2021 WATER YEAR ANNUAL REPORT

Vina Groundwater Subbasin

Final Report - March 2022

Prepared for the Vina and Rock Creek Reclamation District Groundwater Sustainability Agencies and submitted to the California Department of Water Resources to meet the requirements of the Sustainable Groundwater Management Act

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The Vina Subbasin (5-021.57) as defined by DWR's Bulletin 118 subbasin boundaries, updated in 2018, is in Butte County within the Sacramento Valley, as shown in Section 1, Figure 1. The Vina Subbasin lies in the eastern central portion of the Sacramento Groundwater Basin (5-021). The subbasin is managed by two Groundwater Sustainability Agencies (GSA), the Vina GSA and the Rock Creek Reclamation District GSA, to implement the Sustainable Groundwater Management Act (SGMA) in the subbasin. The two GSAs worked cooperatively to develop and submit a single GSP for the Vina Subbasin by the regulatory deadline of January 31, 2022.

The 2021 Water Year (2021 WY), defined as October 1, 2020 to September 30, 2021, started out with moderate precipitation in mid-November, leading to a very dry January, and moderate precipitation in the early spring. The 2021 WY ended as the second driest year on record based on statewide runoff. Overall, the 2021 WY had below average rainfall, snow pack, and runoff conditions. Water supply conditions led to a 5% allocation for State Water Project contractors statewide and curtailment of other local surface water supplies. This included about a 50% reduction in Feather River diversions in the Butte Subbasin by the Joint Districts (which includes Richvale Irrigation District, Butte Water District and Biggs-West Gridley Water District within the Butte Subbasin) and Western Canal Water District.

This annual report coincides with one of the most severe and extensive droughts that has ever impacted the western United States. In December 2021, as the final GSP was being assembled, drought conditions throughout most of California, including in this subbasin were classified as "exceptional," the most extreme classification defined by the U.S. Drought Monitor. Historically, observed impacts during exceptional drought generally include (among other potential impacts reported by the U.S. Drought Monitor):

- widespread water supply shortages,
- depleted surface water supplies,
- extremely low federal and state surface water deliveries,
- curtailment of water rights,
- extremely high surface water prices,
- increased groundwater pumping to satisfy agronomic water demands,
- dry groundwater wells,
- increased well drilling and deepening,
- increased pumping costs,
- wildfire,
- decreased recreational opportunities, and
- poor water quality.

All of these conditions were experienced to some degree across California in 2021 and, at least in part, within the subbasin.

Groundwater Conditions

Currently 78 wells are monitored as part of a Broad Network for groundwater levels in the Vina Subbasin and 17 are Representative Monitoring Site (RMS) wells with assigned Sustainable Management Criteria.

RMS wells are measured at a minimum in the spring and fall each year for SGMA compliance. Appendix A includes a map of the approximate locations of groundwater level RMS wells and each of their hydrographs showing measured groundwater levels for each well's period of record. Appendix B provides an explanation of the terms making up the Sustainable Management Criteria defined in Section 3 of the GSP (e.g. Minimum Threshold, Measurable Objective).

Spring and fall 2021 groundwater levels were above the Measurable Objective, with only one exception: the fall groundwater elevation in well 20N01E10C002M was approximately three feet below the Measurable Objective. All measured groundwater levels remained within the subbasin's Margin of Operational Flexibility and well above the Minimum Threshold of each RMS well. Generally, 2021 groundwater levels were similar to spring 2014-2015 drought conditions with some new historical lows reached in a few wells.

The contour maps (Section 2.1, Figure 3 and Figure 4) show groundwater elevations that are higher in the northern portion of the Vina Subbasin than in the south and higher on the eastern side of the subbasin compared to the western edge. This indicates groundwater flow is generally north to south in the Vina North management area (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, which is the majority of the Vina Subbasin, groundwater levels begin to decline when pumps turn on and groundwater extraction begins, typically in the spring, and continue declining as the irrigation season progresses through the summer months. Of note is the groundwater depression west of Durham. During critically dry years such as 2021, increased groundwater production compensates for reduced rainfall and reduced recharge from Butte Creek likely occurs due to reduced streamflows. These factors may contribute to the depression indicated by the contours. Fall contours also indicate declines relative to spring conditions throughout the subbasin as expected.

The majority of the Vina Subbasin is dependent on groundwater as the only available water source for agricultural irrigation. In addition, the City of Chico, the largest city in the subbasin is solely reliant on groundwater as a municipal/industrial water supply. The Durham Irrigation District also provides municipal water to households in the Durham area through groundwater extraction from four district wells, and domestic wells provide for rural residential water needs throughout the subbasin.

Total estimated groundwater extraction in the 2021 WY was approximately 268,000 acre-feet (AF). This is about 25,000 AF greater than the 2000-2018 average annual groundwater extraction of 243,000 AF for the Vina Subbasin reported in the GSP. 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. In contrast, 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 2013-2015 drought period. The City of Chico saw a decrease of approximately 2.5% in municipal/industrial pumping volumes from 2020 to 2021.

Surface water provided about 4% of the agricultural water demand in the Vina Subbasin in 2021. Surface water is only used by the agricultural sector in the subbasin and is sourced from Butte Creek and Mud Creek. Some water right holders on Butte Creek were curtailed by the SWRCB in 2021. An estimated 9,700 AF of surface water was delivered in 2021 in the subbasin.

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. 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.

Increased groundwater extraction in 2020 (previous irrigation season) relative to long-term average groundwater demand and reduced natural recharge due to dry climate conditions and decreased streamflows, resulted in lower groundwater levels in spring 2021 compared to spring 2020. This amounts to an estimated reduction of groundwater in storage of about 93,400 AF for this time period. Figure ES-1 shows annual and cumulative change in groundwater storage over time, 2000-2021, relative to annual groundwater extraction and water year type. Change in groundwater storage was estimated based on change in measured spring to spring groundwater levels multiplied by the area of the Thiessen polygon associated with the RMS well and a representative storage coefficient of 0.1. Groundwater extraction for 2000-2018 are consistent with the GSP based on Butte Basin Groundwater Model results, 2019 and 2020 are estimated by matching to similar Water Year types, and 2020 extraction is estimated as described in Section 2.2. Values are reported in thousands of acre-feet (TAF).

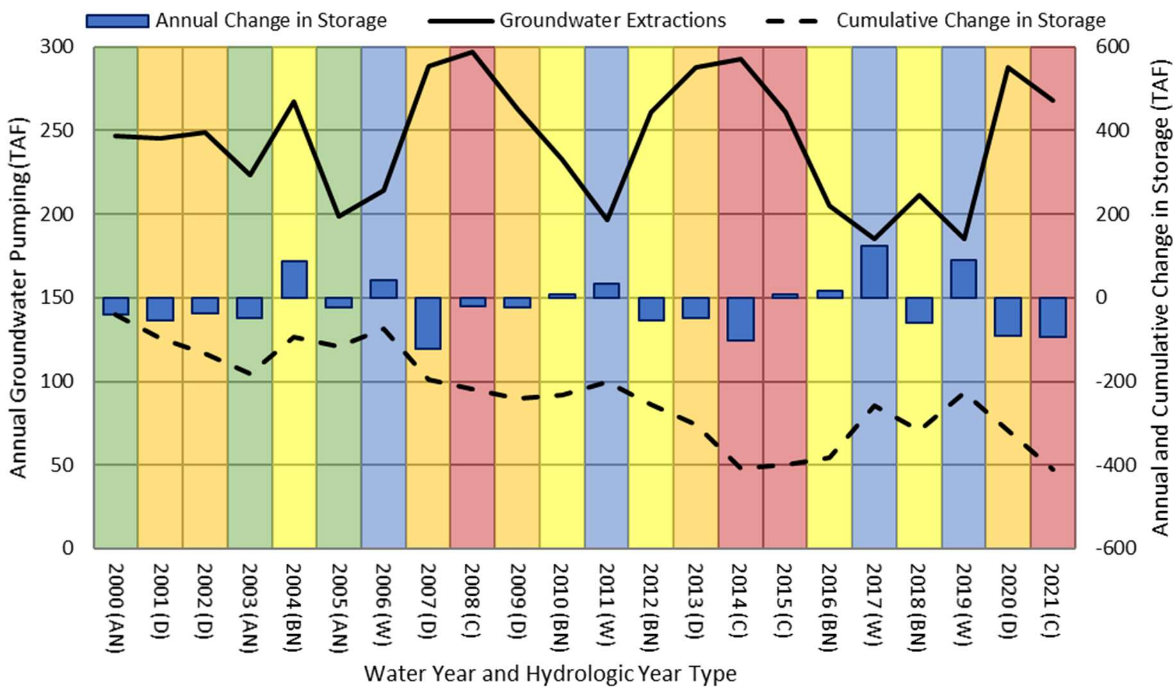


Figure ES-1. Change in Groundwater Storage (Cumulative and Annual Change) and Groundwater Extraction by Water Year Type.

Note: Values calculated spring to spring for each water year. Water year types are identified as wet (W, shaded blue), above normal (AN, shaded green), below normal (BN, shaded yellow), dry (D, shaded orange), or critical (C, shaded red). Groundwater extraction 2000-2018 is consistent with the Vina GSP based on Butte Basin Groundwater Model results, 2019 and 2020 estimated by matching to similar water year types, and 2020 estimated as described in Section 2.2. Groundwater change in storage estimated based on change in measured spring to spring groundwater levels multiplied by the area of Thiessen polygon associated with the monitoring well and the Storage Coefficient of 0.1.

Groundwater Sustainability Plan Implementation Progress

The GSP for the Vina Subbasin was adopted by the GSAs in December 2021 and submitted to DWR in January 2022. This is the first annual report to be prepared since the GSP was submitted. The GSP implementation progress reported in this report covers ongoing work during GSP development since late 2021.

Progress has been made on the following projects and management actions (described in greater detail in Section 3):

- **Residential Water Conservation Project** - The California Water Service Company, a municipal/industrial water provider in the subbasin is currently implementing water conservation practices in accordance with their 2020 Urban Water Management Plan.
- **Agricultural Irrigation Efficiency Project** - A survey of agricultural irrigators in the Vina Subbasin was conducted and the results were analyzed in December of 2021. A summary report is expected to be available in spring of 2022.
- **Fuels Management for Watershed Health Project** - Funding has been secured and fuels reduction treatment has been started on 150 acres in the area above Musty Buck Ridge. In addition, work

is in progress to finalize a Vegetation Management Plan for an additional 4,000 acres in the upper watershed upslope of the Vina Subbasin.

- **Paradise Irrigation District (PID) / California Water Service Intertie Project** – The feasibility of this project as an option that would assist PID in meeting its goals for water supply and resiliency, is currently being evaluated in the Town of Paradise Options Study.
- **Streamflow Augmentation Project** - Progress has been made on the Butte Creek Integrated Stream Flow Enhancement Planning Project. An application was submitted by the Friends of Butte Creek to the Wildlife Conservation Board's Stream Flow Enhancement Program in January 2022 to fund this project.
- **Rangeland Management and Water Retention Project** - California State University Chico and Chico State Enterprises is initiating a study of adaptive/regenerative grazing practices on 2,000 or more acres in the region.
- **Surface Water Supply and Recharge Project** - Progress has been made on the Rock and Sand Creek Flood Mitigation Project.
- **General Plan Updates** - Suggested revisions to the Water Resources Element and applicable General Plan Goals, Policies, and Actions have been made by staff and the Butte County Water Commission as part of the County's General Plan Update process.

GSAs in the Vina Subbasin are preparing to continue to engage stakeholders in the subbasin as they coordinate to develop a workplan for 2022 and discuss implementation priorities.

In addition, Butte County funded and contracted with a consultant to conduct a Drought Impact Analysis Study (expected completion May 2022) to characterize the conditions and economic impacts of drought that occurred in 2021. It will also provide recommendations for County response and readiness in 2022 if dry conditions and drought impacts persist. The study is expected to provide information that may be useful to GSAs as well.

Finally, ongoing activities include monitoring and reporting, updating and maintaining the subbasin's Data Management System, outreach to stakeholders, intra- and inter-basin coordination, and coordination with other efforts to improve characterization of the subbasin (such as DWR's Airborne Electromagnetic Survey Program expected to collect data in the subbasin in May 2022).

Recent progress made on all of the above mentioned activities (and described in detail in Section 3) since late 2021 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.

Vina Subbasin Annual Report

1. Plan Area and Background

The Vina Subbasin (5-021.57) as defined by DWR's Bulletin 118 subbasin boundaries, updated in 2018, is in Butte County within the Sacramento Valley, as shown in Figure 1. The Vina Subbasin lies in the eastern central portion of the Sacramento Valley Groundwater Basin (5-021). The northern boundary is the Butte-Tehama County line; the western boundary is the Butte-Glenn County line; the southern boundary is a combination of the property boundaries owned by the M&T Ranch, the service area boundaries of RD 2106 and Western Canal Water District; and the eastern boundary is the edge of the alluvium as defined by DWR Bulletin 118 Update 2003. The Sacramento River borders the Vina Subbasin on its western side and flows from north to south. The larger surface water features in the subbasin generally flow from east to west towards the Sacramento River and include Big Chico Creek and Butte Creek.

The subbasin is managed by two Groundwater Sustainability Agencies (GSA), the Vina GSA and the Rock Creek Reclamation District GSA. The Vina GSA and RCRD GSA have assumed all authorities of the Sustainability Groundwater Management Act (SGMA) and entered into a Cooperation Agreement for the purpose of developing and implementing a single Groundwater Sustainability Plan (GSP) for the Vina Subbasin. The two GSAs worked cooperatively to develop and submit a single GSP for the Vina Subbasin by the regulatory deadline of January 31, 2022.

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) 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.

The GSP outlines the need to address overdraft and related conditions and has identified 15 projects for potential development that either replace groundwater use (offset) or supplement groundwater supplies (recharge) to meet current and future water demands. In addition, the GSP also identifies seven management actions that can be implemented to focus on reduction of groundwater demand or avoidance of undesirable results. The estimated sustainable yield, or the amount of groundwater that can be withdrawn without causing undesirable results, for the subbasin is estimated at 233,000 acre-feet per year (AFY). This estimate is based on average annual historical groundwater pumping of 243,000 AFY and an annual decrease in storage of 10,000 AFY. As such, groundwater pumping offsets and/or recharge on the order of 10,000 AFY may be required to achieve sustainability. These numbers will continue to be refined as data gaps are filled and the GSP is implemented.

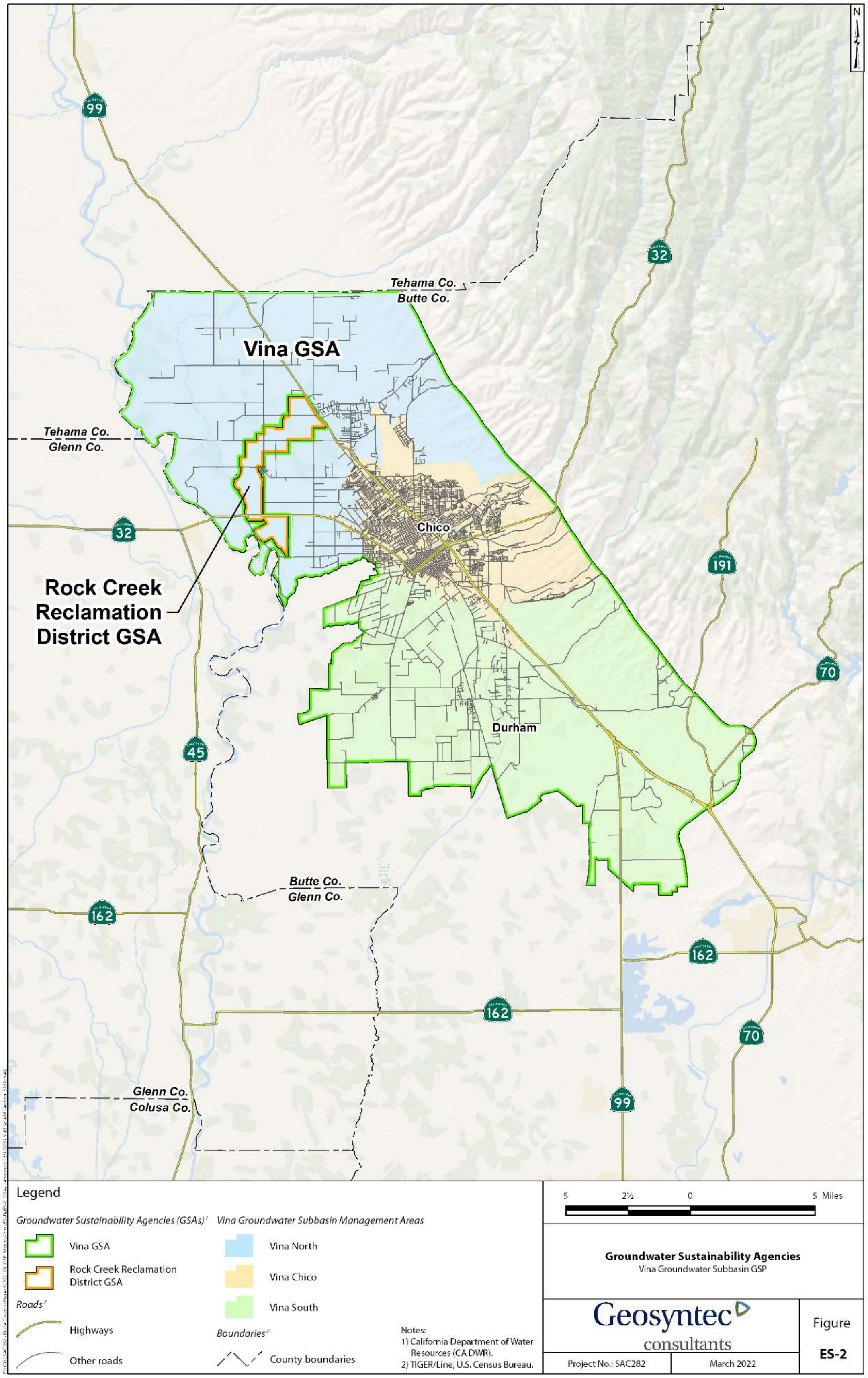


Figure 1. Vina Subbasin showing Groundwater Sustainability Agency Boundaries and Defined Management Areas (Figure ES-2 from Vina GSP)

1.1. 2021 Water Year Hydrologic Conditions

A number of data sources and indices are available to characterize and compare hydrologic conditions within or between particular years. The data sources typically report hydrologic data on a water year basis, or the 12-month period from October through September. The 2021 Water Year (2021 WY) began on October 1, 2020 and ended September 30, 2021. The 2021 WY was classified as a *Critical* year for the Sacramento Hydrologic Region. Water year types are based on the Sacramento Valley Water Year Index identified as wet, above normal, below normal, dry, or critical. At the end of the 2021 WY on September 30, 2021, statewide hydrologic conditions were as follows: precipitation was 49% of average; runoff was 33% of average; and reservoir storage, 58% of average. Sacramento River Region unimpaired runoff observed through September 30, 2021 was about 6.4 million acre-feet, which is about 36% of average.

The Northern Sierra 8-Station Precipitation Index (Figure 2) serves as a precipitation index for the Sacramento River hydrologic region by averaging measurements taken at the following precipitation stations: Blue Canyon, Brush Creek Ranger Station, Mineral, Mount Shasta City, Pacific House, Quincy Ranger Station, Shasta Dam, and Sierraville Ranger Station. This index provides a representative sample of the region's major watersheds: the Upper Sacramento, Feather, Yuba, and American Rivers, which produce inflow to some of California's largest reservoirs - the source of much of the state’s surface water supplies. The 2021 WY ended with 24.0 cumulative inches of precipitation, which is 45% of the long term (1991 - 2020) average of 53.2 inches.

The 2021 WY started out with moderate precipitation in mid-November, leading to a very dry January, and moderate precipitation in the early spring. Total precipitation was insufficient to reach average hydrologic conditions in Northern California. The 2021 WY ended as the second driest year on record based on statewide runoff. Overall, the 2021 WY had below average rainfall, snow pack, and runoff conditions. Water supply conditions led to a 5% allocation for State Water Project contractors statewide and curtailment of other local surface water rights holders by the State Water Resources Control Board. This included about a 50% reduction in Feather River diversions in the Butte Subbasin by Western Canal Water District and the Joint Districts (which includes Richvale Irrigation District, Butte Water District and Biggs-West Gridley Water District within the Butte Subbasin).

