MERCED SGMA

Merced Groundwater Subbasin

GROUNDWATER SUSTAINABILITY PLAN

Water Year 2020 Annual Report

Image courtesy: Veronica Adrover/UC Merced

April 2021

MERCED GROUNDWATER SUBBASIN GROUNDWATER SUSTAINABILITY PLAN: WATER YEAR 2020 ANNUAL REPORT

April 2021

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COMMITMENT & INTEGRITY DRIVE RESULTS

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ACRONYMS

Acronym	Definition
AFY	Acre-Feet per Year
AWMP	Agricultural Water Management Plan
CASGEM	California Statewide Groundwater Elevation Monitoring Program
CCR	California Code of Regulations
CDEC	California Data Exchange Center
CEQA	California Environmental Quality Act
CWC	California Water Code
CWD	Chowchilla Water District
DAC	Disadvantaged Community
DDW	Division of Drinking Water
DPR	Department of Pesticide Regulation
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources
EDA	Economically Distressed Area
EnvDAC	Environmentally Disadvantaged Community
ESJWQC	East San Joaquin Water Quality Coalition
ETc	crop evapotranspiration
Flood-MAR	Flood-Managed Aquifer Recharge
GAMA	Groundwater Ambient Monitoring and Assessment
GICIMA	Groundwater Elevation Monitoring Groundwater Information Center Interactive Mapping Application
GPS	global positioning system
GQTMP	Groundwater Quality Trend Monitoring Program
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
IDC	IWFM Demand Calculator
ILRP	Irrigated Lands Regulatory Program
IRWM	Integrated Regional Water Management
IWFM	Integrated Water Flow Model
LGAWD	Le Grand Athlone Water District
LIDAR	Light Detection and Ranging
MAF	million acre-feet
MCL	Maximum Contaminant Level
MID	Merced Irrigation District
MIUGSA	Merced Irrigation-Urban Groundwater Sustainability

MSGSA	Merced Subbasin Groundwater Sustainability Agency
NRCS	Natural Resources Conservation Service, National Agricultural Statistics Service
PRISM	Precipitation-Elevation Regressions on Independent Slopes Model
SDAC	Severely Disadvantaged Community
SGM	Sustainable Groundwater Management
SGMA	Sustainable Groundwater Management Act
SMCL	secondary maximum contaminant level
TAF	thousand acre-feet
TDS	total dissolved solids
TIWD	Turner Island Water District
TIWD GSA-1	Turner Island Water District Groundwater Sustainability Agency #1
USBR	United States Bureau of Reclamation
USGS	United States Geological Survey

EXECUTIVE SUMMARY

The Merced Groundwater Subbasin (Subbasin) Groundwater Sustainability Plan (GSP) was adopted in late 2019 by the three Groundwater Sustainability Agencies (GSAs) that were formed in accordance with the Sustainable Groundwater Management Act (SGMA) to coordinate, develop, and implement a GSP for the Subbasin: Merced Irrigation-Urban Groundwater Sustainability Agency (MIUGSA), Merced Subbasin Groundwater Sustainability Agency (MSGSA), and Turner Island Water District Groundwater Sustainability Agency #1 (TIWD GSA-1) (MIUGSA, MSGSA, & TIWD GSA-1, 2019). The GSP was submitted to the California Department of Water Resources (DWR) in January 2020, ahead of the January 31, 2020 regulatory deadline for submission of GSPs for critically overdrafted subbasins.

California Water Code (CWC) §356.2 requires the submission of an annual report to DWR by April 1 of each year following the adoption of the GSP. The first Annual Report was submitted on March 31, 2020 and provided an update on basin conditions and plan implementation progress within the Merced Subbasin for water years 2016-2019 (October 1, 2015 – September 30, 2019). This annual report covers water year 2020 (October 1, 2019 – September 30, 2020). CWC §356.2 requires annual reports include information about groundwater elevations (contour maps and hydrographs), groundwater extraction, surface water supply, changes in groundwater storage, and a description of progress towards implementation of the GSP since the previous annual report. Table ES-1 provides a summary of the definition of undesirable results and summary of compliance with the sustainability management criteria.

