
UWMP	Urban Water Management Plan
WY	Water Year

EXECUTIVE SUMMARY

The Vina Subbasin (Subbasin) (5 021.57) Annual Report was prepared on behalf of the Vina Groundwater Sustainability Agency (GSA) and the Rock Creek Reclamation District (RCRD) GSA to fulfill the statutory requirements set by the Sustainable Groundwater Management Act (SGMA) legislation (§10728) and the Groundwater Sustainability Plan (GSP) regulations (§354.40 and §356.2) developed by the California Department of Water Resources (DWR). The regulations mandate the submission of an Annual Report to DWR by April 1st after the reporting year, which spans from October 1st to September 30th. This second Annual Report includes information from the recent water year (WY) 2022 for the Vina Subbasin, located within Butte County and shown in **Figure ES-1.**

The western United States is currently experiencing one of the worst and most extensive droughts in its history, and during the summer of 2022, drought conditions in the Subbasin were classified as "severe" and "extreme" by the U.S. Drought Monitor (https://droughtmonitor.unl.edu/). The Northern Sierra 8-Station summary showed that WY 2022 had lower precipitation than roughly 60% of the previous years since measurement began in WY 1921. The Northern Sacramento region was classified as a critically dry water year according to the 40-30-30 Water Year Index for WY 2022. Above-average evapotranspiration and below-average precipitation were observed in Butte County and below average flow rates were observed in both Butte Creek and Big Chico Creek. Drought conditions have resulted in reduced surface water supplies due to curtailment of water rights by the State Board, increased groundwater pumping to satisfy water demands, dry groundwater wells, increased well drilling and deepening, increased pumping costs, and decreased recreational opportunities in the Subbasin during 2022. In WY 2022, 59 reports of dry or reduced capacity wells have been made by residents through various programs tracking drought conditions within the Subbasin. However, according to a well vulnerability analysis, 56 wells were identified as potentially going dry or having reduced capacity next year near the Chico and Durham areas.

Groundwater conditions in the Subbasin are on track to meet the first 5-year 2027 Interim Milestone for groundwater levels at each of the Representative Monitoring Network (RMS) wells. Groundwater elevations in the Subbasin continued to show slight declines as seen in recent years and were generally slightly lower than groundwater elevations in recent years. New historical water level lows were reached in some wells however, lower groundwater conditions are likely to improve to some degree once the drought ends during wetter hydrological conditions. Groundwater elevations remained near or above the Measurable Objectives (MO) and above the corresponding Minimum Thresholds and therefore remained within the subbasin’s Margin of Operational Flexibility established for each RMS well, hence avoiding undesirable results related to groundwater levels as defined in the GSP.

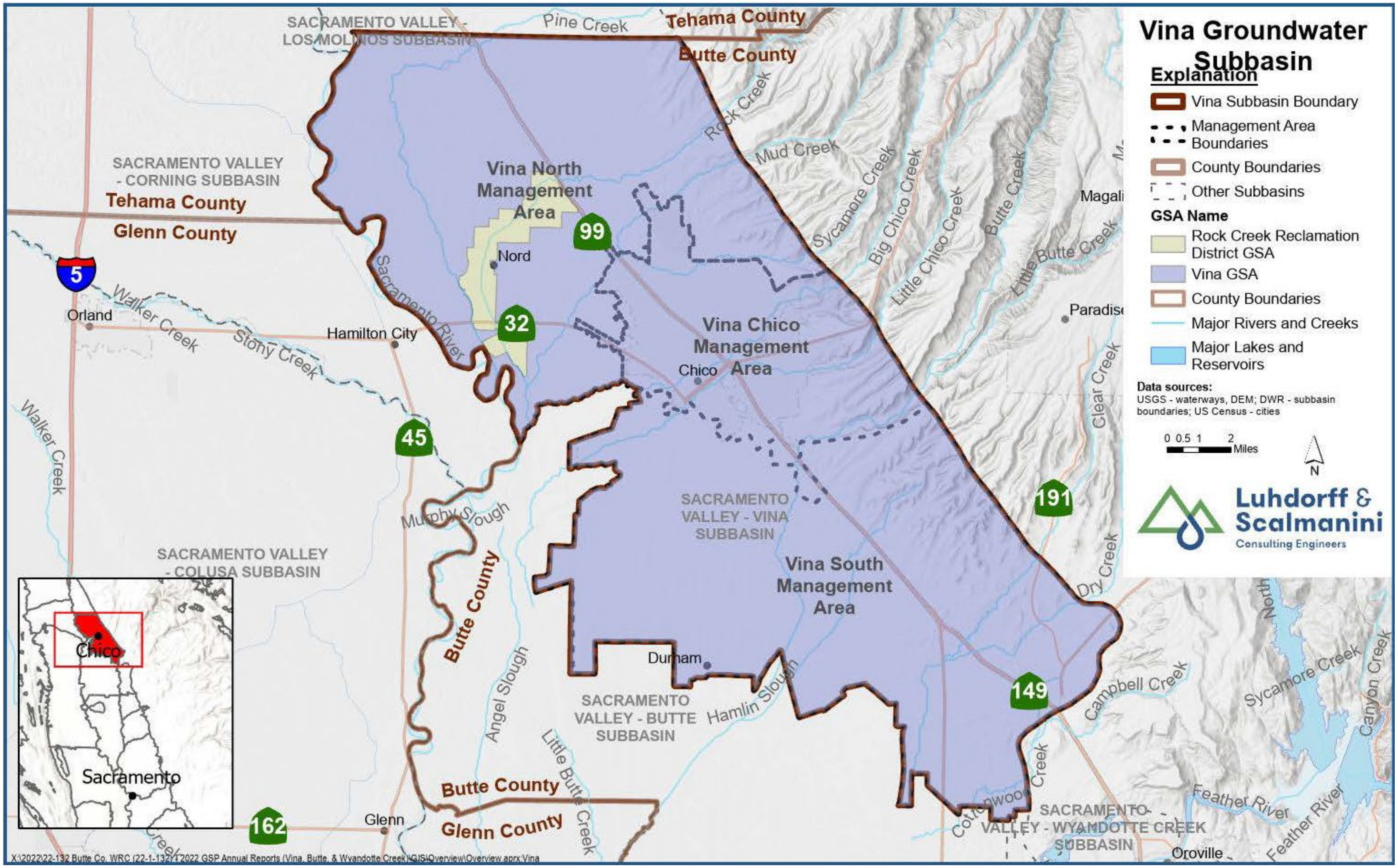


Figure ES-1. Vina Subbasin Boundaries, Groundwater Sustainability Agencies, and Management Areas

Last WY, outside of precipitation, groundwater supplied the majority (93%) of water used[1] within the Subbasin. Agricultural demand used the majority of the water in the subbasin, however municipal and rural users and native vegetation also rely on these water supplies. The volume of groundwater and surface water used on an annual basis within the Subbasin is summarized directly from measured and reported groundwater pumping and surface water diversions when available, however a water budget approach has been used to estimate the remaining, unmeasured volume of groundwater extraction. Groundwater extractions were about 278,700 (AF) in WY 2022, slightly lower than the average annual extractions of the last four Critical WYs on record (2008, 2014, 2015 and 2021) which was 279,745 AF. with the majority (91%) of groundwater[1] being used for agriculture. In drought years, agricultural groundwater extraction increases relative to long-term average demand due to less rainfall and increased evapotranspiration associated with hotter, drier conditions.

In WY 2022, surface water supplied 7% of the agricultural water demand in the Subbasin. The annual volume of surface water delivered to the Subbasin from Butte and Mud Creeks was about 20,500 AF in 2022. Table ES-1 provides a summary of water use by source and sector.

Table ES-1. Vina Subbasin Total Water Use by Water Use Sector

Sector	WY 2022 (AF)		
	Groundwater	Surface Water	Total
Agricultural	253,800	20,500	**274,300**
Municipal	22,300	0	**22,300**
Rural Residential	2,600	0	**2,600**
Native Vegetation (Plant groundwater uptake)	76,000	0	**76,000**
Total	**354,700**	**20,500**	**375,200**
Total (excluding Native Vegetation[1])	**278,700**	**20,500**	**299,200**

[1] Since environmental groundwater use involves natural plant uptake of shallow groundwater, not direct pumping and extraction, a total volume is calculated that excludes it.

Fluctuations in groundwater levels and storage occur when there is an imbalance between the amount of water recharged into the aquifer and the amount of water removed from it. Groundwater levels can be used as a proxy to estimate changes in groundwater storage. The pattern of changes in groundwater storage in the Subbasin typically follows the majority of the Sacramento Valley. During dry years and drought conditions, groundwater storage decreases due to increased extraction and reduced recharge. In 2022, a Critical WY, the groundwater storage decrease was approximately -90,700 AF due to increased extraction and reduced natural recharge. For context, in the past 22 years the largest decrease in groundwater storage is estimated to be -151,700 AF and the highest increase was estimated to be 144,100 AF. **Figure ES-2** shows groundwater pumping, as well as annual and cumulative change in groundwater storage from 2000 to 2022.

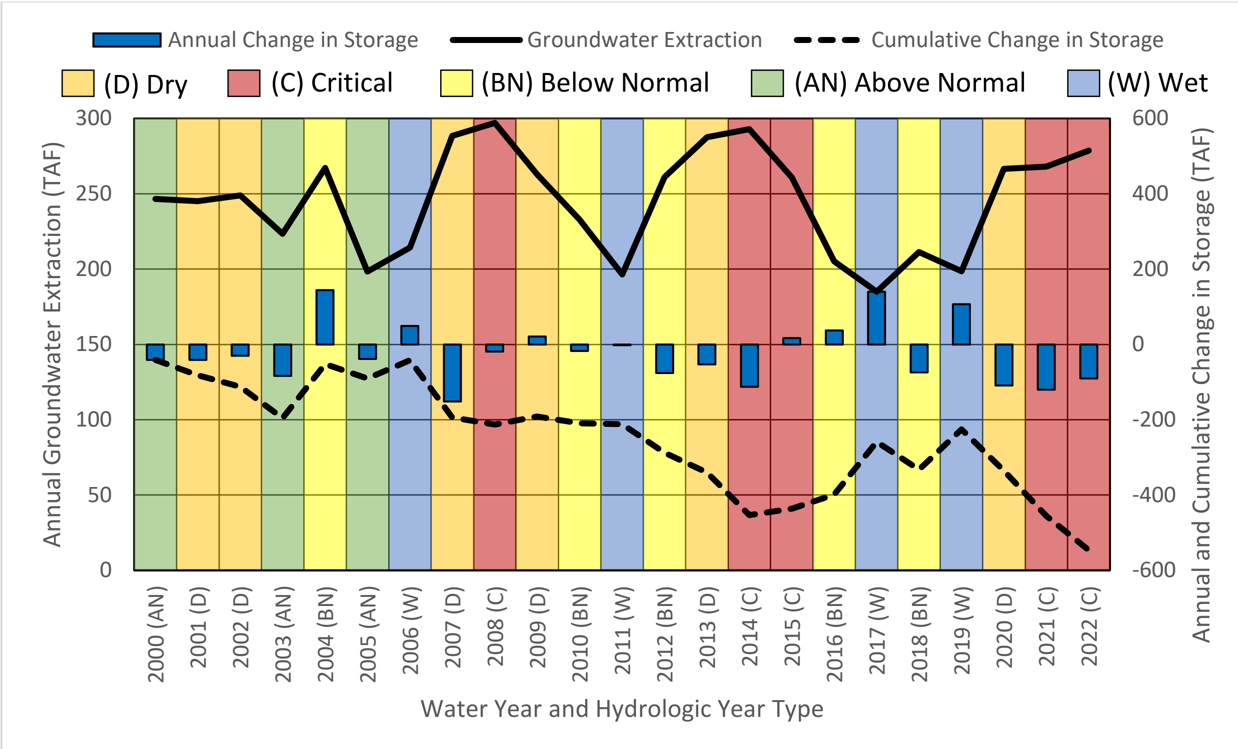


Figure ES-2. Groundwater Pumping, Annual and Cumulative Change in Storage from 2000 to 2022

Since the previous Annual Report, the Vina and Rock Creek GSAs have coordinated with stakeholders to seek funding through DWR's Sustainable Groundwater Management Grant Program for a number of projects previously identified in the GSP. A draft awards list for the grant application is anticipated to be released by DWR in June 2023. Additionally, several actions continue to fulfill GSP requirements, such as monitoring groundwater levels and quality, updating the Data Management System, and annual reporting to DWR. The Vina and Rock Creek GSAs have also recently made progress made on various projects and management actions, demonstrating both GSAs commitments to allocating the necessary time and resources to achieve long-term sustainable management of groundwater resources in the Subbasin.

1 GENERAL INFORMATION – §356.2(A)

The Annual Report for the Vina Subbasin (Subbasin) (5-021.57) was prepared on behalf of the Vina Groundwater Sustainability Agency (GSA) and the Rock Creek Reclamation District (RCRD) GSA to fulfill the statutory requirements of the Sustainable Groundwater Management Act (SGMA) legislation (§10728) and regulatory requirements developed by the California Department of Water Resources (DWR) included in the Groundwater Sustainability Plan (GSP) regulations (§354.40 and §356.2). The regulations require the GSA to submit an Annual Report to DWR by April 1st following the reporting year (October through September). This is the second Annual Report submitted on behalf of the Subbasin and includes data for the most recent reporting year water year (WY) 2022.

1.1 Report Contents

This report is the second Annual Report prepared for the adopted Vina GSP submitted in January 2021. The first Annual Report included data elements for the first reporting year, WY 2021, as well as a “bridge year,” WY 2020. This Annual Report will only include data for the current reporting year, WY 2022. Data elements presented in this report refer to WY 2022, the 12-month period starting October 1, 2021 through September 30, 2022 unless otherwise noted. Pursuant to GSP regulations, the Annual Report includes:

- Groundwater Elevation Data
- Water Supply and Use
- Change in Groundwater Storage
- GSP Implementation Progress

1.2 Basin Setting

The Subbasin is a 288.9 square mile (184,917 acres) area on the western side of Butte County. The Subbasin is managed by the Vina and Rock Creek Reclamation District GSAs. The two GSAs worked cooperatively to develop and submit a single GSP for the Vina Subbasin and submit a single yearly Annual Report.

The Subbasin is shown on the map, **Figure 1-1** and **Figure 1-2**. The Subbasin lies in the eastern central portion of the Sacramento Valley Groundwater Basin, **Figure 1-2**. The Subbasin’s northern boundary is the Butte-Tehama County line, the western boundary is the Butte-Glenn County line, the southern boundary is a combination of property boundaries owned by M&T Ranch, Reclamation District 2106, and Western Canal Water District and the eastern boundary is the edge of the alluvium as defined by DWR Bulletin 118 (DWR, 2004) **(Figure 1-1)**. Several streams traverse the Subbasin moving northeast to southwest to include Big Chico Creek, Butte Creek, Mud Creek, and Rock Creek. Groundwater similarly flows from north to southwest generally toward the Sacramento River.

The GSP defines three management areas (MAs) in the Vina Subbasin: Vina North, Vina Chico, and Vina South. Although all stakeholders have a shared interest in sustainable management of groundwater in this predominantly groundwater dependent subbasin, the landscape of beneficial users varies between MAs. Vina North is dominated by irrigated agriculture dependent on wells with sparsely distributed rural residential domestic well users and the small community of Nord. The Vina Chico MA is predominantly an urban area with California Water Service, Chico (Cal Water, Chico) providing groundwater supplies for residential and municipal/industrial use. To a very limited extent, private domestic wells provide the primary source of water to households or in some cases provide a secondary supply for outdoor water use. The Vina South MA is dominated by irrigated agriculture dependent on groundwater and to a lesser extent, surface water diversions primarily from Butte Creek. In and around the community of Durham, significant numbers of rural residents and ranchettes depend on groundwater typically from relatively shallow domestic wells interspersed with agricultural land uses. In addition, Durham Irrigation District serves household water needs using groundwater from district wells for a portion of the Durham community.

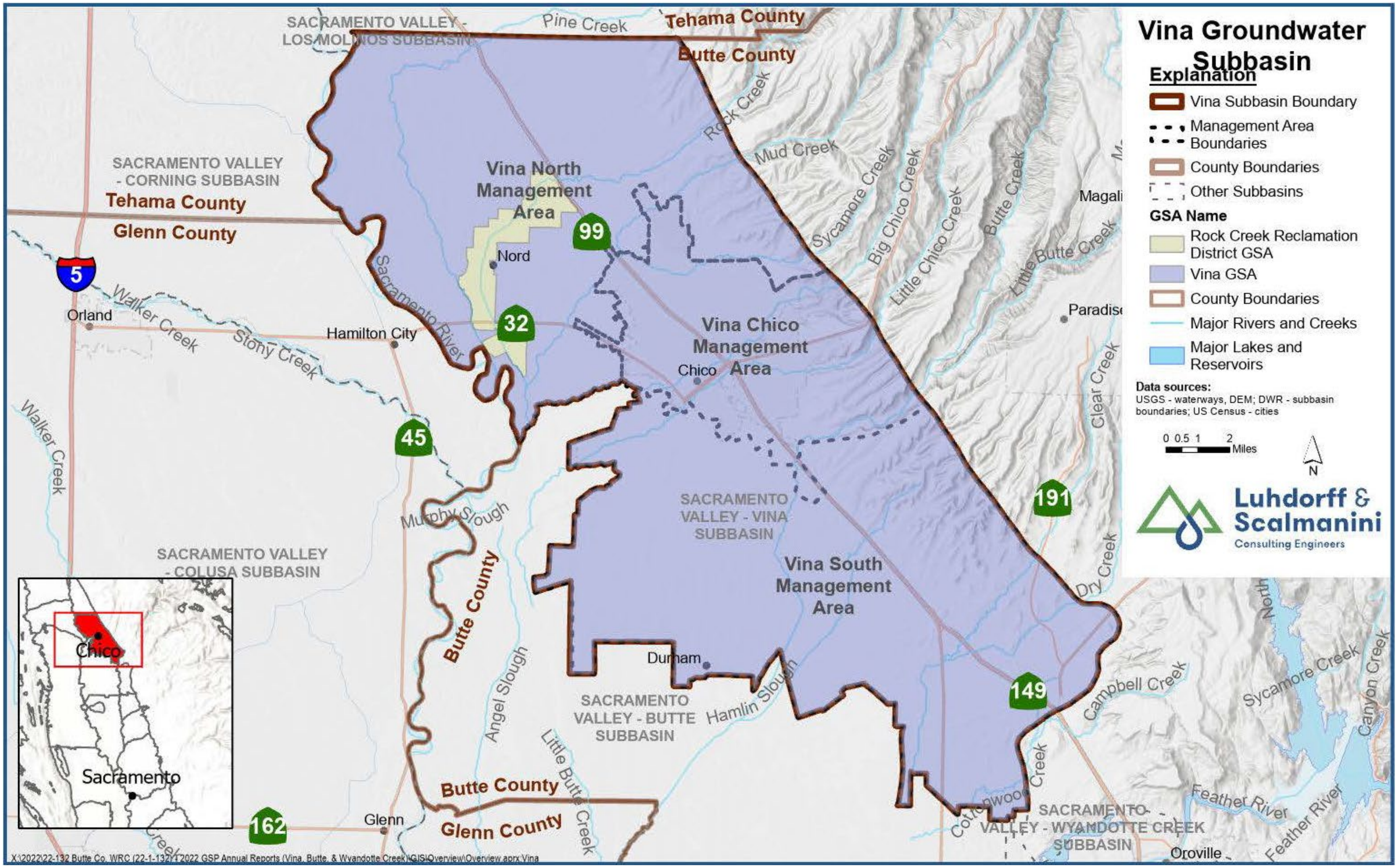


Figure 1-1. Vina Subbasin Boundaries, Groundwater Sustainability Agencies, and Management Areas

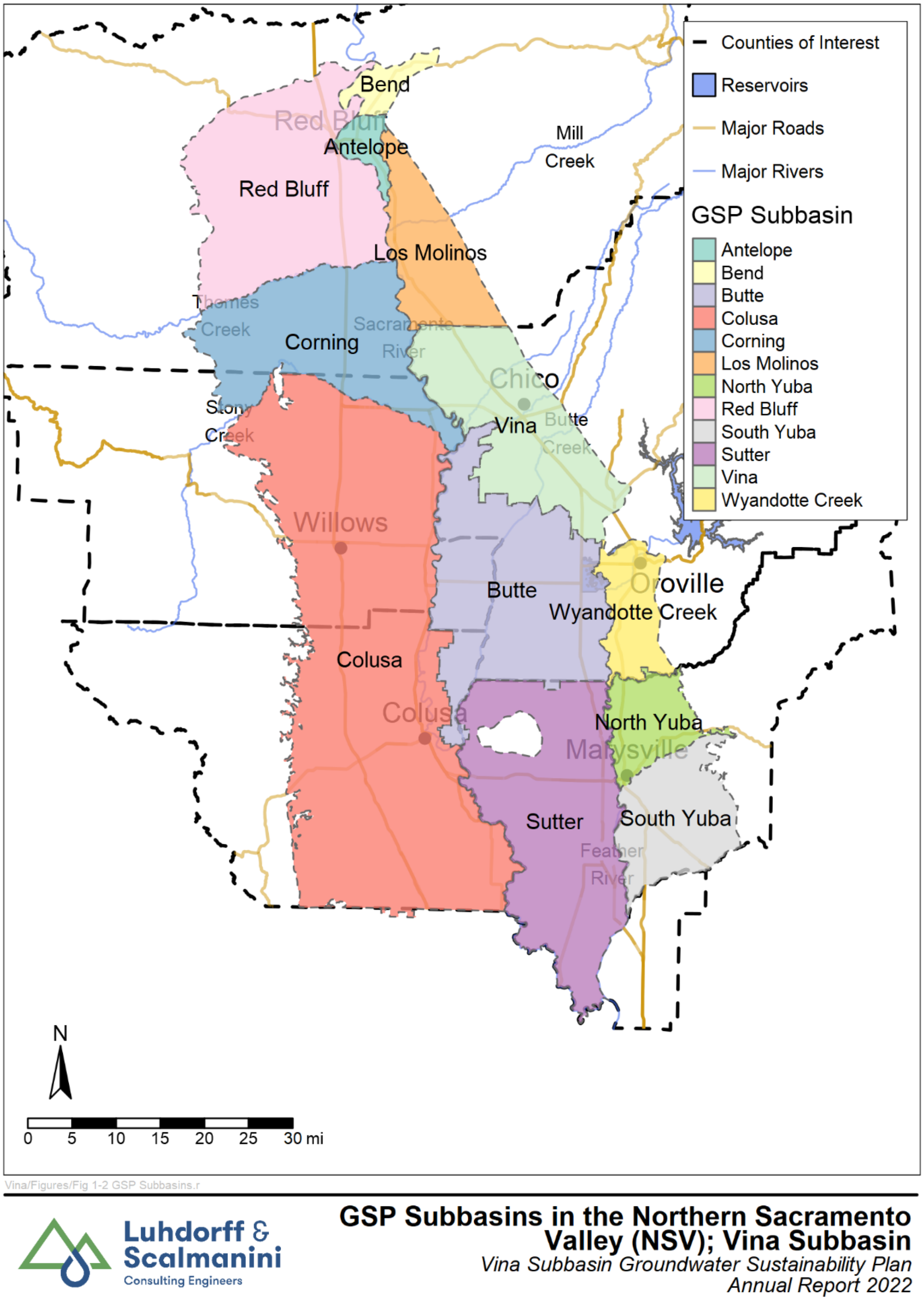


Figure 1-2. GSP Subbasins in the Northern Sacramento Valley (NSV)

The Vina GSP estimates sustainable yield of the Subbasin to be 233,500 acre-feet per year (AFY) based on historical groundwater pumping averages 243,500 AFY, an annual decrease of 10,000 AFY (Geosyntec, 2021). Water use in the Subbasin is dominated by agricultural uses including nut and fruit trees, vineyards, row crops, grazing and rice fields. Municipal water accounts for about 10% of the total water budget with the majority going towards the City of Chico. Groundwater constitutes the majority of the Subbasin's water supplies.

1.3 Current Conditions

This Annual Report coincides with one of the most severe and extensive droughts ever to occur in the western United States. Drought conditions in the Subbasin remained "severe" and "extreme" during summer of 2022 as per classifications provided by the U.S. Drought Monitor (https://droughtmonitor.unl.edu/). Drought conditions have resulted in reduced surface water supplies due to curtailment of water rights by the State Board, increased groundwater pumping to satisfy water demands, dry groundwater wells, increased well drilling and deepening, increased pumping costs, and decreased recreational opportunities in the Subbasin during 2022.

1.3.1 Climate

In WY 2022 the Durham California Irrigation Management Information System (CIMIS) station recorded a total evapotranspiration (ET) and precipitation of 51.7 and 14.8 inches (**Figure 1-3**), respectively. The WY 2022 ET recorded is 1.4 inches above the 32-year average (1990-2022) and precipitation is 6.4 inches below. Data from this station is included as an indication of climate conditions experienced in the valley and within the subbasin.

The Northern Sierra 8-Station Summary is a collection of eight precipitation gages in the mountains of Northern California. WY 2022 was a critically dry year and was dryer than roughly 60 percent of the previous years since measurement began in WY 1921 (**Figure 1-4**). The total precipitation in WY 2022 was 43.0 inches, which was 8.1 inches below the 102-year average. The location of the stations used in the 8-station index are shown in **Figure 1-5.** This index is included as an indication of the water year type from a more regional perspective that reflects higher elevation precipitation and resulting runoff conditions into the Sacramento Valley.

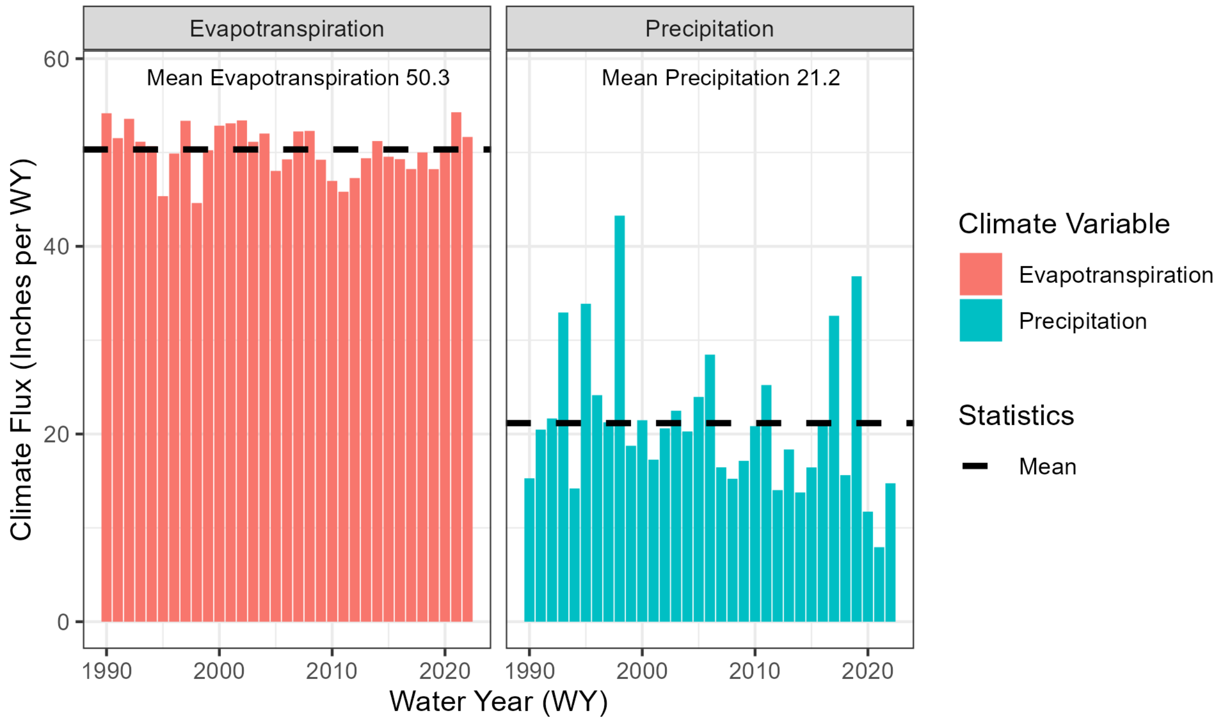


Figure 1-3. Summary of Durham California Irrigation Management Information System (CIMIS) Station

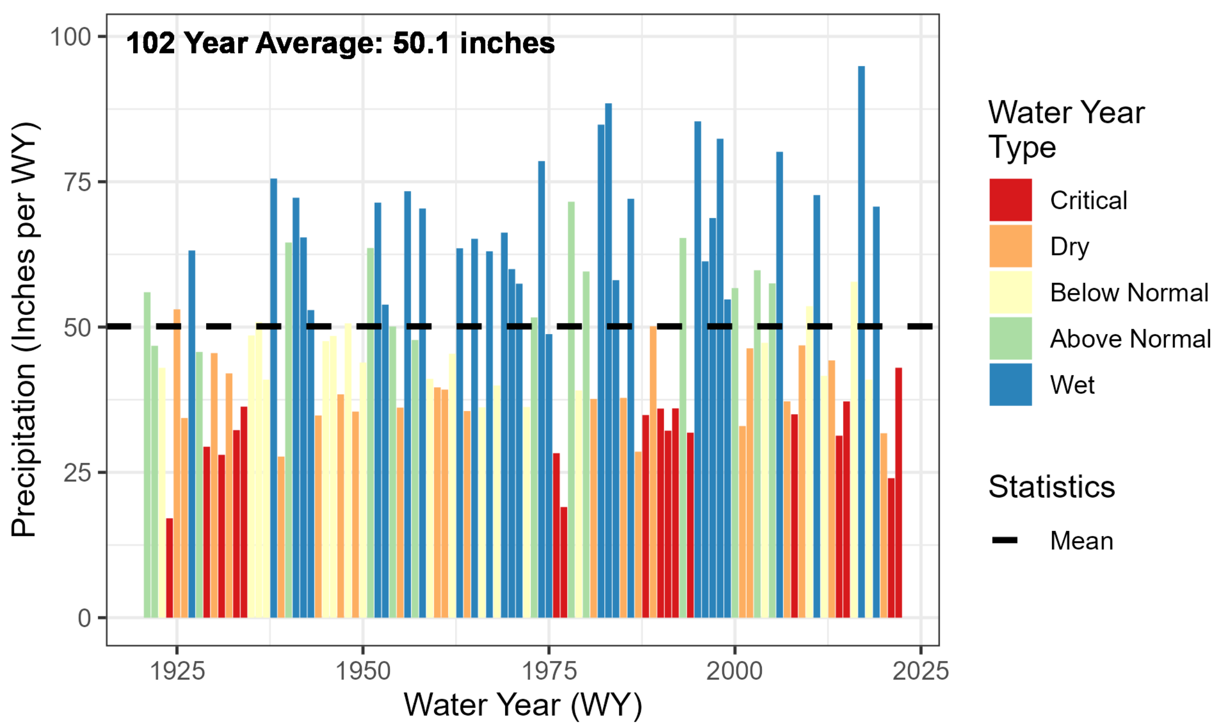


Figure 1-4. Climate Summary from the Northern Sierra 8-Station Index

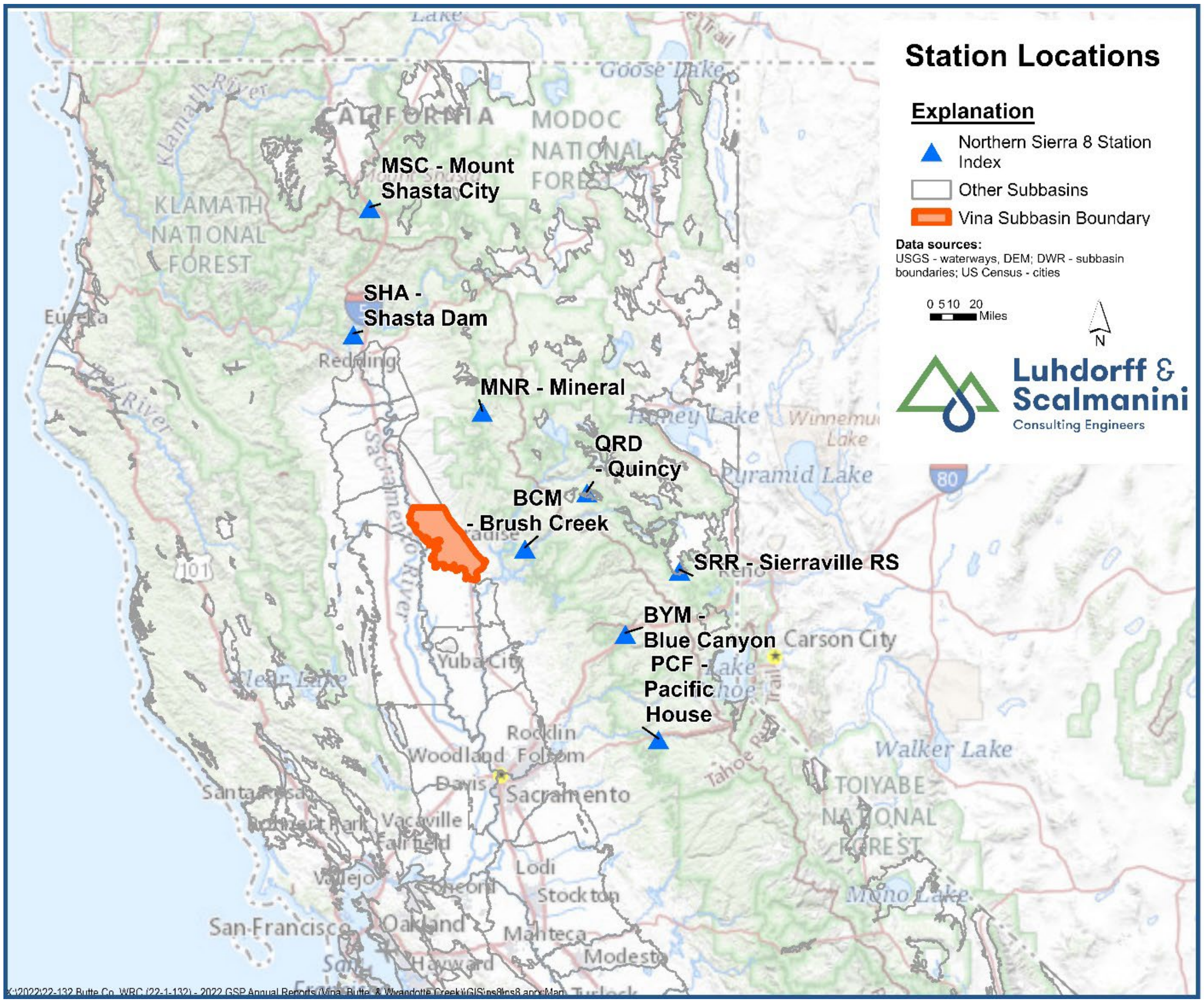


Figure 1-5. Northern Sierra 8-Station Index (Station Locations)

1.3.2 Streamflow

Streamflow is presented at two locations within the Subbasin (**Table 1-1; Figure 1-6**). These two locations represent Butte Creek (**Figure 1-7**) and Big Chico Creek (**Figure 1-8**) which traverse the subbasin and at times contribute recharge to the groundwater system. In general, WY 2022 saw low flow rates across both creeks. The highest and lowest flow rates since 2014 occurred in WYs 2017, and 2021 respectively, with the exception of WY 2022 being the lowest flow rate for the ORD station on the Sacramento River. Some hydrographs have breaks in the data when no data was recorded at the station.