This annual report coincides with one of the most severe and extensive droughts that has ever impacted the western United States. In December 2021, as the final GSP was being assembled, drought conditions throughout most of California, including in this subbasin were classified as “exceptional”, the most extreme classification defined by the U.S. Drought Monitor. Historically, observed impacts during exceptional drought generally include: widespread water shortages, depleted surface water supplies, extremely low federal and state surface water deliveries, curtailment of water rights, extremely high surface water prices, increased groundwater pumping to satisfy water demands, dry groundwater wells, increased well drilling and deepening, increased pumping costs, wildfire, decreased recreational opportunities, and poor water quality, among other potential impacts reported by the U.S. Drought Monitor. All of these conditions were experienced to some degree across California in 2021 and, at least in part, within the subbasin.

Locally, widespread drought impacts have been observed throughout the subbasin as well. The extent of the impacts and programs to help residents, continues to be discussed by the Butte County Board of Supervisors, Water Commission and Drought Task Force. Since the summer of 2020, 45 reports were made to DWR’s Household Water Supply Shortage Reporting System in Butte County alone and another approximately 20 residents reported household dry well issues by calling the Butte County Department of Water and Resource Conservation Department. While a number of the reported dry wells are in the foothills outside of the subbasin, about one-quarter lie within the Vina Subbasin. Most of the reported dry wells are used for domestic water supply. Of the reports in which the depth of the well was indicated, almost all were 200 feet deep or shallower. Counts of dry wells are likely to be low because some landowners choose not to report well problems. Butte and the surrounding counties have provided access to water through water filling stations for those residents experiencing water issues, while they work towards a long-term solution.

Over the long-term as the GSP is implemented, the subbasin will be better positioned to manage and mitigate drought conditions and impacts may be less severe and/or costly.

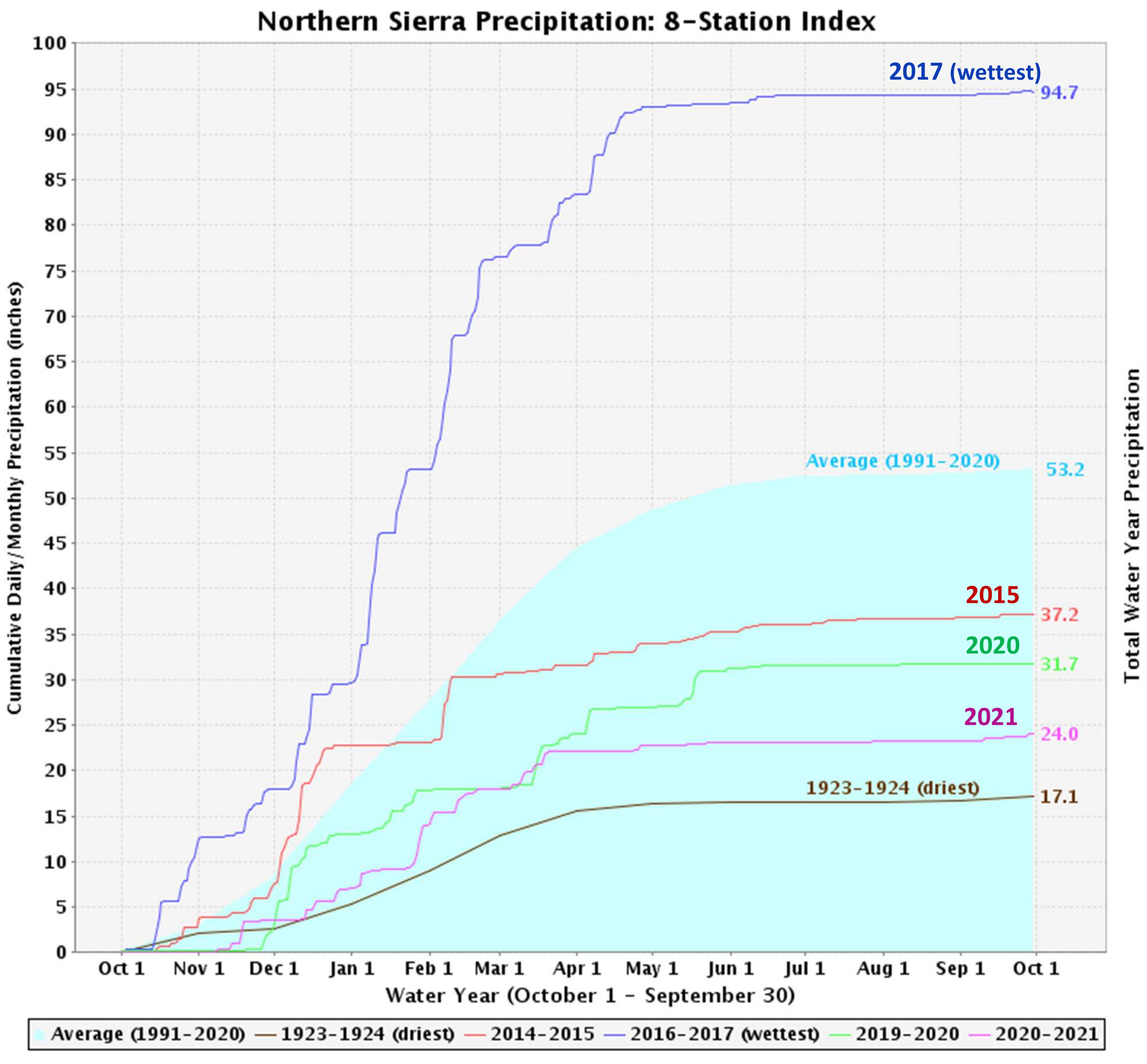


Figure 2. Northern Sierra Precipitation 8-Station Index for Selected Water Years

2. Groundwater Conditions

This section presents the change in groundwater conditions in the Vina Subbasin since the 2020 WY. Comparison of 2021 WY conditions to 2020 WY conditions characterizes the impact of the critically dry year on groundwater extraction, surface water availability, and groundwater conditions.

2.1. Groundwater Elevations

Groundwater levels typically fluctuate seasonally between and within water years. Seasonal fluctuations of groundwater levels occur in response to groundwater pumping and recovery, land and water use activities, recharge and natural discharge. Precipitation, applied irrigation water and local creeks and rivers are all sources of groundwater recharge in the Vina Subbasin. Groundwater pumping for irrigation typically occurs from April to September, although depending on the timing of rainfall, it may shift earlier and/or later into the season. Consequently, groundwater levels are usually highest in the spring and lowest during the irrigation season in the summer months. Fall groundwater measurements (usually measured in October) provide an indication of groundwater conditions after the primary irrigation season.

Data from groundwater level monitoring is available from DWR's online SGMA Data Viewer tool (https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer). Summary data tables of groundwater surface elevations from spring and fall 2021 measurements for Representative Monitoring Site (RMS) wells are summarized in Table 1.

Currently 78 wells are monitored as part of a Broad Network for groundwater levels in the Vina Subbasin and 17 of these are RMS wells with assigned Sustainable Management Criteria. These wells consist of a mixture of domestic and irrigation wells, along with dedicated observation wells and California Water Service Company municipal/industrial supply wells in Chico. Approximately 33 of the Broad Network of monitoring 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 per-year, in March, July, August and October. From 2014 to 2016, groundwater levels were measured monthly from April through October due to severe drought conditions. Appendix A includes a map of the approximate locations of groundwater level RMS wells and each of their hydrographs showing measured groundwater levels for each well's period of record. 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 the groundwater level measurement range is 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 in the Broad Monitoring Network and four of these wells are included as groundwater level RMS wells in the Vina GSP.

2.1.1. Groundwater Elevation Hydrographs

Groundwater elevation hydrographs for each RMS well identified in the GSP are presented in Appendix A. Appendix B provides an explanation of the terms making up the *Sustainable Management Criteria* defined in Section 3 of the GSP (e.g. Minimum Threshold, Measurable Objective). The spring and fall 2021 water levels measured at each RMS well are presented in Table 1, which also provides a comparison of spring and fall water levels to: (i) 2020 WY conditions, (ii) the established Minimum Threshold groundwater elevations, (iii) the established Measurable Objective groundwater elevations, and (iv) the Interim Milestone for 2027.

Spring and fall 2021 levels were above the Measurable Objective, with only one exception: the fall groundwater elevation in well 20N01E10C002M was approximately three feet below the Measurable Objective. All measured groundwater levels remained within the subbasin's Margin of Operational Flexibility and well above the Minimum Threshold of each RMS well. Generally, 2021 groundwater levels were similar to spring 2014-2015 conditions with some new historical lows reached in a few wells.

2.1.2. Groundwater Elevation Contour Maps

The contour maps (Figure 3 and Figure 4) show groundwater elevations that are higher in the northern portion of the Vina Subbasin than in the south and higher on the eastern side of the subbasin compared to the western edge. This indicates groundwater flow is generally north to south in the Vina North management area (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, which is the majority of the Vina 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. Lower fall levels is a pattern typical of 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 flow consistent with recharge from the north and along the eastern foothills
- Convergence of flow toward the Sacramento River in the Vina North MA
- Flow in the Vina South MA converges toward pumping areas west of Butte Creek and near Durham
- The higher concentration of contours in the southeast portion of the subbasin indicate 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 lower transmissivity aquifer materials. Nonetheless, the contours are consistent with understanding of recharge coming from the lower foothills. New sources of information and data may improve understanding of this area (i.e. such as DWR's Airborne Electromagnetic Survey Program)

Of note is the groundwater depression west of Durham. During critically dry years such as 2021, increased groundwater production compensates for reduced rainfall. In addition, reduced recharge from Butte Creek (and other local drainages) likely occurs due to reduced streamflows. These factors may be contributors to the depression indicated by the contours. Fall contours also indicate declines relative to spring conditions throughout the subbasin as expected.

The Vina Subbasin aquifer system is described in the GSP as a single principle aquifer and therefore the maps shown in Figure 3 and Figure 4 do not distinguish between completion intervals of the wells. Therefore the contours represent an aggregate of groundwater elevations across all zones of the primary aquifer system. 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.

Table 1. Spring and Fall 2021 Groundwater Elevations in comparison to 2020 Groundwater Elevations and the Minimum Threshold and Measurable Objective (MO)

State Well Number	Spring Groundwater Conditions			Fall Groundwater Conditions			Minimum Threshold (ft MSL)	Measurable Objective (ft MSL)	Interim Milestone 2027
	2021 Groundwater Elevation (ft MSL)	Change from 2020 to 2021 (ft)	Difference relative to MO (ft)	2021 Groundwater Elevation (ft MSL)	Change from 2020 to 2021 (ft)	Difference relative to MO (ft)			
Vina Subbasin – North Management Area									
23N02W25C001M	135.6	-2.4	5.6	131.8	-1.5	2	50	130	130
23N01W10E001M	150.6	-8.6	14.6	145.8	-0.6	10	80	136	137
23N01E07H001M	166.9	QM	30.9	*162.4*	QM	QM	72	136	140
22N01W05M001M	132.0	-1.8	17.0	119.6	-4.9	5	31	115	116
23N01W36P001M	127.1	-5.0	19.1	112.7	-5.7	5	45	108	110
23N01E33A001M	141.4	-4.1	16.4	134.4	-4.0	9	72	125	128
Vina Subbasin – Chico Management Area									
CWSCH01b	117.0	-6.0	11.0	140.0	31.0	34	85	106	107
CWSCH02	118.0	-8.0	13.0	108.0	2.0	3	85	105	108
CWSCH03	123.0	-3.0	15.0	109.0	-3.0	1	85	108	109
CWSCH07	113.0	-3.0	18.0	99.0	-7.0	4	85	95	97
22N01E28J003M	130.1	-7.5	19.1	115.5	9.5	5	85	111	113
Vina Subbasin – South Management Area									
21N01E21C001M	NM	NM	NM	80.8	QM	17	10	64	67
21N02E18C003M	150.1	-9.3	20.1	153.2	3.1	23	65	130	132
20N01E10C002M	112.4	8.4	20.4	88.8	-4.6	-3	20	92	93
20N02E24C001M	106.8	-2.4	29.8	92.7	-8.1	16	18	77	81
20N02E09L001M	*115.9*	QM	QM	NM	NM	NM	30	91	93
21N02E26E005M	114.1	-4.3	19.1	106.8	-4.4	12	36	95	97

Note: Mean Sea Level (MSL)

Red/italicized numbers indicate questionable measurements (QM). NM indicates no measurement was taken.

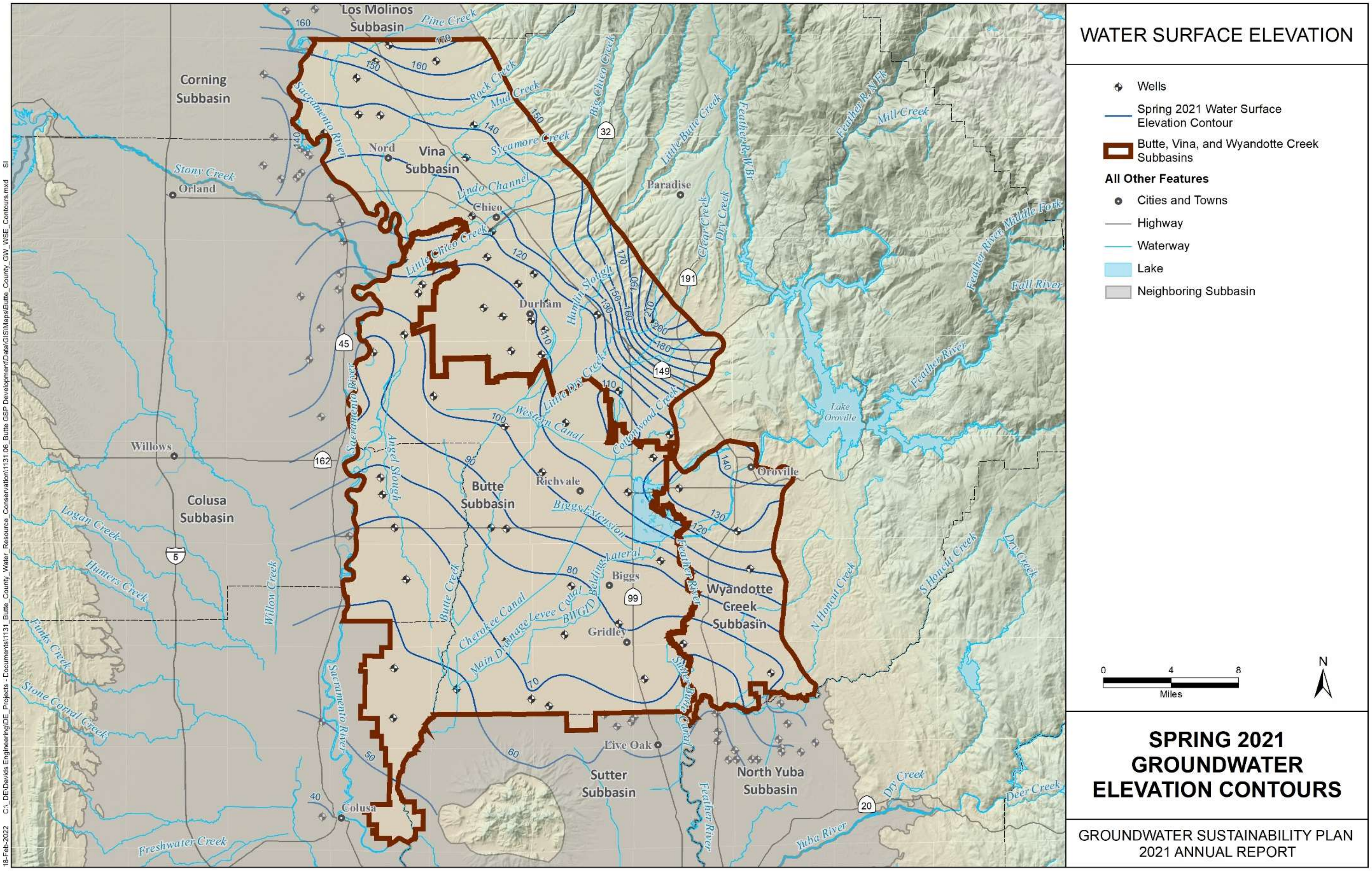


Figure 3. Spring 2021 Groundwater Elevation Contours for the Primary Aquifer

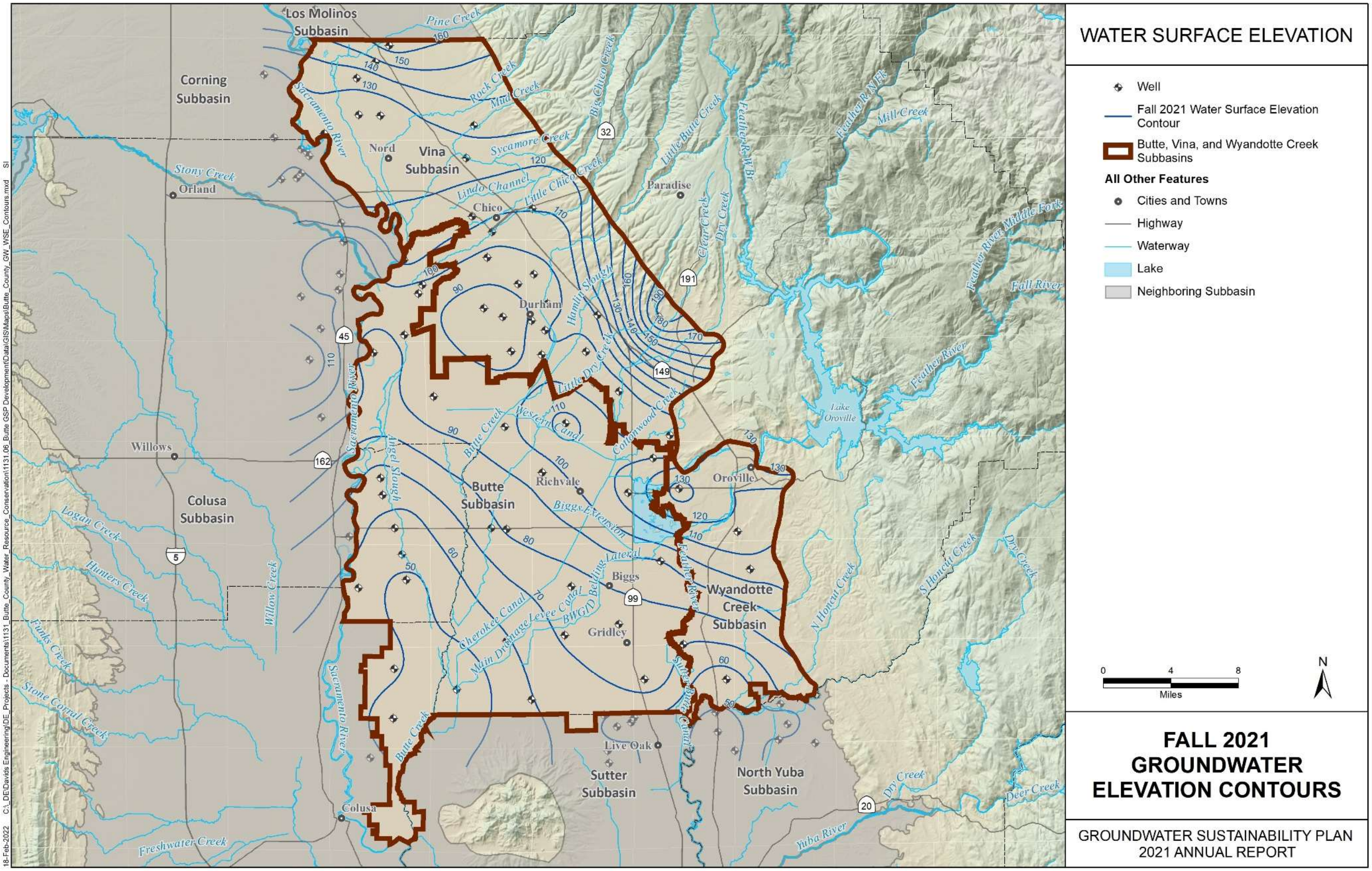


Figure 4. Fall 2021 Groundwater Elevation Contours for the Primary Aquifer

2.2 Water Use Estimates

The following section presents measured and estimated groundwater extraction and surface water used for the agricultural, municipal/industrial, and domestic sectors for the 2021 WY.

2.2.1. Groundwater Extraction

The majority of the Vina Subbasin is dependent on groundwater as the only available water source for agricultural irrigation. In addition, the City of Chico, the largest city in the subbasin is solely reliant on groundwater as a municipal/industrial water supply. The Durham Irrigation District also provides municipal water to households in the Durham area through groundwater extraction from three district wells, and domestic wells provide for rural residential water needs throughout the subbasin. Figure 5 shows a map of the general areas and pumping rates where extraction occurs. The subregions shown on the map are established in the Butte Basin Groundwater Model (BCDWRC, 2021).

Total estimated groundwater extraction in the 2021 WY was approximately 268,000 AF. This is about 24,000 AF greater than the 2000-2018 average annual groundwater extraction of 243,000 AF for the Vina Subbasin reported in the GSP. 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. In contrast, 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 2013-2015 drought period. The City of Chico saw a decrease of approximately 2.5% of municipal/industrial pumping volumes from 2020 to 2021.

Table 2. 2021 Water Year Groundwater Extraction by Water Use Sector

Sector	Extraction (AF)	Method
Agricultural and Managed Wetlands		
Vina Subbasin	242,400	Estimate
Municipal/Industrial		
City of Chico	22,640	Measured
Durham Irrigation District	640	Measured
Subtotal	23,280	
Domestic		
Rural Residential	2,300	Estimate
Total	***267,980***	

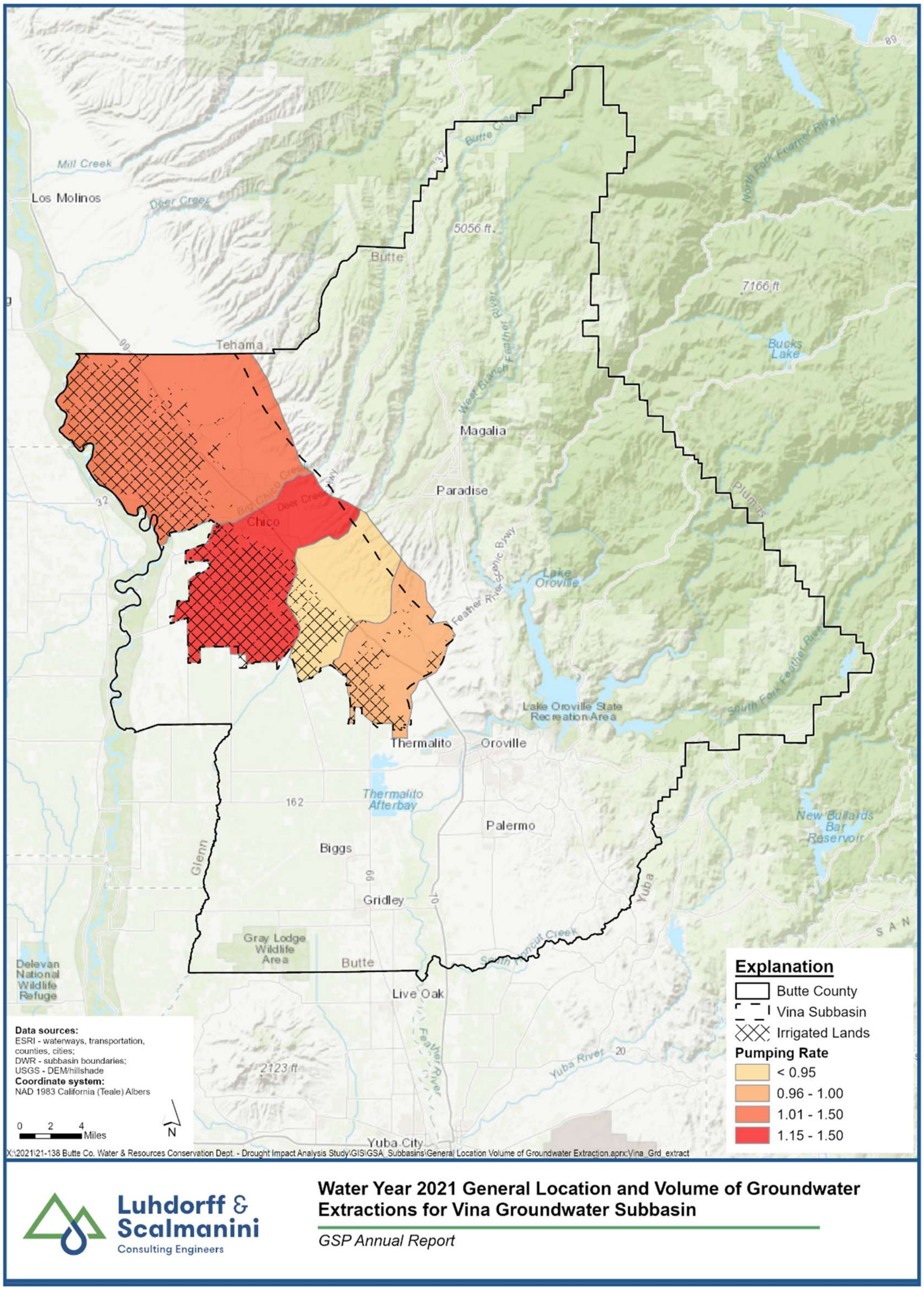


Figure 5. General Location (based on Butte Basin Groundwater Model subregions) and Volume of Groundwater Extraction shown as a Rate (acre-feet per acre) for 2021 WY

Agricultural groundwater extraction is estimated based on estimated agricultural water demand using 2021 land use (acreage for 17 different crops), climate conditions (i.e. precipitation and evapotranspiration), and crop coefficients consistent with those used in the Butte Basin Groundwater Model (used to develop water budgets for the Vina GSP). This includes estimated groundwater extraction for irrigating managed wetlands. It should be noted that although the fundamental approach is similar to that used to estimate groundwater extraction in the GSP, the Butte Basin Groundwater Model was not updated with 2021 data and was not used to provide these estimates. Therefore, future updates and use of the Model may result in different estimates for 2021 groundwater extraction. The approach used herein to estimate groundwater extraction is considered reasonable and cost effective for the purposes of the annual report. Coincident with the development of this annual report, Butte County is funding a Drought Impact Analysis Study to characterize conditions and economic impacts of the drought in 2021. Technical work for the Study provided water budget estimates for this annual report. The final report for the Study is expected to be released in May 2022.

Rural residential groundwater extraction is estimated based on the California Water Service Company's 2020 Urban Water Management Plan's 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. Municipal/industrial water supplies are measured and were provided by the utility.

2.2.2. Surface Water Supply

Surface water provided about 4% of the agricultural water demand in the Vina Subbasin in 2021. Diversions from Butte Creek and Mud Creek are estimated based on historic State Water Resource Control Board (SWRCB) Electronic Water Rights Information Management System (eWRIMS) data for total diversions. Surface water delivery estimates are based on historic deliveries in the area that have occurred in dry and critical years. Some water right holders on Butte Creek were curtailed by the SWRCB in 2021. Total surface water deliveries for the Vina Subbasin are estimated to be about 9,700 AF as shown in Table 3.

Table 3. Summary of 2021 Surface Water Deliveries by Source and Sector

Sector	Source	Surface Water (AF)	Method
Agricultural			
	Butte Creek & Mud Creek	9,700	Estimate
Total		***9,700***	

2.2.3. Total Water Available

Groundwater supplies about 96% of the agricultural water demand in the subbasin and also constitutes about 96% of the total water supplies for all water demand sectors.

Total water available for use in the Vina Subbasin was tabulated from groundwater extraction volumes reported in Table 2 and the surface water supply reported in Table 3. Total water available is summarized in Table 4 for the 2021 WY. The results are either based on measured data or estimates as described in the previous two sections.

Table 4. 2021 Water Year Total Water Available by Water Use Sector and Water Source Type

Sector	Groundwater Extraction (AF)	Surface Water (AF)	Method	*Total (AF)*
Agricultural	242,400	9,700	**Estimate**	***252,100***
Municipal/Industrial	23,280	Not Applicable	**Measured**	***23,280***
Domestic	2,300	Not Applicable	**Estimate**	***2,300***
Total	***267,980***	***9,700***		***277,680***

2.3. Change in 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. 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.

Increased groundwater extraction in 2020 (previous irrigation season) relative to long-term average groundwater demand, as well as reduced natural recharge due to dry climate conditions and decreased streamflows, resulted in lower groundwater levels in spring 2021 compared to spring 2020. This amounts to an estimated reduction of groundwater in storage of about 93,400 AF for this time period. Figure 6 shows estimated change in storage using groundwater level conditions in RMS wells and a representative storage coefficient of 0.1, with Thiessen polygons defining a representative area for each RMS well. The representative storage coefficient was established by roughly calibrating estimated change in storage based on changes in observed water levels (i.e. calculated using water level data, representative area, and storage coefficient parameter) with estimated change in storage outputs from the Butte Basin Groundwater Model as reported in the GSP to aggregate characteristics across all zones of the principal aquifer system. A total of 20 pairs of concurrent annual storage changes from both of these methods (i.e., (1) groundwater level change method used in this report and (2) modeled storage changes from the GSP) 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.

Figure 7 shows annual and cumulative change in groundwater storage over time, 2000-2021, relative to annual groundwater extraction and water year type.

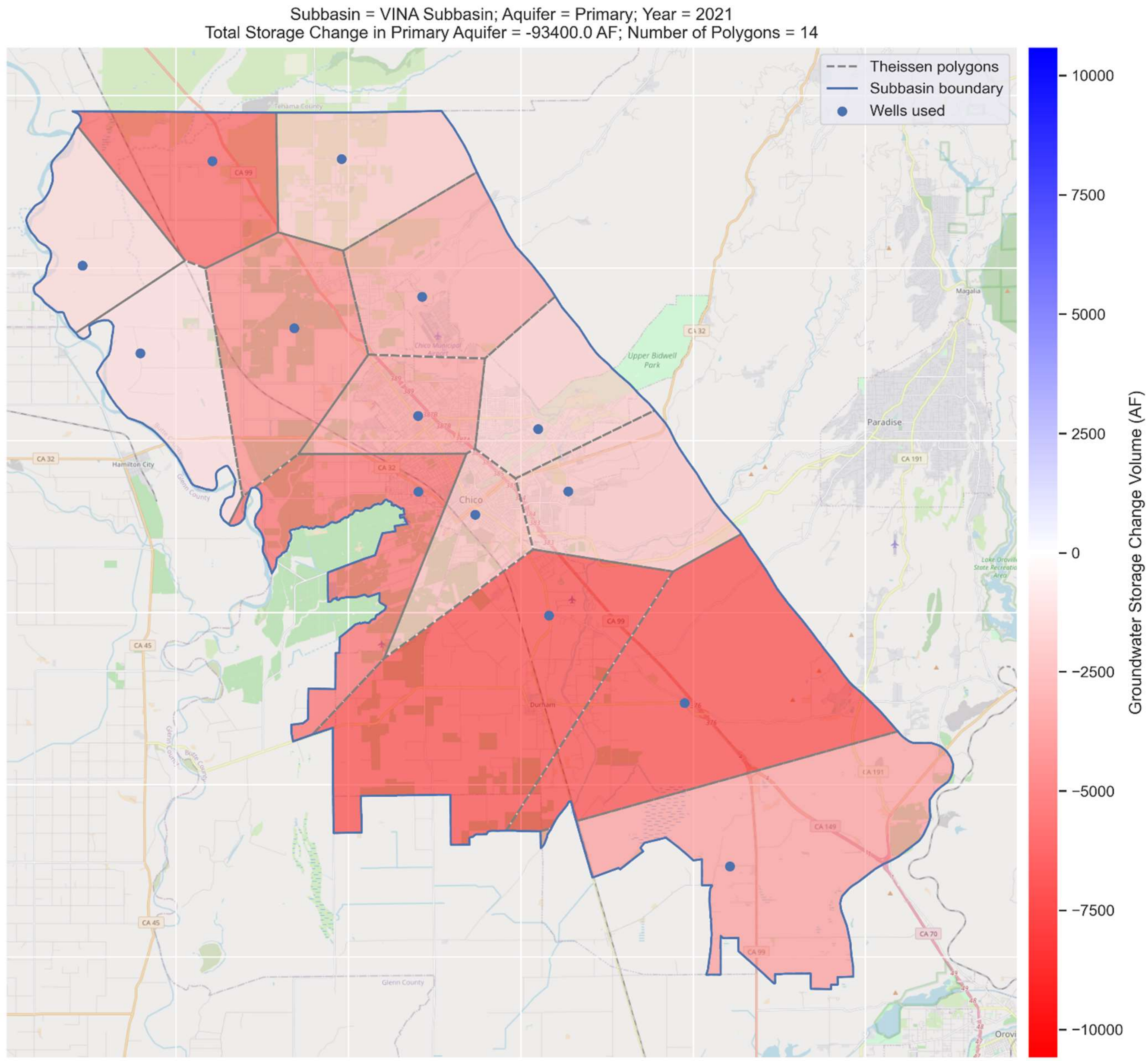


Figure 6. Change in Groundwater Storage from Spring 2020 to Spring 2021 using groundwater elevations from RMS wells and Storage Coefficient of 0.1. Spring measurements were computed as the average of all available groundwater level measurements from March and April of the respective year.

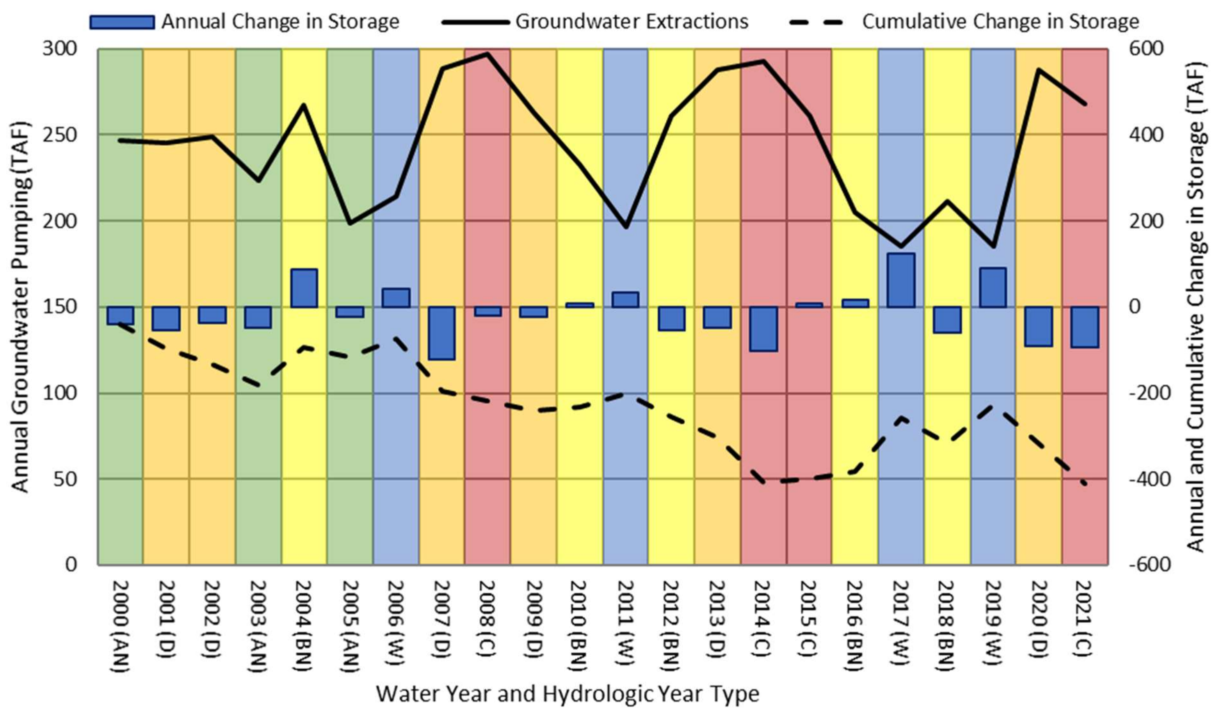


Figure 7. Change in Groundwater Storage (Cumulative and Annual Change) and Groundwater Extraction by Water Year Type.

Note: Values calculated spring to spring for each water year. Water year types are identified as wet (W, shaded blue), above normal (AN, shaded green), below normal (BN, shaded yellow), dry (D, shaded orange), or critical (C, shaded red). Groundwater extraction 2000-2018 is consistent with the Vina GSP based on Butte Basin Groundwater Model results, 2019 and 2020 estimated by matching to similar water year types, and 2020 estimated as described in Section 2.2. Groundwater change in storage estimated based on change in measured spring to spring groundwater levels multiplied by the area of Thiessen polygon associated with the monitoring well and the Storage Coefficient of 0.1.

3. Groundwater Sustainability Plan Implementation Progress

The GSP for the Vina Subbasin was adopted by the Vina and Rock Creek Reclamation District GSAs in December 2021 and submitted to DWR in January 2022. This is the first annual report to be prepared since the GSP was submitted. The GSP implementation progress reported in this report covers ongoing work during GSP development since late 2021.

3.1 Interim Milestone Achievement Progress

As shown in Table 1, 2021 groundwater level conditions are higher than the first 5-year 2027 interim milestone for the RMS wells in the Vina Subbasin with a few exceptions. While a few of the hydrographs indicate recent groundwater level measurements below the 2027 interim milestone, it is important to note that these measurements occurred in years experiencing dry hydrological conditions and/or drought conditions. Groundwater conditions below the Measurable Objective may occur during severe drought conditions but are expected to recover following the end of drought during wetter hydrological conditions. The GSAs are working to implement projects and management actions in the GSP to address the imbalance of inflows and outflows currently leading to a slight longer term downward trend in water levels.

Ongoing Stakeholder Engagement

Since completing the GSP, the GSAs are continuing to plan stakeholder meetings with the first scheduled for March of 2022. Stakeholders participating in these meetings will review and discuss a suite of projects aimed at achieving sustainability in the subbasin by 2042. Additional projects beyond those identified in the GSP may be included. Upon additional evaluation, the stakeholder group may recommend that the GSAs move a subset of the projects identified in the GSP ahead for further assessment, modeling or scoping. The GSAs' Boards will continue to prioritize stakeholder feedback in the implementation phase of the GSP, because of the vital role stakeholders play in finding successful groundwater management approaches for the variety of beneficial uses and users of groundwater in the subbasin.

3.2 GSP Project Implementation Progress

Achieving sustainability in the subbasin may require implementation of projects and management actions. The subbasin will achieve sustainability by both identifying and increasing alternative sources of supply and reducing groundwater demand. Currently, no pumping restrictions have been proposed for the subbasin; however, the GSAs maintain the flexibility to implement such demand-side management. The GSAs in the Vina Subbasin have decided to continue to evaluate implementation of the GSP and long-term funding strategies in upcoming meetings. The recent progress towards implementation of projects and management actions applicable to the subbasin as described below demonstrates the GSAs' commitment to allocating the necessary time and resources to achieve long-term sustainable management of the groundwater resources in the subbasin. Progress made by the GSAs or partners in the Vina Subbasin is described below.

Residential Water Conservation Project

The California Water Service Company, 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. These conservation projects using groundwater as the supply source for the households they serve will directly affect groundwater levels and groundwater storage by reducing demand. Conservation efforts in the 2021 WY resulted in a 2.5% reduction in urban pumping compared to 2020 (amounting to a reduction of approximately 600 AF).

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 Vina Subbasin. The purpose of 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 is expected to be available in spring of 2022. Recommendations from the survey will be made available to the local agricultural community and the public. Voluntary implementation of the recommended practices are expected to be initiated between 2024 and 2030 by local irrigators. The Vina GSA along with participating partners will pursue grant funds to help implement these practices. The Agricultural Irrigation Efficiency project addresses declining water levels and the declining volume of groundwater stored in the aquifer (and therefore potential land subsidence) by reducing groundwater demand. The main objective of the project is to improve groundwater levels and storage by modifying irrigation practices to reduce groundwater demand.

Fuels Management for Watershed Health Project

This project involves fuel management in the upper watershed of the Vina Subbasin. Funding has been secured and fuels reduction treatment has been started on 150 acres in the area above Musty Buck Ridge. Initiation of similar work on an additional 150 acres is currently pending funding and the treatment will begin once funding is secured. Additionally, work is in progress to finalize a Vegetation Management Plan for an additional 4,000 acres in the upper watershed upslope of the Vina Subbasin. These projects will affect groundwater levels, storage, and surface water depletions. By increasing the amount of open canopy in these forested areas and therefore the surface area of the soil for rain to fall on, more precipitation can seep into the soil and the groundwater system. Severe fires can increase soil bulk density, and reduce soil porosity. These projects will reduce the potential for catastrophic fires to occur which will maintain the soil structure and soil porosity allowing for percolation of precipitation into the groundwater system. Intense burns may induce water repellent layers in the soil, which can block water infiltration and contribute to runoff and erosion. Fuel reduction in the upper watershed will also result in reduced water demand from vegetation growth, which depending on their proximity to the streams, may increase runoff into these surface waterways resulting in increased recharge from the creeks and streams.