Table 1-1. Mean Yearly Surface Flows of Selected Stations (cubic feet per second)

Station	River	2014 (C)	2015 (C)	2016 (BN)	2017 (W)	2018 (BN)	2019 (W)	2020 (D)	2021 (C)	2022 (C)
BCD	Butte Creek	104	123	293	786	203	417	146	80	211
BIC	Big Chico Creek	42	524	731	859	547	451	61	36	77
ORD	Sacramento River	5,771	7,167	9,715	22,110	7,185	16,679	7,081	5,266	5,226

Water Year Types Classified According to the Sacramento Valley Water Year Index:
AN = Above Normal, BN = Below Normal, C = Critical, D = Dry, W = Wet

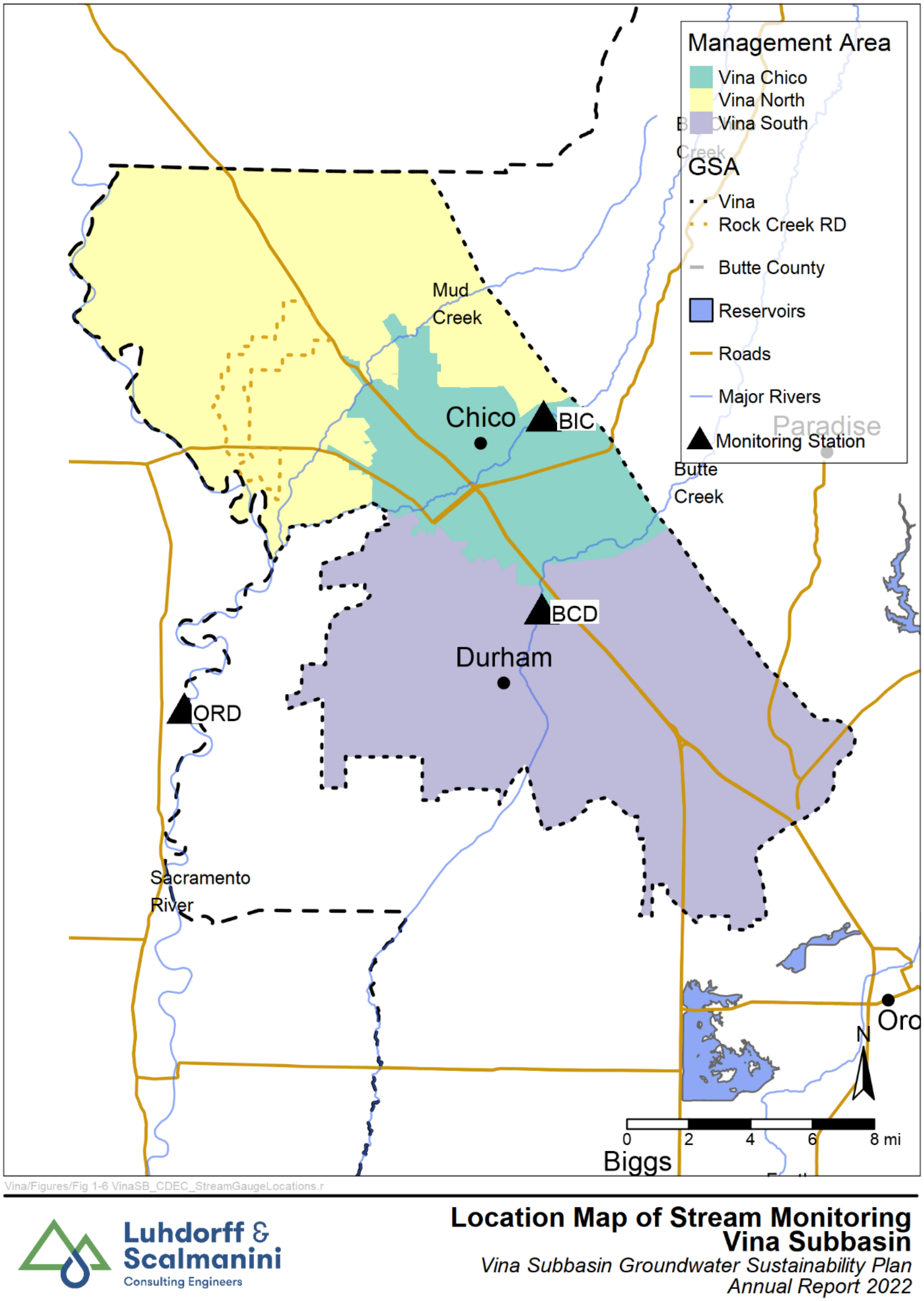


Figure 1-6. Location Map of Streamflow Monitoring

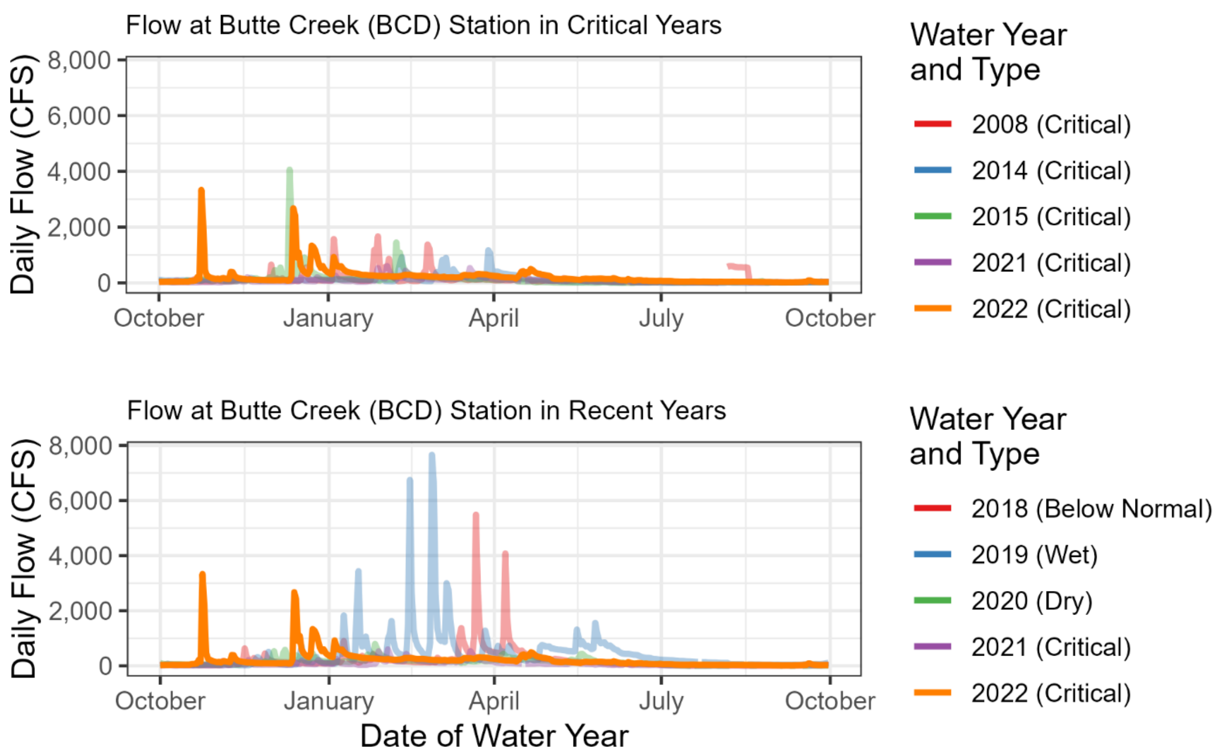


Figure 1-7. Flow at Butte Creek (BCD) Station

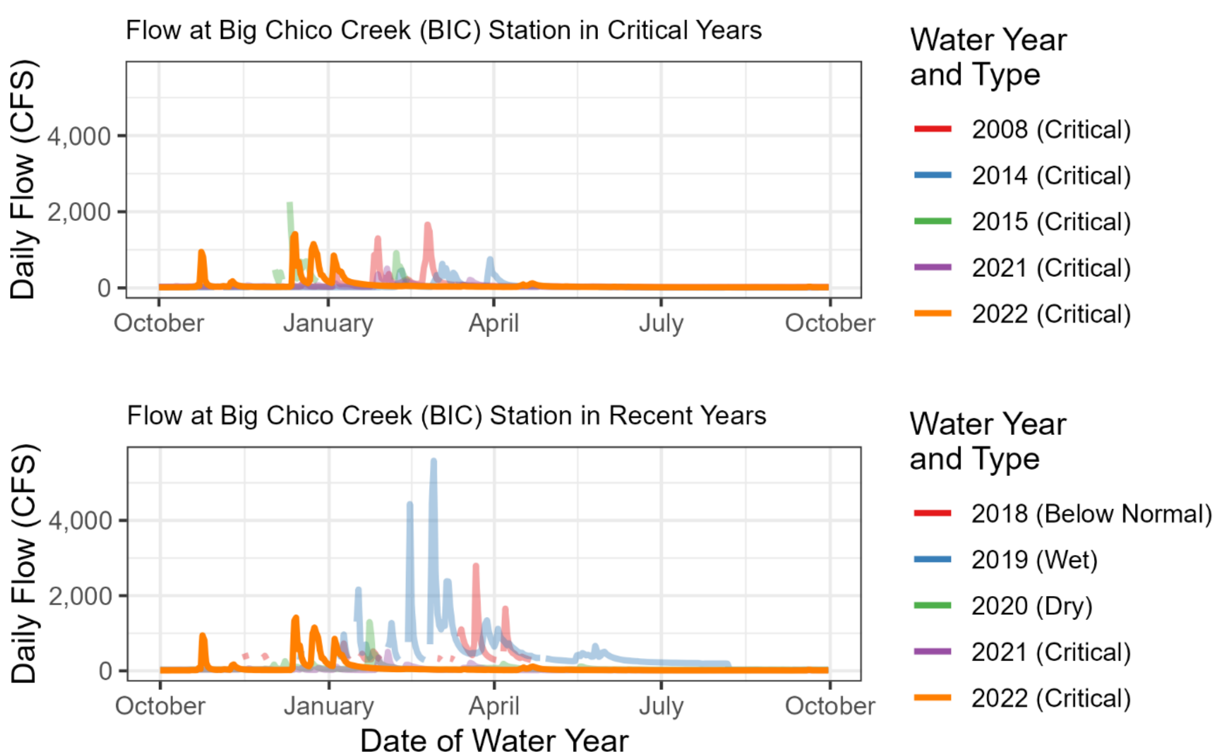


Figure 1-8. Flow at Big Chico Creek (BIC) Station

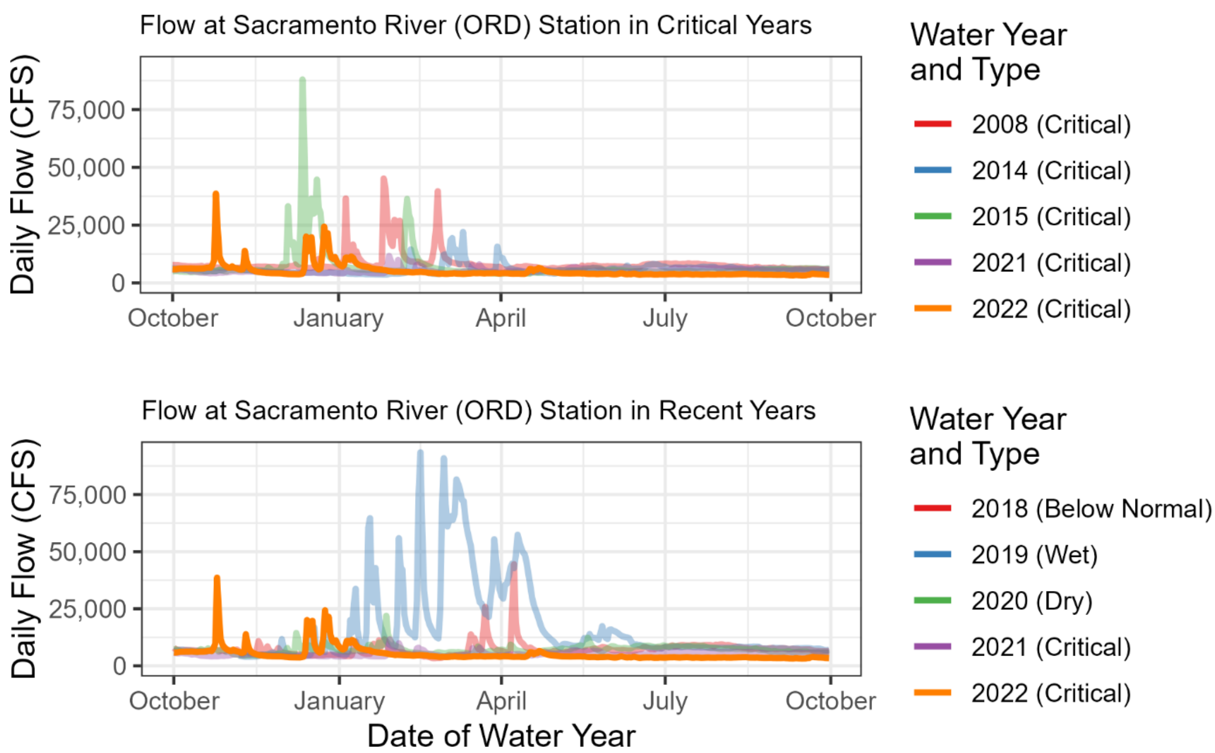
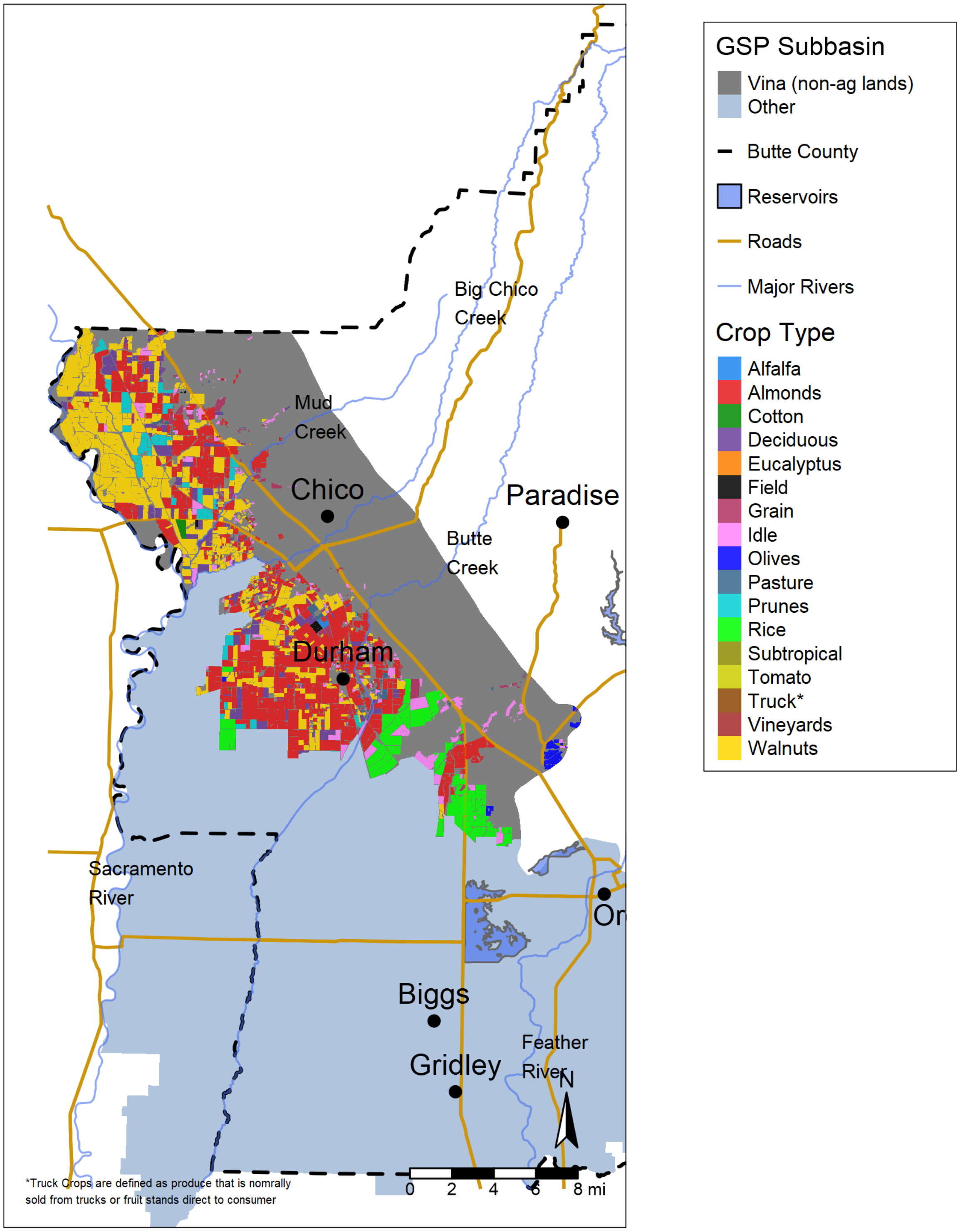


Figure 1-9. Flow at Sacramento River (ORD) Station

1.3.3 Agricultural Acreage

Land use trends in the Subbasin were examined based on Land IQ data (LandIQ, 2023) use classifications were kept consistent with the BBGM land use classes. Total agricultural acreage in 2022 is estimated to be 78,700 acres. Due to the availability of Land IQ data, agricultural acreages were compared from 2018 to 2022 **(Table 1-2)**. This comparison shows the change from a Below Normal (2018) to Critical (2022) Water Year type. Long term trends, like those presented in the 20-Year Land and Water Use Change in Butte County and the Vina Subbasin (1999-2019) (Land IQ, 2021) requires multi-year averages to capture true agricultural expansion and/or contraction. Orchard deciduous crops, mainly young perennials, and walnut orchard acreages increased by 1,400, and 100 acres, respectively. Fallowed land increased by almost 1,400 acres. Almond and grain crop acreage declined by 1,200 and 800 acres, respectively. The remaining land use classes were largely unchanged. Analysis of land use changes shows that the increase in deciduous crops came largely from almonds and walnuts, these orchards are most likely replanting of older orchards and are classified as young perennials. Increased walnut acreages are attributed to conversion of deciduous, almond, and grain crops. Increases in fallowed land were due to fallowing of rice and grain crops. Overall, from 2018 to 2022 agricultural acreage decreased by 150 acres including fallowed lands. A map of 2022 agricultural acreage in Vina Subbasin is presented below in **Figure 1-10**.



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Consulting Engineers

2022 Agricultural Acreages (Land IQ)
Vina Subbasin
Vina Subbasin Groundwater Sustainability Plan
Annual Report 2022

Figure 1-10. 2022 Agricultural Acreage (Land IQ)

Table 1-2. Agricultural Acreages for Major Crop Types in Subbasin (2018 & 2022)				
Land Use	**2018 (Acres 1,000x)**	**2022 (Acres 1,000x)**	**Change (Acres 1,000x)**	**Change (%)**
Rice	7.9	7.2	-0.8	-11%
Walnuts	25.8	25.9	0.1	0%
Idle or Fallow	2.9	4.3	1.4	32%
Almonds	30.9	29.7	-1.2	-4%
Deciduous*	3.7	5.0	1.4	27%
Prunes	2.8	2.8	0.0	2%
Grain	2.4	1.7	-0.8	-45%
Pasture	0.7	0.6	0.0	-8%
Miscellaneous**	1.7	1.4	-0.3	-22%
Total	**78.8**	**78.7**	**-0.2**	

Mainly young perennials.

***Can include vineyards, olives, cotton, and field crops.*

1.3.4 Well Completion Reports

Well Completion Reports (WCRs) are submitted to DWR within 60 days of completed drilling of a new well. Information on the number of these reports submitted within the Vina Subbasin is from the DWR Online System for Well Completion Reports (OSWCR) (DWR, 2022). Over the past nine years, the Subbasin has averaged the installation of nine agricultural wells and 13 domestic wells per year (**Table 1-4**). Agricultural wells are typically larger diameter and installed to deeper depths than domestic wells (**Table 1-5**). Due to the deeper construction, total number of feet drilled for agricultural wells typically exceeds that of domestic wells, although this was not the case in 2022 (**Table 1-6**). **Figure 1-11** shows the depth of new domestic wells over time represented by a box and whisker plot. A steady increase in the average domestic well depth can be seen starting roughly in the 1960’s.

Table 1-4. Number of Well Completion Reports by Sector in Vina Subbasin									
Sector	**2014 (C)**	**2015 (C)**	**2016 (BN)**	**2017 (W)**	**2018 (BN)**	**2019 (W)**	**2020 (D)**	**2021 (C)**	**2022 (C)**
Agriculture	5	15	10	7	9	12	3	12	2
Domestic	16	25	10	8	8	18	10	9	12
Public or Industrial	1	1	3	--	--	--	--	1	--

Water Year Types Classified According to the Sacramento Valley Water Year Index:
AN = Above Normal, BN = Below Normal, C = Critical, D = Dry, W = Wet

Table 1-5. Median Depth of New Wells by Sector (feet) Over Time in Vina Subbasin									
Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022
	(C)	(C)	(BN)	(W)	(BN)	(W)	(D)	(C)	(C)
Agriculture	365	640	630	300	340	400	380	650	530
Domestic	208	235	210	200	210	200	268	220	283
Public or Industrial	255	572	1,225	--	--	--	--	200	--

Water Year Types Classified According to the Sacramento Valley Water Year Index:
AN = Above Normal, BN = Below Normal, C = Critical, D = Dry, W = Wet

Table 1-6. Total Drilled Feet of New Wells in Subbasin by Sector (feet) Over Time									
Sector	2014	2015	2016	2017	2018	2019	2020	2021	2022
	(C)	(C)	(BN)	(W)	(BN)	(W)	(D)	(C)	(C)
Agriculture	--	6,010	7,620	2,100	2,860	5,432	1,730	3,815	1,070
Domestic	--	4,140	1,854	833	1,426	3,671	2,725	1,710	3,140
Public or Industrial	--	--	2,037	--	--	--	--	--	--

Water Year Types Classified According to the Sacramento Valley Water Year Index:
AN = Above Normal, BN = Below Normal, C = Critical, D = Dry, W = Wet

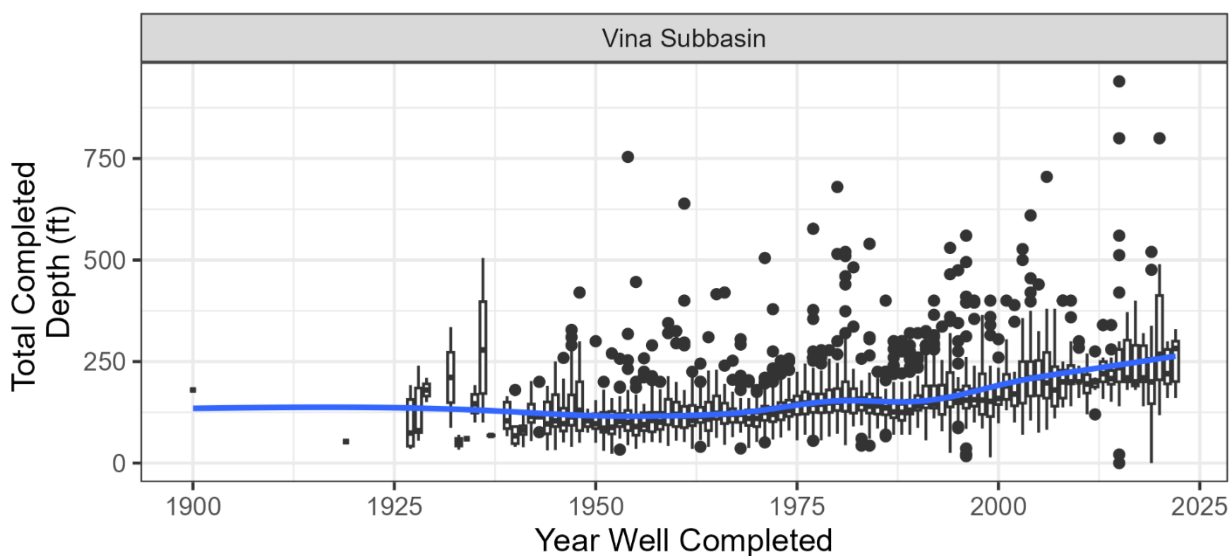


Figure 1-11. Depth of New Domestic Wells Drilled in Vina Subbasin

Note: In Figure 1-11, the vertical boxes represent 75% of the well depths, while the vertical black lines and points extend to show the other 25% of well depths each year. The blue line is a regression fitted by least squares method and represents the trend of depth of domestic well depths through time.

1.3.5 Drought Restrictions and Dry Wells

The California drought stressed multiple areas of the State during WY 2022. Drought declarations and management actions have taken place at the state level. Below is a general timeline of drought restrictions within the State of California relevant to the Northern Sacramento Valley (NSV), and the actions directly affecting the Subbasin indicated in *italics*.

WY 2021

- December 1, 2020: State Water Project (SWP) announces initial allocation of 10% for 2021.
- March 23, 2021: SWP announces final 5% allocation for 2021.
- April 10, 2021: 50% curtailment in Feather River diversions by the Joint Districts (which include Richvale Irrigation District, Butte Water District and Biggs-West Gridley Water District within Butte County) and Western Canal Water District in the Butte Subbasin.
- May 20, 2021: Governor Newsom declared a drought emergency for 41 counties.
- May 26, 2021: USBR reduced Central Valley Project (CVP) water users to be 0% for agricultural water service contractors and 25% for M&I water service contractors.
- May 28, 2021: Final Temperature Management Plan for the Sacramento River (2021).
    - The SRSC agreed to pump additional groundwater to leave surface water in stream for beneficial uses.
    - SRSC agreed to reduce their Shasta Reservoir diversions from 75% to 67% to aid in cold water conditions.
- August 20, 2021: The State Water Resources Control Board (SWRCB) issued curtailment orders to over 4,000 water rights holders in California.

WY 2022

- January 4, 2022, SWRCB adopted the prohibited wasteful water uses emergency regulation.
- January 20, 2022: SWP announces tentative increase to allocations to 15% for 2022.
- March 18, 2022: SWP announces final allocation of 5% for WY 2022.
- March 28, 2022: Governor Newsom issued Executive Order No. N-7-22 meant to provide response to and mitigate drought impacts.
    - This order requires additional review of well permits by local jurisdictions and groundwater sustainability agencies in groundwater basins subject to SGMA and classified as medium or

high priority. The goal being that proposed wells are not inconsistent with any sustainable groundwater management program established in any GSP.

- Both existing wells seeking alteration, and proposed wells, must first determine that extraction of groundwater from the proposed well is (1) not likely to interfere with the production and functioning of existing nearby wells, and (2) will not likely cause subsidence that would adversely impact or damage nearby infrastructure.

- April 14, 2022: Sacramento River Settlement Contractors received an 18% allocation from the Central Valley Project
- April 19, 2022: 50% curtailment in Feather River diversions by the Joint Districts (which include Richvale Irrigation District, Butte Water District and Biggs-West Gridley Water District within Butte County) and Western Canal Water District in the Butte Subbasin.
- June 1, 2022: Drought Impact Analysis Report for Butte County released.
- June 2022: Butte County Drought Assistance Program begins taking applications from residents with dry household wells for assistance with water deliveries and water storage tank installations.

Private well-owner reporting of dry wells can be conducted in several ways. In Butte County, reporting can be done through DWRs voluntary Household Water Supply Shortage Reporting System (mydrywell.water.ca.gov; "Dry Well Reporting System"), through the Butte County Office of Emergency Management (OEM) Drought Assistance Program and/or through the Butte County Environmental Health Division of the Department of Public Health (EH). Those who report to the County programs are encouraged to fill out a report in the DWR Dry Well Reporting System, but not all do so.

There were 16 reports of dry or reduced capacity through the DWR voluntary Dry Well Reporting System within the Subbasin in 2022 (**Table 1-7; Table 1-8; Figure 1-12**). **Table 1-9** summarizes the 10 reports of dry wells to Butte County EH. Reports to Butte County EH are obtained through a question on well drilling applications for applicants looking to either drill a new well or deepen / repair an existing well and therefore are not representative of county-wide conditions. Within the 2022 WY, 33 Vina Subbasin residents applied for the Butte County OEM Drought Assistance Program to receive water deliveries and or water storage tanks due to a dry or reduced capacity household domestic well at their residences **(Table 1-10). Figure 1-13** shows the approximate location of the wells reported through this program. Applicants to all of the County programs are encouraged to fill out a report in the DWR Dry Well Reporting System, but not all do so.