Paradise Irrigation District (PID) Intertie Project

Paradise Irrigation District (PID) in coordination with the California State Water Resources Control Board is currently conducting 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, that 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 ongoing with the most recent meeting held in February 2022. The final version of the Options Study is anticipated to be available in late March 2022.

According to the draft document, this infrastructure project would need additional detailed study to determine the impact on PID operations. 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 Intertie Project.

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 streamflows as well as direct and in-lieu recharge.

There has been progress on one specific project, the Butte Creek Integrated Stream Flow Enhancement Planning Project. An application was submitted by the Friends of Butte Creek to the Wildlife Conservation Board's Stream Flow Enhancement Program in January 2022 to fund this 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 ten 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 on behalf of the Friends of Butte Creek to the Wildlife Conservation Board's Stream Flow Enhancement Program in late 2021 to fund this project.

Rangeland Management and Water Retention Project

Under this project, California State University Chico and Chico State Enterprises is 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.

Surface Water Supply and Recharge Project

These projects will involve activities that increase the surface water supply to the Vina 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, 3) surface water and/or flood water application to recharge basins and/or recharge ponds or other applications.

Progress has been made on one specific project, 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 Vina 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 Request for Proposals from qualified contractors was drafted and published in early 2022 for this work.

3.3 GSP Management Actions Implementation Progress

The recent progress on management actions demonstrates the GSAs' commitment to allocating the necessary time and resources to achieve long-term sustainable management of the groundwater resources of the GSAs. Progress by the GSAs on the management actions is described below.

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.

3.4 Other Relevant Efforts

Implementation Activities

Additionally, activities in the subbasin to implement SGMA and meet the commitments of the GSP include:

- Monitoring and recording of groundwater levels
- 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

Drought Impact Analysis Study

The Butte County Drought Preparedness and Mitigation Plan (Drought Plan) was adopted in 2004 and was developed to protect the County from the effects of a drought. The Drought Plan includes: an overview of Butte County's drought background; an institutional framework to approach drought; a monitoring plan; a response and mitigation plan; and a discussion of water transfers during a drought. The purpose of the Drought Plan is to provide an efficient and systematic process for Butte County that results in a short- and long-term reduction in drought impacts to the citizens, economy, and environment.

In preparation for potentially continued drought conditions, Butte County funded and contracted with a consultant to conduct a Drought Impact Analysis Study to characterize the conditions and economic impacts of drought that occurred in 2021. It will also provide recommendations for County response and readiness in 2022 if dry conditions and drought impacts persist. The study is expected to provide information that may be useful to GSAs as well.

3.5 Conclusion

Recent progress made on all of the above mentioned activities applicable to the GSAs since late 2021 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.

4. References

Butte County Department of Water and Resource Conservation (BCDWRC). 2021. Model Documentation v 1.0. Butte Basin Groundwater Model. 30 November. Available at: https://www.buttecounty.net/waterresourceconservation/groundwater.

Geosyntec Consultants, Inc. 2021. Vina Groundwater Sustainability Plan. Available at: https://sgma.water.ca.gov/portal/gsp/preview/86

Appendices

2021 Water Year Annual Report

2021 Water Year Annual Report

Appendix A

Characteristics and Hydrographs of Representative Monitoring Site (RMS) Wells

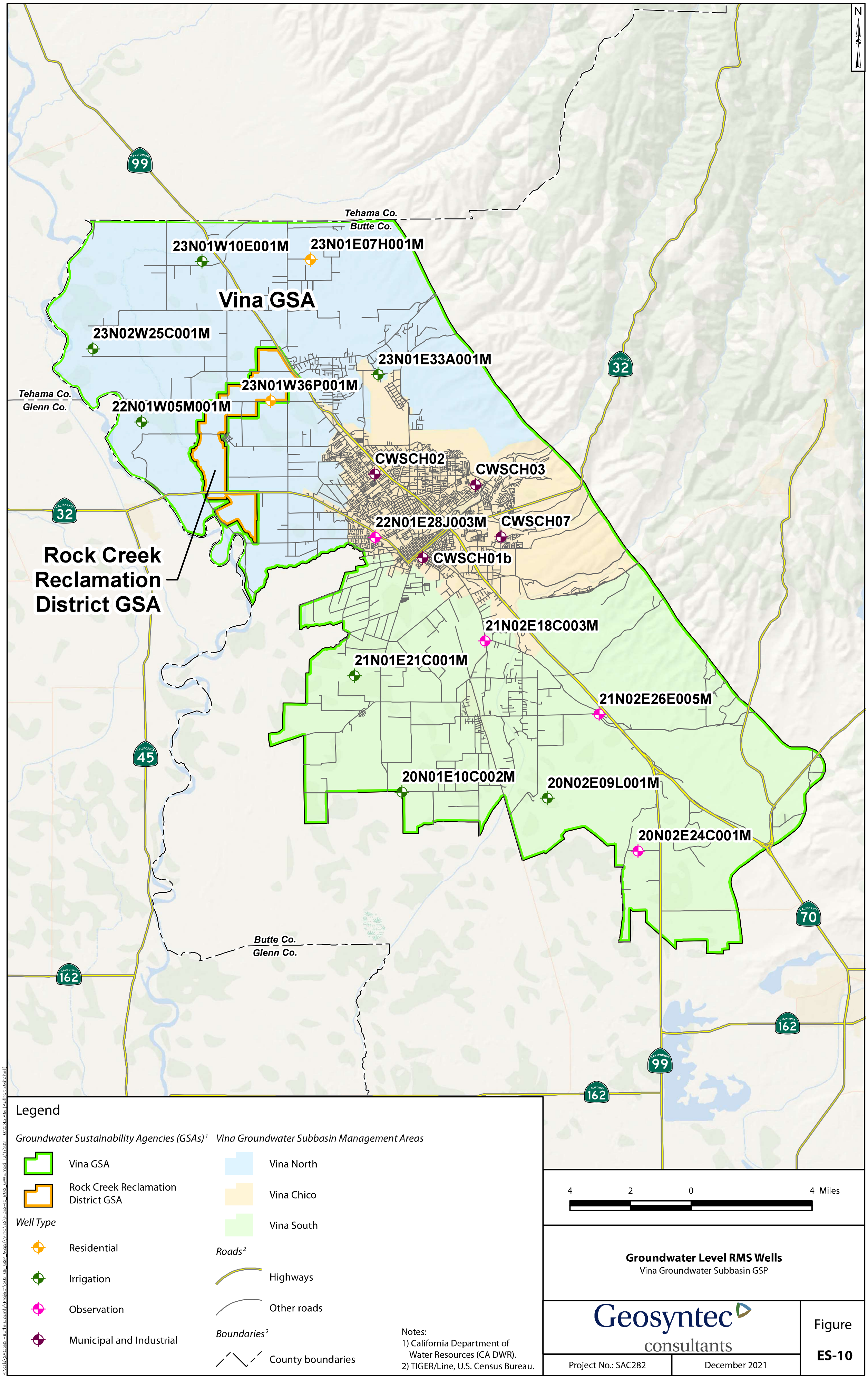
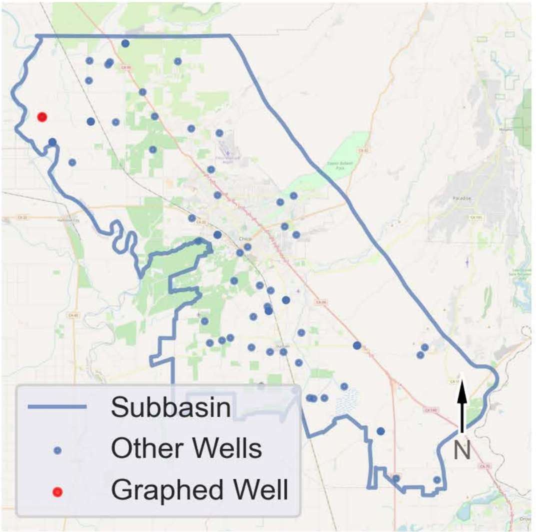

N
Tehama Co.
Butte Co.
23N01W10E001M
23N01E07H001M
Vina GSA
23N02W25C001M
23N01E33A001M
23N01W36P001M
Tehama Co.
Glenn Co.
22N01W05M001M
CWSCH02
CWSCH03
22N01E28J003M
CWSCH07
CWSCH01b
Rock Creek
Reclamation
District GSA
21N02E18C003M
21N01E21C001M
21N02E26E005M
20N01E10C002M
20N02E09L001M
20N02E24C001M
Butte Co.
Glenn Co.
99
32
45
70
162
Legend
Groundwater Sustainability Agencies (GSAs)[1]
Vina GSA
Rock Creek Reclamation District GSA
Well Type
Residential
Irrigation
Observation
Municipal and Industrial
Vina Groundwater Subbasin Management Areas
Vina North
Vina Chico
Vina South
Roads[2]
Highways
Other roads
Boundaries[2]
County boundaries
Notes:
1) California Department of Water Resources (CA DWR).
2) TIGER/Line, U.S. Census Bureau.
4 2 0 4 Miles
Groundwater Level RMS Wells
Vina Groundwater Subbasin GSP
Geosyntec consultants
Project No.: SAC282
December 2021
Figure
ES-10

Table 4-5: Groundwater Levels Representative Monitoring Site Well Construction Details

RMS Well ID	State Well Number (Site Name)	Total Depth (feet bgs)	Screened Interval (feet bgs)	Reference Point Elevation[1] (feet)	Reference Point Description	Ground Surface Elevation[1] (feet)
Vina Subbasin – North Management Area						
25C001M	23N02W25C001M	243	N/A	161.2	Hole cut inside of casing	157.4
10E001M	23N01W10E001M	668	600-668	190.68	1-inch hole inside pump base	189.38
07H001M	23N01E07H001M	195	115-195	283	Top of casing, remove blue cap	282
05M001M	22N01W05M001M	200	N/A	153.28	Hole in pump south side	151.48
36P001M	23N01W36P001M	165	N/A	164.35	Top of casing crack in north side	162.75
33A001M	23N01E33A001M	506	53-506	252.34	1-inch hole in top of casing	252.34
Vina Subbasin – Chico Management Area						
CWSCH01b	CWSCH01b	>600	---	200	N/A	---
CWSCH02	CWSCH02	>600	---	183	N/A	---
CWSCH03	CWSCH03	>600	---	258	N/A	---
CWSCH07	CWSCH07	<600	---	270	N/A	---
28J003M	22N01E28J003M	279	200-279	179.79	Top of casing easterly 1-inch casing	178.89
Vina Subbasin – South Management Area						
21C001M	21N01E21C001M	565	240-300 448-508	133.64	Hole in pump base west side	133.34
18C003M	21N02E18C003M	240	130-140 160-170 190-200	191.15	Top of shortest PVC casing	189.07
10C002M	20N01E10C002M	210	20-120	128.35	Top of casing south side	127.35
24C001M	20N02E24C001M	155	124-134	159.65	Top of casing, northern-most piezo	157.75
09L001M	20N02E09L001M	710	460-710	143.83	Hole in pump base, southeast side	139.33
26E005M	21N02E26E005M	315	265-275 280-290	184.44	Top of next to shortest PVC casing	182.26

Note:
1 –NAVD88
N/A – Not available
PVC – polyvinyl chloride
--- Details of public supply wells not disclosed

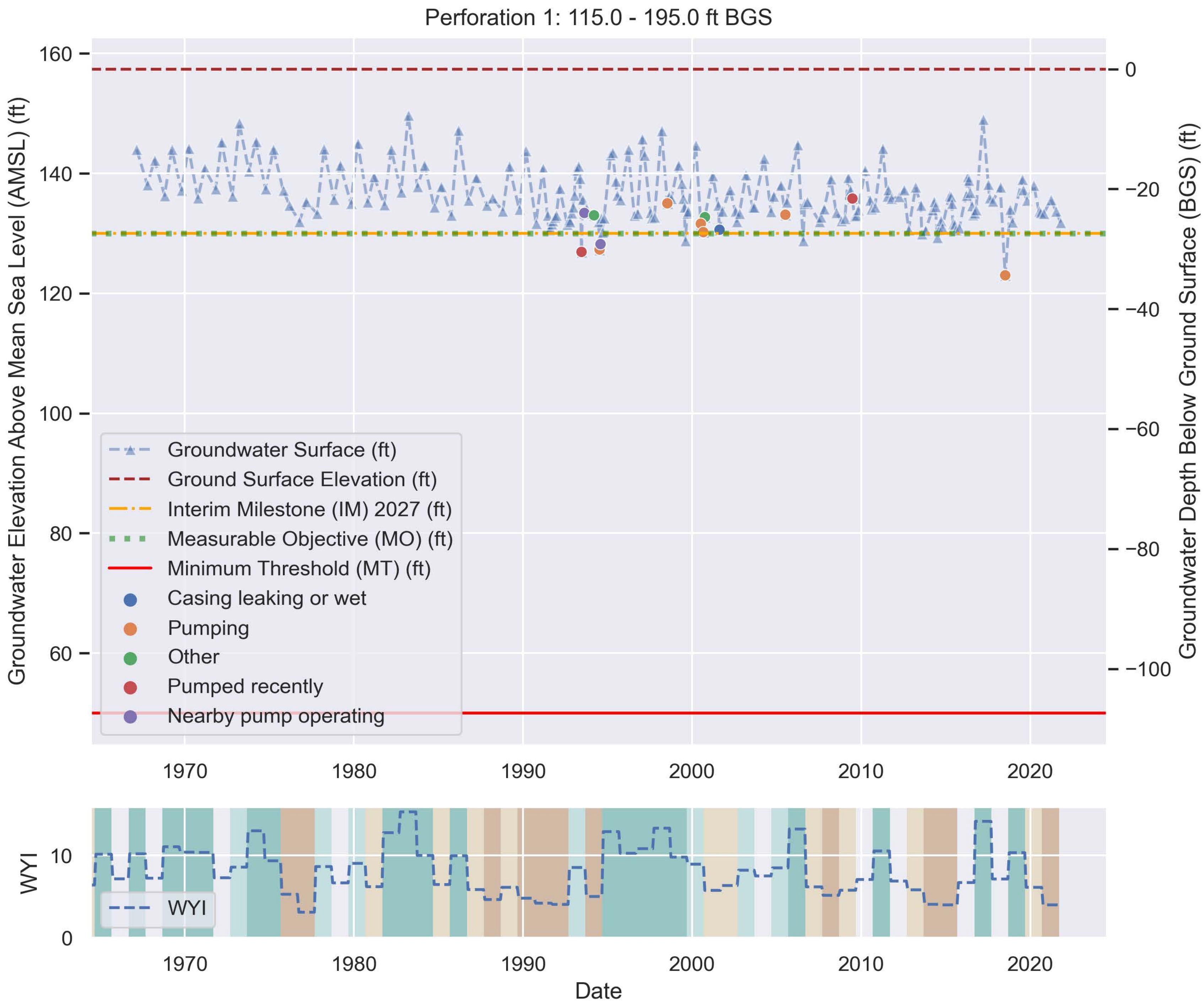
VINA Subbasin - State Well Number (SWN): 23N02W25C001M



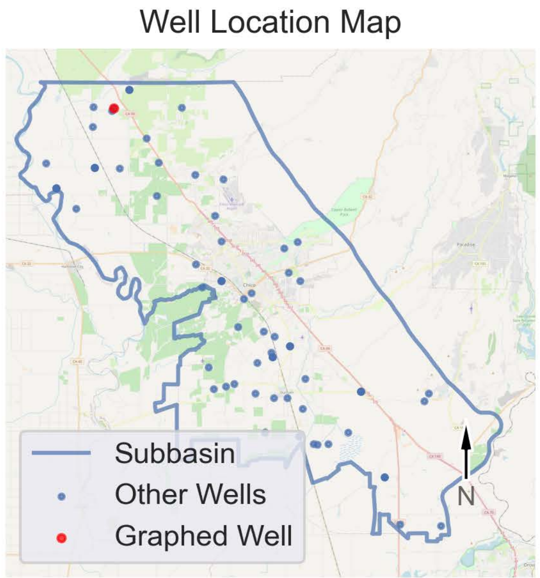
Sustainable Management Criteria:

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.



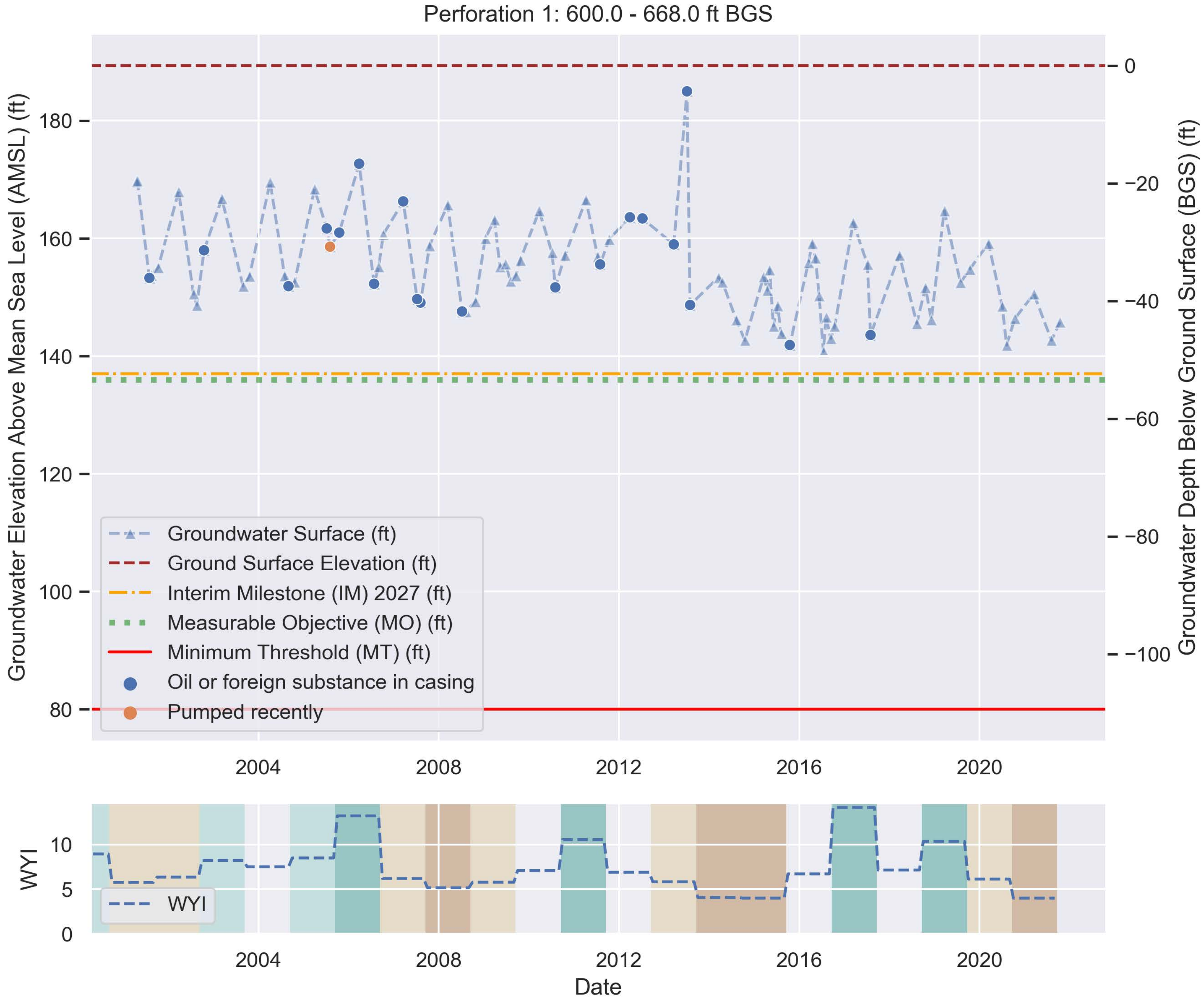
VINA Subbasin - State Well Number (SWN): 23N01W10E001M



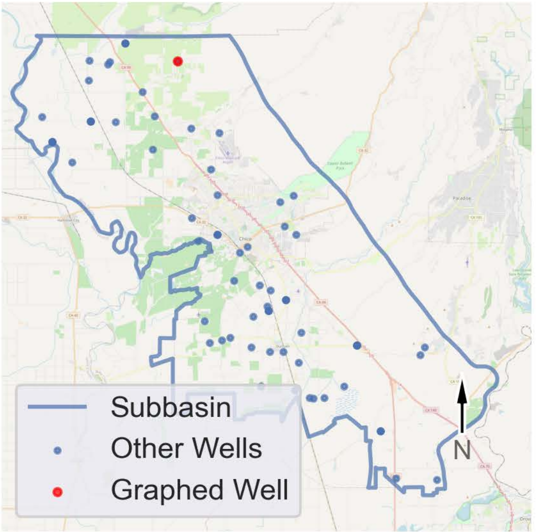
Sustainable Management Criteria:

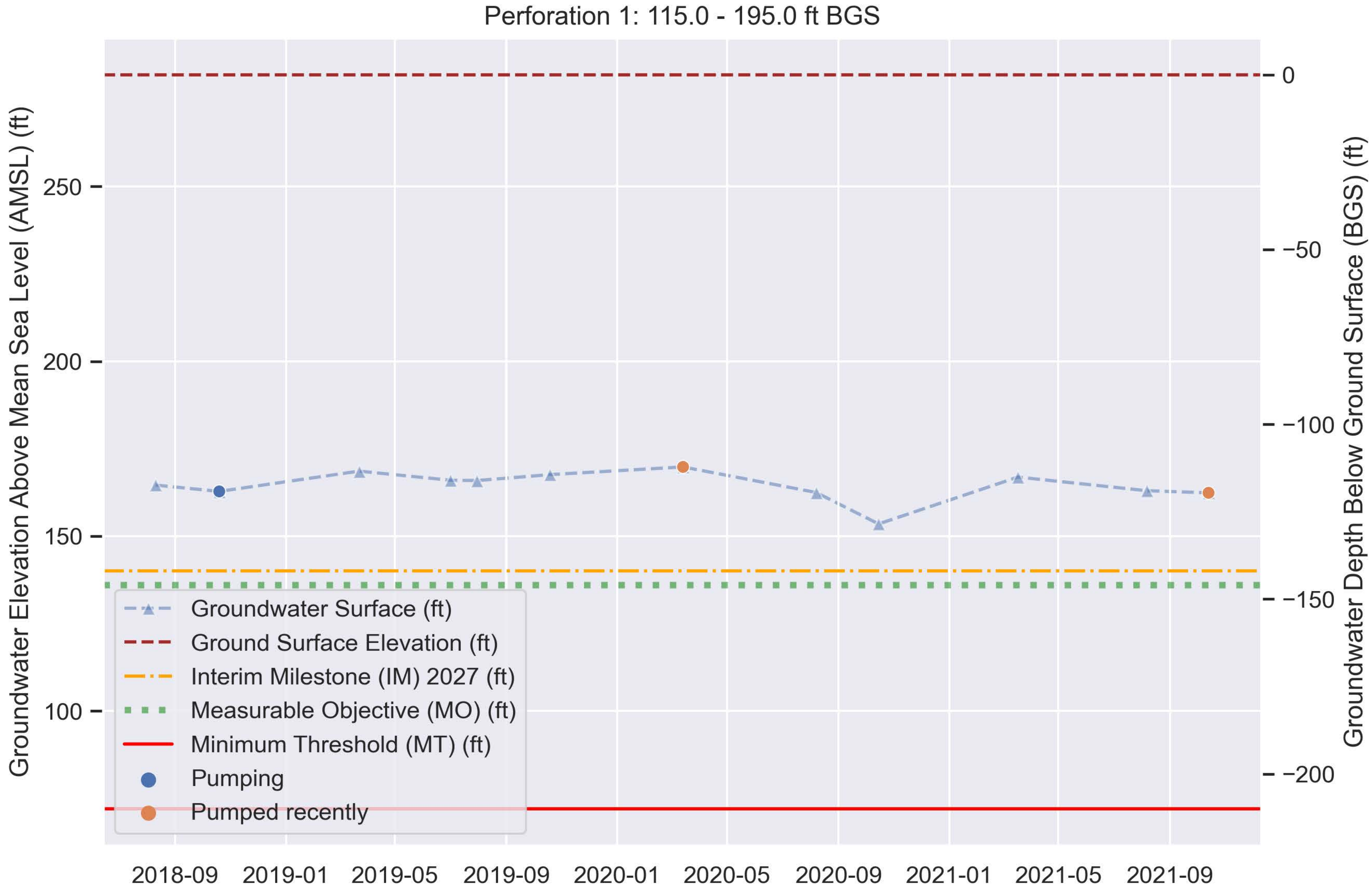
IM (2027) = 137.0 ft AMSL
MO = 136.0 ft AMSL
MT = 80.0 ft AMSL

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



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

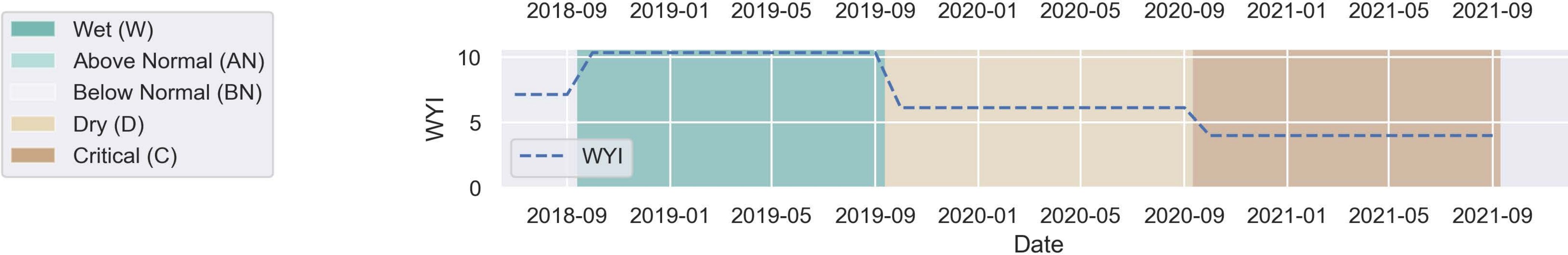




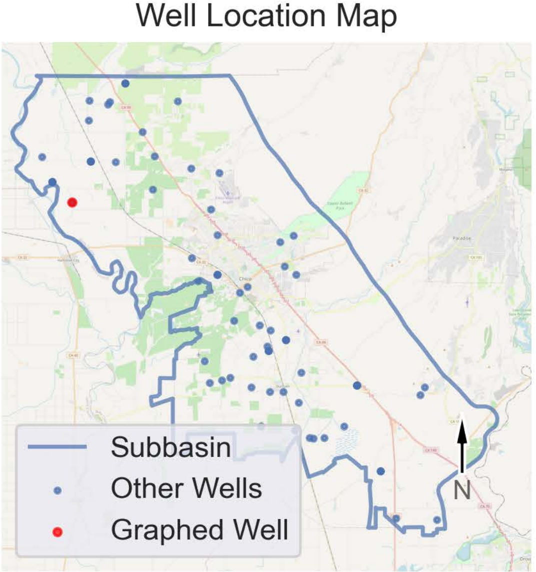
Sustainable Management Criteria:

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.



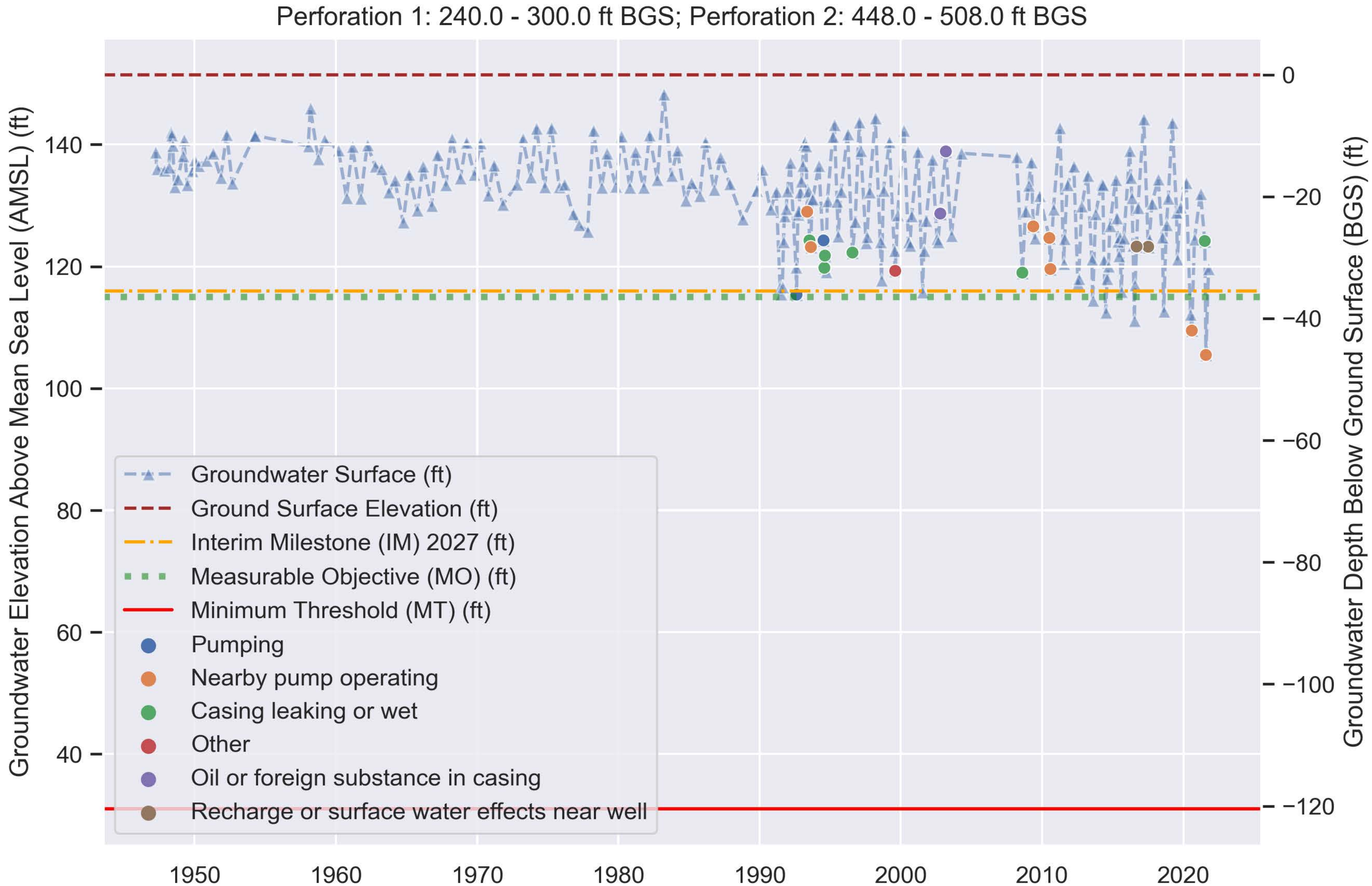
VINA Subbasin - State Well Number (SWN): 22N01W05M001M

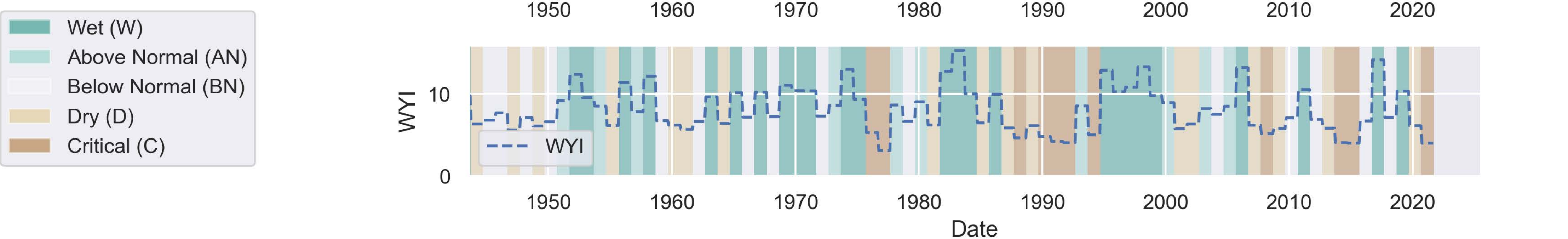


Sustainable Management Criteria:

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

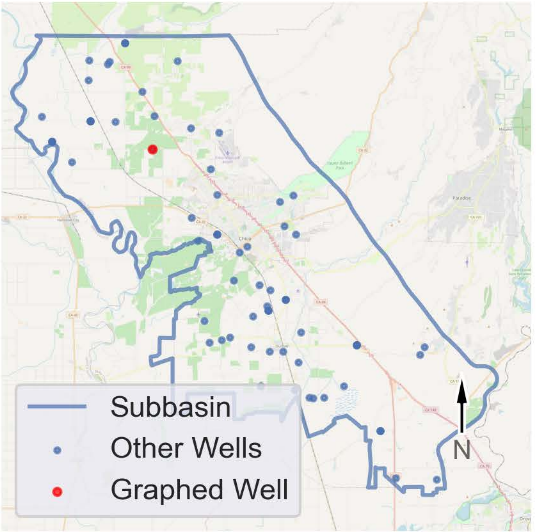
Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.

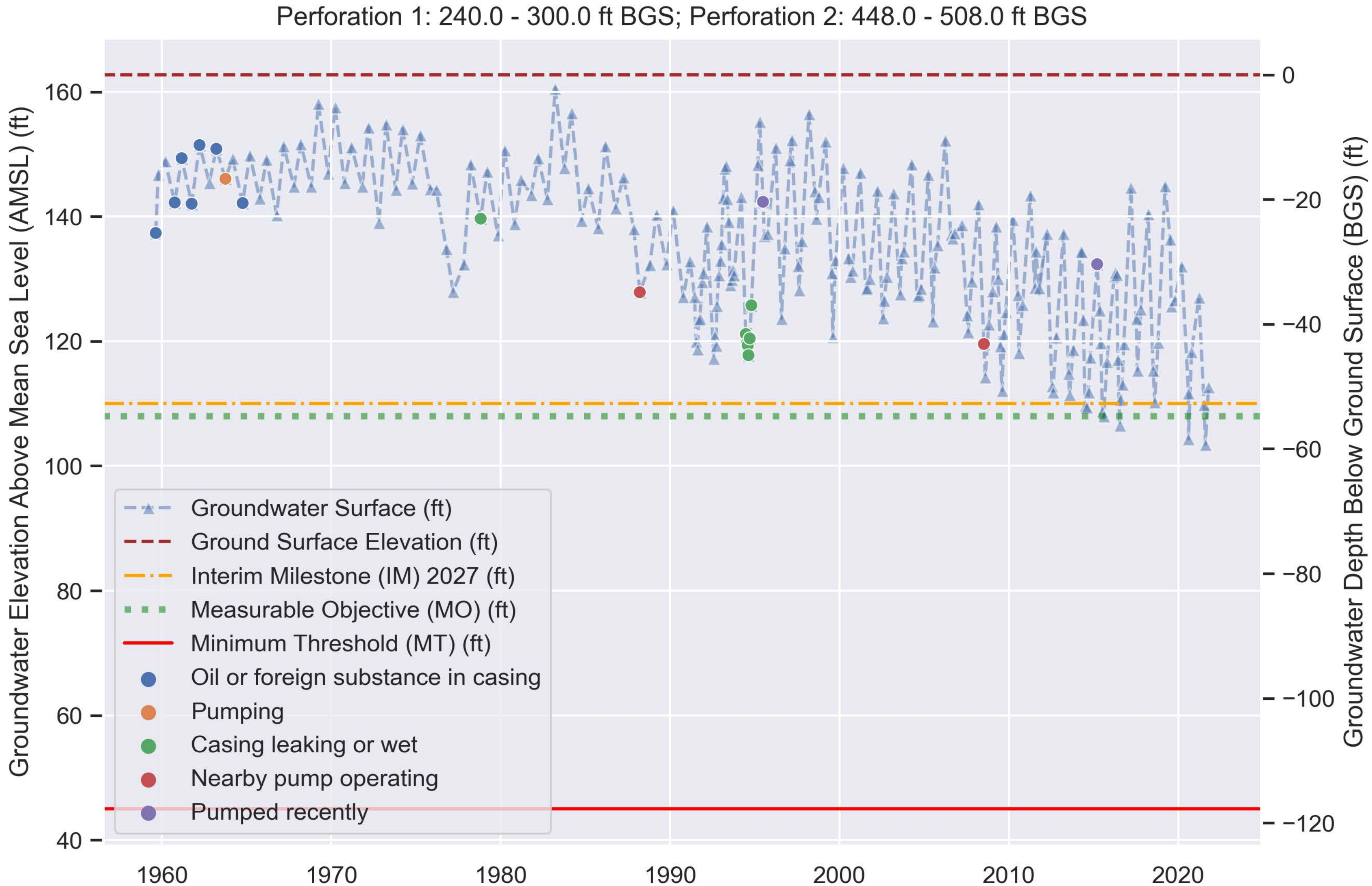




VINA Subbasin - State Well Number (SWN): 23N01W36P001M

Well Location Map

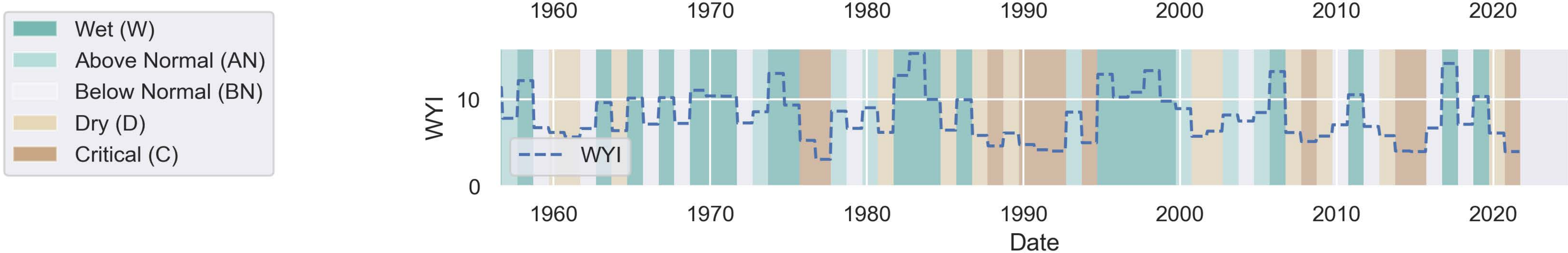




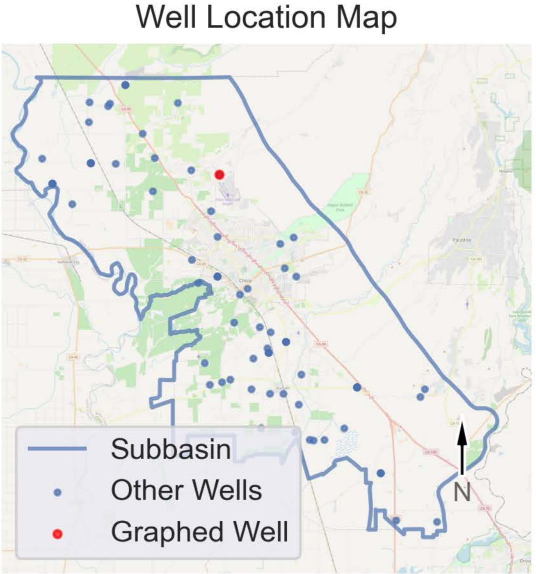
Sustainable Management Criteria:

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.