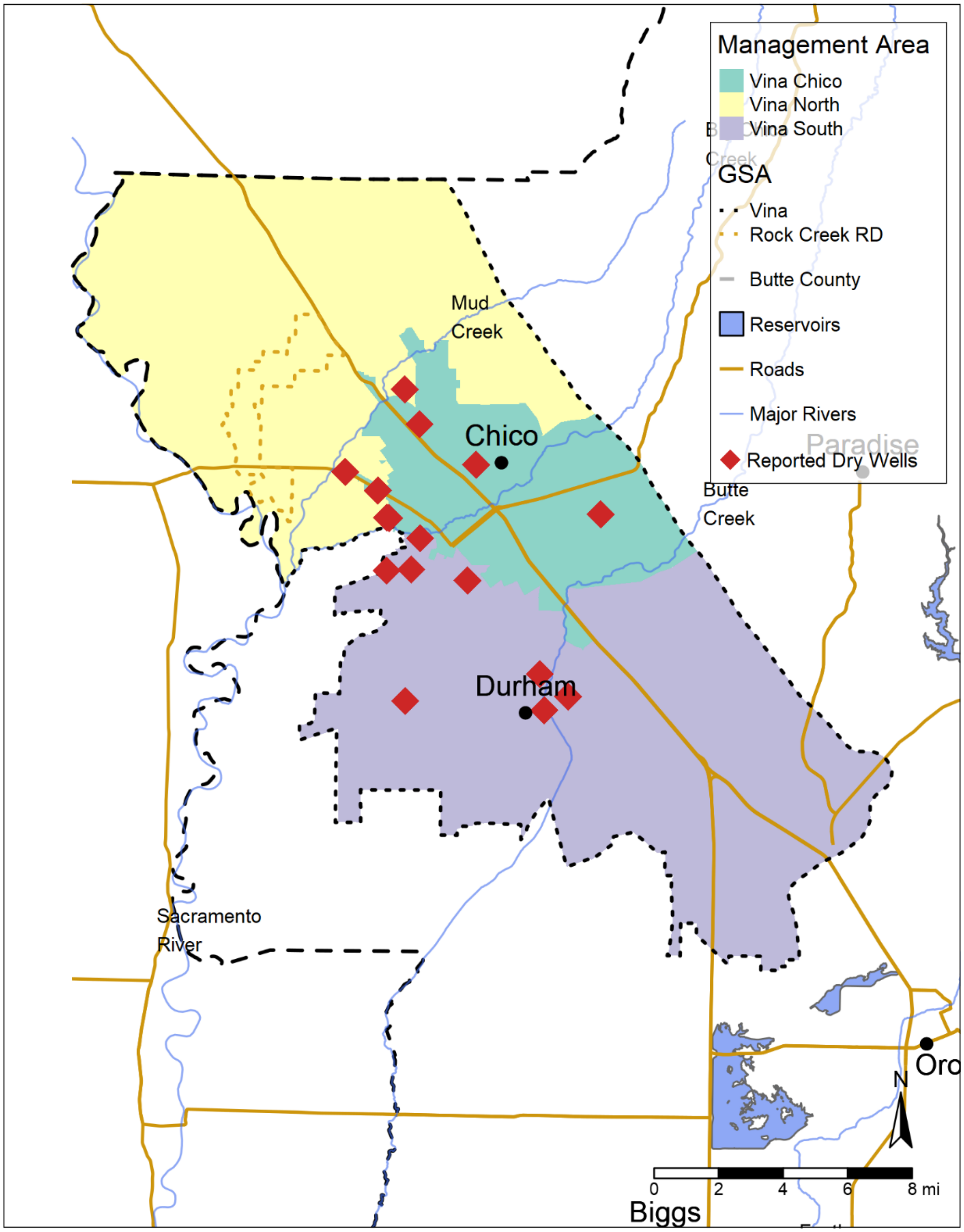
In addition, eight households were annexed to the California Water Services (Cal Water) Chico municipal water system due to their well's experiencing dry or reduced capacity conditions, which is down from 25 that were annexed in 2021.

Table 1-7. Dry Wells Reported through DWR Dry Well Reporting System in the Vina Subbasin								
2014 (C)	2015 (C)	2016 (BN)	2017 (W)	2018 (BN)	2019 (W)	2020 (D)	2021 (C)	2022 (C)
2	2	--	--	1	--	--	10	16

Table 1-8. Dry Wells Reported through DWR Dry Well Reporting System by Management Area									
Management Area	2014 (C)	2015 (C)	2016 (BN)	2017 (W)	2018 (BN)	2019 (W)	2020 (D)	2021 (C)	2022 (C)
Vina North	1	0	--	--	--	--	--	3	2
Vina Chico	-	2	--	--	--	--	--	5	7
Vina South	1	--	--	--	1	--	--	2	7

Table 1-9. Dry Wells Reported to Butte County Environmental Health		
Subbasin	2021 (C)	2022 (C)
Vina Subbasin	21	10

Table 1-10. Butte County OEM Drought Assistance Program Applicants	
Subbasin	2022 (C)
Vina North	4
Vina Chico	12
Vina South	17
Total	**33**



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Dry Wells Reported to DWR Dry Well Reporting System During WY 2022; Vina Subbasin
Vina Subbasin Groundwater Sustainability Plan
Annual Report 2022

Figure 1-12. Reports to the DWR Dry Well Reporting System during Water Year 2022

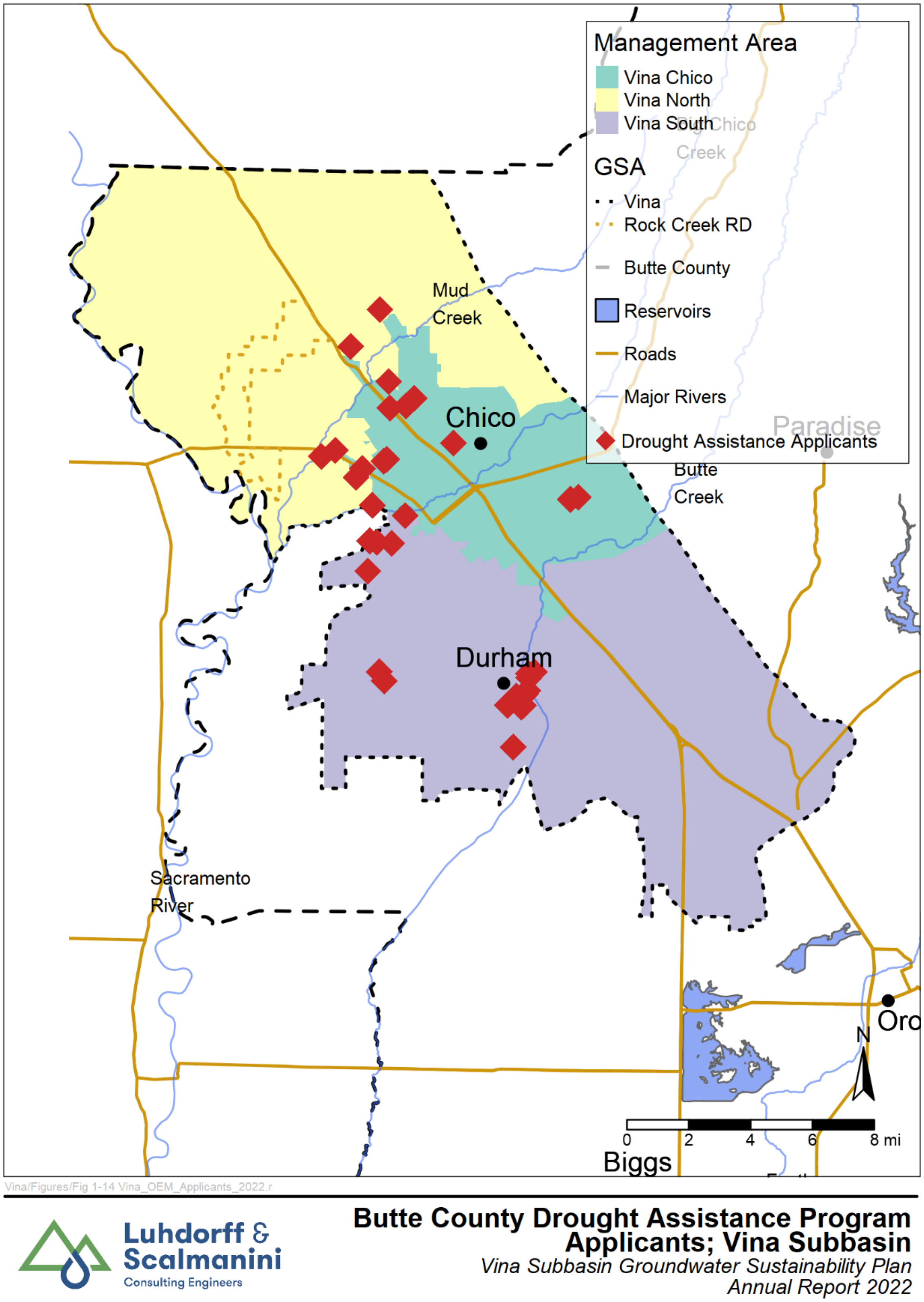


Figure 1-13. Butte County Office of Emergency Management Drought Assistance Program Applicants

1.3.6 Vulnerable Well Analysis

Most rural households within the Subbasin rely on domestic wells for their drinking water supply. If these wells go dry or experience reduced capacity due to declining groundwater levels, it can cause significant hardship for those households. A well vulnerability analysis was conducted in order to evaluate the potential number and location of vulnerable wells in the coming year (those that could go dry or experience reduced capacity in 2023) given current groundwater levels and projected future groundwater levels. The DWR Online System of Well Completion Reports (OSWCR) database was used to estimate the total depth of wells in the subbasin for wells drilled within the last 40 years. For the analysis, if the groundwater elevation was lower than ten feet from the bottom of the well, it was considered to be vulnerable.

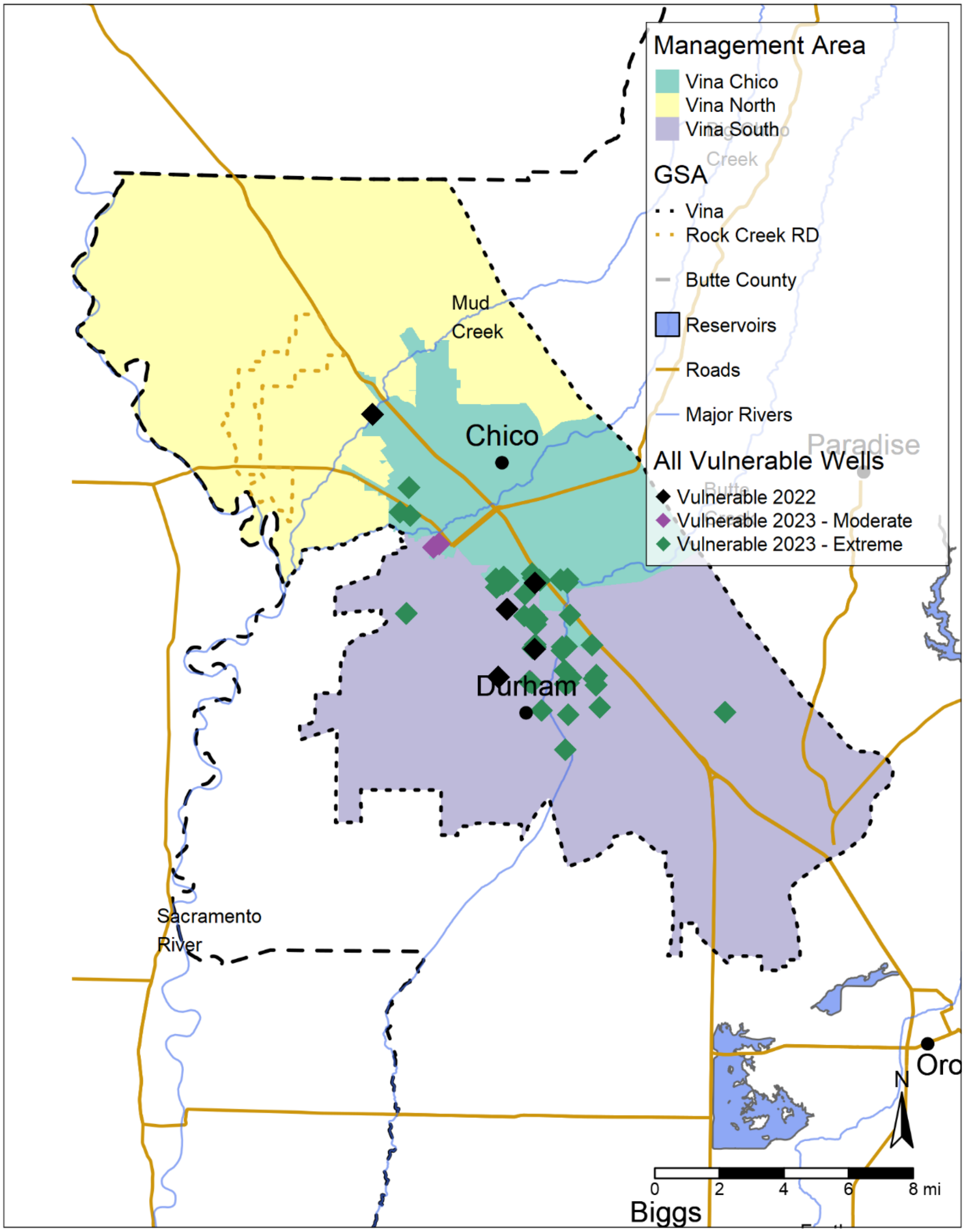
Three scenarios were analyzed:

1. 2022 Scenario: An estimate of how many wells were vulnerable in Fall 2022 based on Fall 2022 measured groundwater levels compared to well depths within the Subbasin.

2. 2023 Moderate Scenario: An estimate of how many wells are predicted to be vulnerable in Fall 2023, assuming the same decline in groundwater levels observed between 2021 and 2022 compared to well depths within the Subbasin.

3. 2023 Extreme Scenario: An estimate of how many wells are predicted to be vulnerable in Fall 2023, assuming the same decline in groundwater levels observed between 2020 and 2022 compared to well depths within the Subbasin.

   Based on the analysis, there were five wells in Fall 2022 and 56 wells in 2023 that should have been vulnerable to dry or reduced capacity conditions, located south of Chico and in the Durham area (**Figure 1-14**). A summary of vulnerable wells under current 2022 conditions, a moderate 2023 scenario and extreme 2023 scenario is included in **Table 1-11**.



Vina/Figures/Fig 1-11 Vina Vulnerable Wells.r

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Consulting Engineers

Vulnerable Wells for All Scenarios
Vina Subbasin
Vina Subbasin Groundwater Sustainability Plan
Annual Report 2022

Figure 1-14. Vulnerable Wells for all Scenarios

Table 1-11. Summary of Vulnerable Wells Analysis in Vina Subbasin			
Management Area	**Vulnerable in Fall 2022**	**Vulnerable 2023 - Moderate**	**Vulnerable 2023 - Extreme**
Vina North	0	0	0
Vina Chico	2	2	12
Vina South	3	1	41
Total	**5**	**3**	**53**

2 GROUNDWATER ELEVATIONS – §356.2(b)(1)

Groundwater elevations fluctuate seasonally throughout the Subbasin. Seasonal fluctuations of groundwater levels occur in response to groundwater pumping and recovery, land and water use activities, recharge, and natural discharge. Sources of recharge into the groundwater system include precipitation, applied irrigation water, and seepage from local creeks and rivers. Groundwater pumping for irrigation typically occurs from April to September, consequently groundwater levels are usually highest in the spring and lowest during the irrigation season in the summer months. Fall groundwater measurements (typically measured in October) provide an indication of groundwater conditions after the primary irrigation season.

A Broad Network of 78 wells was defined during GSP development to monitor groundwater levels in the Subbasin. Seventeen of these are Representative Monitoring Site (RMS) wells that were selected in the GSP for monitoring groundwater levels and were assigned Sustainable Management Criteria (SMC). The RMS wells consist of a mixture of domestic and irrigation wells, dedicated observation wells and California Water Service Company municipal/industrial supply wells in Chico. Hydrographs depicting groundwater elevations in the RMS wells over time (and through 2022) are included in **Appendix A**. Approximately 33 of the Broad Network wells measured by DWR and Butte County are equipped with data loggers (i.e., transducers), which continuously monitor and record hourly changes in groundwater levels. These and the remaining wells are measured by hand four times each year in March, July, August, and October. Data from groundwater level monitoring wells is available from DWR's online SGMA Data Viewer tool (https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer). Summary tables of groundwater elevations from Spring and Fall 2022 measurements for RMS wells are presented in **Table 2-1**.

The groundwater level monitoring methods are consistent with the protocols described in the Vina GSP. Groundwater elevations are measured using a steel tape, electric sounder, pressure transducers, acoustic or sonar sounder, or by airline measurements. The accuracy of groundwater level measurements are typically either 0.01 feet or 0.1 feet depending on the equipment used. In addition to the groundwater level monitoring conducted by Butte County and DWR, California Water Service Company measures monthly groundwater levels in approximately 60 municipal/industrial groundwater supply wells the Chico urban area. Seven of these wells are included in the Broad Network and four of these wells are included as groundwater level RMS wells in the Vina GSP.

The following sections provide a summary of groundwater elevations and conditions during 2022 through presentation and description of groundwater elevation contour maps (Section 2.1) and hydrographs of groundwater elevations (Section 2.2).

2.1 Groundwater Elevation Contour Maps – §356.2(b)(1)(A)

Groundwater elevation contour maps for Spring and Fall 2022 were prepared for this Annual Report and are presented in **Figure 2-1** and **Figure 2-2,** as values of the water elevations above mean sea level. Annual spring contours are intended to generally represent seasonal high groundwater elevations, while fall contours are intended to generally represent seasonal low groundwater elevations. For WY 2022 the average seasonal high, as measured by the RMS wells in **Table 2-1**, was 122.5 ft AMSL, and the average seasonal low was 114.5 ft AMSL, generally lower than WY 2021 where the average seasonal high was 128.4 ft AMSL, and the average seasonal low was 118.8 AMSL. The contour maps displayed in **Figure 2-1** and **Figure 2-2** show that groundwater elevations are higher in the northern and eastern portions of the Vina Subbasin than in the southern and western areas. This indicates that groundwater flow is generally north to south in the Vina North MA, predominantly east to west in the Vina Chico MA, and northeast to southwest in the Vina South MA. In areas dependent on groundwater supplies for irrigation – the majority of the Subbasin – groundwater levels begin to decline when pumps turn on, typically in the spring, and continue declining as the irrigation season progresses through the summer months. Groundwater levels are typically lower in the fall in valley floor locations due to irrigation season pumping.

The contour maps illustrate several general features of the groundwater flow system in the Vina Subbasin, including:

- Overall west-southwest groundwater flow consistent with recharge from the north and along the eastern foothills
- Convergence of groundwater flow toward the Sacramento River in the Vina North MA
- Convergence of groundwater flow toward pumping areas west of Butte Creek and near Durham in the Vina South MA
- The higher concentration of contours in the southeast portion of the subbasin indicates a steeper gradient and could suggest higher groundwater flow. However, given the characteristics of aquifer materials on the eastern portion of the Subbasin, the steep gradient is likely evidence of aquifer materials with lower transmissivity. Nonetheless, the contours are consistent with the current understanding of recharge coming from the lower foothills. New sources of information and data may improve understanding of this area (e.g., such as DWR's Airborne Electromagnetic Survey Program)

Of note is the occurrence of steeper gradients in the Vina North MA in the fall than spring. Additionally, in the Vina South MA west of Durham water level gradients flatten in both spring and fall, whereas in 2021 a groundwater depression was present west of Durham. This change could be contributed to slightly reduced pumping in the area when compared to 2021. Fall contours also indicate declines relative to spring conditions throughout the subbasin as expected.

The Subbasin aquifer system is described in the GSP as a single principal aquifer and therefore the maps shown in **Figure 2-1** and **Figure 2-2** do not distinguish between completion intervals of the wells. The contours represent an aggregate of groundwater elevations across all zones of the primary aquifer system and are shown as values in feet above mean sea level. Groundwater elevation contours were developed by creating a continuous groundwater elevation surface based on available monitoring well data using the kriging interpolation method. Questionable groundwater elevation measurements were excluded, and some additional minor adjustments to the contours were made based on expert judgement. Maps showing the regional context of groundwater contours, including groundwater contours in the Butte and Wyandotte Creek Subbasins, are included in **Appendix A**.

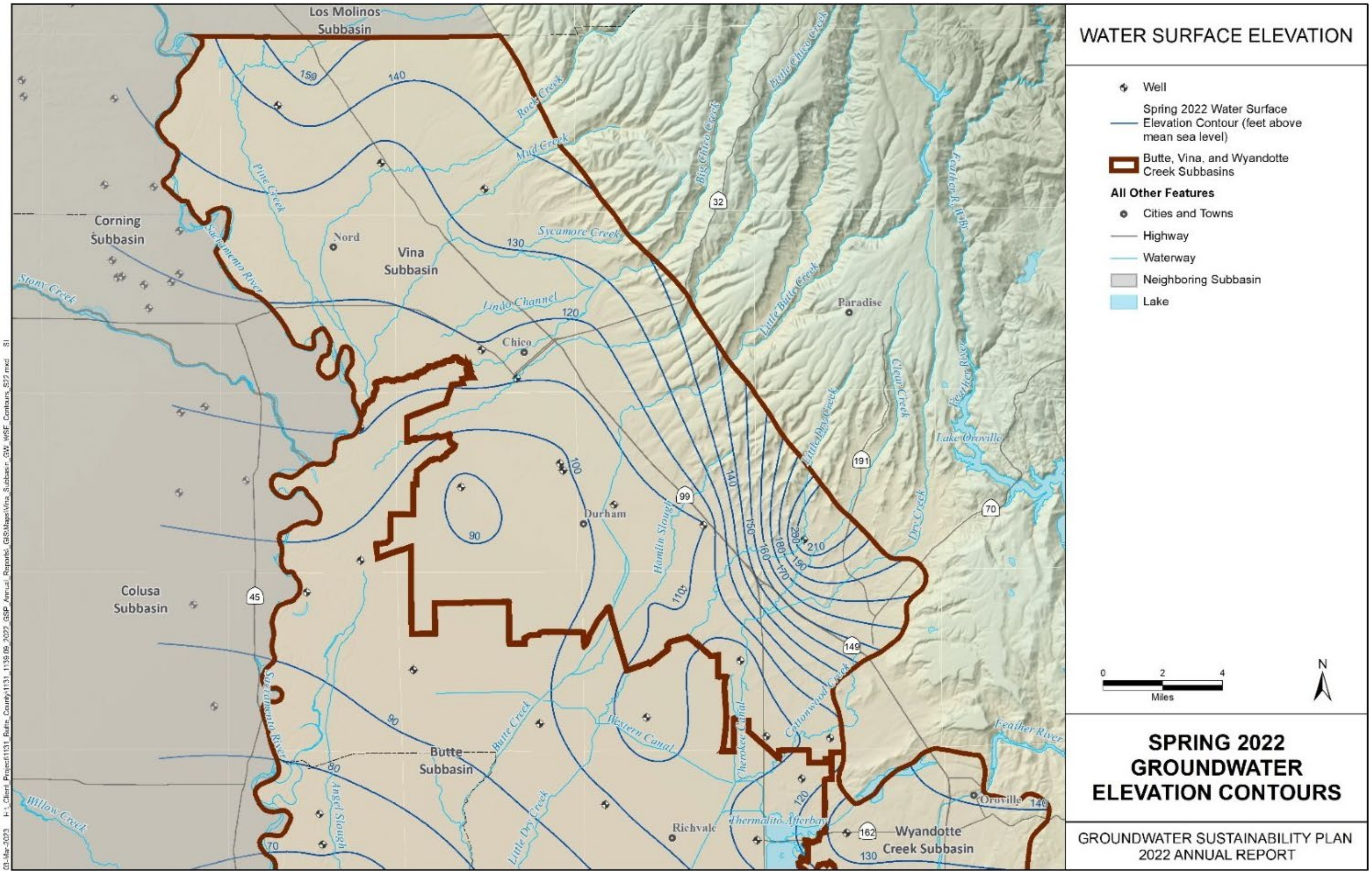

Figure 2-1. Vina Subbasin Contours of Equal Groundwater Elevation, Spring 2022 (Seasonal High)

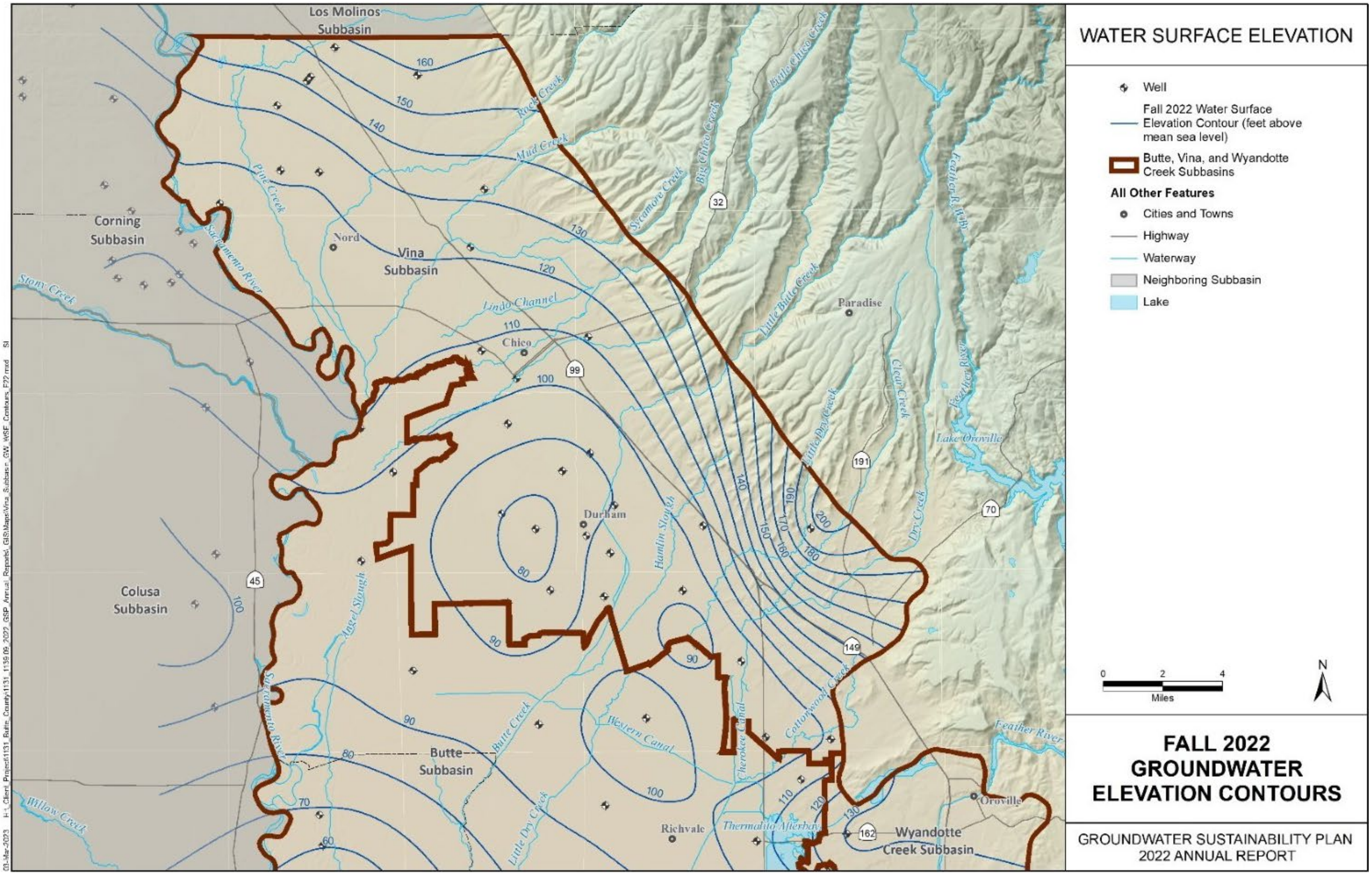

Figure 2-2. Vina Subbasin Contours of Equal Groundwater Elevation, Fall 2022 (Seasonal Low)

2.2 Hydrographs of Groundwater Elevations – §356.2(b)(1)(B)

Groundwater elevation hydrographs for each RMS well identified in the GSP are presented in **Appendix A**. **Appendix B** provides an explanation of the terms that comprise the *Sustainable Management Criteria* defined in Section 3 of the GSP (e.g., Minimum Threshold [MT], Measurable Objective [MO]). The seasonal high (Spring 2022) and seasonal low (Fall 2022) groundwater elevations measured at each RMS well are presented in **Table 2-1. Table 2-1** also summarizes the: (i) MA each RMS well is located in, (ii) the established MT groundwater elevations, (iii) the established MO groundwater elevations, and (iv) the Interim Milestone (IM) for 2027, the changes in groundwater elevations from 2021 to 2022, and the differences between the 2022 groundwater elevations and the MO.

Spring and Fall 2022 levels were generally lower than or near to those of previous years. Wells 20N01E10C002M, 23N01W36P001M, CWSCH01b, 20N01E10C002M, and 22N01W05M001M had a seasonal low below their MO. Of the wells that had a seasonal low below their MO, all had seasonal high levels above their respective MOs. Despite the lower groundwater levels, all measured groundwater levels below their MO remained more than 25 feet above the MT of that RMS well. Generally, Fall 2022 groundwater levels were similar to 2021 conditions with some new historical lows reached in a few wells.

Table 2-1. Measurable Objectives, Minimum Thresholds and Seasonal Groundwater Elevations of Representative Monitoring Site Wells

State Well Number / Representative Monitoring Site (RMS) ID[1]	Management Area	Groundwater Elevation (feet above mean sea level)								
		MO[2]	MT[2]	Interim Milestone 2027	Seasonal High (Spring)			Seasonal Low (Fall)		
					2022	Difference (feet) from:		2022	Difference (feet) from:	
						2021	MO[2]		2021	MO[2]
23N02W**25C001M**	North	130	50	130	135.6	0.0	5.6	131.2	-0.6	1.2
23N01W**10E001M**	North	136	80	137	152.2	1.6	16.2	--	--	--
23N01E**07H001M**	North	136	72	140	163.9	-3.0	27.9	161.2	-1.2	25.2
22N01W**05M001M**	North	115	31	116	129.1	-2.9	14.1	122.6	3.0	7.6
23N01W**36P001M**	North	108	45	110	117.9	-9.2	9.8	107.9	-4.8	-0.1
23N01E**33A001M**	North	125	72	128	136.4	-5.0	11.4	132.2	-2.1	7.2
CWSCH01b	Chico	106	85	107	110.0	-7.0	4.0	103.0	1.0	-3.0
CWSCH02	Chico	105	85	108	112.0	-6.0	7.0	108.0	0.0	3.0
CWSCH03	Chico	108	85	109	117.0	-8.0	9.0	110.0	-1.0	2.0
CWSCH07	Chico	95	85	97	101.0	-8.0	6.0	100.0	5.0	5.0
22N01E**28J003M**	Chico	111	85	113	123.2	-6.9	12.2	114.7	-0.8	3.7
21N01E**21C001M**	South	64	10	67	86.9	--	22.9	80.0	-0.8	16.0
21N02E**18C003M**	South	130	65	132	153.7	3.6	23.7	150.6	-2.5	20.6
20N01E**10C002M**	South	92	20	93	--	--	--	--	--	--
20N02E**24C001M**	South	77	18	81	101.0	-5.8	24.0	91.4	-1.3	14.4
20N02E**09L001M**	South	91	30	93	110.8	-5.1	19.8	101.2	--	10.2
21N02E**26E005M**	South	95	36	97	109.9	-4.2	14.9	104.1	-2.7	9.1

[1] *The portion of the State Well Number shown in* ***bold underlined text*** *is the RMS ID.*

[2] *MO = measurable objective, MT = minimum threshold*

3 WATER SUPPLY AND USE

Water use data by sector required per §356.2 is summarized in the following text and is categorized by groundwater supply, surface water supply, and total supply. Groundwater use was taken from records where available and otherwise were estimated from 2022 land use data, climate conditions, and crop coefficients consistent with those used in the BBGM. Surface water use was estimated from historic deliveries when records were not available.

3.1 Water Budget Approach

Water supply and use in the Subbasin were quantified using the best available data sources and information. Where available, groundwater extraction and surface water supplies were quantified directly from measured and reported groundwater pumping, surface water diversions, and deliveries data. A water budget approach has been used to estimate the remaining, unmeasured volume of groundwater extraction that has occurred to meet demand in the Subbasin.

During GSP development, the BBGM was used to prepare water budgets for the Subbasin that characterized historical, current, and projected water supply and water use conditions. In the first Annual Report, information from the BBGM was leveraged to quantify subregion-scale water budgets in the Subbasin through WY 2021.

Building on past work, the water budget approach used in this Annual Report utilizes available geospatial data and information to quantify crop water demand, precipitation, and other parameters with pixel-scale resolution (30-meter (m) x 30 m), corresponding to the spatial resolution of satellite imagery used in developing these inputs. In addition to geospatial data, available surface water supply and groundwater extraction data is incorporated into the water budget by distributing that water out to specific regions where that water is used (e.g., surface water supplier service areas). The remaining groundwater extraction needed to meet demand is then calculated based on the balance of water demand and available water supplies, with consideration for rainfall, irrigation, and soils characteristics. The result is a spatially distributed water budget calculated with a finer spatial resolution than was possible in the previous water budgets. This water budget approach generally follows the process described in Hessels et al. (2022). The pixel-scale water budget results provide greater insight into where water use occurs in the Subbasin and are configurable to create water budget summaries for any region of the Subbasin.

This approach was used to calculate monthly water budgets by water use sector in the Subbasin during the current reporting year (WY 2022), as required in 23 CCR §356.2. Key water budget inflows and outflows calculated in this water budget approach were compared with equivalent values from the BBGM and the first Annual Report, allowing verification of the consistency between this water budget approach and previous approaches.

Data and information that is used in the water budget approach generally includes:

- Actual ET estimates, extracted from OpenET remote sensing analyses. OpenET is a multi-agency web-based geospatial information system (GIS) utility that quantifies spatial ET using satellite imagery. While OpenET is a new utility, the underlying methodologies to quantify ET apply a variety of well-established modeling approaches that are widely used in government and research. The OpenET modeling approaches are also similar to the approaches used to quantify ET in the BBGM used in GSP development. OpenET results are available in the Subbasin with a spatial resolution of 30 m x 30 m (approximately 0.22 acres), allowing easily scalable ET quantification. Additional information about the OpenET team, data sources, and methodologies are available at: https://openetdata.org/.

- Precipitation estimates, extracted from the Parameter-elevation Regressions on Independent Slopes Model (PRISM), developed by the PRISM Climate Group at Oregon State University. PRISM quantifies spatial precipitation estimates, among other climate parameters, based on available weather station data and modeled spatial relationships with topography and other factors influencing weather and climate. PRISM data is available in the Subbasin with a spatial resolution of 4-kilometer (km) x 4 km. Additional information about the PRISM data and methodologies are available at: https://prism.oregonstate.edu.

- 2022 land use data, evaluated through two approaches. Both datasets were compared and evaluated to identify changes in land use as well as the spatial extent of water use sectors in the Subbasin.

  - Pixel-scale (30 m x 30 m) land use coverages of the Subbasin were prepared through analysis of the following datasets:

    - DWR 2019 statewide crop mapping dataset (https://data.cnra.ca.gov/dataset/statewide-crop-mapping)

    - U.S. Department of Agriculture (USDA) CropScape 2022 Cropland Data Layer coverage (https://nassgeodata.gmu.edu/CropScape/)

  - Current field-scale land use coverages for the Subbasin in 2022 were also provided by Land IQ survey results.

- Measured surface water diversions data, reported from water supplier records or collected from publicly available sources (water rights diversion records, etc.). Surface water diversions data are generally available at the supplier scale. In this water budget approach, diversions were distributed evenly across the irrigated pixels associated with that supplier's service area.

- Measured groundwater extraction data, reported from municipal and agricultural water supplier pumping records and private pumping records, where available. Groundwater extraction data is generally available at the supplier scale and was distributed evenly across the urban or irrigated pixels associated with that supplier's service area.

- Measured boundary water outflow data, reported from water supplier records where available.

Additional details groundwater extraction and surface water supply data sources are given in the sections below.

3.2 Groundwater Extraction – §356.2(b)(2)

Groundwater extraction in the Subbasin is summarized in **Table 3-1**. Groundwater extraction is reported from pumping records where available, while the remaining groundwater extraction in the Subbasin is estimated through the water budget approach described in the previous section.

The majority of the Subbasin is dependent on groundwater as the only available water source for agricultural irrigation. During dry and critically dry years, agricultural groundwater extraction increases relative to long-term average demand due to less rainfall and therefore reduced soil moisture, and increased evapotranspiration associated with hotter, drier conditions. Agricultural groundwater extraction was estimated through the water budget approach described above.

The City of Chico, the largest city in the subbasin, is solely reliant on groundwater for their municipal water supply. The Durham Irrigation District also provides municipal water to households in the Durham area through groundwater extraction from three district wells. In contrast to agricultural water use, municipal water use during drought years may decrease relative to long-term averages due to urban conservation efforts. This was observed in reported groundwater extraction for the City of Chico during the 2013 to 2015 drought period. More recently the City of Chico saw a decrease of approximately 2.5% of municipal/industrial pumping volumes from 2020 to 2021. In 2022 the City of Chico saw a slight increase in ground water use of 1.5% over 2021. Municipal water supplies in the Vina Subbasin are measured and were provided by each utility/water agency.

Additionally, private domestic wells provide rural residential water needs throughout the Subbasin. Rural residential groundwater extraction through domestic wells was estimated based on the California Water Service Company's 2020 Urban Water Management Plan's (UWMP) 2020 water use (CWSC, 2020). Water use in 2020 was 184 gallons per capita per day (GPCD). The UWMP Act (1983) requires urban water suppliers to prepare a UWMP every five years. The 2020 GPCD was combined with 2020 census data for parcels that are not serviced by municipal supplies. Parcel data was obtained from county geographic information system (GIS) portals. Residential parcels inside the subbasin, and outside of municipal service areas were selected.

Environmental groundwater use in the Subbasin includes uptake of shallow groundwater from deeply-rooted plants. Although no groundwater is directly pumped or extracted for use in these areas, the consumptive use of shallow groundwater has been estimated through the water budget approach described above for areas classified as native vegetation, riparian vegetation, or barren lands. The estimated volumes are based on the evaporative demand unable to be met through precipitation that must instead be met through plant access to shallow groundwater. There are roughly 62,800 acres of native vegetation, 2,700 acres of riparian vegetation, and 500 acres of barren lands in the Subbasin (66,000 acres total) with a total estimated groundwater use of 76,000 acre-feet (AF), or roughly 1.2 AF per acre (AF/ac). The estimated water use ranged from 1.0 AF/ac for native vegetation to 3.7 AF/ac for riparian vegetation, which has more consistent and reliable access to shallow groundwater (which may or may not be connected to the primary aquifer). This method of estimating environmental groundwater use is dependent on both precipitation and ET estimates. Since environmental groundwater use is modeled over a large area, small changes or uncertainties in precipitation, ET, or ET from precipitation have a large impact on the overall estimated volume. Additionally, the method does not differentiate between evapotranspiration coming from changes in root zone soil moisture storage and the shallow groundwater system. As a result, a portion of the quantified environmental groundwater demand may be met through a depletion of root zone soil moisture rather than uptake of shallow groundwater from the aquifer. All else being equal, larger depletions of root zone soil moisture are more likely to occur (1) during below normal, dry, and critical water years and (2) in landscapes with deeply rooted vegetation.

The Vina Subbasin did not have any managed recharge volumes or groundwater extractions for managed wetlands in WY 2022. The recorded municipal supplies do not distinguish between urban and industrial water uses.

The total estimated groundwater extraction in the 2022 WY was approximately 278,700 acre-feet (AF). This is about 35,700 AF greater than the 2000 to 2018 average annual groundwater extraction of 243,500 AF for the Subbasin reported in the GSP and slightly lower than the average annual extractions of the last four Critical WYs on record (2008, 2014, 2015 and 2021) which was 279,745 AF. The difference is largely influenced by increased agricultural pumping in 2022 due to drought conditions. This volume of extraction is within the range of groundwater pumped during previous critically dry years. **Figure 3-1** shows the general location and volumes of 2022 groundwater extractions in the Subbasin. The subregions shown on the map are defined in the BBGM (BCDWRC, 2021). Groundwater use by sector is shown in **Table 3-1**. About 91% of the total groundwater extraction[1] was used by the agricultural sector while the remaining 9% was used for municipal and rural residential water needs.

Table 3-1. Vina Subbasin Groundwater Use by Water Use Sector

Sector	WY 2022 (AF)
Agricultural	253, 800
Municipal	22,300
Rural Residential	2,600
Native Vegetation (Plant groundwater uptake)	76,000
Total	**354,700**
Total (excluding Native Vegetation[1])	**278,700**

[1]Since native vegetation groundwater use involves natural plant uptake of shallow groundwater, not direct pumping and extraction, a total volume is calculated that excludes it.

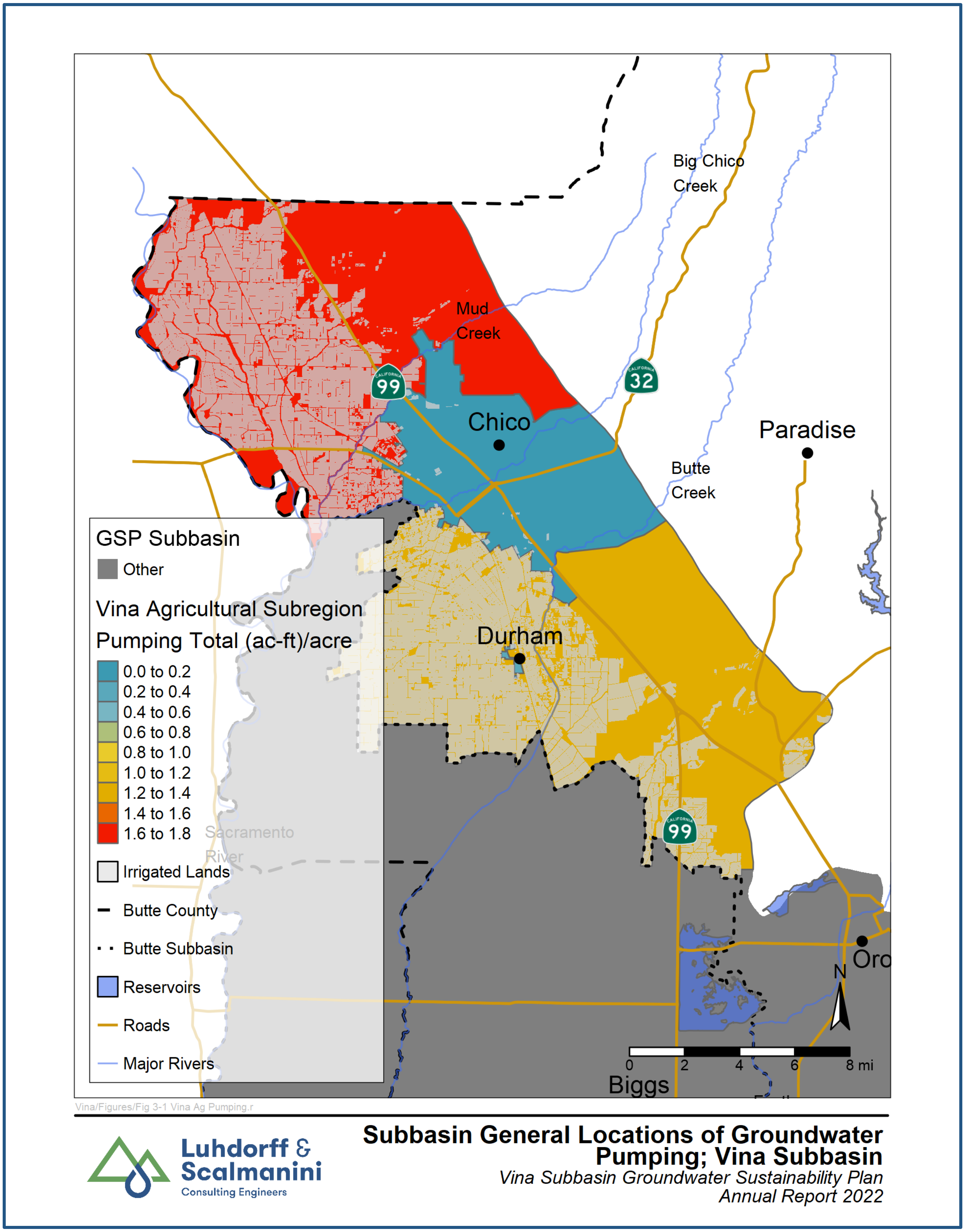

Figure 3-1. Vina Subbasin General Locations and Estimates of Groundwater Pumping – 2022

3.3 Surface Water Supply – §356.2(b)(3)

Surface water supplies used or available for use in the Subbasin are summarized in **Table 3-2**. Surface water supplies are reported directly from water supplier records or retrieved from publicly available sources (water rights diversion records, etc.) where available.

Surface water provided about 7% of the agricultural water demand in the Subbasin for WY 2022. Diversions from Butte Creek and Mud Creek were accessed from the State Water Resource Control Board's (SWRCB) Electronic Water Rights Information Management System (eWRIMS; SWRCB, 2023). eWRIMS data on surface water delivery indicated which water rights holders on Butte Creek and Mud Creek had made diversions during WY 2022. It also provided information on which water rights holders were curtailed during WY 2022, see Section 1.3.5 for curtailments in WY 2022. There are currently no surface water supplies for municipal use in the Vina Subbasin. Total surface water deliveries for the Vina Subbasin are estimated to be about 20,500 AF as shown in **Table 3-2**.

Table 3-2. Vina Subbasin Surface Water Use by Water Use Sector

Sector	WY 2022 (AF)
Agricultural	20,500
Environmental (diversions)	0
Total	**20,500**

3.4 Total Water Use by Sector – §356.2(b)(4)

Groundwater supplies about 93% of the agricultural water demand in the subbasin and constitutes about 95% of the total water supplies[1] for all water demand sectors. Total water available for use in the Subbasin was tabulated from groundwater extraction volumes reported in **Table 3-1** and the surface water supply reported in **Table 3-2**. Total water available is summarized in **Table 3-3** for the 2022 WY. The results are either based on measured data or estimates as described in the previous two sections.

Table 3-3. Vina Subbasin Total Water Use by Water Use Sector

Sector	WY 2022 (AF)		
	Groundwater	Surface Water	Total
Agricultural	253,800	20,500	274,300
Municipal	22,300	0	22,300
Rural Residential	2,600	0	2,600
Native Vegetation (Plant groundwater uptake)	76,000	0	76,000
Total	**354,700**	**20,500**	**375,200**
Total (excluding Native Vegetation[1])	**278,700**	**20,500**	**299,200**

[1]Since environmental groundwater use involves natural plant uptake of shallow groundwater, not direct pumping and extraction, a total volume is calculated that excludes it.

3.5 Uncertainties in Water Use Estimates

Uncertainties in water budget estimates are presented below in **Table 3-4**. The uncertainty of these water budget components is based on typical accuracies given in technical literature and the cumulative estimated accuracy of all inputs used to calculate the components.

Table 3-4 Estimated Uncertainty in Water Use Estimates

Water Budget Component	Data Source	Estimated Uncertainty (%)	Source
Groundwater Water			
Agricultural	Measurement	20%	Typical uncertainty from water balance calculation.
Municipal/Industrial	Measurement/Estimate	5%	Typical accuracy of municipal water system reporting.
Domestic Wells	Calculation	15%	Estimated from per capita water use and Census information.
Native Vegetation (Plant groundwater uptake)	Calculation	25%	Estimated based on land use classification, precipitation, and ET.
Surface Water			
Agricultural	Calculation	10%[1]	Estimated from SB 88 measurement accuracy standards.

[1] *Higher uncertainty of 10%-20% is typical for estimated surface water inflows, including un-gaged inflows from small watersheds into creeks that enter the Basin.*

4 GROUNDWATER STORAGE

Long-term fluctuations in groundwater levels and groundwater in storage occur when there is an imbalance between the volume of water recharged into the aquifer and the volume of water removed from the aquifer, either by extraction or natural discharge to surface water bodies. If, over a period of years, the amount of water recharged to the aquifer exceeds the amount of water removed from the aquifer, then groundwater levels will increase and groundwater storage increases (i.e., positive change in storage). Conversely, if, over time, the amount of water removed from the aquifer exceeds the amount of water recharged then groundwater levels decline and groundwater storage decreases. These long-term changes can be linked to various factors including increased or decreased groundwater extraction or variations in recharge associated with wet or dry hydrologic cycles.

Since groundwater storage is closely related to groundwater levels, measured changes in groundwater levels can serve as a proxy for and be utilized to estimate changes in groundwater storage. Changes in groundwater storage in the Subbasin follow a pattern typically seen in the majority of the Sacramento Valley. During normal to wet years, groundwater is withdrawn during the summer for irrigation, and is replenished during the winter through recharge of precipitation and surface water inflows, allowing groundwater storage to potentially rebound by the following spring. During dry years and drought conditions, this pattern is disrupted when more groundwater may be pumped to meet irrigation demand

and less recharge may occur due to reduced precipitation, diminished or curtailed surface water supplies, and lower stream levels. Review of the RMS well hydrographs (**Appendix A**) indicate that groundwater elevations in many RMS wells in the subbasin show some level of decline in recent years. This is influenced by the large percentage of water years since 2006 that have been dry (i.e., characterized as Below Normal, Dry, or Critical).

In 2022 (a Critical WY), groundwater storage decreased by approximately 90,700 AF. Increased groundwater extraction in 2022 relative to long-term average groundwater demand, as well as reduced natural recharge due to dry climate conditions and decreased stream flows, resulted in lower groundwater levels in Spring 2022 compared to Spring 2021 although Fall water levels in 2022 were not significantly lower than 2021 levels.

4.1 Change in Groundwater Storage – §356.2(b)(5)(B)

Annual groundwater pumping, groundwater storage changes, along with the cumulative change in storage over time, are presented for 2000 through 2022 in **Table 4-1** and **Figure 4-1.** These materials also include hydrologic year type for each WY. Increased groundwater extraction in 2021 (the previous irrigation season) relative to long-term average groundwater demand, as well as reduced natural recharge due to dry climate conditions and decreased stream flows, resulted in generally lower groundwater levels in Spring 2022 compared to Spring 2021. This amounts to an estimated reduction of groundwater in storage of about 90,700 AF for this time period.

The historical record back to the year 2000 includes multiple data sources. Groundwater extractions for 2000 through 2018 were obtained from the BBGM and the water budgets prepared as part of the Vina Subbasin GSP [Geosyntec, 2021]. The 2019 and 2020 groundwater extraction values were calculated as the average based for the hydrologic year type from 2000 to 2018. The 2021 groundwater extraction values were obtained from last year's Annual Report and developed using the methods described therein. The 2022 groundwater extraction values were developed using the water budget approach described in **Section 3.1**; it excludes environmental groundwater use, since it involves uptake of shallow groundwater through deeply rooted plants, not direct pumping and extraction. In subsequent years, it is anticipated that the water budget approach used for 2022 will be applied to the prior period of 2019 through 2021 as well. Groundwater extractions for the entire period include pumping for agricultural, municipal, and rural residential purposes.

The annual and cumulative change in groundwater storage is both calculated for the period from 2000 through 2022 based on the methodology described below in **Section 4.2**. This methodology differs from the change in groundwater storage estimates available through the BBGM. An evaluation of a total of 20 pairs of concurrent annual storage changes over the period from 1999 through 2018 assembled from the BBGM and the methodology described in **Section 4.2** was completed to evaluate the new methodology. Although groundwater storage changes differ in some cases, the general trends are similar and there is agreement between the methodologies. It is anticipated that the methodology described in **Section 4.2** will be utilized for Annual Report updates until the BBGM model is updated from 2018 through the present (anticipated to be completed as part of the 5-year update to GSP, if not sooner).

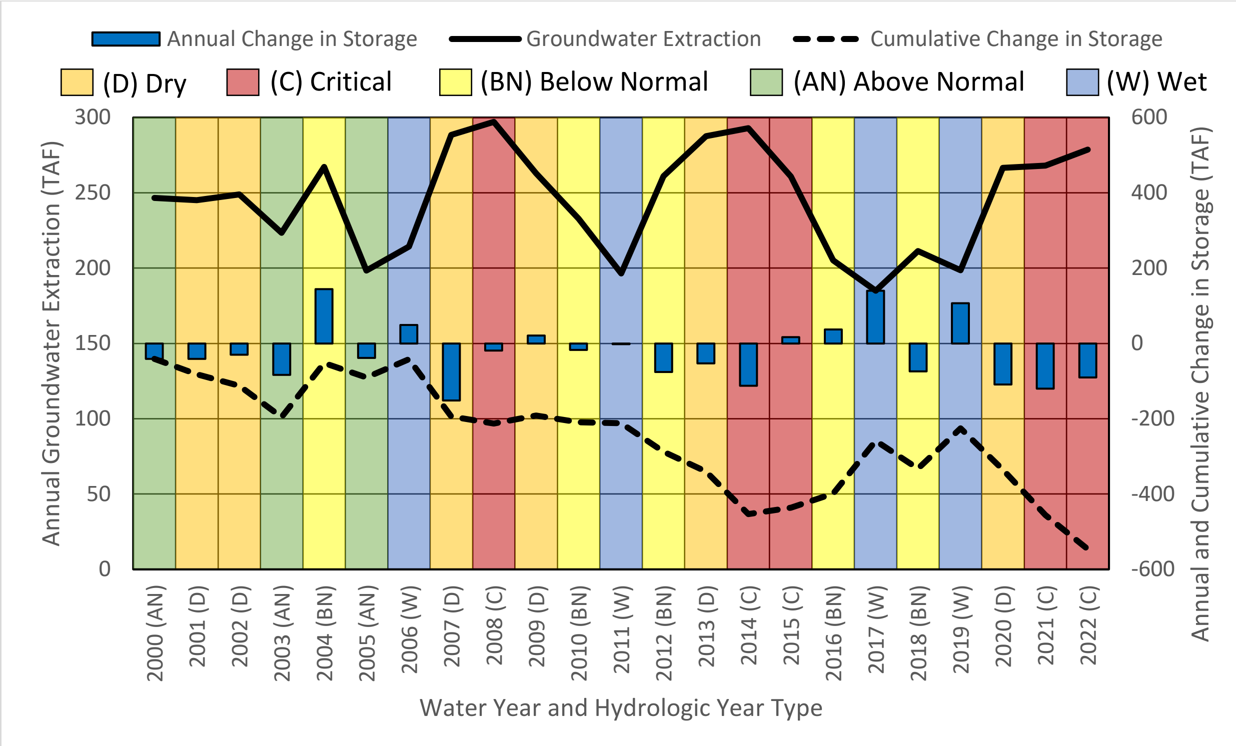

Figure 4-1. Groundwater Pumping and Annual and Cumulative Change in Storage from 2000 to 2022

Table 4-1. Groundwater Extraction, Annual Groundwater Storage Change and Cumulative Change in Storage			
Water Year (Hydrologic Year Type)	Groundwater Extraction* (Acre Feet)	Annual Change in Storage (Acre Feet)	Cumulative Change in Storage (Acre Feet)
2000 (AN)	246,600	-41,000	-41,000
2001 (D)	245,200	-40,800	-81,800
2002 (D)	248,900	-30,300	-112,100
2003 (AN)	223,500	-83,900	-196,000
2004 (BN)	267,200	144,100	-51,900
2005 (AN)	198,400	-38,800	-90,700
2006 (W)	214,400	48,700	-42,000
2007 (D)	288,400	-151,700	-193,700
2008 (C)	297,100	-18,900	-212,600
2009 (D)	263,000	20,700	-191,900
2010 (BN)	232,700	-17,600	-209,500
2011 (W)	196,500	-2,100	-211,600
2012 (BN)	261,000	-75,700	-287,300

Table 4-1. Groundwater Extraction, Annual Groundwater Storage Change and Cumulative Change in Storage			
Water Year (Hydrologic Year Type)	Groundwater Extraction* (Acre Feet)	Annual Change in Storage (Acre Feet)	Cumulative Change in Storage (Acre Feet)
2013 (D)	287,600	-53,000	-340,300
2014 (C)	293,000	-112,600	-452,900
2015 (C)	260,900	16,800	-436,100
2016 (BN)	205,100	37,200	-398,900
2017 (W)	185,000	140,300	-258,600
2018 (BN)	211,400	-73,900	-332,500
2019 (W)	198,600	106,700	-225,800
2020 (D)	266,600	-109,400	-335,200
2021 (C)	267,980	-120,400	-455,600
2022 (C)	278,700	-90,700	-546,300
Average**			
2000-2022 (23 years)	245,100	-23,800	
Wet (4 years)	198,600	73,400	
Above Normal (3 years)	222,800	-54,600	
Below Normal (5 years)	235,500	2,800	
Dry (6 years)	266,600	-60,800	
Critical (5 years)	279,500	-65,200	

Positive values indicate inflows to the groundwater system and negative values indicate outflows from the groundwater system.

Water Year types classified according to the Sacramento Valley Water Year Index:
AN = Above Normal, BN = Below Normal, C = Critical, D = Dry, W = Wet

** Groundwater Extraction values are based on BBGM for 2000-2018 (See GSP Appendix 2A [Geosyntec, 2021]). Groundwater extraction values for 2019-2022 are described above. They all include agricultural, municipal, and rural residential pumping and exclude environmental groundwater use (i.e., uptake of shallow groundwater through deeply rooted plants).*

*** Averages of each water budget component for the entire 2000 to 2022 period, and for different water year types within this period.*

4.2 Groundwater Storage Maps – §356.2(b)(5)(A)

The spatial distribution of estimated groundwater storage changes for the period from Spring 2021 to Spring 2022 are shown in **Figure 4-2.** Since groundwater storage is closely related to groundwater levels, measured changes in groundwater levels can serve as a proxy for and be utilized to estimate changes in groundwater storage. Change in storage was estimated using groundwater level data from RMS wells (those with Spring 2021 and Spring 2022 measurements) and a representative storage coefficient of 0.1, with Thiessen polygons defining a representative area surrounding each RMS well. The representative storage coefficient was established by roughly calibrating the estimated change in storage based on changes in observed groundwater levels (method 1, i.e., calculated using groundwater level data, representative area, and a storage coefficient parameter) with estimated change in storage outputs from the BBGM (method 2), as reported in the GSP, aggregating characteristics across all zones of the principal aquifer system. A total of 20 pairs of concurrent annual storage changes assembled from both methods over the period from 1999 through 2018 were used for calibration. Determination of a representative storage coefficient allows for estimating the change in volume of groundwater storage based on the measured change in groundwater levels and known representative area (i.e., Thiessen polygon) associated with each groundwater level measurement.

Negative changes in storage values indicate lowering groundwater levels and depletion of groundwater storage, whereas positive change in storage values represent rising groundwater levels and accretion of groundwater in storage. As shown in **Figure 4-2**, the change in storage for each representative area (i.e., Thiessen polygon) in the Vina Subbasin over the previous year was mostly between 0 and -5,000 AF. The representative area around northern Chico in the central portion of the Subbasin has a larger negative change in storage, while the area around Durham and the southern Chico area has a positive change in storage. Total groundwater storage change in the Subbasin was estimated to be roughly -90,700 AF between Spring 2021 and Spring 2022.

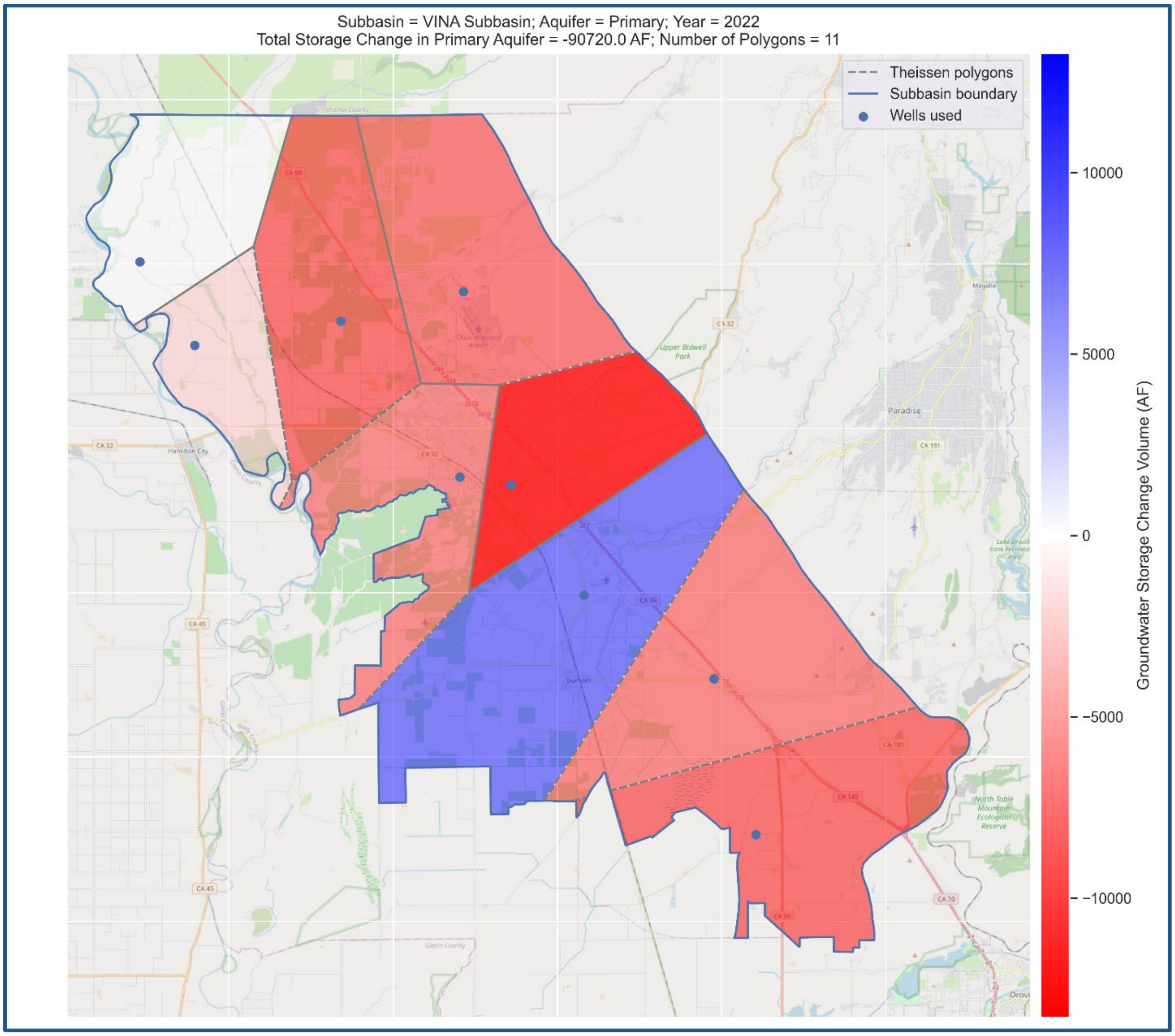

Figure 4-2. Change in Groundwater Storage from Spring 2021 to Spring 2022

4.3 Uncertainty in Groundwater Storage Estimates

Uncertainty associated with the change in groundwater storage estimates depends in part on the underlying uncertainty of the groundwater level data, representative area (i.e., Thiessen polygon), and the calibrated storage coefficient parameter that were used to calculate the change in groundwater storage. As described in **Section 4.2**, a calibration process was conducted to roughly align the estimated change in groundwater storage based on observed groundwater levels to the estimated change in groundwater storage outputs from the BBGM. Thus, the uncertainty of the estimated change in groundwater storage reported in **Table 4-1** and **Figure 4-2** is estimated to be approximately equal to the uncertainty of the estimated change in groundwater storage outputs from the BBGM (typically 20-30% for integrated hydrologic models).