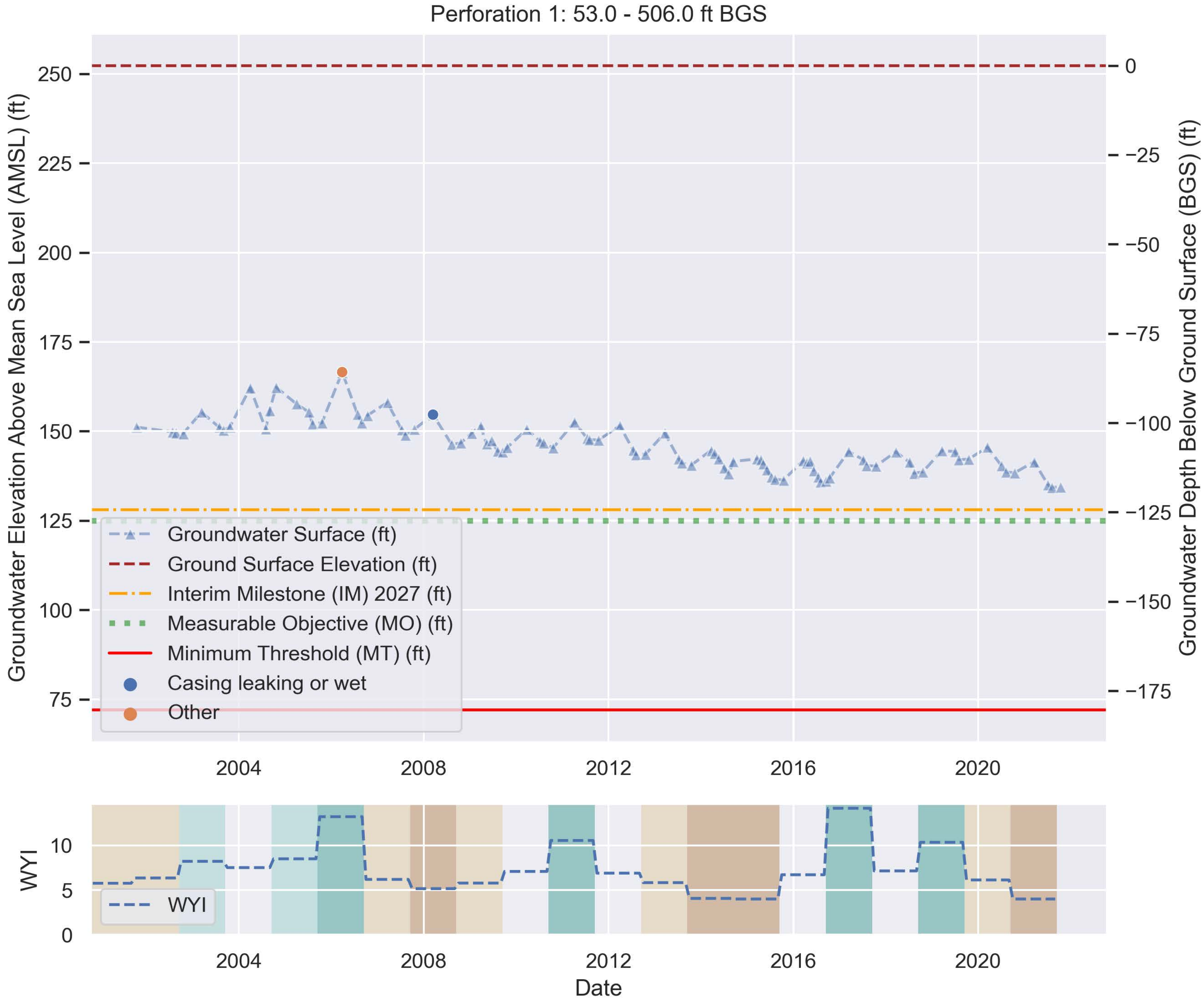
VINA Subbasin - State Well Number (SWN): 23N01E33A001M



Sustainable Management Criteria:

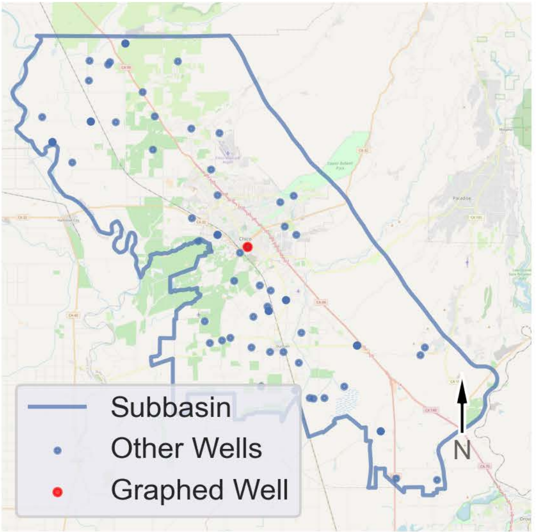
IM (2027) = 128.0 ft AMSL
MO = 125.0 ft AMSL
MT = 72.0 ft AMSL

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

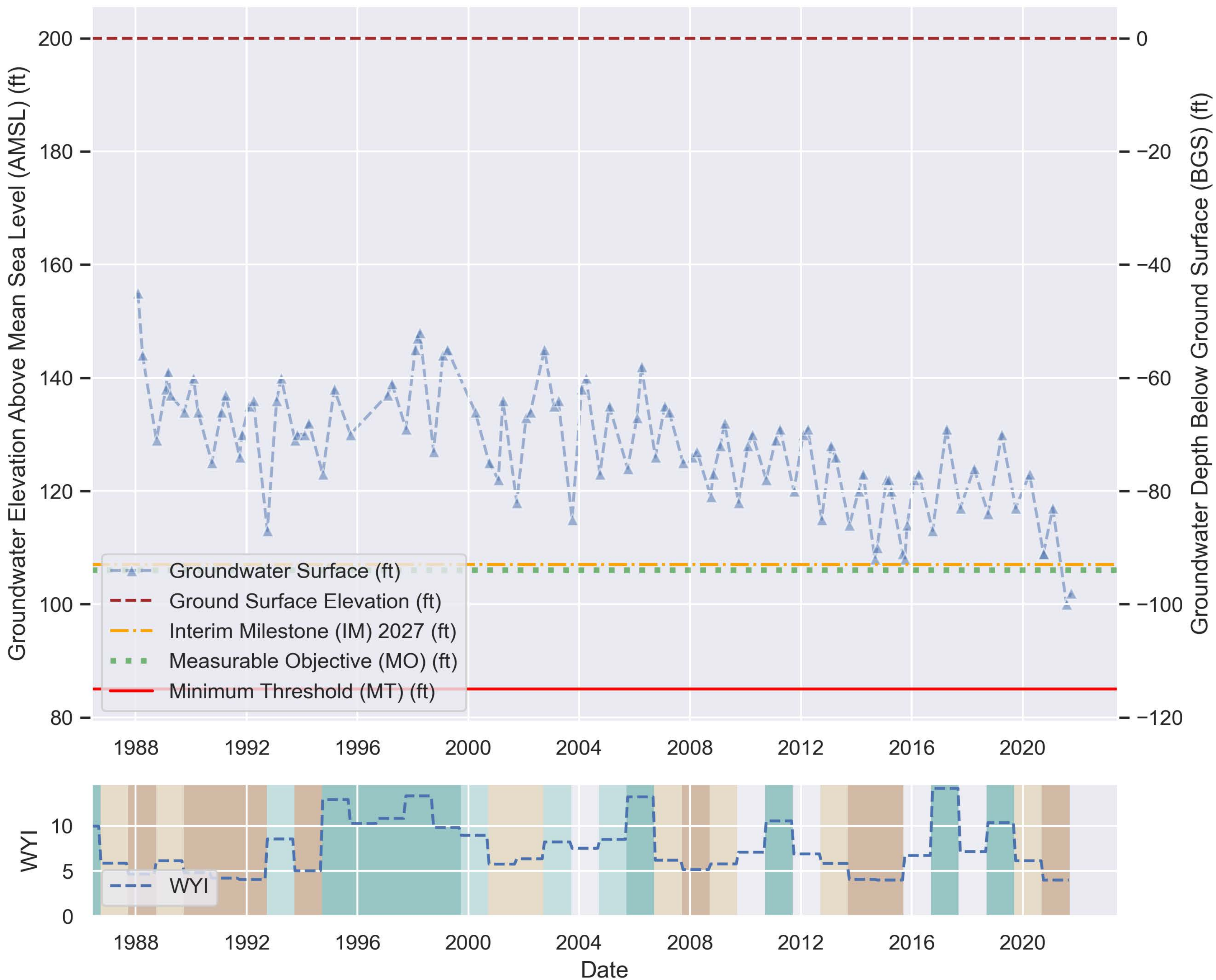


VINA Subbasin - State Well Number (SWN): CWSCH01b

Well Location Map



Perforation 1: Perforation data not available.



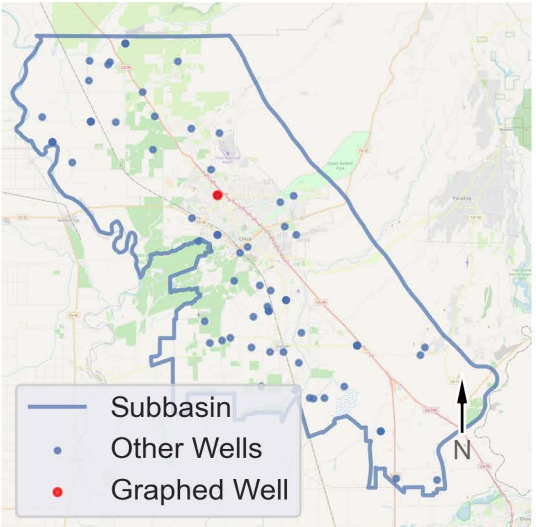
Sustainable Management Criteria:

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.

VINA Subbasin - State Well Number (SWN): CWSCH02

Well Location Map



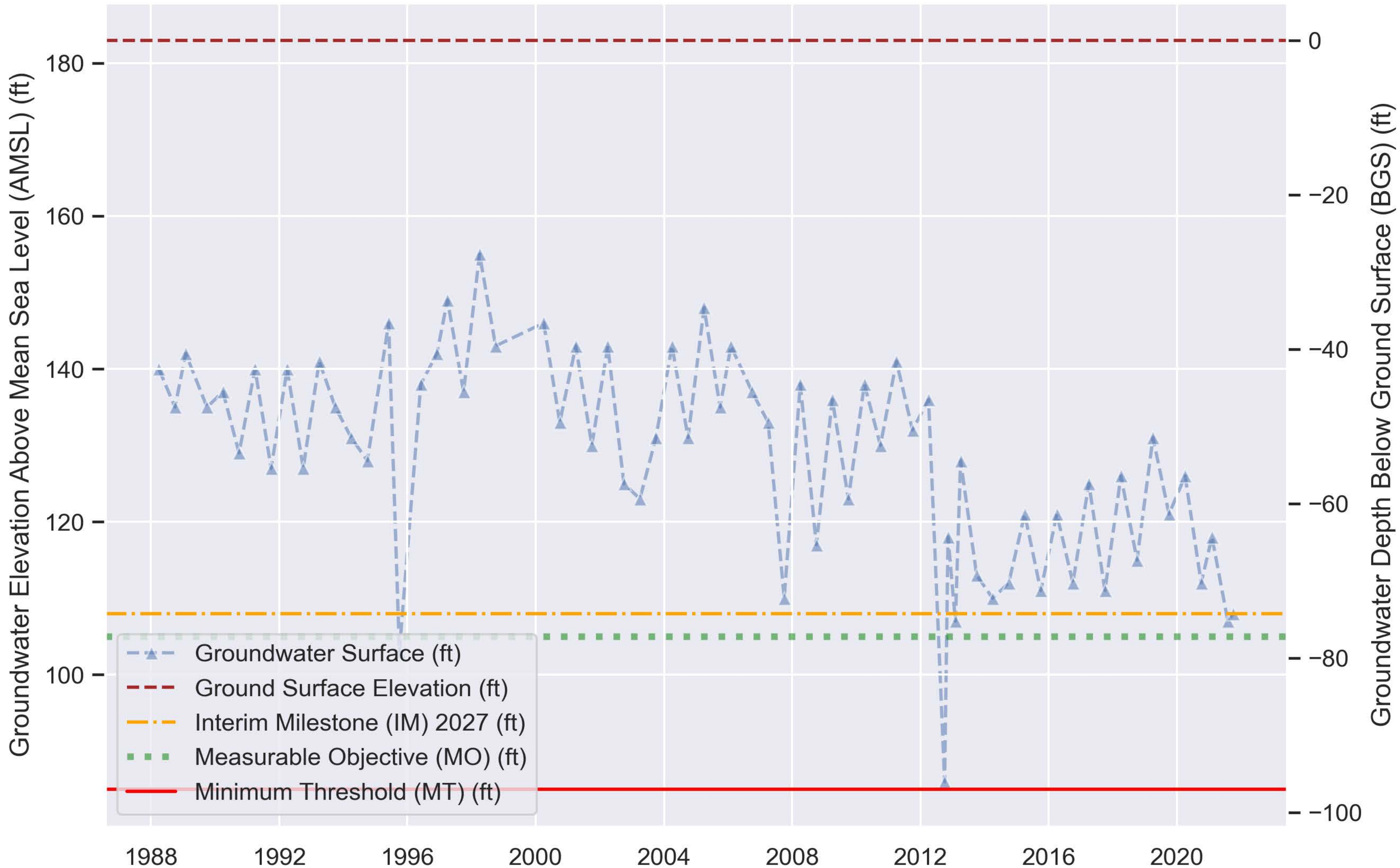
Sustainable Management Criteria:

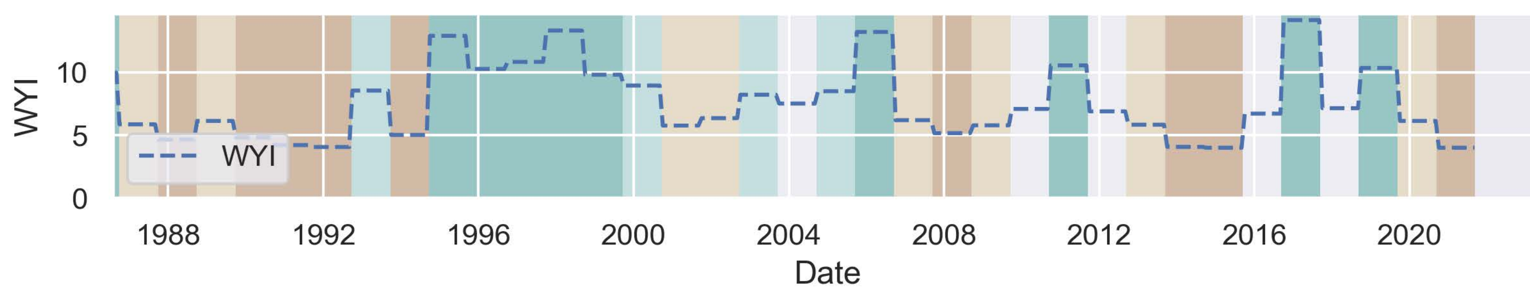
IM (2027) = 108.0 ft AMSL
MO = 105.0 ft AMSL
MT = 85.0 ft AMSL

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

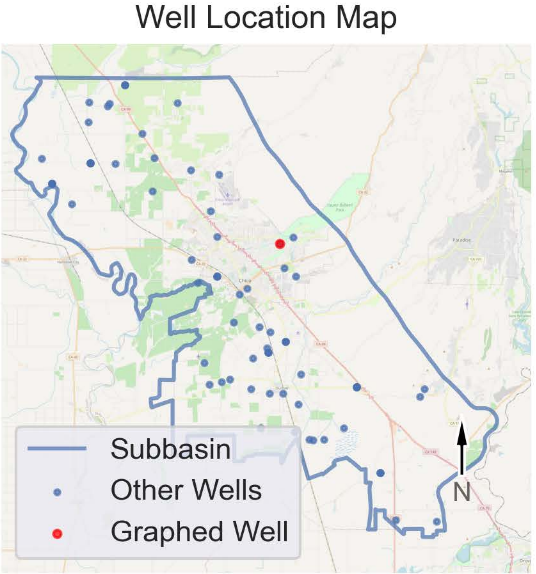
Wet (W)
Above Normal (AN)
Below Normal (BN)
Dry (D)
Critical (C)

Perforation 1: Perforation data not available.





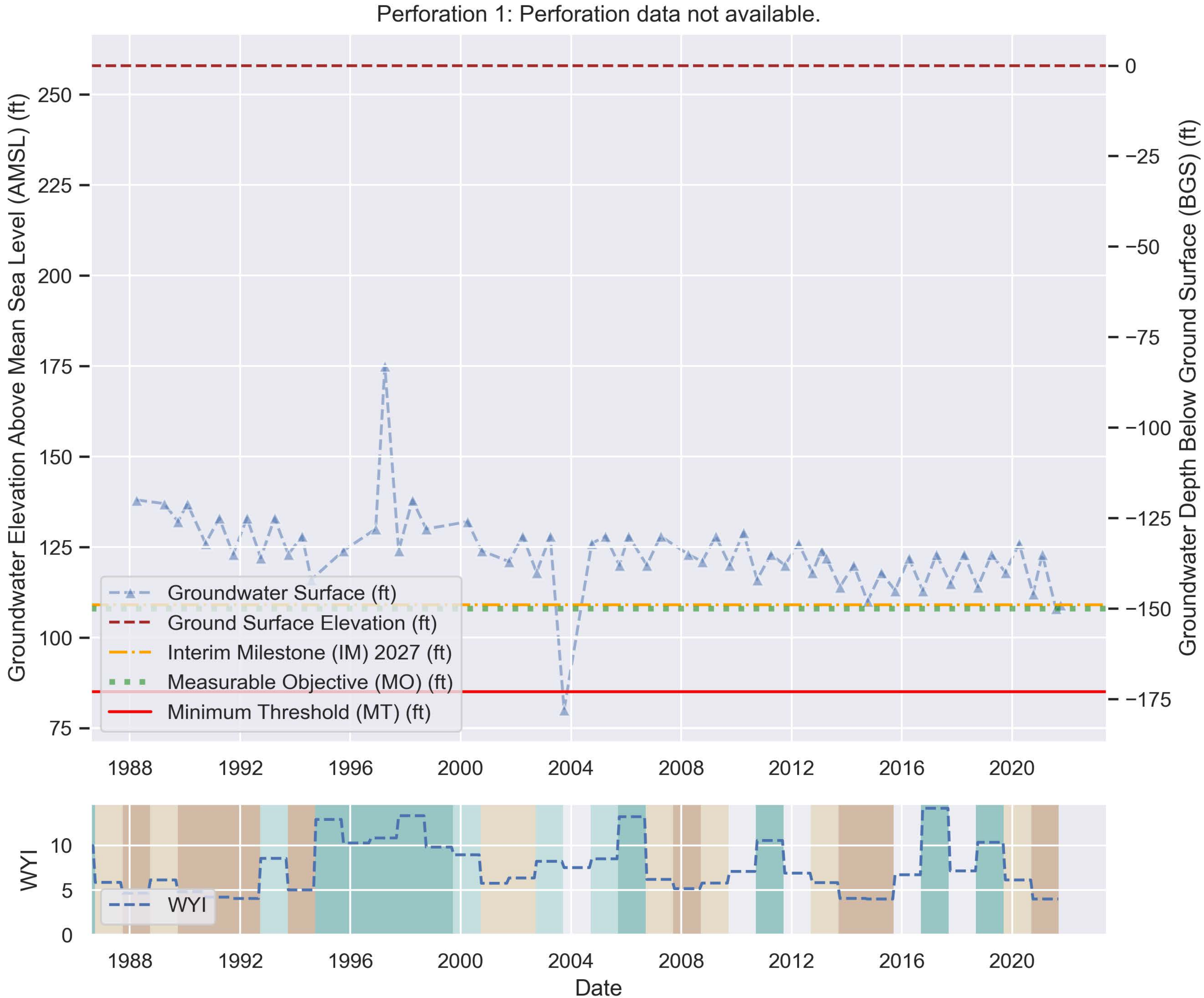
VINA Subbasin - State Well Number (SWN): CWSCH03



Sustainable Management Criteria:

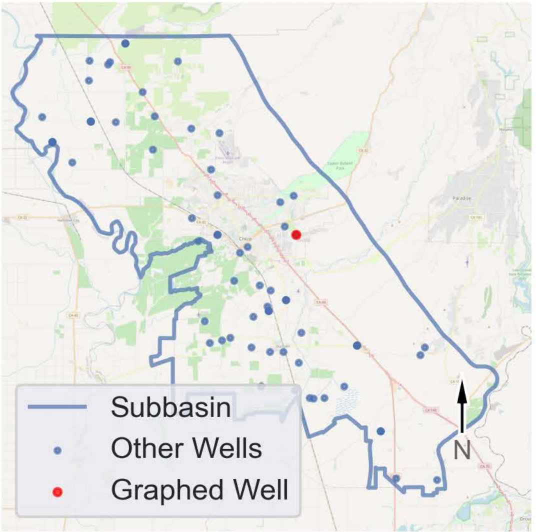
IM (2027) = 109.0 ft AMSL
MO = 108.0 ft AMSL
MT = 85.0 ft AMSL