5 GSP IMPLEMENTATION PROGRESS – §356.2(b)(5)(C)

5.1 Main Activities of Water Year 2022 and Updates since 2021 Annual Report

The main activities and updates since the previous Annual Report are as follows:

- Butte County, as a member agency of the Vina GSA, funded a project for the Vina GSA to identify and implement a long-term funding strategy to support GSP implementation, and to complete the 2022 Annual Report.

- The GSAs coordinated on the development of a proposal seeking funding through DWR's Sustainable Groundwater Management (SGM) Grant Program. Coordination efforts included planning and refinement of Projects and Management Actions (PMAs), evaluating and ranking PMAs, and preparing and submitting the grant application. In total, 10 components were included in the grant application. In addition to funding for specific GSP PMAs (described in each corresponding PMA section, below), the grant application sought funding for GSP Annual Reports, GSP revisions and updates, inter-basin coordination, regional coordination for developing an approach to develop interconnected surface water SMC, data management system refinements, and well inventory efforts. The grant application was submitted in December 2022, and a draft awards list is anticipated to be released by DWR in June 2023.

- Progress has been made on at least 16 PMAs since the last annual report (**Tables 5-1 and 5-2**).

    - Progress was made on ongoing conservation and management projects. Rangeland and fuel management plans are in progress.

    - The GSAs and project proponents have further developed and/or sought funding for at least 11 PMAs that would support a range of activities, including monitoring, and multi-benefit recharge.

Several other actions continue in the Subbasin to fulfill the requirements of the GSP. These include:

- Monitoring and recording of groundwater levels and groundwater quality data
- Maintaining and updating the Data Management System with newly collected data
- Annual reporting of subbasin conditions and submission to DWR as required by SGMA
- Ongoing Intra- and Inter-basin Coordination

5.2 Progress Toward Achieving Interim Milestones

Groundwater conditions in the Subbasin are on track to meet the first 5- year 2027 IM for groundwater levels at each of the RMS wells. During the Spring and Fall of 2022, groundwater elevations were near or lower than seasonal groundwater elevations in previous years. In Spring 2022, most groundwater elevations were above the established MOs, but in Fall 2022, five wells (20N01E10C002M, 23N01W36P001M, CWSCH01b, 20N01E10C002M, and 22N01W05M001M) had groundwater elevations below the MOs (as indicated in **Table 2-1**). The lower Fall 2022 levels were expected due to extended drought conditions, which has increased demands for groundwater in the Subbasin. All measured groundwater levels remain within the Subbasin's Margin of Operational Flexibility and were more than 25 feet above the MT of each RMS well.

5.3 Progress Toward PMA Implementation

The following sections summarize the GSA's progress towards implementing PMAs that were developed to manage groundwater conditions in the Subbasin and achieve the groundwater sustainability objectives described in the GSP. Projects as outlined in the GSP are provided below in **Section 5.4** and summarized in **Table 5-1**. Updates on the status of management actions are described below in **Section 5.5** and summarized in **Table 5-2**.

Table 5-1. Summary of Project Implementation Status

GSP Category	Project	Current Status	Notable Progress Since Last Annual Report
Planned	Residential Water Conservation Project	Ongoing	Conservation programs saved 18.3 million gallons of water
Planned	Agricultural Irrigation Efficiency Project	Seeking funding	Recommendations report released June 2022
Planned	Scoping for Flood Managed Aquifer Recharge (FloodMAR)/Surface Water Supply and Recharge	Seeking funding	Grant application was submitted in December 2022 that would support project implementation
Planned	Community Water Education Initiative	Ongoing	Seeking funding
Potential	Paradise Irrigation District (PID) Intertie Project	Awaiting feasibility study	Town of Paradise Opinions Study released in June 2022
Potential	Streamflow Augmentation Projects	Seeking funding	Grant application was submitted in December 2022 that would support project implementation
Potential	Community Monitoring Program	Seeking funding	Seeking funding
Potential	Rangeland Management and Water Retention Project	Awaiting management plan	Grant application submitted; CSUC and Chico State Enterprises are Developing a Management Plan

Table 5-1. Summary of Project Implementation Status

GSP Category	Project	Current Status	Notable Progress Since Last Annual Report
Potential	Removal of Invasive Species	Planning, seeking funding	Initial data collection completed, identification and mapping initiated, grant application submitted
Potential	Surface Water Supply and Recharge Project	Seeking funding	Grant application was submitted in December 2022 that would support project implementation
Conceptual	Extend Orchard Replacement Program	Seeking funding	Grant application was submitted in December 2022 that would support project implementation
Other	Butte County Stream-Aquifer Interaction Study (Multi-Agency)	Ongoing, seeking funding	Ongoing project, grant application was submitted in December 2022 that would support project implementation

Table 5-2. Summary of Management Actions

Management Action	Notable Progress Since Last Annual Report
General Plan Updates	Ongoing coordination for the 2040 General Plan update
Domestic Well Mitigation	Not in effect, seeking funds for domestic well survey

5.4 GSP Project Implementation Progress

5.4.1 Residential Water Conservation Project

- The California Water Service Company in Chico (Cal Water Chico), a municipal/industrial water provider in the Subbasin, is currently implementing water conservation practices in accordance with their 2020 Urban Water Management Plan. Some of these conservation projects include the installation of low flow fixtures, toilet replacements, urinal valve and bowl replacements, clothes washer replacements, residential conservation kits, smart controllers, turf removal program, and high efficiency irrigation nozzles. Other projects include water waste prevention ordinances, household water audits, metering, conservation pricing, public education and outreach, programs to assess and manage distribution system real loss, water conservation program coordination and staffing support, and other demand management measures. Cal Water Chico supplies groundwater to all households it serves. Thus, these conservation projects will directly benefit groundwater levels and groundwater storage by reducing groundwater demand.

- In 2022 Cal Water Chico reported a savings of 18.3 million gallons as a results of conservation programs used by Cal Water Chico customers.

5.4.2 Agricultural Irrigation Efficiency Project

- Butte County, the Agricultural Groundwater Users of Butte County, and the Butte County Farm Bureau collaborated to conduct a survey of agricultural irrigators in the Subbasin. The survey was focused on evaluating current irrigation methods and practices, identifying opportunities and methods to improve irrigation efficiency, determining potential issues preventing the adoption of efficiency practices, and providing recommendations for increasing participation in these practices.

- The results of this survey were analyzed in December of 2021 and a summary report was published in June of 2022 (ESRA, 2022).

- Recommendations from the survey include the following:

    1. Engage in research and programs that reduce the costs of individual practices and the uncertainty involved with practice implementation. Farmers need a better understanding of how different practices will influence their agricultural productivity and economic outcomes.

    2. Use trusted information sources such as the Butte County Farm Bureau and Agricultural Groundwater Users of Butte County to communicate about groundwater management and SGMA.

    3. Focus SGMA policy tools on voluntary and incentive-based practices rather than more mandatory practices that directly regulate groundwater pumping behavior.

    4. Provide opportunities for farmers to learn from each other about how they are thinking about groundwater management and SGMA, because the overall community support for SGMA is more widespread than individual farmers believe.

    5. Train pest control advisors (PCAs) about groundwater issues being encountered in the Subbasin. Even if PCAs are not being hired to manage groundwater or irrigation, their high level of communication with farmers is an opportunity for outreach and education.

    6. The role of climate change in influencing groundwater availability is something that farmers are concerned about and may be effectively framed as changes in weather or extreme events like drought.

    7. Develop programs targeting small farms, which tend to have less information, be less connected to policy discussions, and less likely to adopt practices.

- Voluntary implementation of the recommended practices is expected to be initiated between 2024 and 2030 by local irrigators. The Vina GSA along with participating partners are actively pursuing grant funds to help implement these practices.

5.4.3 Scoping for Flood Managed Aquifer Recharge (FloodMAR) / Surface Water Supply and Recharge

- This project will focus on the initial scoping and identification of specific recharge opportunities in the Subbasin, laying the groundwork for future recharge projects. In the GSP, Vina GSA and RCRD GSA planned to focus their efforts on areas with the greatest need for recharge and seek grants and other funding sources to implement the projects.

- The Vina GSA, along with participating partners, submitted a grant application to pursue funds through DWR's SGM Grant Program for two efforts that directly support this project:

  - The proposed Groundwater Recharge Feasibility Analysis and Site Evaluation project consists of a feasibility analysis to identify potential groundwater recharge implementation projects for the GSAs to implement within the Subbasin. This project builds upon previous studies for groundwater recharge in the area, including the 2018 Evaluation of Restoration and Recharge within Butte County and the 2022 Rock and Sand Creek Flood Mitigation Project. Key considerations for groundwater recharge projects will include site feasibility, multi-benefits, water and land availability, water rights, water supply cost and certainty, opportunities for partnership, funding sources, optimal methods of recharge, and consistency with achieving the sustainability goals for the Subbasin. The project would also address the legal implications associated with actively managing recharge water in the Subbasin.

  - The proposed Agricultural Surface Water Supplies Feasibility Analysis project aims to increase surface water supplies available to meet both agricultural and urban water demands by identifying and refining, in preparation for future implementation efforts, the two most promising agricultural surface water supply projects in the Subbasin.

- Analyses and conclusions resulting from these scoping efforts will also directly support implementation of the Surface Water Supply and Recharge project (**Section 5.1.11**). A draft awards list is anticipated to be released by DWR in June 2023.

5.4.4 Community Water Education Initiative

- As described in the GSP, the Community Water Education Initiative project is led by the Center for Water and the Environment (CWE) at California State University, Chico (CSUC), and consists of two main components:

  - The Community Water Education Project, which would expand on community outreach and education associated with water-related topics and issues of the region, such as regional groundwater issues, connectivity of surface and groundwater, decision-making during drought years, basic aquifer knowledge, and more, and target agricultural well users, domestic well users, and municipal customers.

  - The Big Chico Creek Watershed Tour Project, which would continue and expand on the annual tour of Big Chico Creek so that it includes community members and more groundwater education, with a focus on the Vina Subbasin, with the goal of helping the community better understand their role in sustainable groundwater management.

- The Community Water Education Project is still planned, although the timeline for expansion is still dependent on funding. The CWE has continued offering the Big Chico Watershed Tours, and CSUC continues to educate students and engaged community members about the importance of the watershed and its nexus with groundwater sustainability.

5.4.5 Paradise Irrigation District Intertie Project

- Paradise Irrigation District (PID), in coordination with the California State Water Resources Control Board, has conducted the Town of Paradise Options Study to identify and evaluate long-term options for improvements to the PID water system infrastructure and finances to ensure the long-term sustainability and resiliency of the water system(s) as well as support redevelopment of the Town of Paradise. This study is also a mandated requirement to ensure that PID can obtain funding for its drinking water system improvements from the California State Legislature. The Options Study considers 23 project and financial options, based on evaluation of a variety of opportunities and constraints, which would assist PID in meeting their long-term water supply and resiliency goals. Consideration and analysis of the feasibility of a PID/California Water Service Company Intertie project is considered in the study. This project would allow PID to provide a surface water source to the City of Chico to help offset groundwater demand and benefit groundwater levels, as groundwater is currently the only source of water for residents in Chico. Stakeholder meetings regarding the progress of the Options Study, which includes this project, have been held throughout the Options Study development process.

- The final version of the Options Study was released in June 2022. According to the final report, the PID Intertie Project has been explored and considered, but has not been pursued further because of cost and feasibility considerations. Additional analysis would be needed to determine the impact on PID operations, as this project may require expansion or modification of PID's water treatment plant. In addition, the cost and schedule requirements to implement the project would not address PID's immediate goals. Given this information, no additional progress has been made on the PID Intertie Project.

5.4.6 Streamflow Augmentation Projects

- These projects would transport excess untreated surface water from water right holders in the upper watershed to various parts of the Vina Subbasin through creeks and streams. The goal of the project would be to provide additional water sources to riparian water holders such as Durham Mutual, Rancho Esquon, M&T Ranch, and Gorrill Ranches. In addition, the project would increase streamflow as well as direct and in-lieu recharge.

- Since the initial GSP development, there has been progress on one specific project, the Butte Creek Integrated Stream Flow Enhancement Planning Project. The project would undertake a comprehensive analysis of all Butte Creek surface diversions, upstream storage, groundwater, and imported water with a goal of identifying six to 10 water right acquisitions and/or implementation projects that will generate 5.0 or more cubic feet per second. A technical and legal analysis will support development of a plan to enhance stream flow above baseline conditions during critical migration and rearing seasons for threatened spring run Chinook Salmon and threatened Central Valley Steelhead on the middle and lower reaches of the canyon section of Butte Creek and in Little Butte Creek. The planning proposal will evaluate potential acquisition and implementation opportunities to acquire, exchange, or forbear water for dedication to stream flow enhancement and salmonids. There will be consideration of utilizing surplus stored water, water efficiencies in the conveyance and use of irrigation water from various diversions and longer-term monitoring of water flow and temperature. This project seeks to partner with irrigators to benefit both farms and fish along with the recharge of the Vina Subbasin aquifer. Increased flows from the project will increase recharge into the subbasin from Butte Creek and reduce the need for groundwater pumping for some landowners, affecting groundwater levels, storage, and surface water depletions.

- An application was submitted to the Wildlife Conservation Board's Stream Flow Enhancement Project Program by the Friends of Butte Creek to fund this project on September 28th, 2022 and the decision to not fund this project was released on December 28th, 2022. Reasons for not funding this project include a lack of staff available to review numerous submissions. There are plans to reapply for funding for this project in Spring 2023.

- A proposal to the Bureau of Reclamation to evaluate and clean up portions of the California Department of Fish and Wildlife (CDFW) and Mechoopda Reserves on Butte Creek was approved in September 2022. There are plans to start the project in Spring 2023.

- The Vina GSA, along with participating partners, is also pursuing grant funds through DWR's SGM Grant Program for the Agricultural Surface Water Supplies Feasibility Analysis project, which is expected to support the overarching goals of the Streamflow Augmentation Projects. The proposed Agricultural Surface Water Supplies Feasibility Analysis project aims to increase surface water supplies available to meet both agricultural and urban water demands by identifying and refining, in preparation for future implementation efforts, the two most promising agricultural surface water supply projects in the Subbasin. The grant application was submitted in December 2022, and a draft awards list is anticipated to be released by DWR in June 2023.

5.4.7 Community Monitoring Program

- As proposed in the GSP, this project would create routine groundwater level monitoring programs for approximately 8,000 acres of Ecological Reserves in the region between lower Forest Ranch and Cohasset Road near Chico Airport, including the Big Chico Creek, Sheep Hollow, and Cabin Hollow tributaries. The project would be under the authority of CSUC and Chico Ecological Reserves and is expected to benefit groundwater levels by tracking overall groundwater level trends in the region and providing important, up-to-date data for making decisions on water management. The establishment of these new monitoring programs is planned to take place before 2025, pending funding.

- The Vina GSA, along with participating partners, is pursuing grant funds through DWR's SGM Grant Program for a Community Monitoring and Domestic Well Survey project that is expected to support the overarching goals of these planned efforts, although the focus of the grant project is on monitoring groundwater level conditions in domestic wells. The grant application was submitted in December 2022, and a draft awards list is anticipated to be released by DWR in June 2023.

5.4.8 Rangeland Management and Water Retention Project

- Under this project, CSUC and Chico State Enterprises are initiating a study of adaptive/ regenerative grazing practices on 2,000 or more acres in the region. The study is measuring soil compaction, erosion, groundwater retention, and biological diversity. If this study finds that water retention engineering projects would be feasible in the region, based on the collected data on local soil, then CSUC would create a master management plan and take necessary steps to complete the water retention projects. This project covers two locations within and upslope of the subbasin across 3,850 acres of historical rangeland between Musty Buck Ridge and Cohasset Road. Currently, there is a contract in place to create a Management Plan for the land which includes long-term rangeland management research activities to describe current conditions of the land including soil conditions which will inform the feasibility to initiate water retention and recharge projects which would benefit groundwater levels, storage, and surface water depletions.

- A grant application has been submitted to the Wildlife Conservation Board that would fund completion of a management plan and CEQA permitting project implementation for the full project area (more than 3,800 acres), allowing for future water retention planning efforts. CSUC and Chico State Enterprises are currently developing a management plan in partnership with Point Blue Conservation.

5.4.9 Removal of Invasive Species

- This project will involve mapping, management planning, and ultimately lead to the removal of invasive species that negatively impact the natural ecosystem in the Subbasin by consuming water and hampering recharge. This project would take place in the Upper Watershed at approximately 8,000 acres between lower Forest Ranch and the Chico Airport, including the Big Chico Creek, Sheep Hollow, and Cabin Hollow drainages. As described in the GSP, invasive species and native grasses in meadows and oak savannahs would be mapped between 2022 and 2023. This would then be followed by the development of an invasive management for water retention plan between 2023 and 2024, the acquisition of funding between 2022 and 2026, and the implementation of invasive species removal projects after 2025.

- The initial data collection, in partnership with Point Blue Conservation, took place in WY 2022 and has allowed for the beginning of identifying and mapping invasive flora in the areas of interest.

- In WY 2022 Chico State Enterprises submitted an application to the Wildlife Conservation Board (WCB), which includes $600,000 to develop more robust baseline data around current site conditions, including invasive species abundance and diversity. The funding will also support the development of a management plan for those invasive species.

- In WY 2022 Chico State Enterprises also applied and has a grant pending with the US Fish and Wildlife Service (USFWS) to manage invasive species on approximately 9 acres around two springs in the areas of interest.

5.4.10 Surface Water Supply and Recharge Project

- These projects will involve activities that increase the surface water supply to the Subbasin through 1) direct application of surface water to crops, 2) application of surface water and/or flood water to land surface (i.e., existing orchards) for recharge purposes, and 3) application of surface water and/or flood water to recharge basins and/or recharge ponds or other applications.

- Progress has been made on four projects. The first project is the Rock and Sand Creek Flood Mitigation Project, which will address solutions to flooding, public safety, and recharge of the aquifer, focusing on potential floodwater detentions on Sand Creek, an undeveloped tributary basin that joins Rock Creek in the Subbasin. The project will assess potential hydrologic benefits of alternative detention strategies, including creation of seasonal wetland habitats. The magnitude and timing of flood flows down Sand Creek and Rock Creek will be analyzed. A feasibility study will be developed that will lead to the capturing of stormwater and augmentation of the region's aquifer water supplies. The intended outcome of the project is to acquire data that will be used to develop potential mitigation measures for flooding in the Rock Creek Reclamation District area, while supporting increased recharge of the aquifer. The data may also be used to decide future actions towards habitat restoration and runoff management to sustain groundwater levels. A Decision Support Tool will determine future construction, scope, and feasibility. Funding for this project has been secured through the Integrated Regional Water Management Program Proposition 1, the Water Quality, Supply, and Infrastructure Improvement Act of 2014 for this project. A Prop 1 funded Feasibility Study is underway and will be completed by December 2023.

- The second project, the Lindo Channel Surface Water Recharge Implementation project, seeks to increase recharge in an area of the subbasin that has experienced groundwater declines, therefore increasing groundwater levels, minimize potential flood impacts, support groundwater dependent ecosystems, and improve the interface between groundwater and streams. The project would consist of determining the minimum required flow in Big Chico Creek and potential water available for diversion into Lindo Chanel and to better assess the volume of groundwater recharge that could be achieved; and to implement the recharge project with shallow water level monitoring to assess its effects on groundwater. The project would address groundwater level declines in the vicinity of the City of Chico. The Vina GSA is seeking funding for this project through grant funds. The grant application was submitted in December 2022, and a draft awards list is anticipated to be released by DWR in June 2023.

- The third project, the Agricultural Surface Water Supplies Feasibility Analysis project, seeks to identify and refine future surface water supply projects that will address MOs and MTs related to groundwater levels, storage, and the depletion of interconnected surface waters. This project would increase surface water supplies available to meet both agricultural and urban water demands. The objectives are to identify and refine the two most promising agricultural surface water supply projects for the Vina Subbasin for future implementation. The Vina GSA is seeking funding for this project through grant funds. The grant application was submitted in December 2022, a draft awards list is anticipated to be released by DWR in June 2023.

- The fourth project, the Groundwater Recharge Feasibility Analysis and Site Evaluation project, involves conducting a feasibility analysis to identify potential groundwater recharge implementation projects to implement in the subbasin. This study builds upon previous for groundwater recharge such as the 2018 Evaluation of Restoration and Recharge within Butte County (ERR Project) and the 2022 Rock and Sand Creek Flood Mitigation Project (Sand Creek Project; first project in this section). The results of the analysis would be used to identify potential areas for recharge and or recharge projects for implementation and to conduct one groundwater recharge investigation of an anticipated 80-acre facility for use in developing preliminary design plans and preliminary design specifications for one project to be implemented. The Vina GSA is seeking funding for this project through grant funds. The grant application was submitted in December 2022, a draft awards list is anticipated to be released by DWR in June 2023.

5.4.11 Extend Orchard Replacement Program

- One project aimed at conserving groundwater is the Extend Orchard Replacement Program, which seeks to reduce overall groundwater pumping demand from the Vina Subbasin through increased land fallowing. This is intended to be a demand side intervention aimed at extending the fallowing period an additional year during orchard replacement, which may then reduce the average annual ET of groundwater. The fallowing period could be extended from one to two years.

- The Vina GSA is seeking funding for this project through grant funds. A draft awards list is anticipated to be released by DWR in June 2023.

5.5 GSP Management Action Implementation Progress

Below are the Management Action Updates and their progress in implementation since the 2021 Annual Report.

5.5.1 General Plan Updates

- Butte County staff, who serve as members of the Vina GSA Management Committee, have been cooperating with the Butte County Department of Development Services in the 2040 General Plan Update. Specifically, staff along with the Water Commission has made suggested revisions to the Water Resources Element and applicable General Plan Goals, Policies, and Actions. These updates will ensure that important components of the GSP are supported by the General Plan.

- Domestic Well Mitigation

- This Management Action seeks to address dry domestic wells in the Subbasin. If a growing number of these wells go dry, the GSAs may propose the following steps to mitigate the issue:

    1. Establish a voluntary registry of domestic wells.
    2. Compile domestic well logs, screen depths, and locations.
    3. Secure financial resources to improve, deepen, or replace select domestic wells.
    4. Provide emergency response to homes with dry domestic wells, including supplying bottled water and potable water for sanitation. Priority would be given to disadvantaged communities dependent on groundwater as a drinking water resource.

- While this management action is not in effect, the Vina GSA, along with participating partners, is pursuing grant funds through DWR's SGM Grant Program for a Community Monitoring and Domestic Well Survey project that would support the goals of this management action by creating a registry of domestic wells in the region. The grant application was submitted in December 2022, and a draft awards list is anticipated to be released by DWR in June 2023.

6 CONCLUSIONS

Since the Vina and RCRD GSAs submitted the adopted GSP to DWR in January 2022, the GSAs have been actively working on sustainable groundwater management in the Basin. As presented in Section 5 of this report, recent progress made on a variety of PMAs demonstrates the commitment of the GSAs to implement the GSP by allocating the necessary time and resources to achieve long-term sustainable management of the groundwater resources in the Subbasin.

7 REFERENCES

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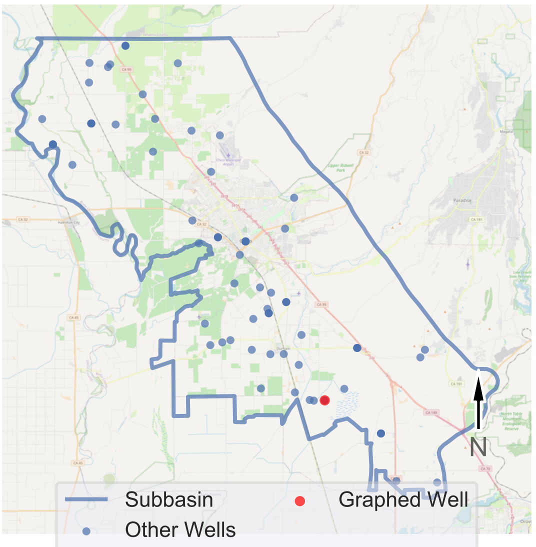
2022 Water Year Annual Report

Appendix A

Characteristics and Hydrographs of Representative Monitoring Site (RMS) Wells and County Wide Groundwater Contour Maps for the Primary Aquifer

VINA Subbasin - State Well Number (SWN): 20N02E09L001M

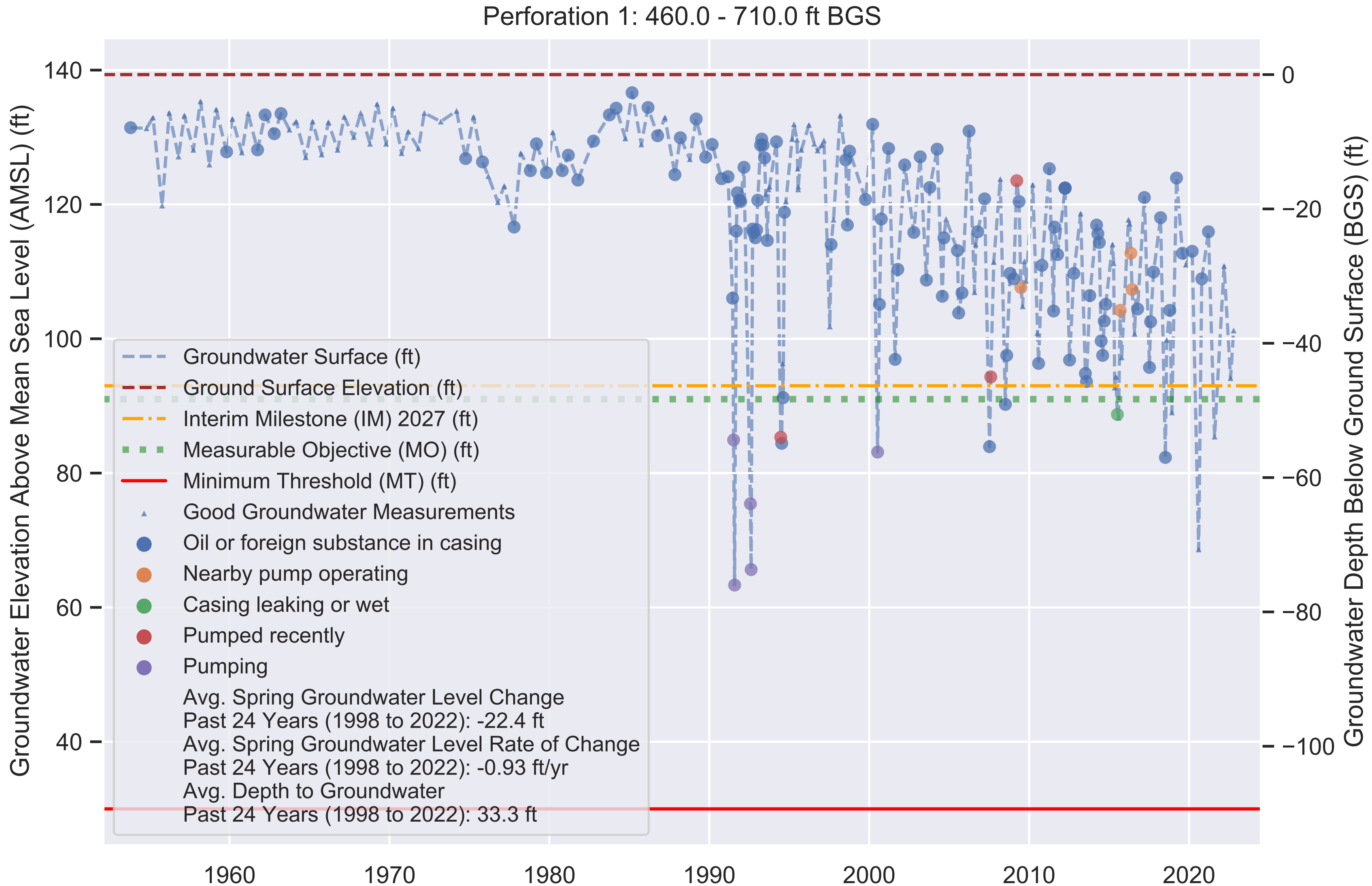
Well Location Map

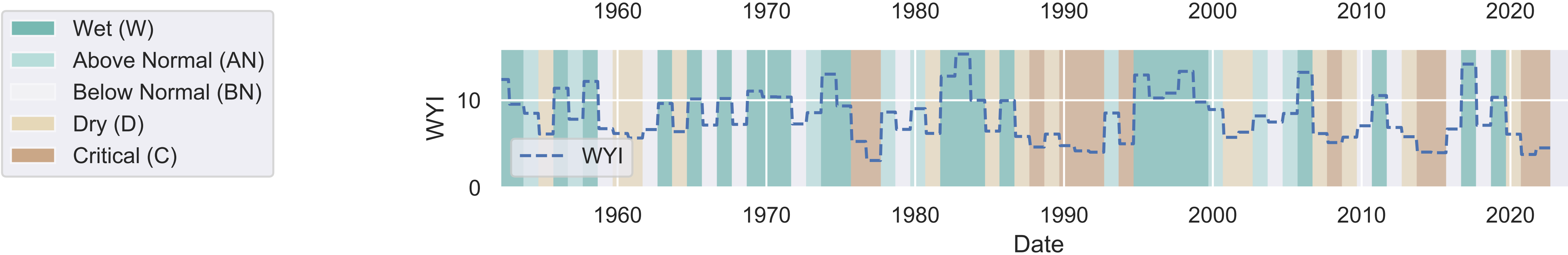


Sustainable Management Criteria:

IM (2027) = 93.0 ft AMSL
MO = 91.0 ft AMSL
MT = 30.0 ft AMSL

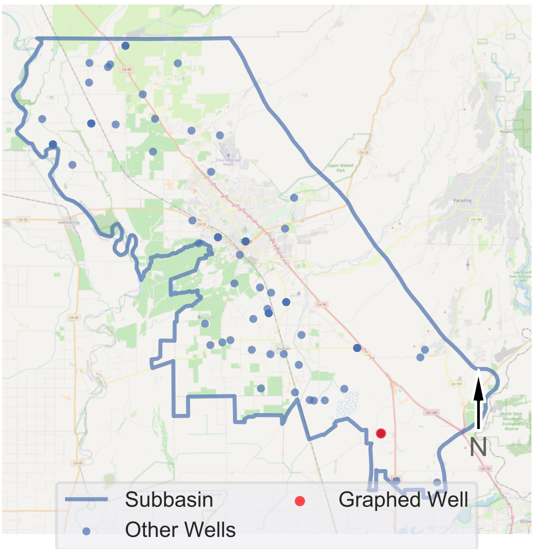
Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.