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



VINA Subbasin - State Well Number (SWN): CWSCH07

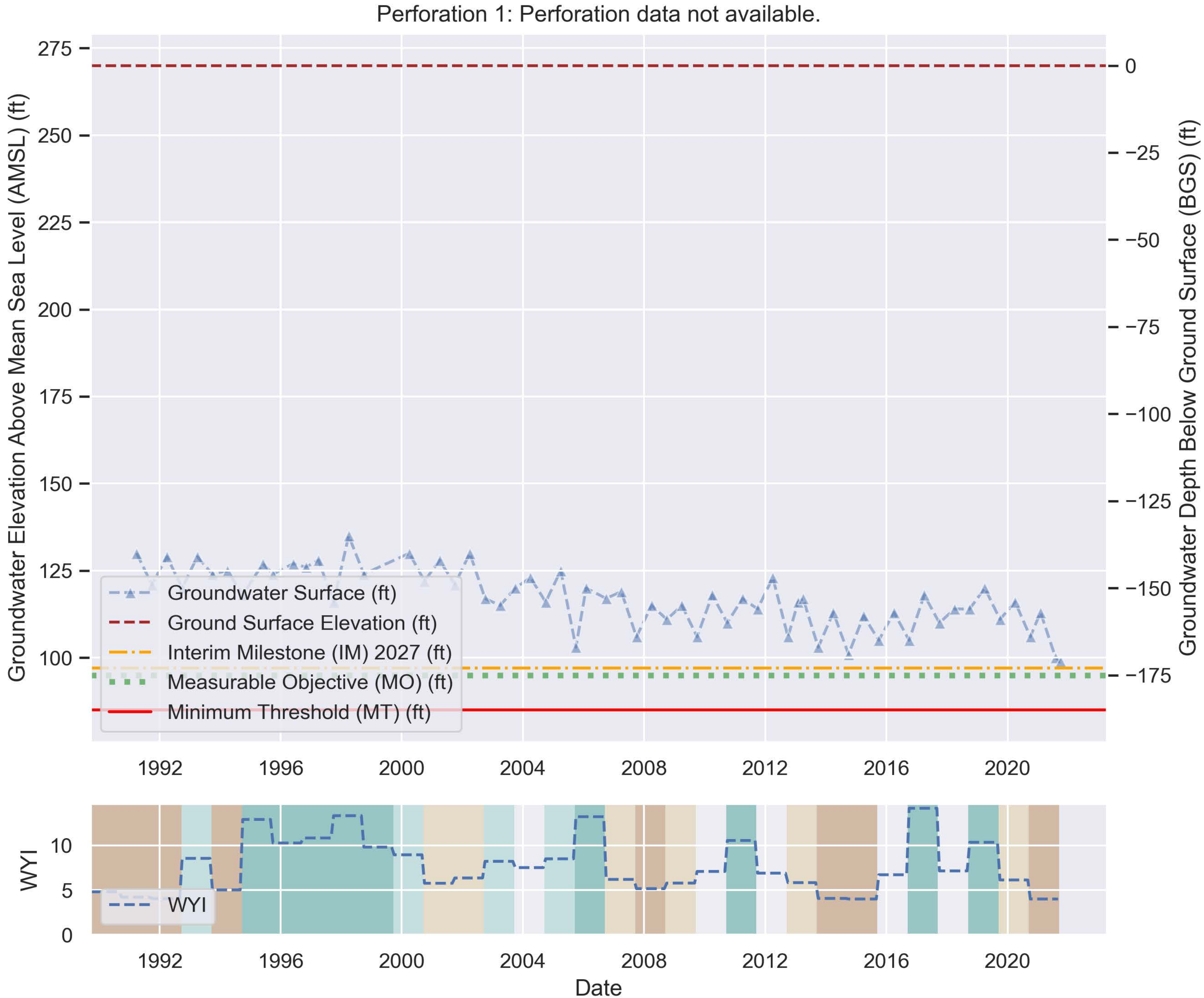
Well Location Map



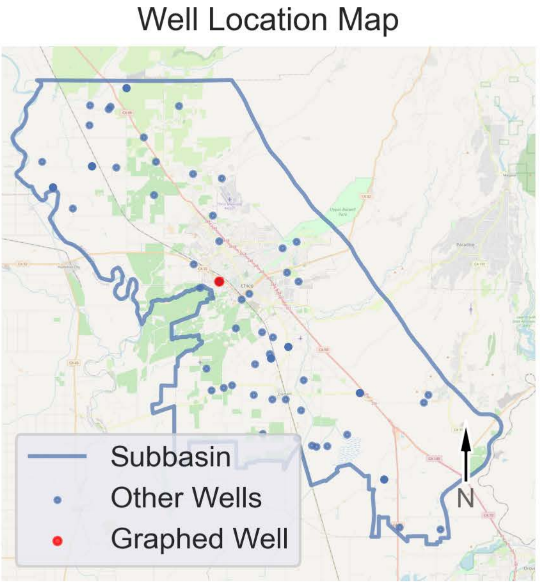
Sustainable Management Criteria:

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.



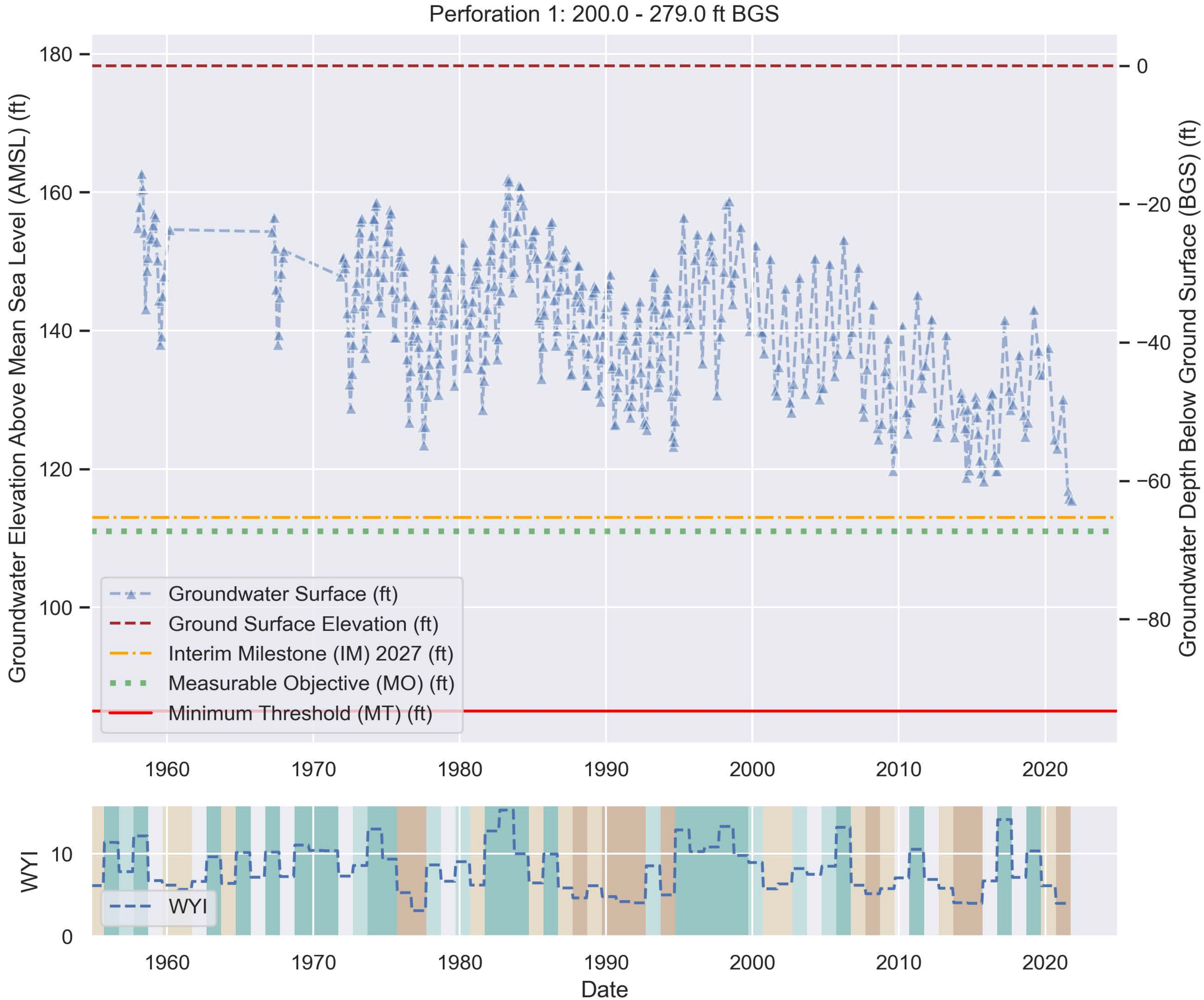
VINA Subbasin - State Well Number (SWN): 22N01E28J003M



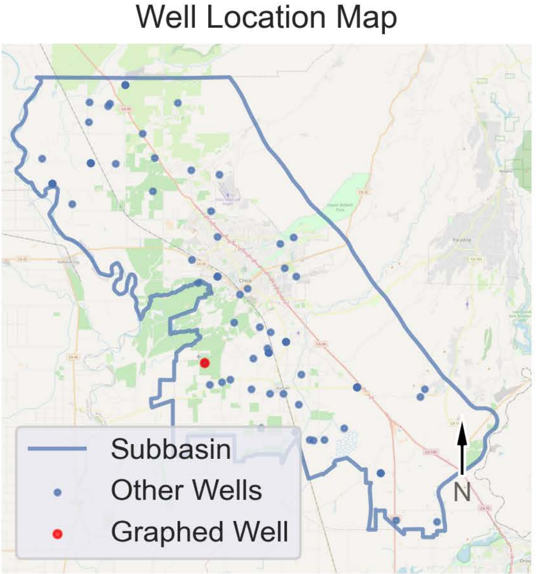
Sustainable Management Criteria:

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.



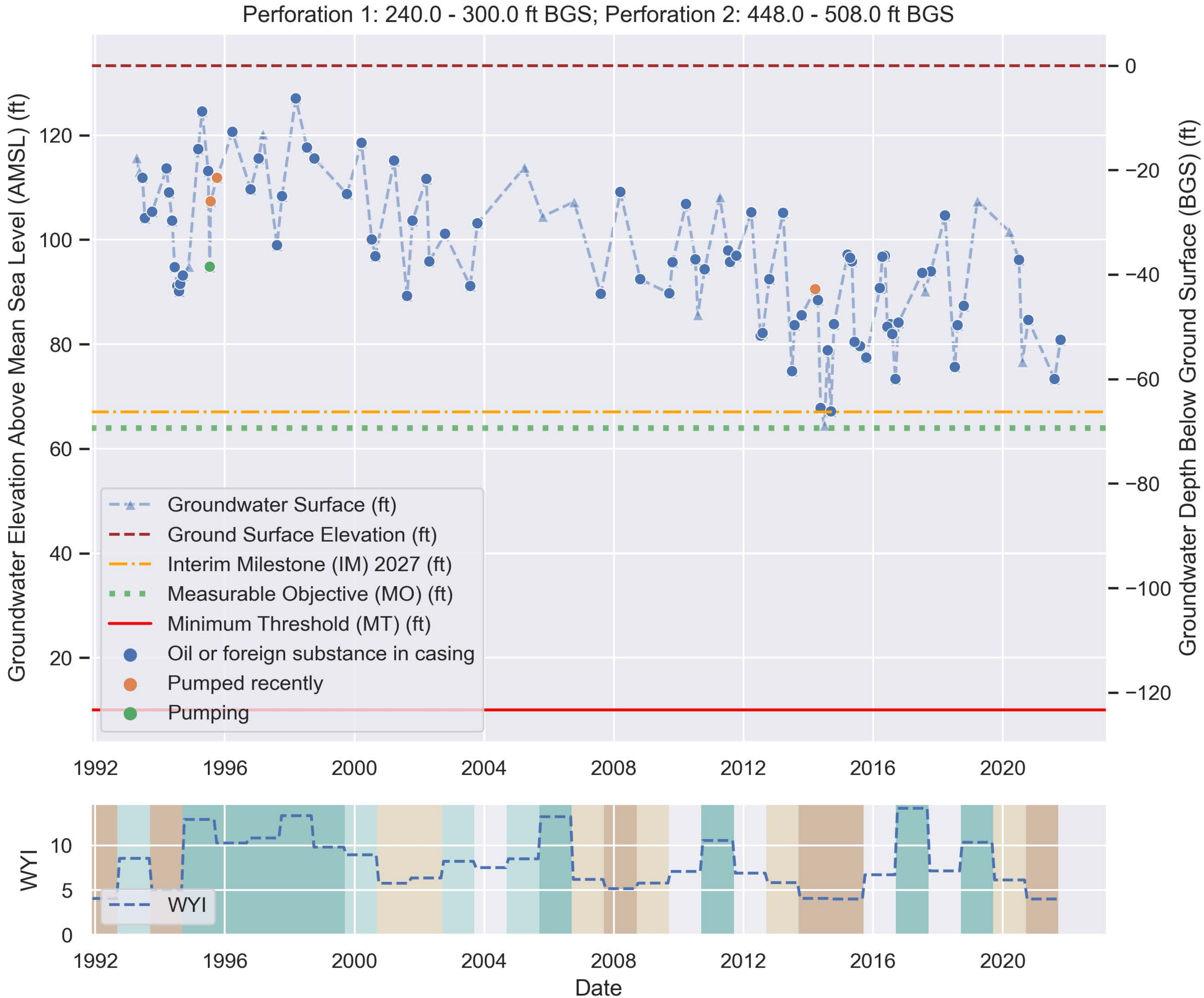
VINA Subbasin - State Well Number (SWN): 21N01E21C001M



Sustainable Management Criteria:

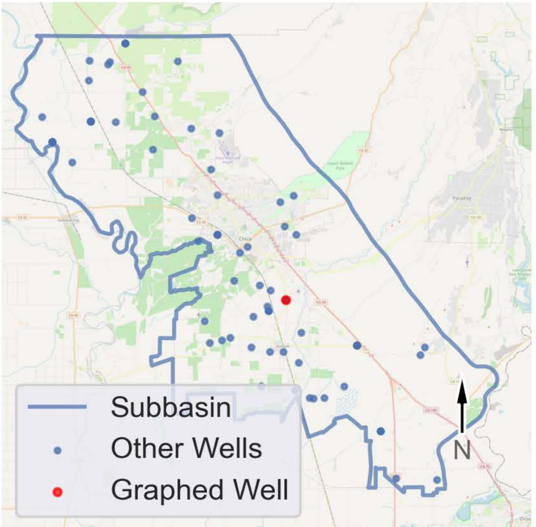
IM (2027) = 67.0 ft AMSL
MO = 64.0 ft AMSL
MT = 10.0 ft AMSL

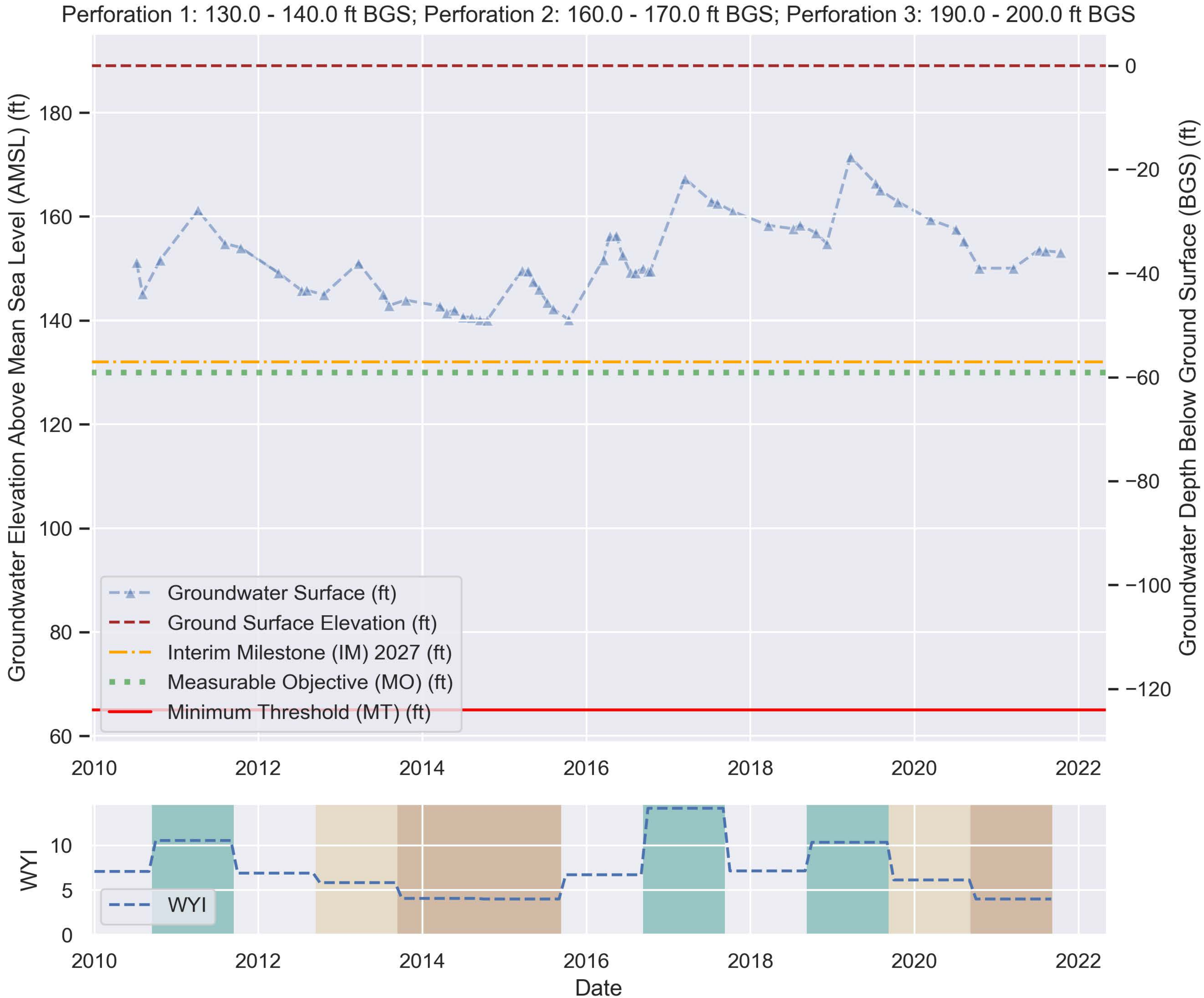
Sacramento Valley Water Year Index (WYI) shown on lower right. Meaning of colors defined below.



VINA Subbasin - State Well Number (SWN): 21N02E18C003M

Well Location Map





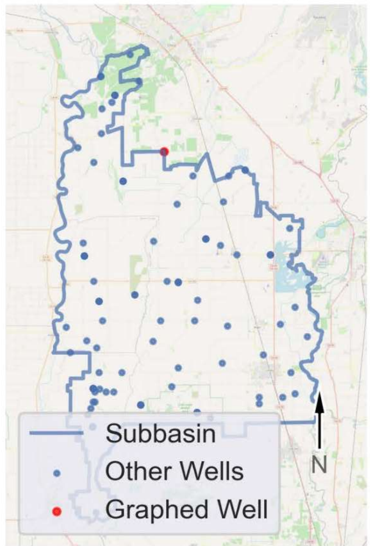
Sustainable Management Criteria:

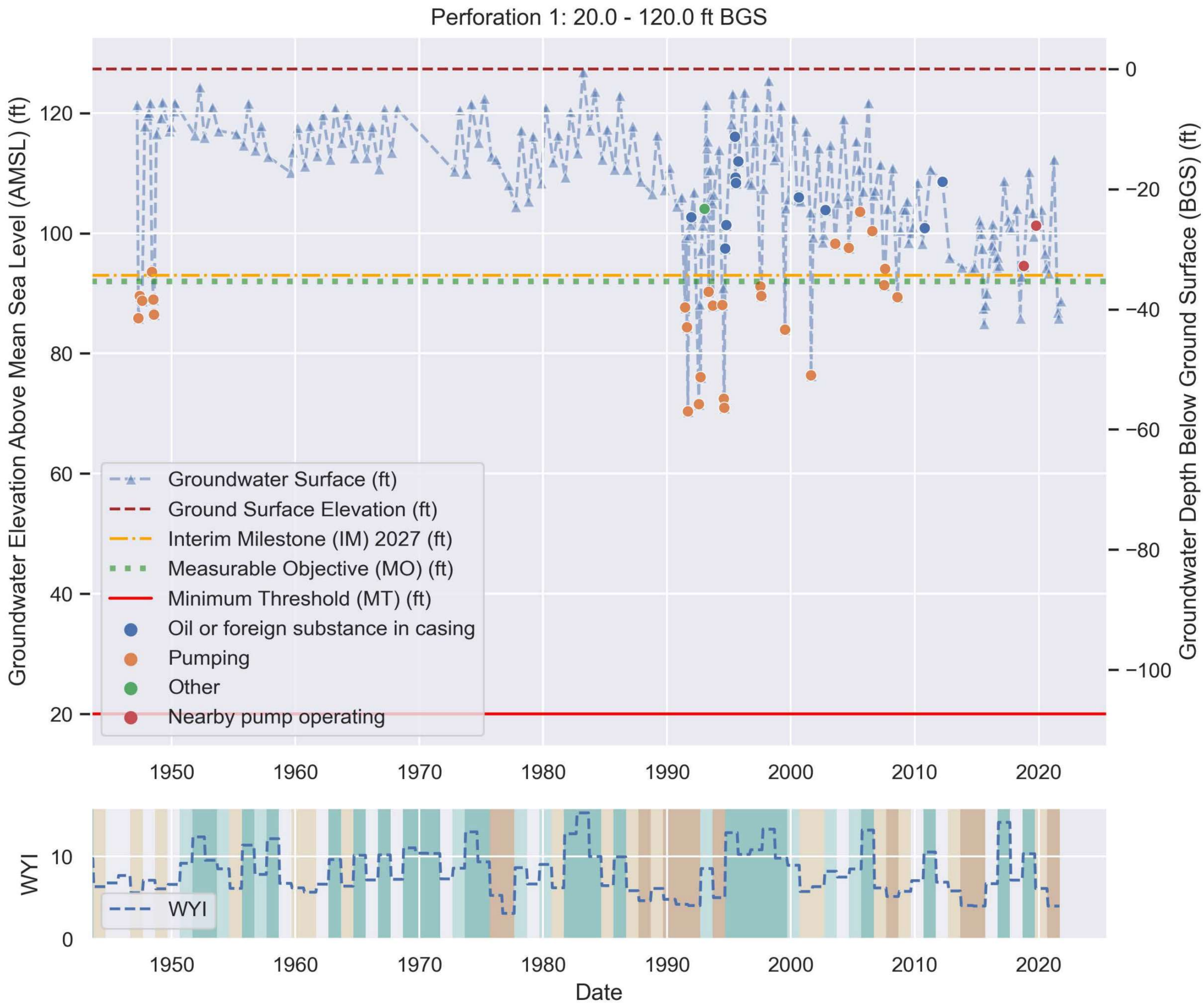
IM (2027) = 132.0 ft AMSL
MO = 130.0 ft AMSL
MT = 65.0 ft AMSL

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

BUTTE Subbasin - State Well Number (SWN): 20N01E10C002M

Well Location Map

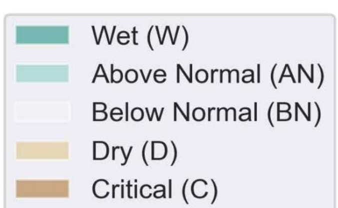




Sustainable Management Criteria:

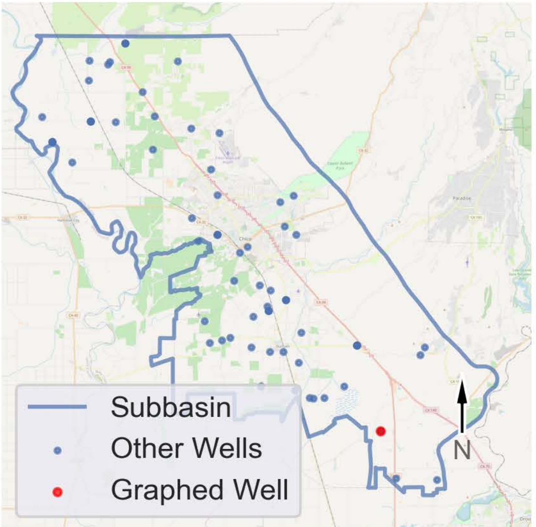
IM (2027) = 93.0 ft AMSL
MO = 92.0 ft AMSL
MT = 20.0 ft AMSL

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



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

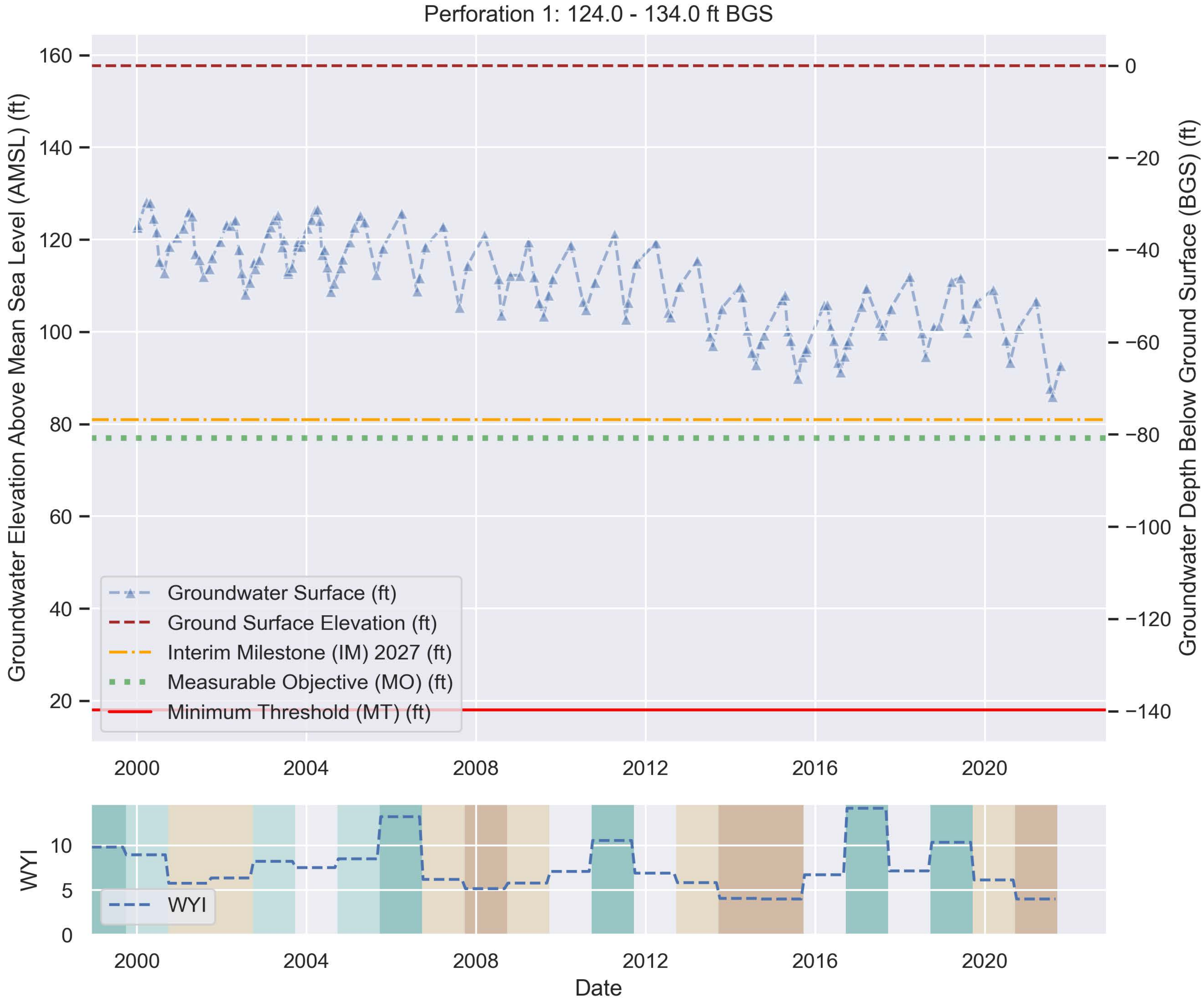
Well Location Map



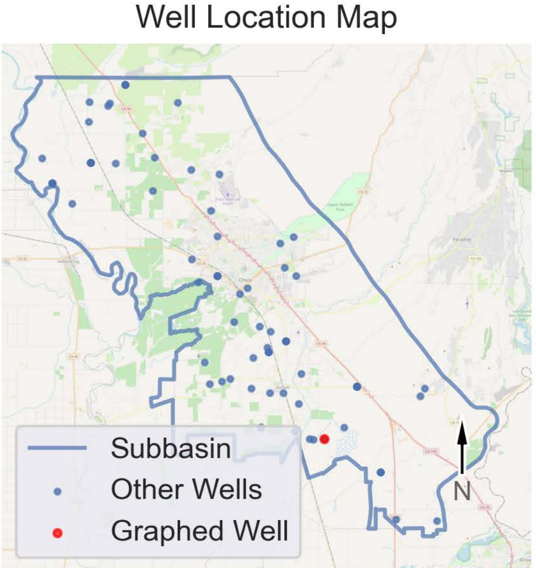
Sustainable Management Criteria:

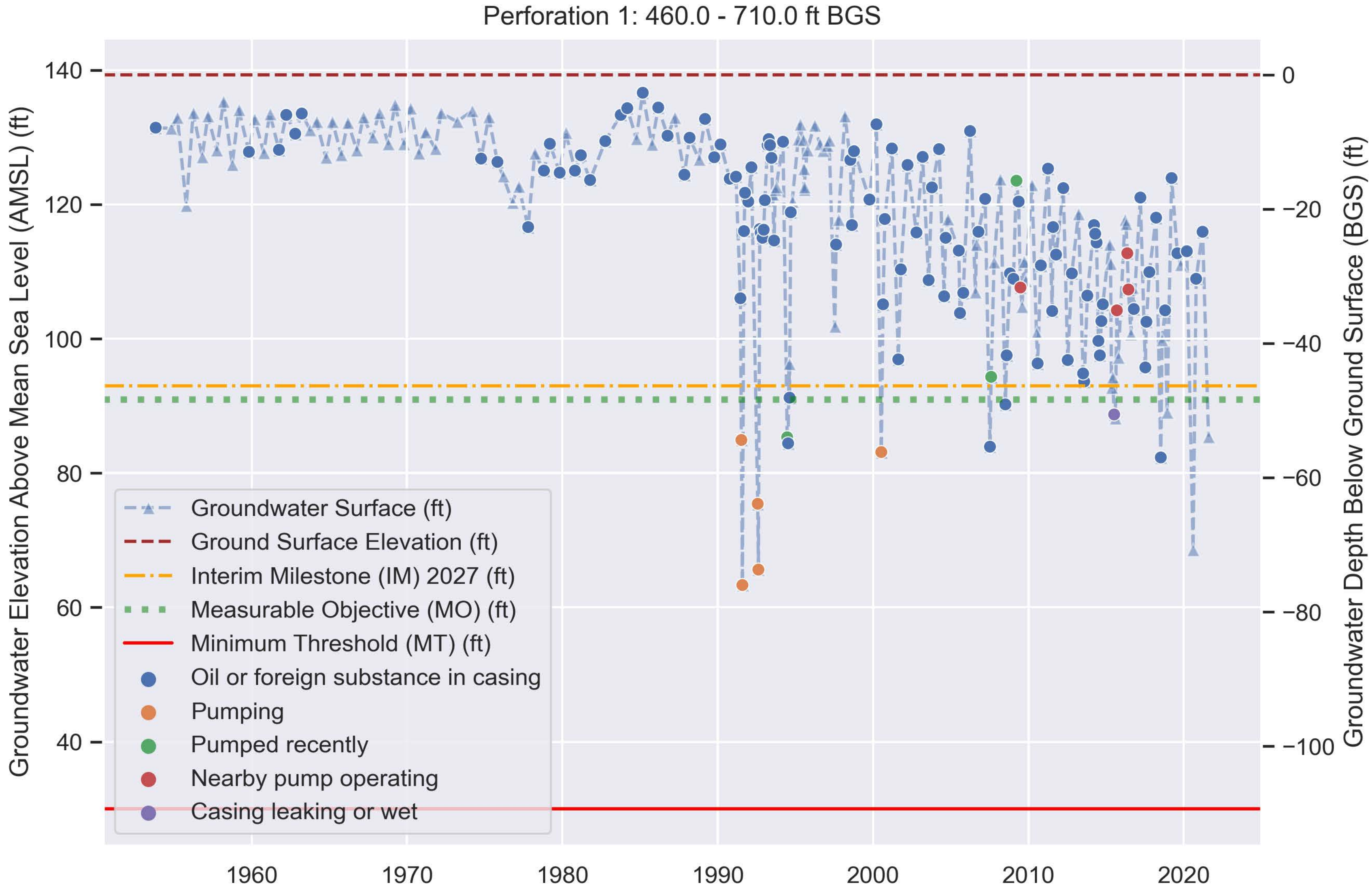
IM (2027) = 81.0 ft AMSL
MO = 77.0 ft AMSL
MT = 18.0 ft AMSL

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



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

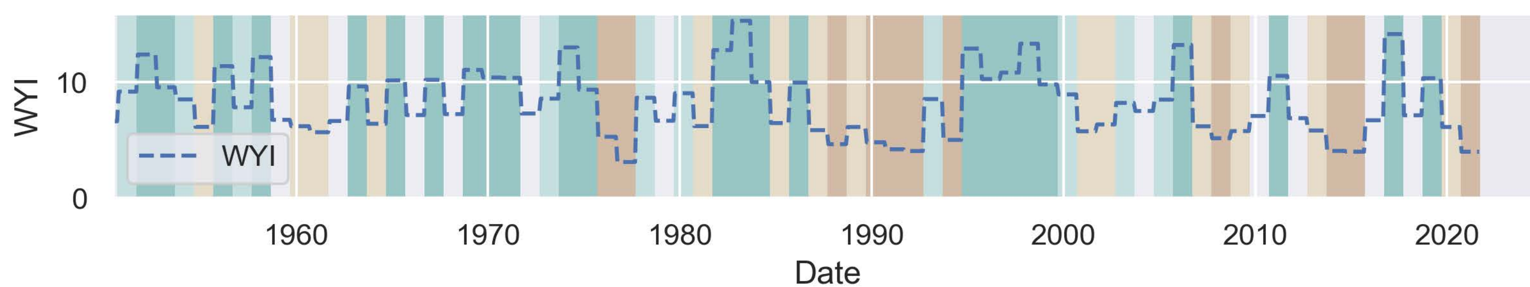


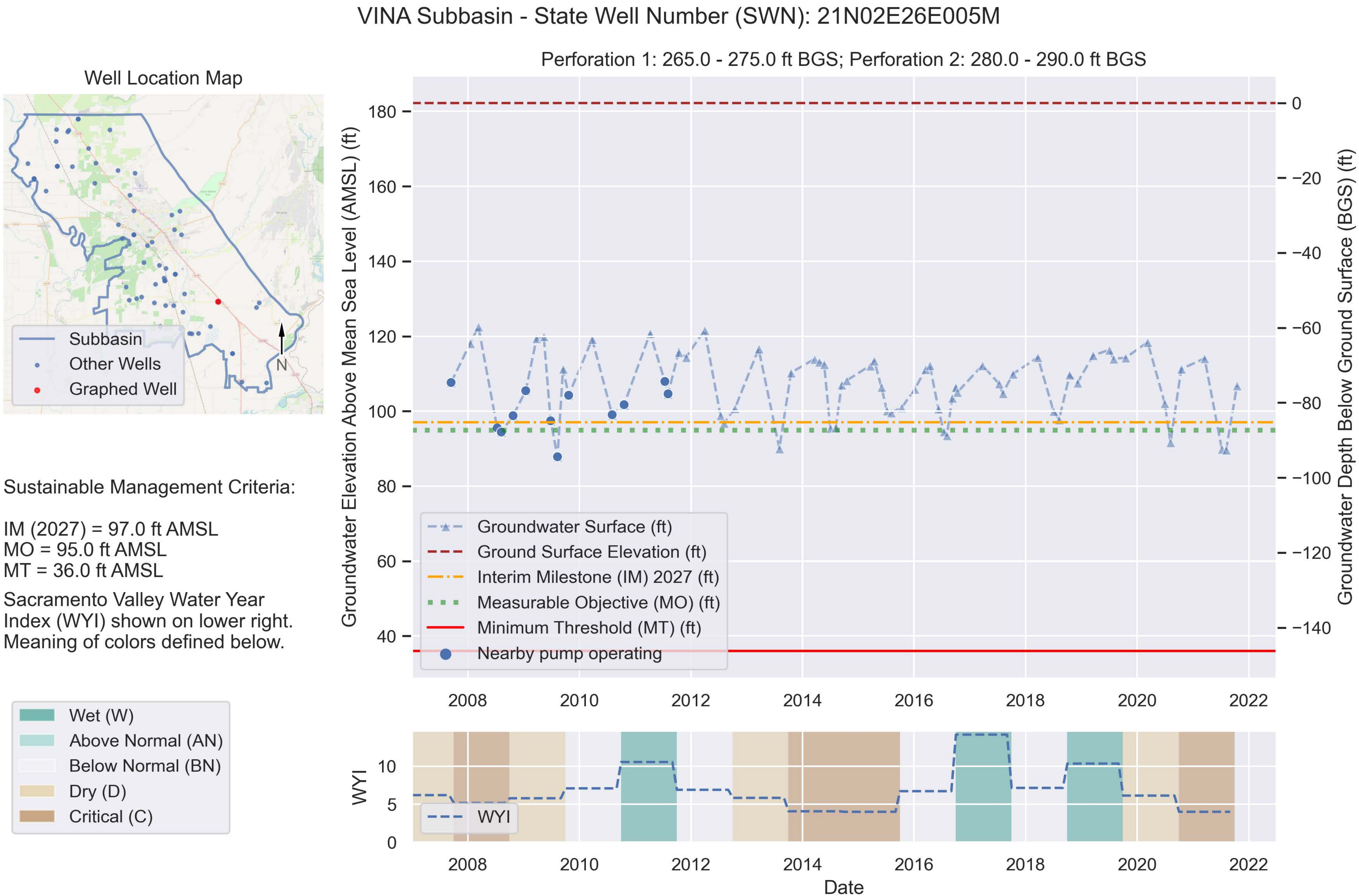


Sustainable Management Criteria:

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): 21N02E26E005M
Well Location Map
Subbasin
Other Wells
Graphed Well
N
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.
Wet (W)
Above Normal (AN)
Below Normal (BN)
Dry (D)
Critical (C)
Perforation 1: 265.0 - 275.0 ft BGS; Perforation 2: 280.0 - 290.0 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)
Nearby pump operating
WYI
Date

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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.

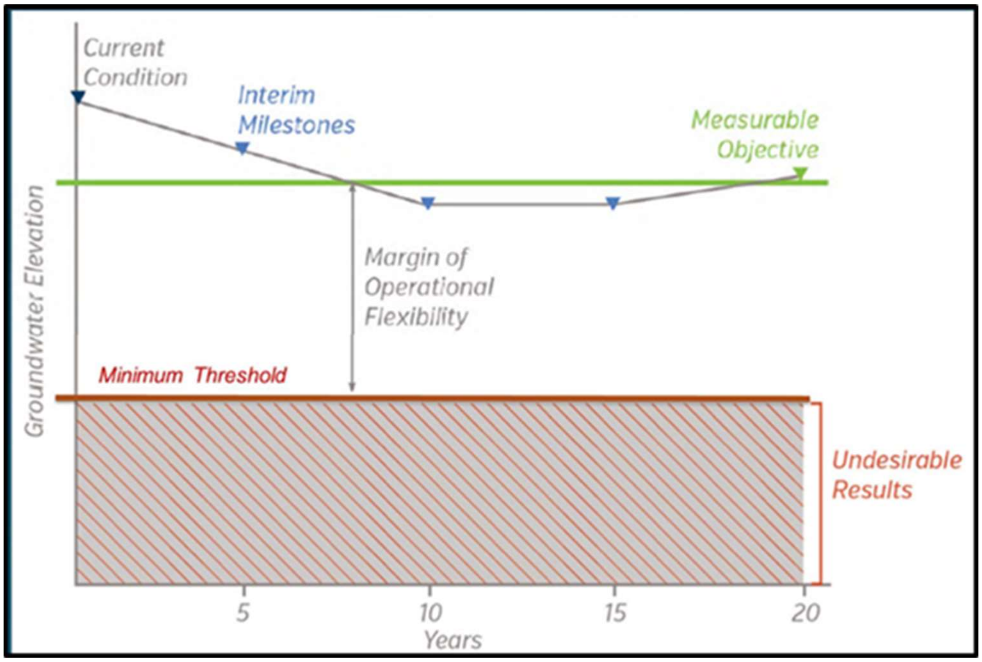

Illustration of Terms Used for Describing Sustainable Management Criteria Using the Groundwater Level SI

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	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.	15	Monitoring data submitted to the Monitoring Network Module.
	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.	4:12	
	(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.	14, 16:17	
	(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.	13:14, 30:49	
	(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.	18:20	
	(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.	20	
	(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.	20:21	
	(5) Change in groundwater in storage shall include the following:		
	(A) Change in groundwater in storage maps for each principal aquifer in the basin.	21:22	
	(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.	23	
	(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.	23:28	