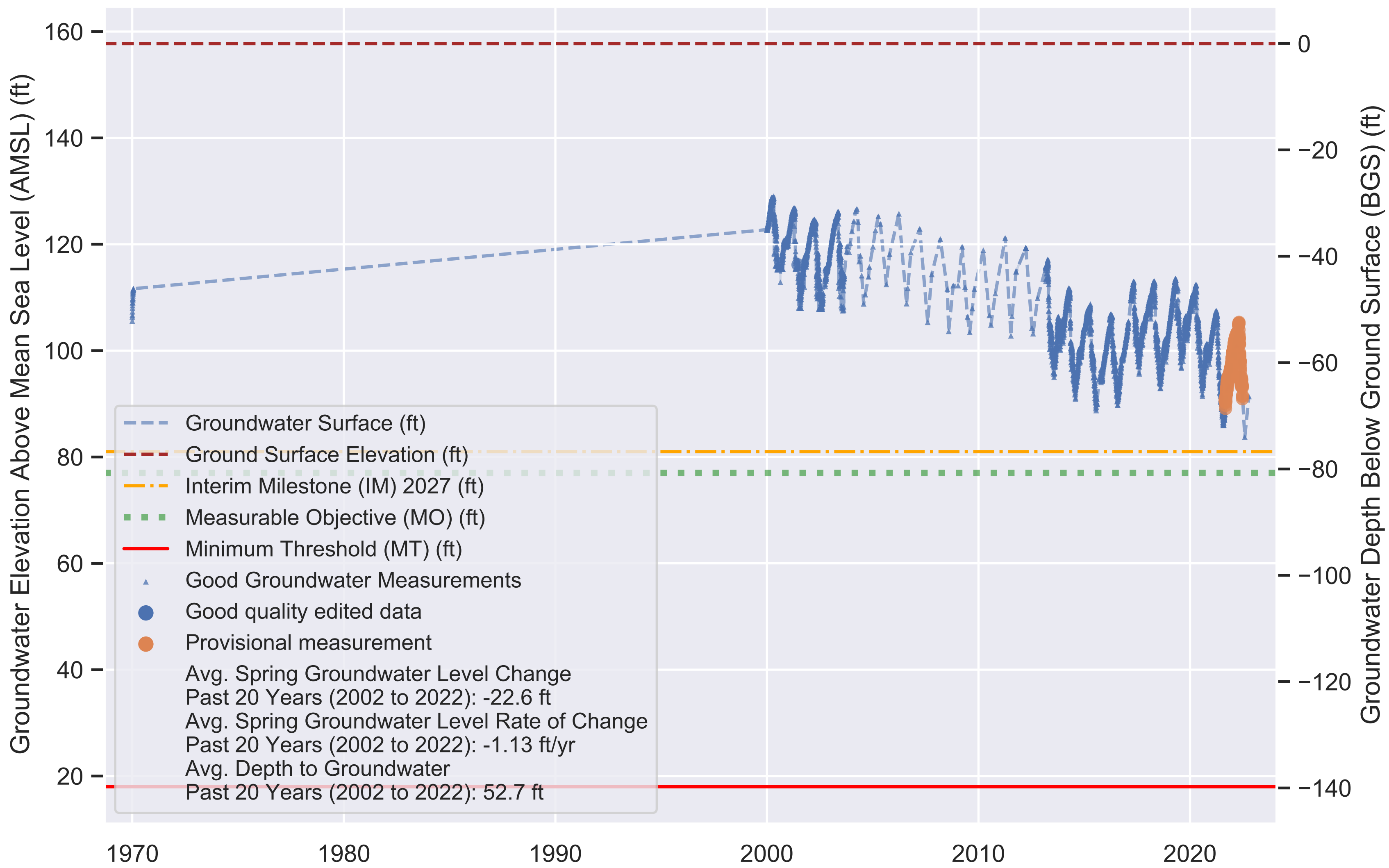


VINA Subbasin - State Well Number (SWN): 20N02E24C001M

Well Location Map



Perforation 1: 124.0 - 134.0 ft BGS

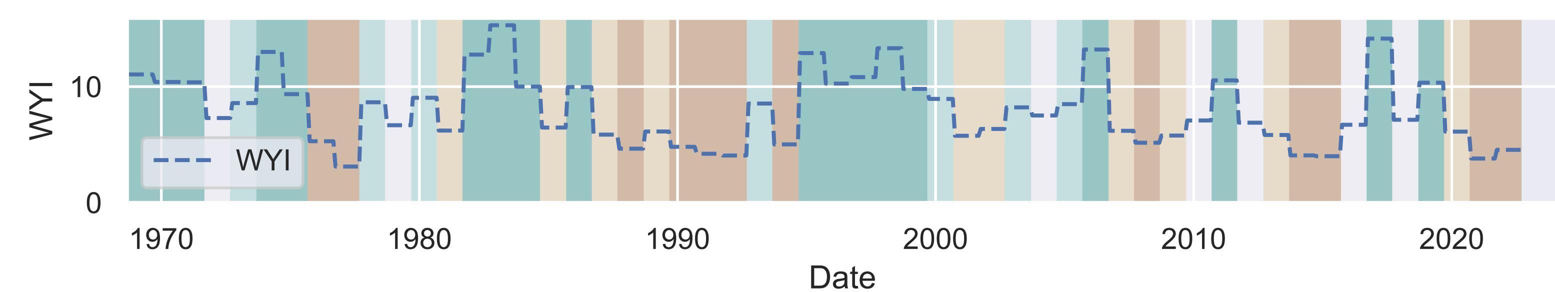


Sustainable Management Criteria:

IM (2027) = 81.0 ft AMSL
MO = 77.0 ft AMSL
MT = 18.0 ft AMSL

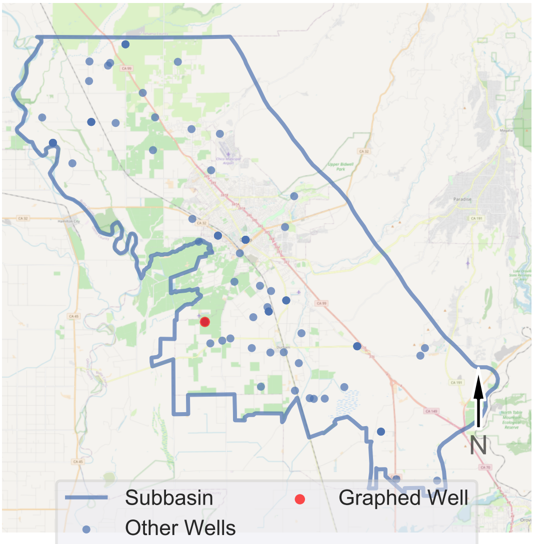
Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.

- Wet (W)
- Above Normal (AN)
- Below Normal (BN)
- Dry (D)
- Critical (C)

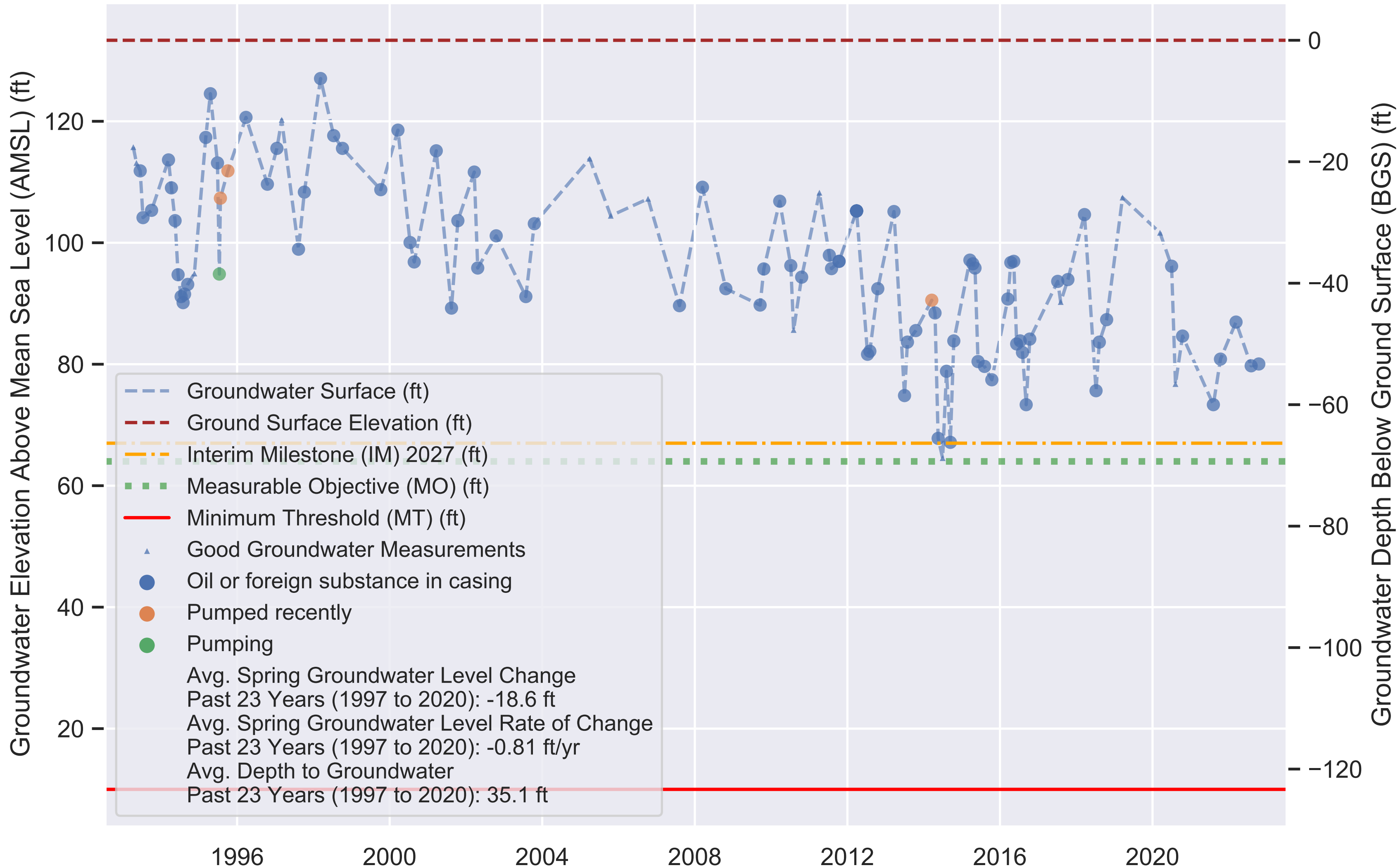


VINA Subbasin - State Well Number (SWN): 21N01E21C001M

Well Location Map



Perforation 1 (P1): 240.0 - 300.0; P2: 448.0 - 508.0 ft BGS

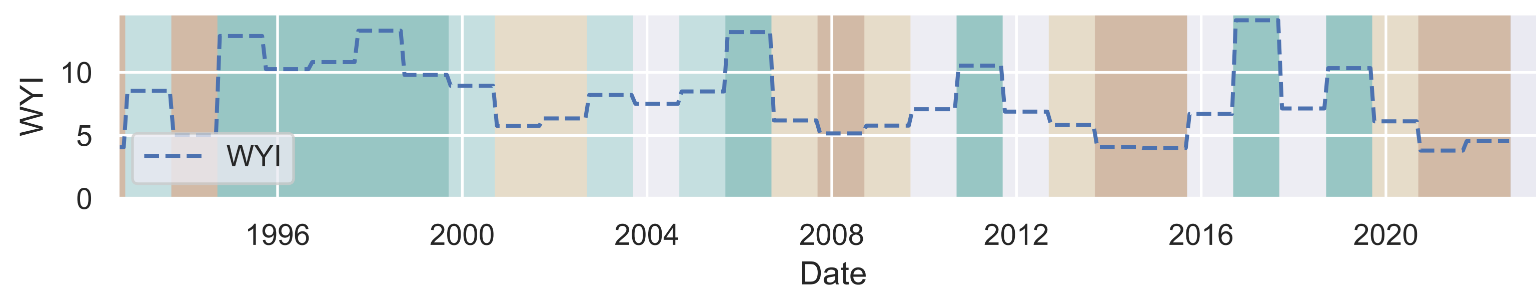


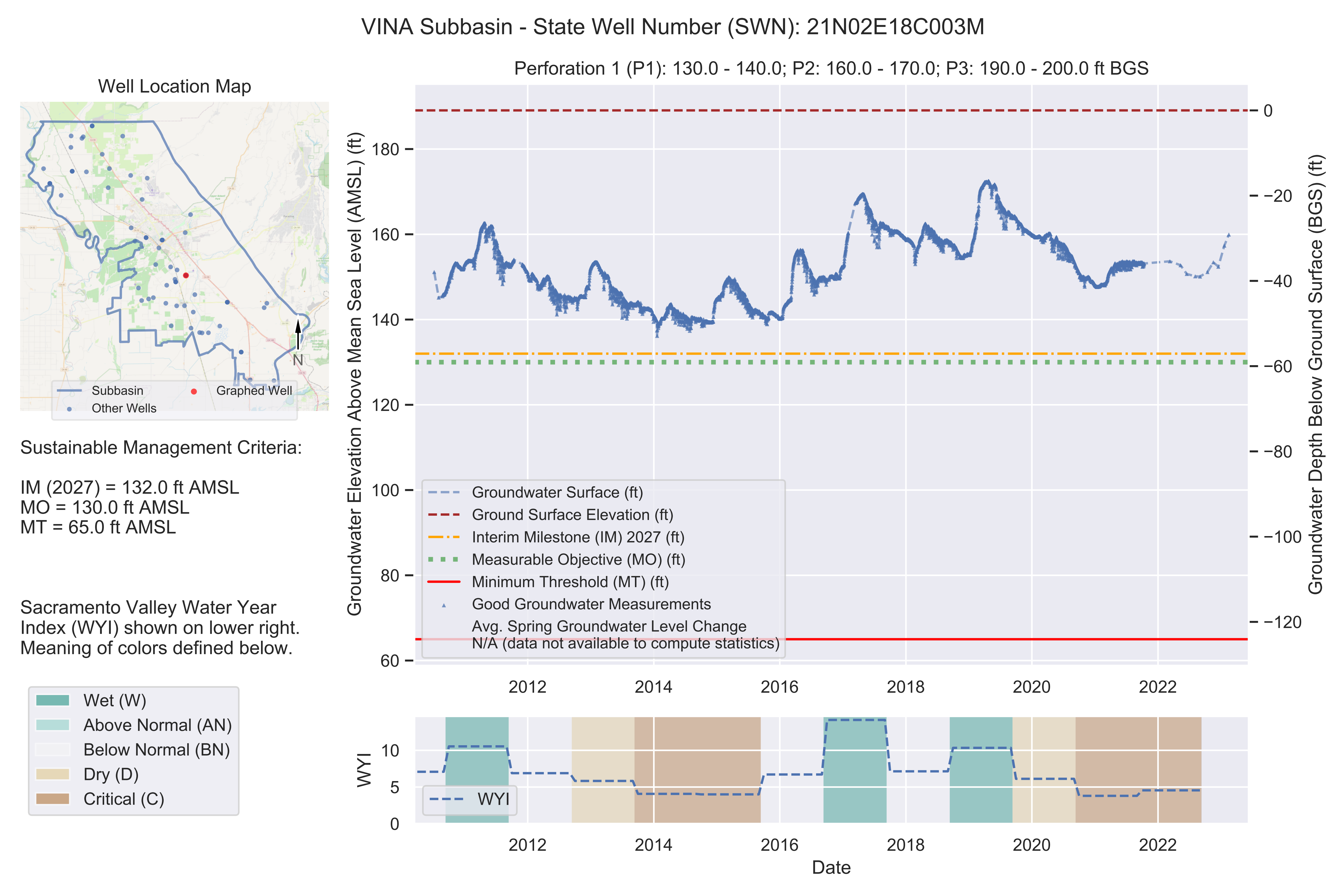
Sustainable Management Criteria:

IM (2027) = 67.0 ft AMSL
MO = 64.0 ft AMSL
MT = 10.0 ft AMSL

Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.

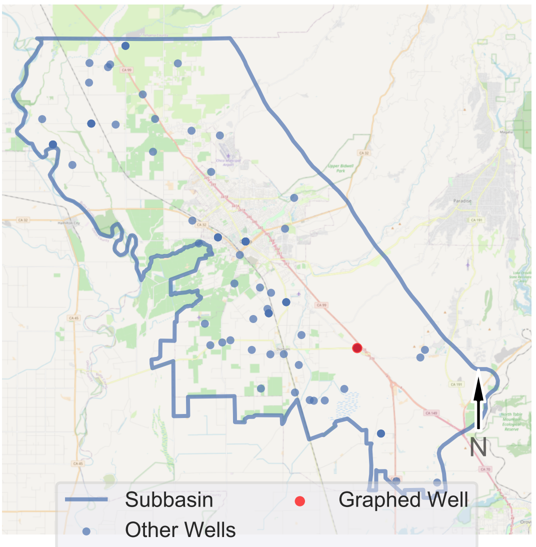
- Wet (W)
- Above Normal (AN)
- Below Normal (BN)
- Dry (D)
- Critical (C)




VINA Subbasin - State Well Number (SWN): 21N02E18C003M
Well Location Map
Subbasin
Graphed Well
Other Wells
N
Sustainable Management Criteria:
IM (2027) = 132.0 ft AMSL
MO = 130.0 ft AMSL
MT = 65.0 ft AMSL
Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.
Wet (W)
Above Normal (AN)
Below Normal (BN)
Dry (D)
Critical (C)
Perforation 1 (P1): 130.0 - 140.0; P2: 160.0 - 170.0; P3: 190.0 - 200.0 ft BGS
Groundwater Elevation Above Mean Sea Level (AMSL) (ft)
Groundwater Depth Below Ground Surface (BGS) (ft)
Groundwater Surface (ft)
Ground Surface Elevation (ft)
Interim Milestone (IM) 2027 (ft)
Measurable Objective (MO) (ft)
Minimum Threshold (MT) (ft)
Good Groundwater Measurements
Avg. Spring Groundwater Level Change
N/A (data not available to compute statistics)
180
160
140
120
100
80
60
0
−20
−40
−60
−80
−100
−120
2012
2014
2016
2018
2020
2022
WYI
10
5
0
Date

VINA Subbasin - State Well Number (SWN): 21N02E26E005M

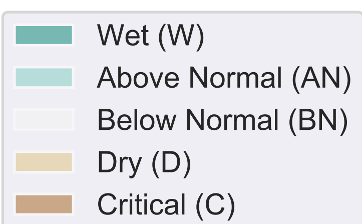
Well Location Map

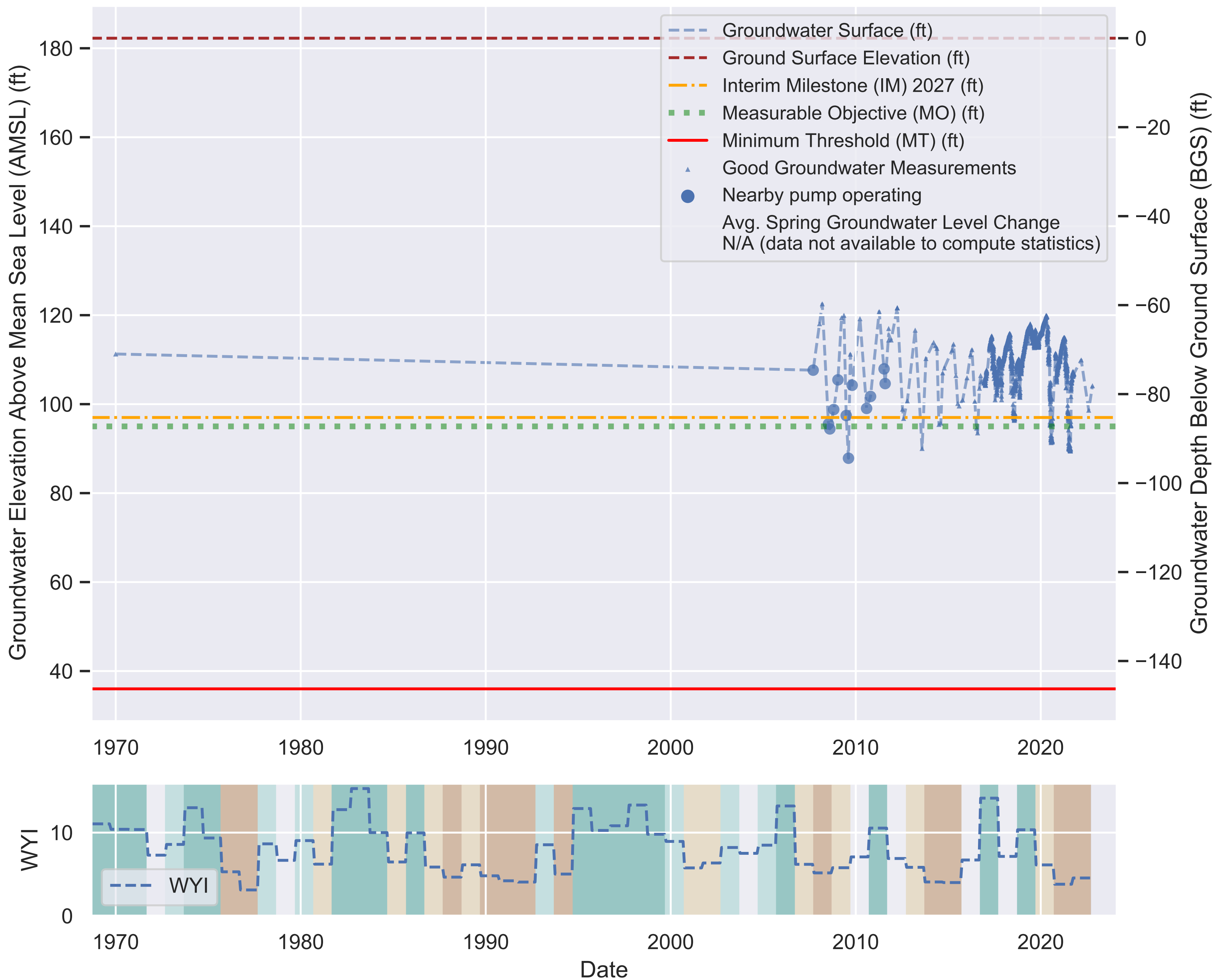


Sustainable Management Criteria:

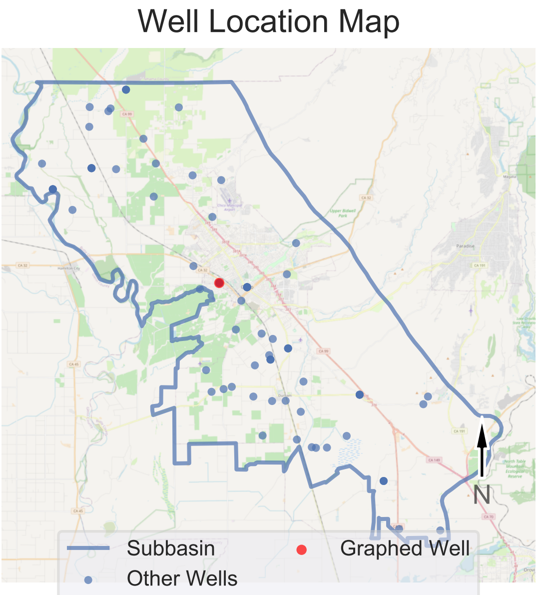
IM (2027) = 97.0 ft AMSL
MO = 95.0 ft AMSL
MT = 36.0 ft AMSL

Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.





VINA Subbasin - State Well Number (SWN): 22N01E28J003M

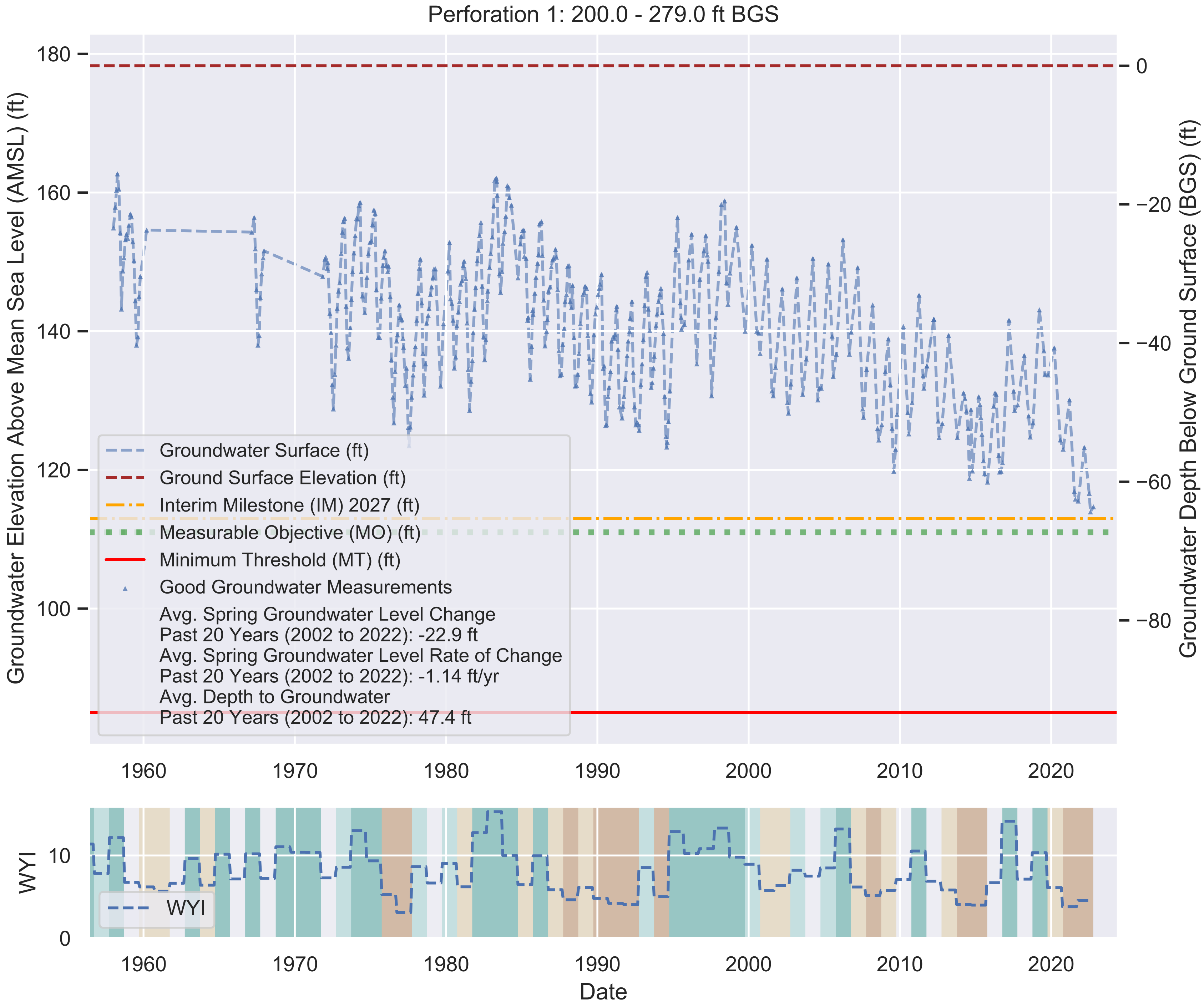


Sustainable Management Criteria:

IM (2027) = 113.0 ft AMSL
MO = 111.0 ft AMSL
MT = 85.0 ft AMSL

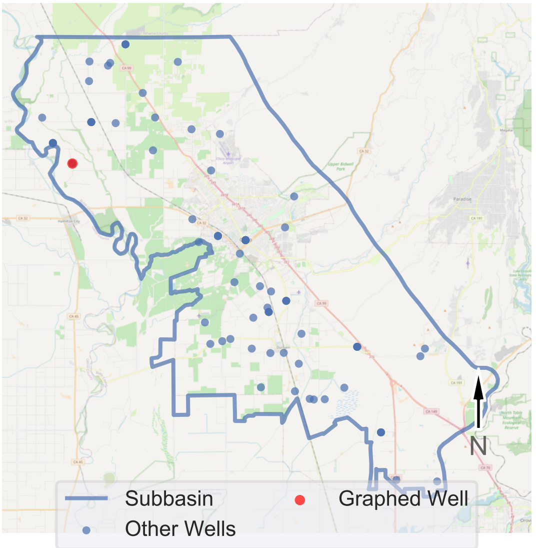
Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.

- Wet (W)
- Above Normal (AN)
- Below Normal (BN)
- Dry (D)
- Critical (C)



VINA Subbasin - State Well Number (SWN): 22N01W05M001M

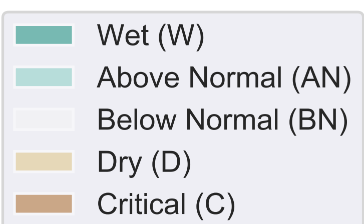
Well Location Map

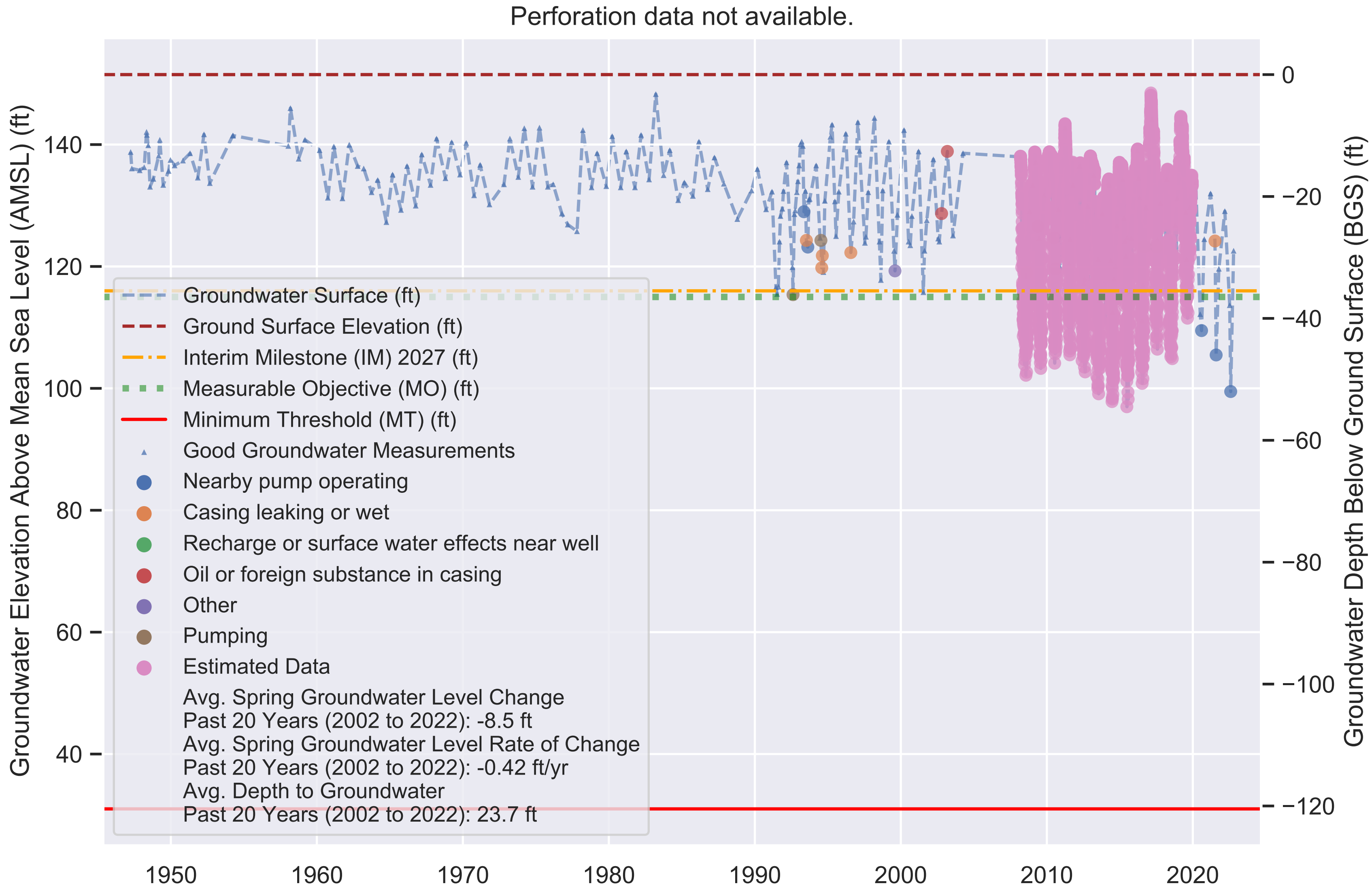


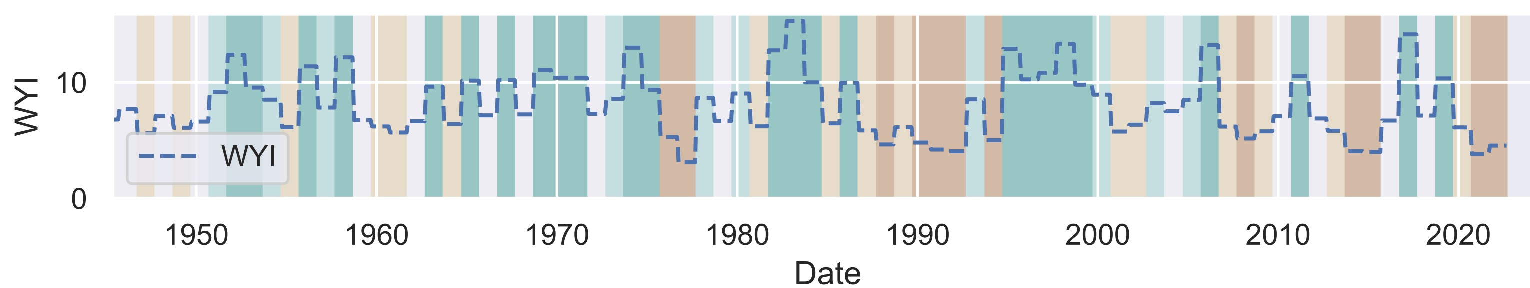
Sustainable Management Criteria:

IM (2027) = 116.0 ft AMSL
MO = 115.0 ft AMSL
MT = 31.0 ft AMSL

Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.

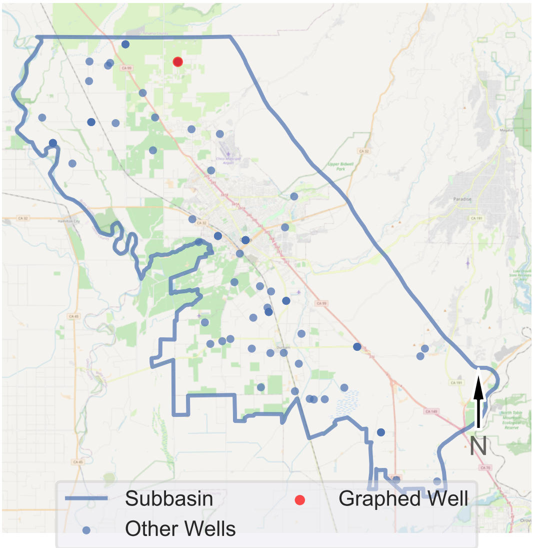




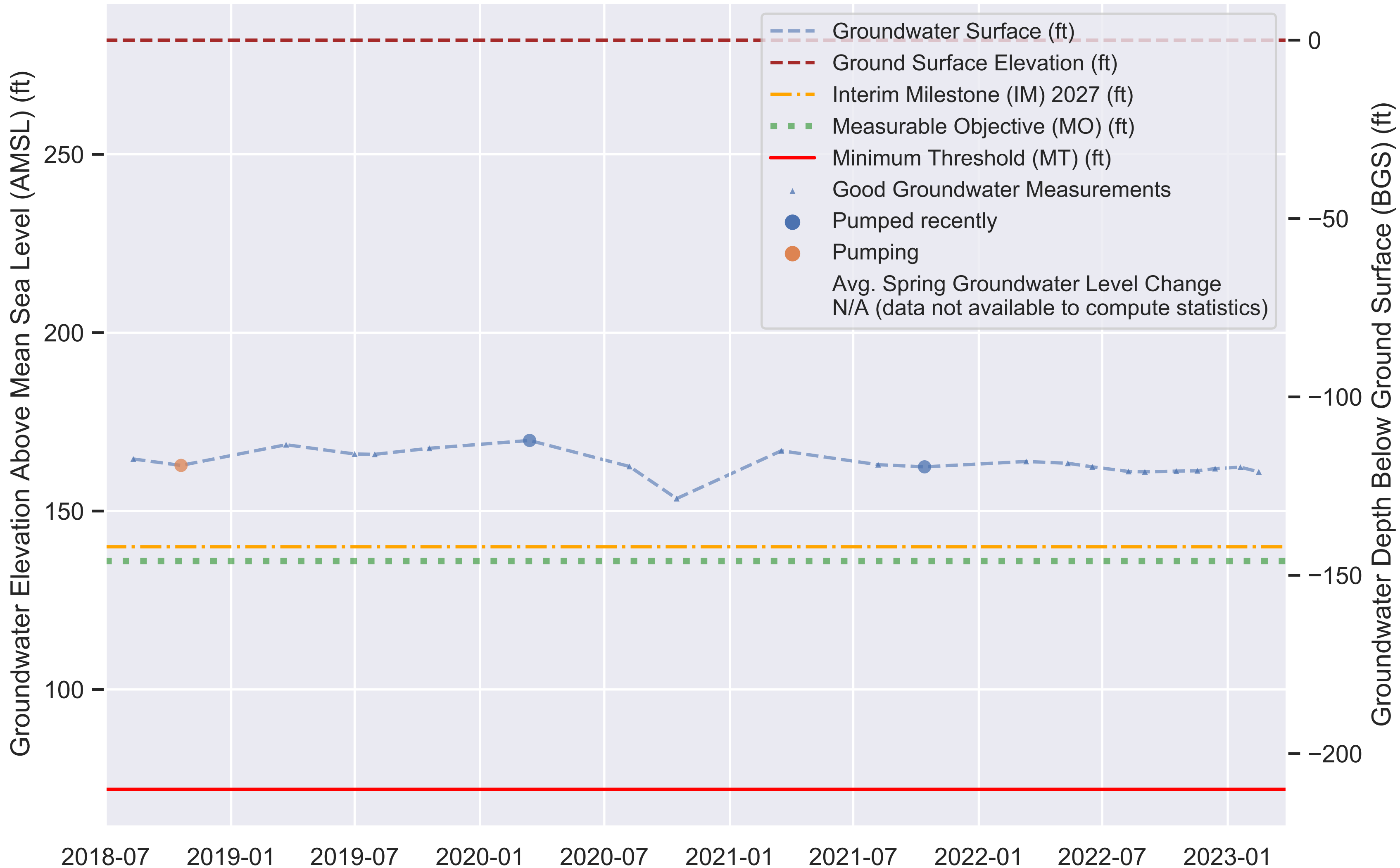


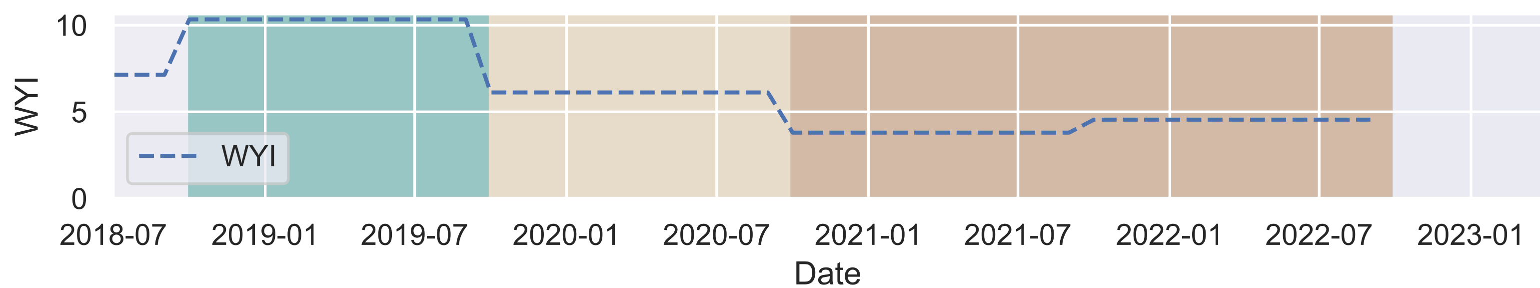
VINA Subbasin - State Well Number (SWN): 23N01E07H001M

Well Location Map



Perforation 1: 115.0 - 195.0 ft BGS





Sustainable Management Criteria:

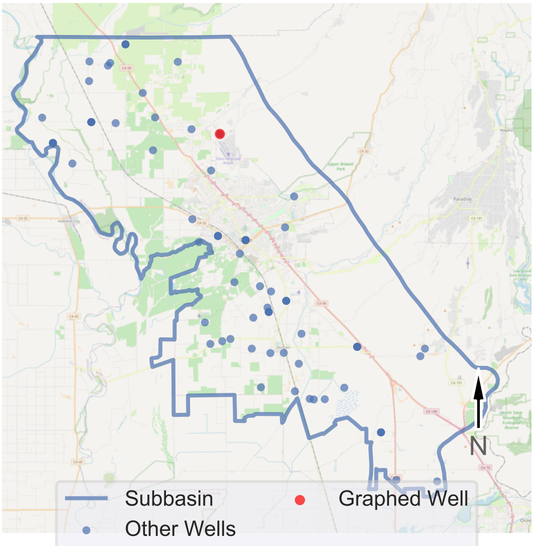
IM (2027) = 140.0 ft AMSL
MO = 136.0 ft AMSL
MT = 72.0 ft AMSL

Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.

- Wet (W)
- Above Normal (AN)
- Below Normal (BN)
- Dry (D)
- Critical (C)

VINA Subbasin - State Well Number (SWN): 23N01E33A001M

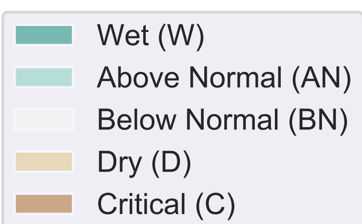
Well Location Map



Sustainable Management Criteria:

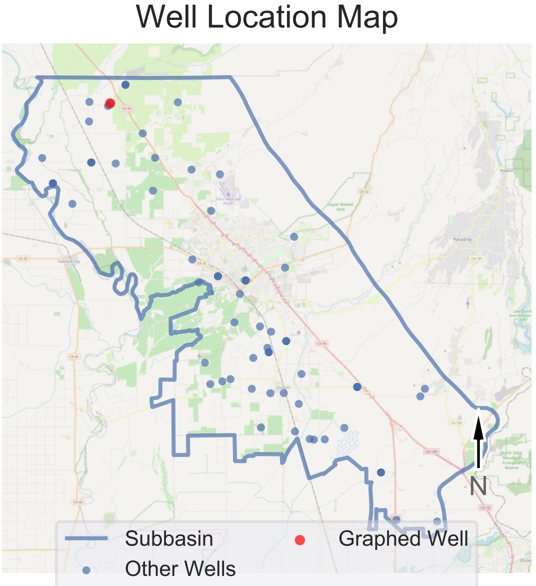
IM (2027) = 128.0 ft AMSL
MO = 125.0 ft AMSL
MT = 72.0 ft AMSL

Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.



Perforation 1: 53.0 - 506.0 ft BGS

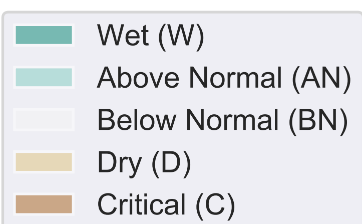
VINA Subbasin - State Well Number (SWN): 23N01W10E001M

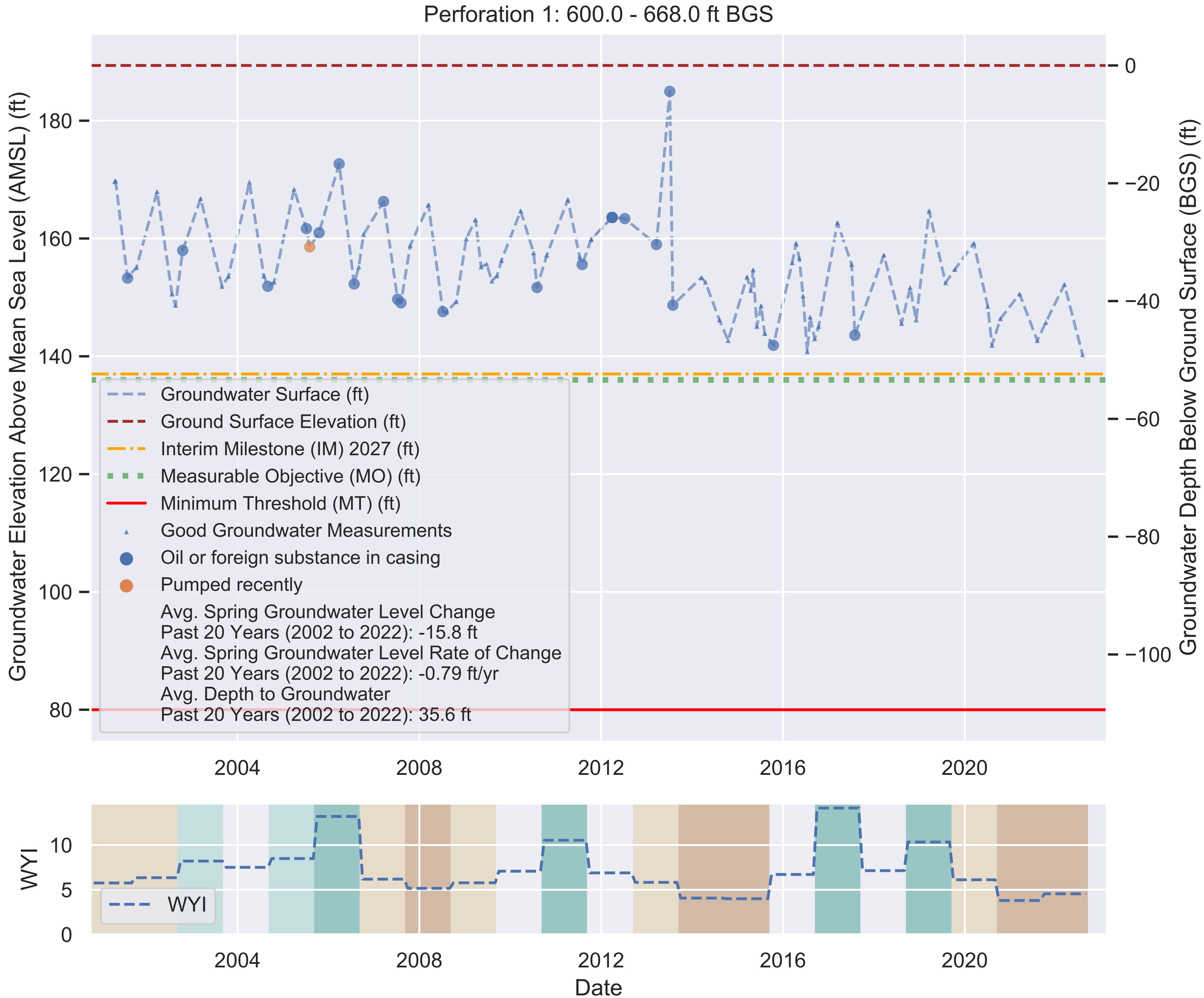


Sustainable Management Criteria:

IM (2027) = 137.0 ft AMSL
MO = 136.0 ft AMSL
MT = 80.0 ft AMSL

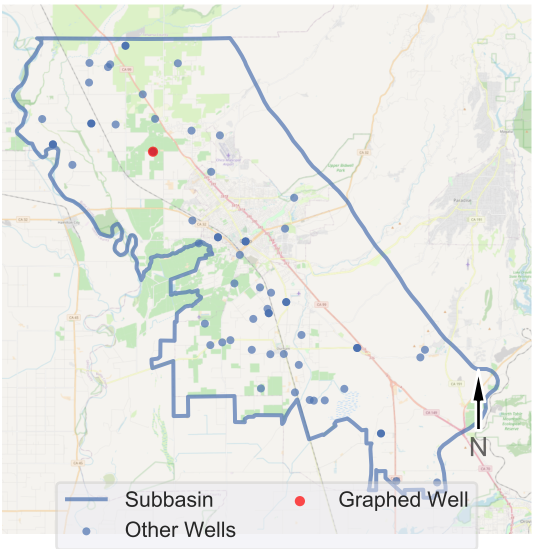
Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.





VINA Subbasin - State Well Number (SWN): 23N01W36P001M

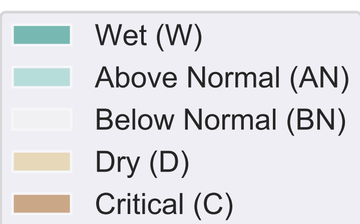
Well Location Map

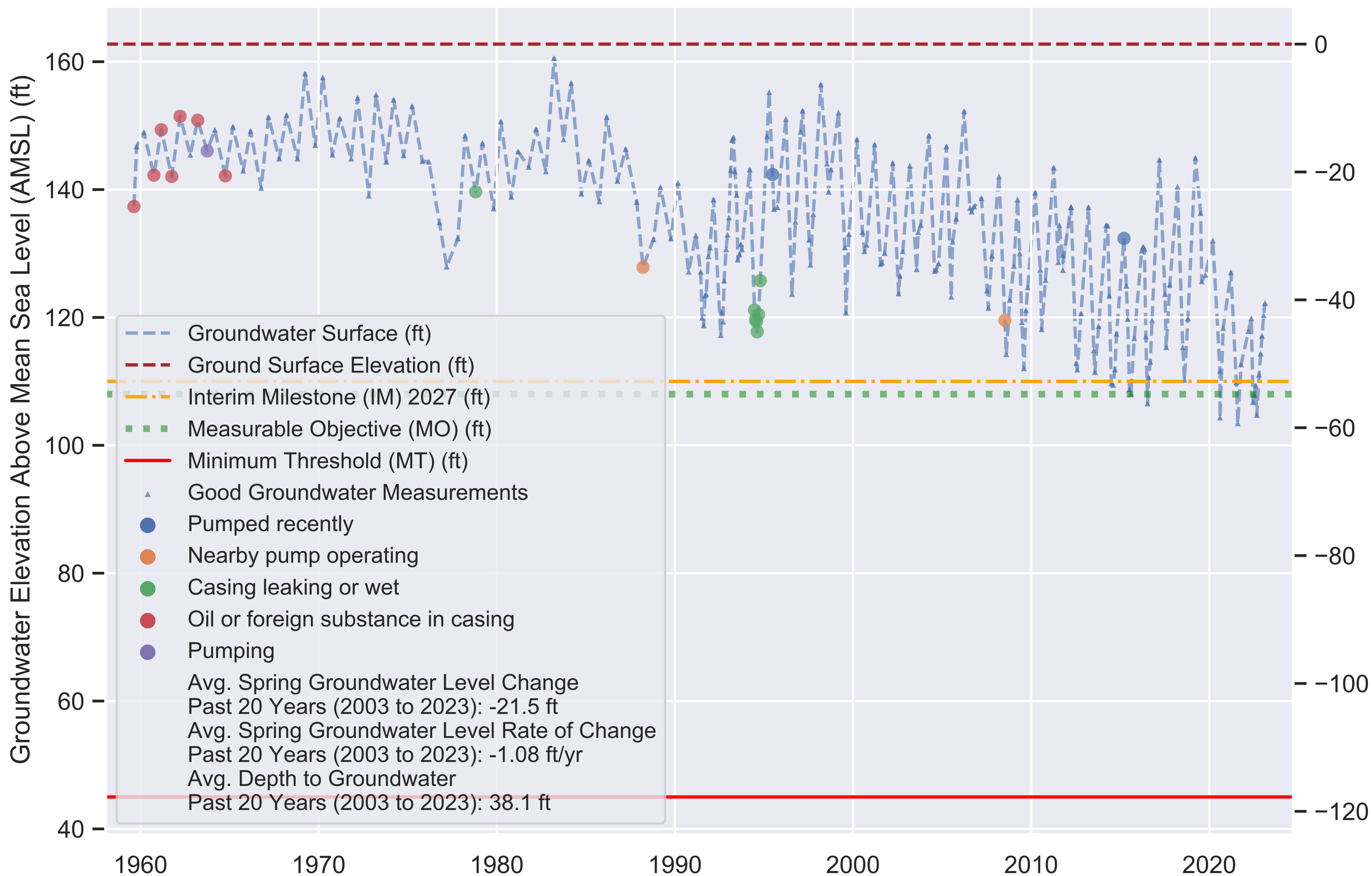


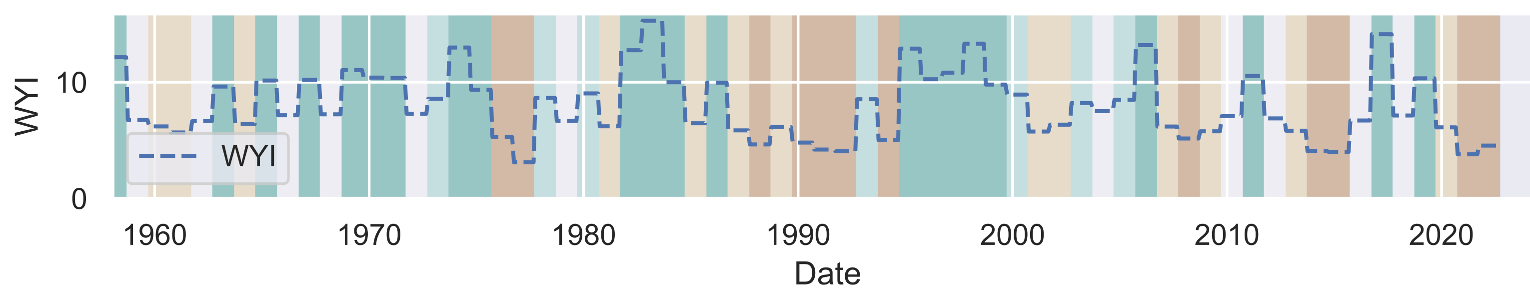
Sustainable Management Criteria:

IM (2027) = 110.0 ft AMSL
MO = 108.0 ft AMSL
MT = 45.0 ft AMSL

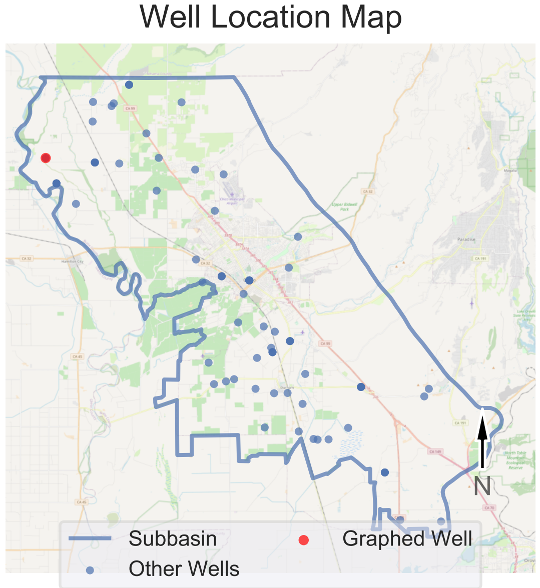
Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.







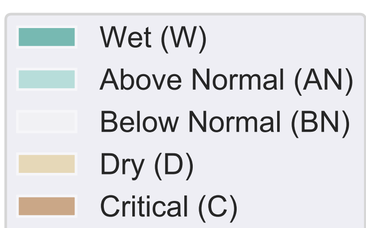
VINA Subbasin - State Well Number (SWN): 23N02W25C001M



Sustainable Management Criteria:

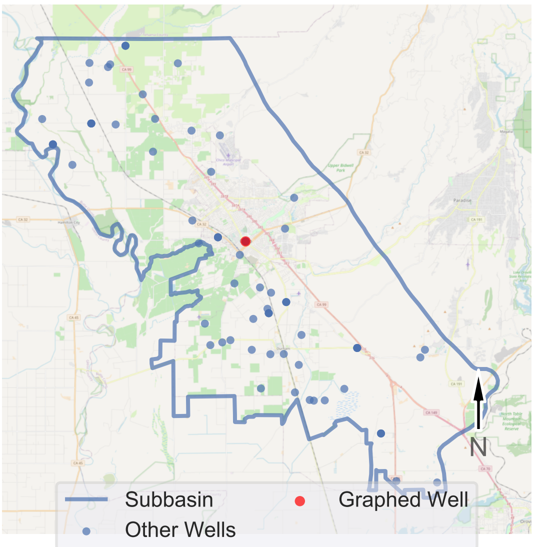
IM (2027) = 130.0 ft AMSL
MO = 130.0 ft AMSL
MT = 50.0 ft AMSL

Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.



VINA Subbasin - State Well Number (SWN): CWSCH01b

Well Location Map

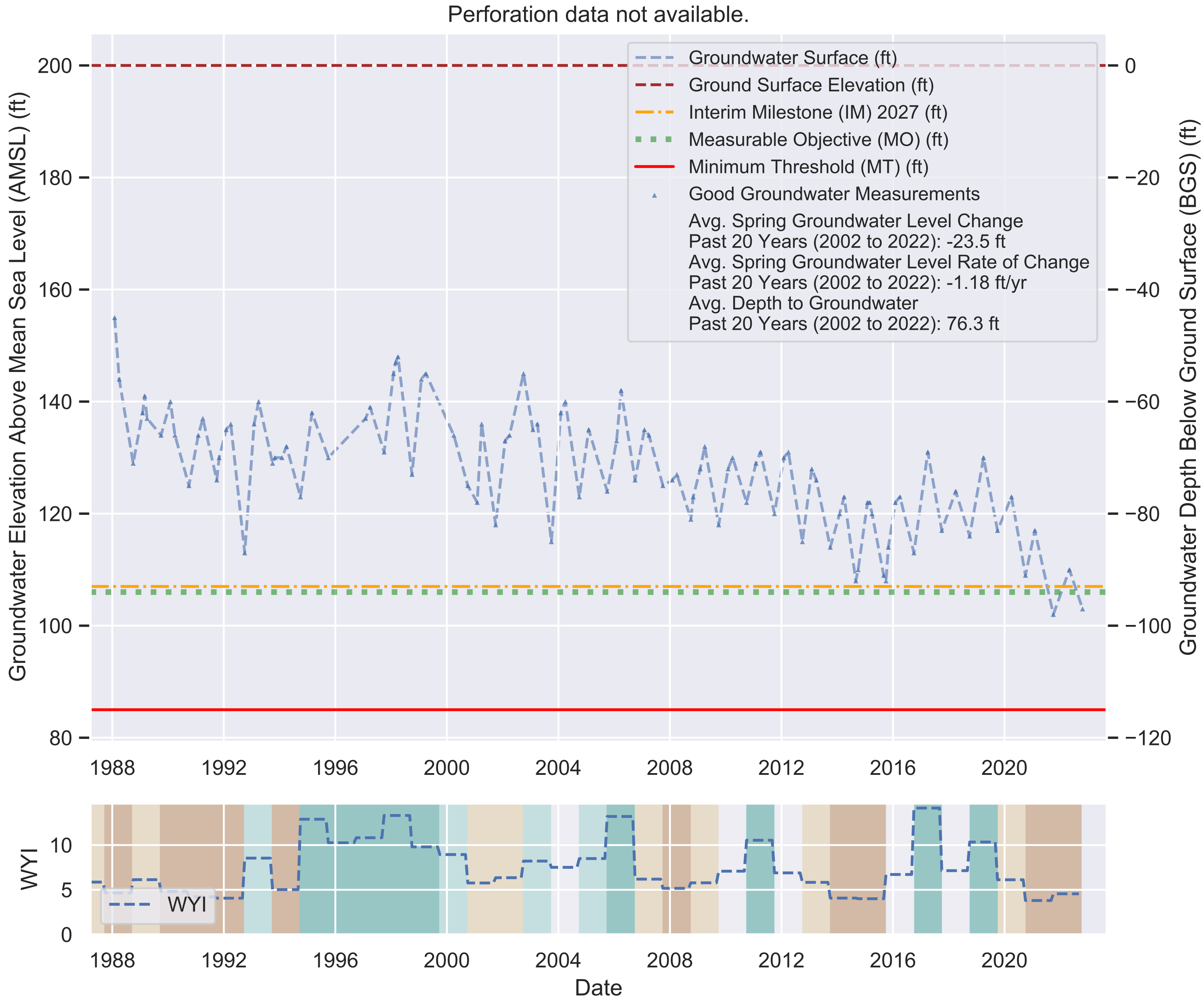


Sustainable Management Criteria:

IM (2027) = 107.0 ft AMSL
MO = 106.0 ft AMSL
MT = 85.0 ft AMSL

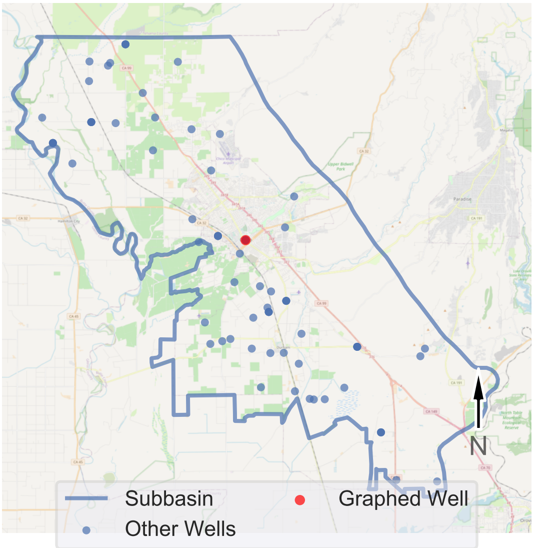
Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.

- Wet (W)
- Above Normal (AN)
- Below Normal (BN)
- Dry (D)
- Critical (C)

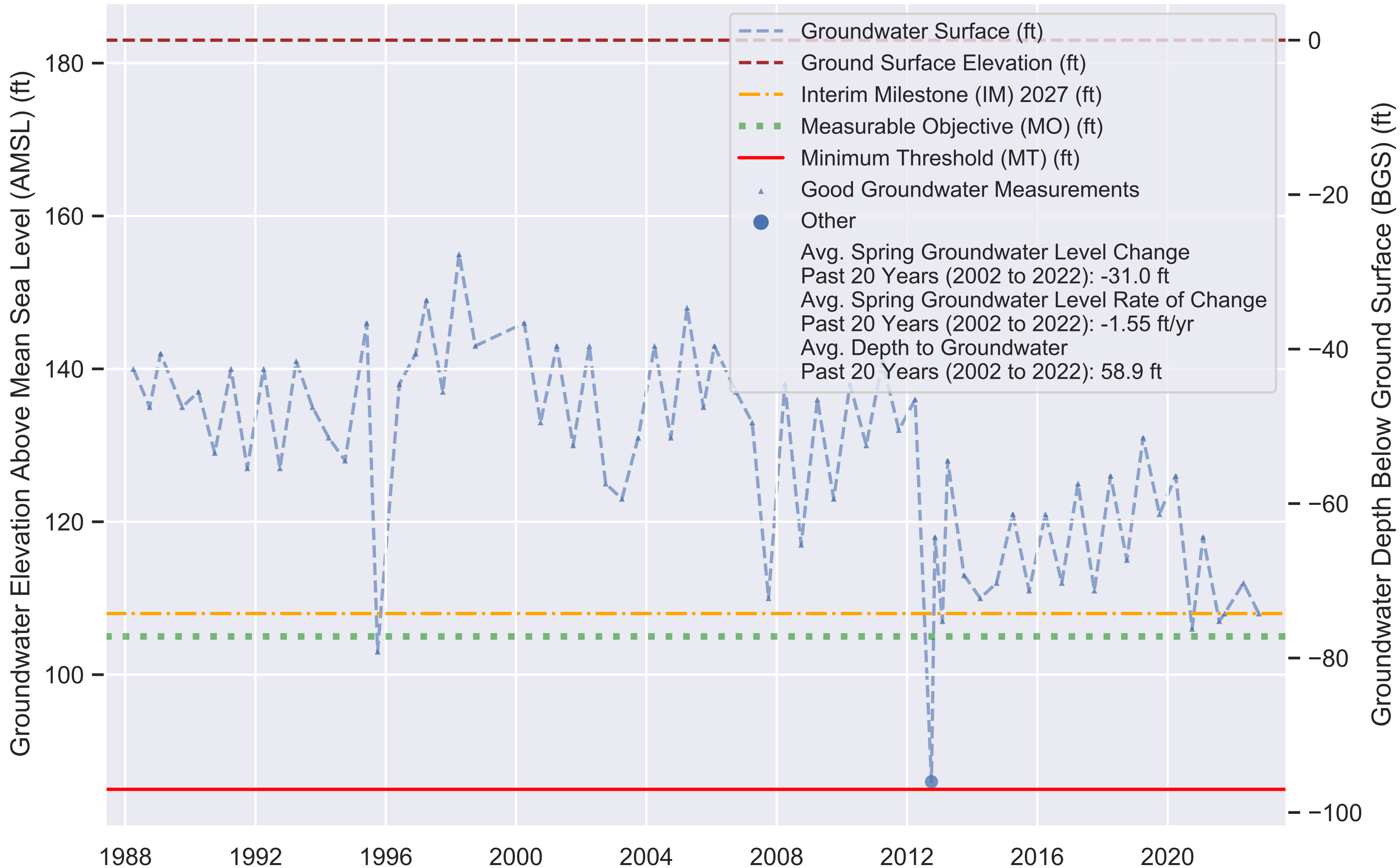


VINA Subbasin - State Well Number (SWN): CWSCH02

Well Location Map



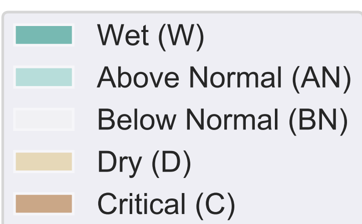
Perforation data not available.

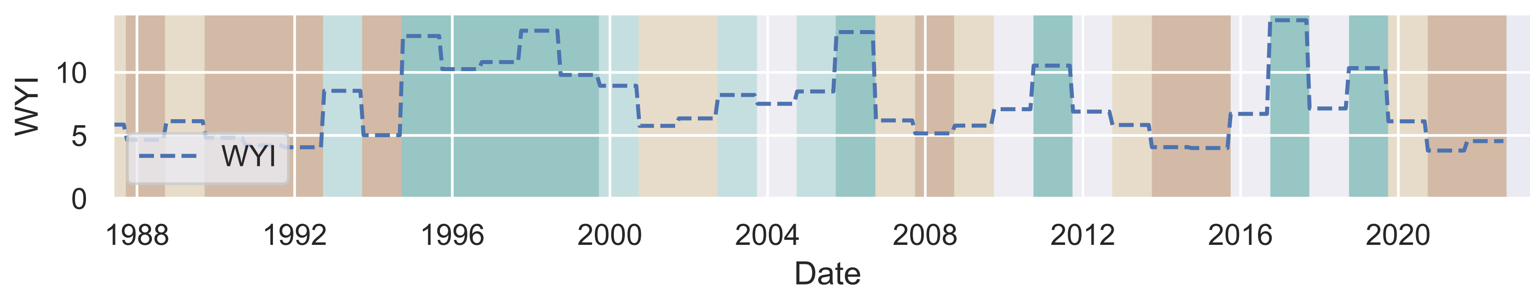


Sustainable Management Criteria:

IM (2027) = 108.0 ft AMSL
MO = 105.0 ft AMSL
MT = 85.0 ft AMSL

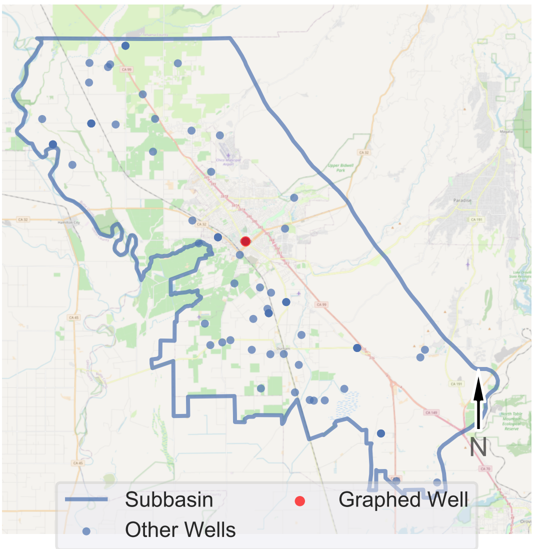
Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.





VINA Subbasin - State Well Number (SWN): CWSCH03

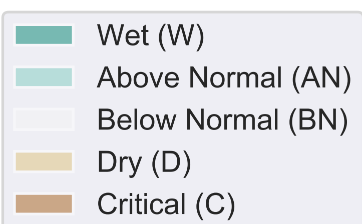
Well Location Map

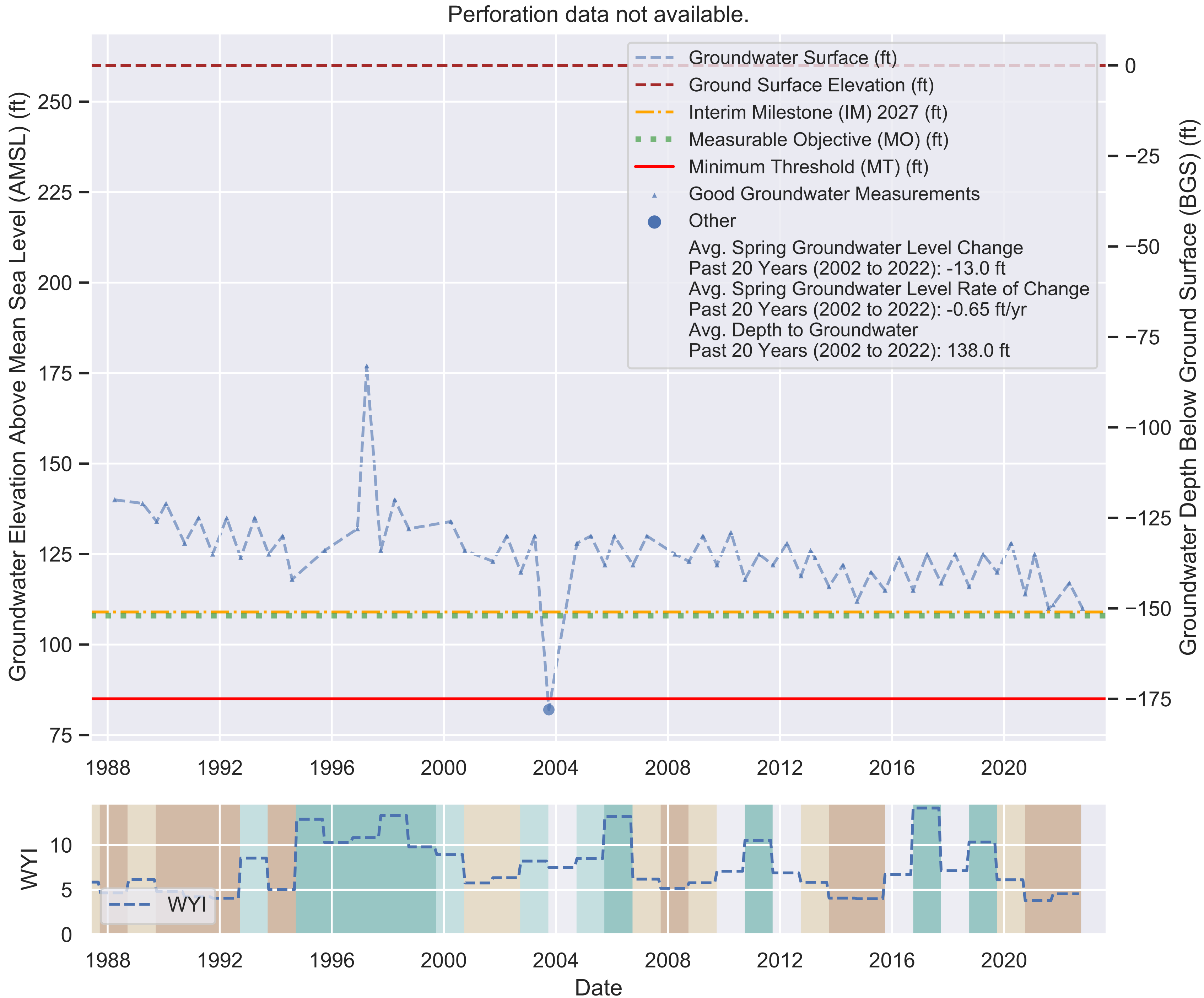


Sustainable Management Criteria:

IM (2027) = 109.0 ft AMSL
MO = 108.0 ft AMSL
MT = 85.0 ft AMSL

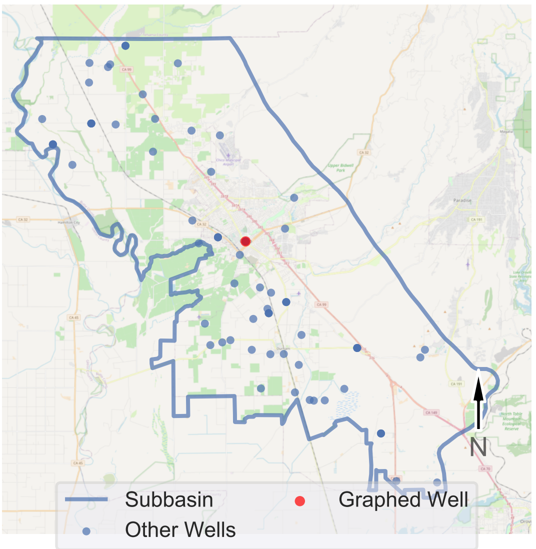
Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.





VINA Subbasin - State Well Number (SWN): CWSCH07

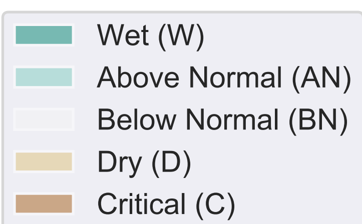
Well Location Map

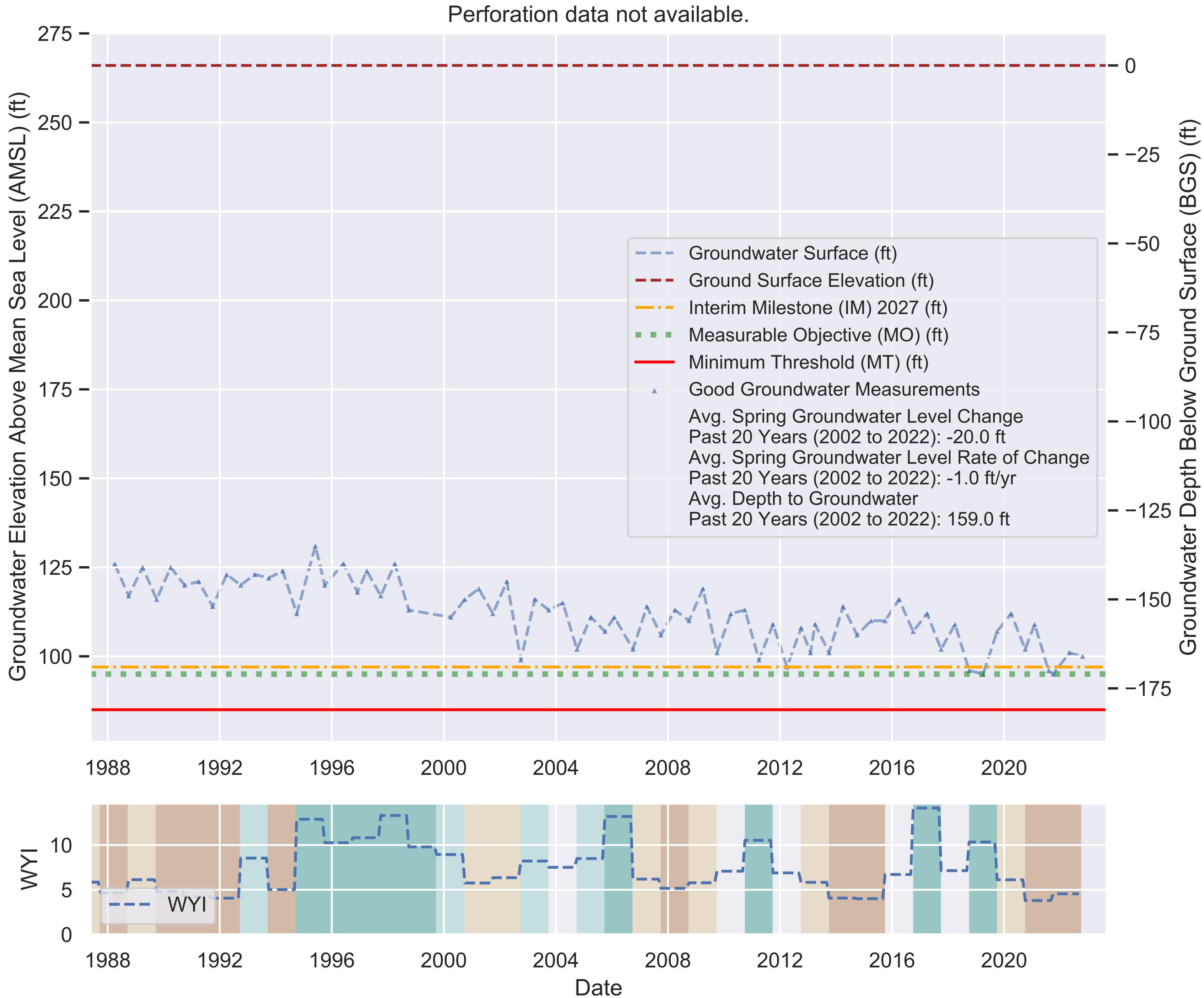


Sustainable Management Criteria:

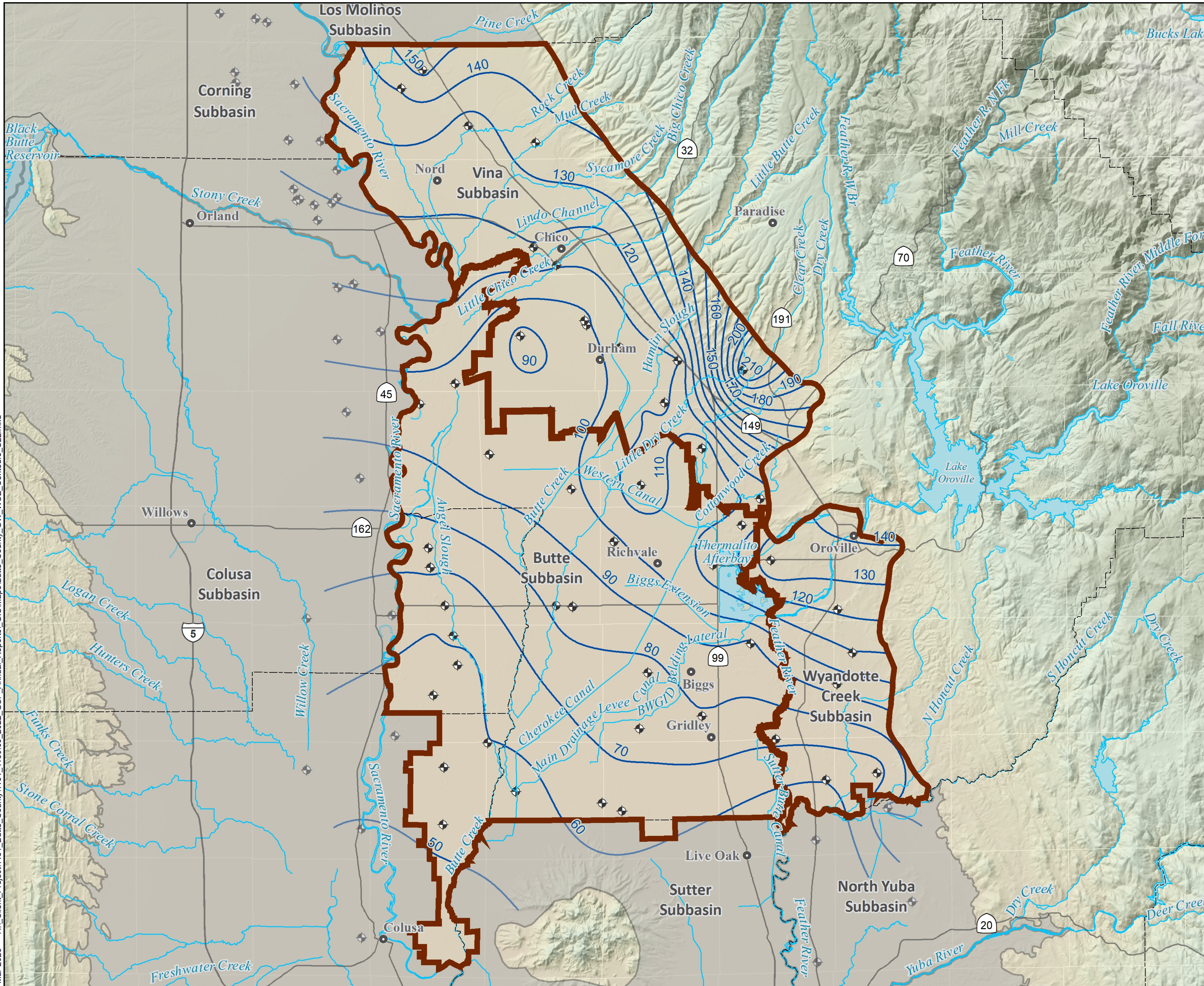
IM (2027) = 97.0 ft AMSL
MO = 95.0 ft AMSL
MT = 85.0 ft AMSL

Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.





WATER SURFACE ELEVATION



- Well
- Spring 2022 Water Surface Elevation Contour (feet above mean sea level)
- Butte, Vina, and Wyandotte Creek Subbasins

All Other Features

- Cities and Towns
- Highway
- Waterway
- Lake
- Neighboring Subbasin

0 4 8
Miles

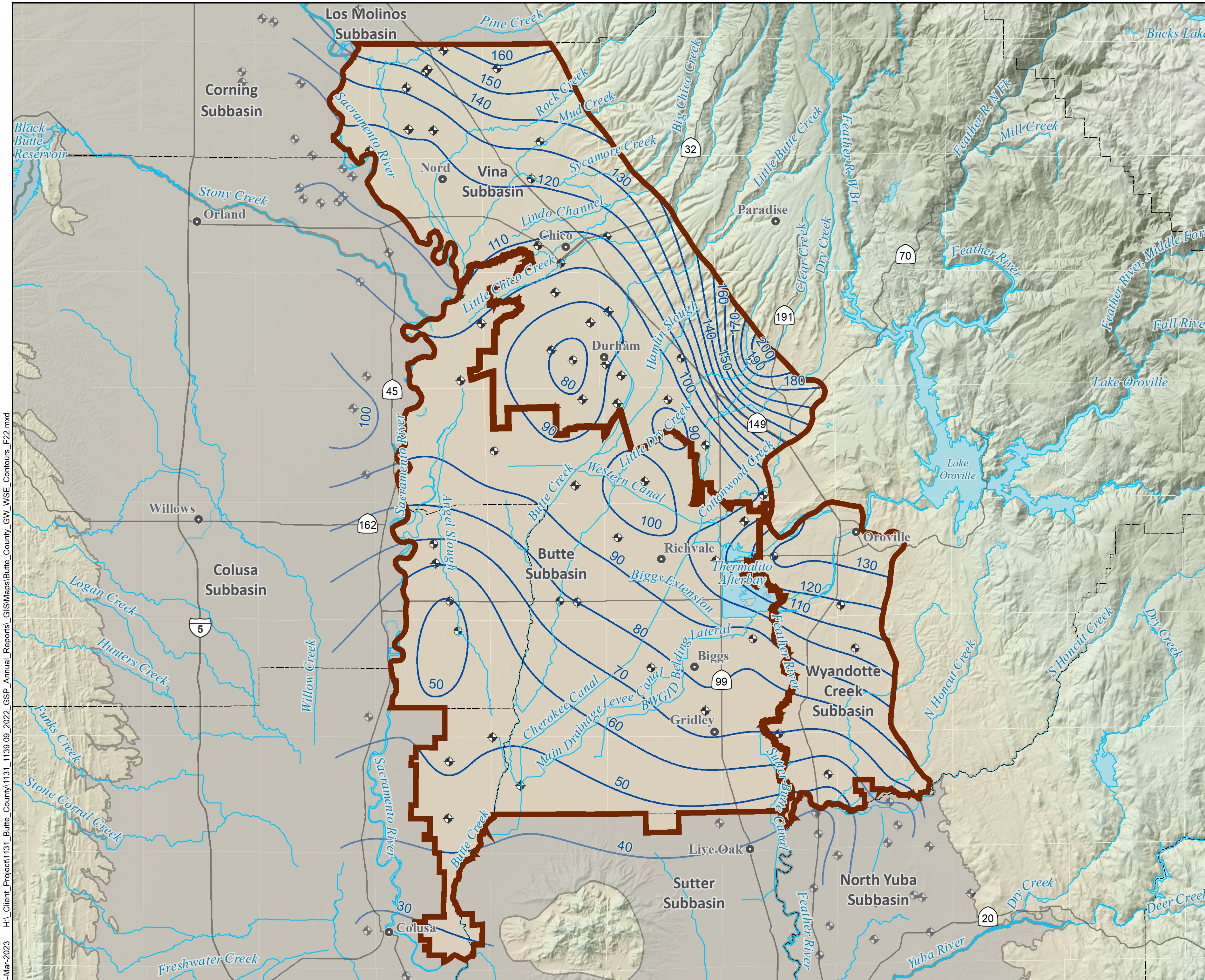
N

SPRING 2022 GROUNDWATER ELEVATION CONTOURS

GROUNDWATER SUSTAINABILITY PLAN
2022 ANNUAL REPORT

H:_Client_Projects\1131_Butte_County\1131_1139.09_2022_GSP_Annual_Reports_GIS\Maps\Butte_County_GW_WSE_Contours_S22.mxd

03-Mar-2023



WATER SURFACE ELEVATION

- Well
- Fall 2022 Water Surface Elevation Contour (feet above mean sea level)
- Butte, Vina, and Wyandotte Creek Subbasins

All Other Features

- Cities and Towns
- Highway
- Waterway
- Lake
- Neighboring Subbasin

0 4 8
Miles

N

FALL 2022 GROUNDWATER ELEVATION CONTOURS

GROUNDWATER SUSTAINABILITY PLAN
2022 ANNUAL REPORT

03-Mar-2023 H:_Client_Projects\1131_Butte_County\1131_1139.09_2022_GSP_Annual_Reports_GIS\Maps\Butte_County_GW_WSE_Contours_F22.mxd

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Appendix B

Explanation of Sustainable Management Criteria

Appendix B: Explanation of Sustainable Management Criteria

The Sustainable Groundwater Management Act (SGMA) requires a Groundwater Sustainability Plan (GSP) to define Sustainable Management Criteria (SMC) for the groundwater subbasin. The SMC offer guideposts and guardrails for groundwater managers seeking to achieve sustainable groundwater management. SGMA defines sustainable groundwater management as “the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results,” where the planning and implementation horizon is 50 years with the first 20 years spent working toward achieving sustainable groundwater management and the following 30 years (and beyond) spent maintaining it (California Water Code §10721).

“Undesirable Results” are associated with up to six Sustainability Indicators (SI), including groundwater levels, groundwater storage, water quality, seawater intrusion, land subsidence, and interconnected surface water. SGMA defines undesirable results as those having significant and unreasonable negative impacts. Failure to avoid undesirable results on the part of the GSAs may lead to intervention by the State. Once the sustainability goal and undesirable results have been locally identified, projects and management actions are formulated to achieve the sustainability goal and avoid undesirable results.

SI and associated undesirable results, if significant and unreasonable

The Vina Subbasin is divided into three management areas (MAs): North, Chico, and South. The associated undesirable results for each SI have been defined similarly across the three MAs within the Vina Subbasin. In turn, the rationale and approach for determining Minimum Thresholds and Measurable Objectives for each SI are the same across all MAs in the Vina Subbasin.

The terminology for describing SMC is defined as follows:

Undesirable Results – Significant and unreasonable negative impacts associated with each SI.

Minimum Threshold (MT) – Quantitative threshold for each SI used to define the point at which undesirable results may begin to occur.

Measurable Objective (MO) – Quantitative target that establishes a point above the MT that allows for a range of active management to prevent undesirable results.

Margin of Operational Flexibility – The range of active management between the MT and the MO.

Interim Milestones (IMs) – Targets set in increments of five years over the implementation period of the GSP offering a path to sustainability.

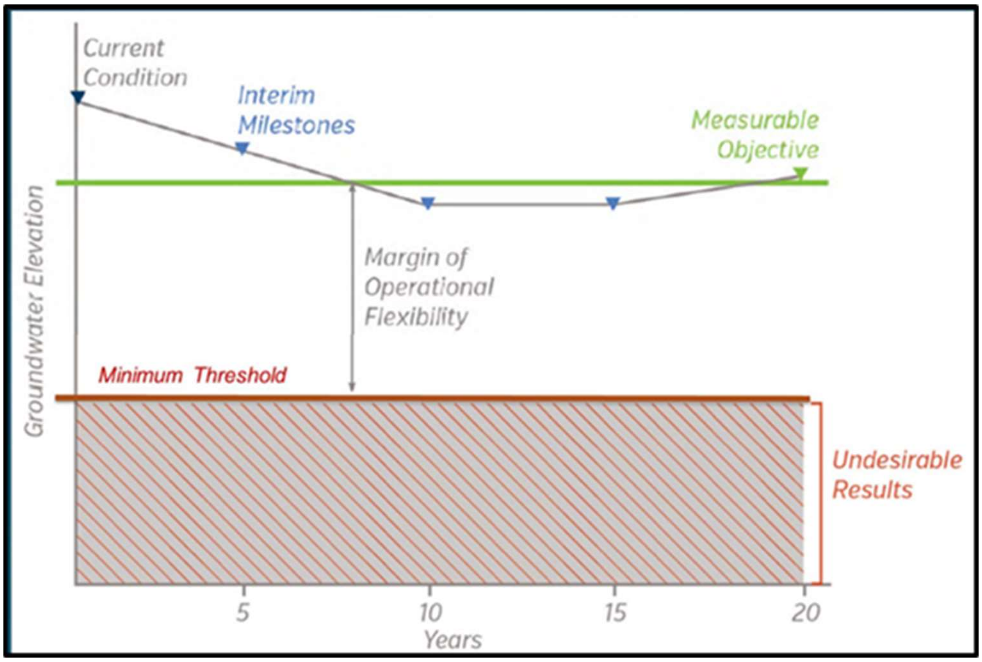

Illustration of Terms Used for Describing Sustainable Management Criteria Using the Groundwater Level SI

The Figure above illustrates these terms for the groundwater level SI.

SI are intended to be measured and compared against quantifiable SMC throughout a monitoring framework of Representative Monitoring Site (RMS) wells. Ongoing monitoring of SI can:

Determine compliance with the adopted GSP

Offer a means to evaluate the effectiveness of projects and management actions over time

Allow for course correction and adaptation in five-year updates

Facilitate understanding among diverse stakeholders

Support decision-making on the part of the GSAs into the future

The SMC for the Vina Subbasin is fully explained and defined in Section 3 of the GSP available here:

https://sgma.water.ca.gov/portal/gsp/preview/86

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Appendix C

GSP Annual Reporting Elements Guide

Groundwater Sustainability Plan Annual Report Elements Guide

Basin Name	Sacramento Valley- Vina Subbasin		
GSP Local ID			
California Code of Regulations - GSP Regulation Sections	***Groundwater Sustainability Plan Elements***	**Document *page number(s) that address the applicable GSP element.***	***Notes: Briefly describe the GSP element does not apply.***
Article 5	**Plan Contents**		
Subarticle 4	***Monitoring Networks***		
§ 354.40	**Reporting Monitoring Data to the Department**		
	Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department.	38	
	Note: Authority cited: Section 10733.2, Water Code. Reference: Sections 10728, 10728.2, 10733.2 and 10733.8, Water Code.		
Article 7	**Annual Reports and Periodic Evaluations by the Agency**		
§ 356.2	**Annual Reports**		
	Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:		
	(a) General information, including an executive summary and a location map depicting the basin covered by the report.	7-32	
	(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:		
	(1) Groundwater elevation data from monitoring wells identified in the monitoring network shall be analyzed and displayed as follows:		
	(A) Groundwater elevation contour maps for each principal aquifer in the basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.	35-36	
	(B) Hydrographs of groundwater elevations and water year type using historical data to the greatest extent available, including from January 1, 2015, to current reporting year.	64-80	
	(2) Groundwater extraction for the preceding water year. Data shall be collected using the best available measurement methods and shall be presented in a table that summarizes groundwater extractions by water use sector, and identifies the method of measurement (direct or estimate) and accuracy of measurements, and a map that illustrates the general location and volume of groundwater extractions.	40-43	
	(3) Surface water supply used or available for use, for groundwater recharge or in-lieu use shall be reported based on quantitative data that describes the annual volume and sources for the preceding water year.	44	
	(4) Total water use shall be collected using the best available measurement methods and shall be reported in a table that summarizes total water use by water use sector, water source type, and identifies the method of measurement (direct or estimate) and accuracy of measurements. Existing water use data from the most recent Urban Water Management Plans or Agricultural Water Management Plans within the basin may be used, as long as the data are reported by water year.	44	
	(5) Change in groundwater in storage shall include the following:		

California Code of Regulations - GSP Regulation Sections	*Groundwater Sustainability Plan Elements*	**Document** *page number(s) that address the applicable GSP element.*	*Notes: Briefly describe the GSP element does not apply.*
	(A) Change in groundwater in storage maps for each principal aquifer in the basin.	50	
	(B) A graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the basin based on historical data to the greatest extent available, including from January 1, 2015, to the current reporting year.	47	
	(c) A description of progress towards implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report.	51-61	

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Appendix D

DWR Portal Upload Tables

A. Groundwater Extractions

Total Groundwater Extractions (AF)	Water Use Sector Urban (AF)	Water Use Sector Industrial (AF)	Water Use Sector Agricultural (AF)	Water Use Sector Managed Wetlands (AF)	Water Use Sector Managed Recharge (AF)	Water Use Sector Native Vegetation (AF)	Water Use Sector Other (AF)	Water Use Sector Other Description
354,700	22,300	0	253,800	0	0	76,000	2,600	Rural Residential

B. Groundwater Extraction Methods

Meters Volume (AF)	Meters Description	Meters Type	Meters Accuracy (%)	Meters Accuracy Description	Electrical Records Volume (AF)	Electrical Records Description	Electrical Records Type	Electrical Records Accuracy (%)	Electrical Records Accuracy Description	Land Use Volume (AF)	Land Use Description	Land Use Type	Land Use Accuracy (%)	Land Use Accuracy Description	Groundwater Model Volume (AF)	Groundwater Model Description	Groundwater Model Type	Groundwater Model Accuracy (%)	Groundwater Model Accuracy Description	Other Method(s) Volume (AF)	Other Method(s) Description	Other Method(s) Type	Other Method(s) Accuracy (%)	Other Method(s) Accuracy Description
22,300	Metered Municipal Wells	Direct	5-10 %	Metered connection maintained by California Water Service and Durham Irrigation District.	0					329,800	Land use estimates were derived from crop mapping and LandIQ survey results	Estimate	20-30 %	Typical uncertainty for water balance calculation	0					2,600	Rural residential groundwater extraction is estimated based on California Water Service Company's 2020 Urban Water Management Plan 2020 usage of an average per capita water use of 184 gallons per capita per day. Population data from the 2020 census was coupled with parcel data to identify total population not serviced by municipal supplies	Estimate	10-20 %	Uncertainties are from population estimates and gallon per capita per day estimates

C. Surface Water Supply

Total Surface Water Supply (AF)	Methods Used To Determine	Water Source Type Central Valley Project (AF)	Water Source Type State Water Project (AF)	Water Source Type Colorado River Project (AF)	Water Source Type Local Supplies (AF)	Water Source Type Local Imported Supplies (AF)	Water Source Type Recycled Water (AF)	Water Source Type Desalination (AF)	Water Source Type Other (AF)	Water Source Type Other Description
20,500	Diversions for local supplies are estimated based on historic State Water Resource Control Board eWRIMS (Electronic Water Rights Information Management System) data for total diversions. Surface water delivery estimates are based on historic deliveries in the area that have occurred in dry and critical years	0	0	0	20,500	0	0	0	0	

D. Total Water Use

Total Water Use (AF)	Methods Used To Determine	Water Source Type Groundwater (AF)	Water Source Type Surface Water (AF)	Water Source Type Recycled Water (AF)	Water Source Type Reused Water (AF)	Water Source Type Other (AF)	Water Source Type Other Description	Water Use Sector Urban (AF)	Water Use Sector Industrial (AF)	Water Use Sector Agricultural (AF)	Water Use Sector Managed Wetlands (AF)	Water Use Sector Managed Recharge (AF)	Water Use Sector Native Vegetation (AF)	Water Use Sector Other (AF)	Water Use Sector Other Description
375,200	Methods used are a combination of estimates based on land use and population/ per capita water use, metered municipal water use, and estimates based on historic water rights data for dry and critical years	354,700	20,500	0	0	0		22,300	0	274,300	0	0	76,000	2,600	Rural Residential