Table ES-1: Summary of Sustainable Management Criteria

Sustainability Indicator	Minimum Threshold (MT)	Measurable Objective (MO)	Undesirable Result	WY 2020 Annual Report Status
Groundwater Levels	Depth of shallowest well in a 2-mile radius of each representative well or minimum pre-January 1, 2015, elevation	Projected average future groundwater level under sustainable yield modeling simulation	Greater than 25% of representative wells fall below MT in 2 consecutive wet, above normal, or below normal years[1]	No wells exceeded MT. 9 wells exceeded MO.
Groundwater Storage	Not applicable - not present and not likely to occur in the Subbasin due to the significant volumes of freshwater in storage			
Seawater Intrusion	Not applicable - not present and not likely to occur due to the distance between the Subbasin and the Pacific Ocean (and Sacramento-San Joaquin Delta)			
Degraded Water Quality	1,000 mg/L TDS	500 mg/L TDS	At least 25% representative wells exceed MT for 2 consecutive years	No wells exceeded MT. 2 wells exceeded MO.
Land Subsidence	-0.75 ft/year	-0.25 ft/year	Exceedance of MT at 3 or more representative sites for 2 consecutive years	No sites exceeded MT. 4 of 4 sites exceeded MO.
Depletions of Interconnected Surface Waters	Groundwater levels used as a proxy for this sustainability indicator			

1. *Water year types based on San Joaquin Valley Water Year Index.*

Groundwater Levels

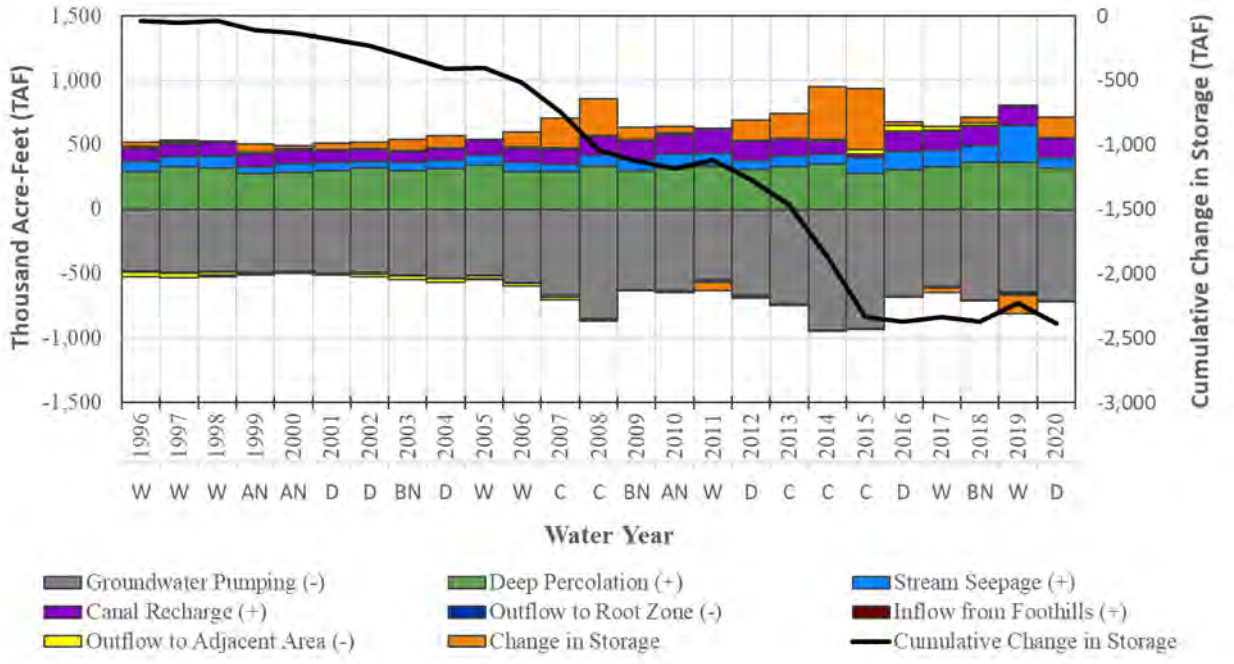
DWR has not yet published a San Joaquin Valley Water Year Index value for 2020, but with 2.4 MAF of summed runoff reported in the San Joaquin Valley Water Year Type Index (DWR, 2021b), it has been assumed to be a dry year for the purpose of this annual report. Generally, groundwater level declines were observed in water year 2020.

Based on data from 10 wells in the Above Corcoran Clay Principal Aquifer, average groundwater level change was -2.9 ft from fall 2019 to fall 2020. Based on data from 12 wells in the Below Corcoran Clay Principal Aquifer, average groundwater level change was +0.6 ft from fall 2019 to fall 2020. Based on data from 11 wells in the Outside Corcoran Clay Principal Aquifer, average groundwater level change was -3.4 ft/yr from fall 2019 to fall 2020. Hydrographs and contour maps of groundwater elevation can be found in Appendix A and Appendix B, respectively.

Groundwater Storage

The Merced Water Resources Model (MercedWRM) was updated with recent hydrologic and basin operation information from water year 2020 to estimate historical change in storage of the Merced Subbasin. The cumulative change in storage during the updated historical water budget period of water years 2006-2020 was estimated as -1.98 MAF, or an average reduction of 132 thousand acre-feet (TAF) per year. During year 2020, the cumulative change in storage was estimated as -157 TAF. Figure ES-1 shows the cumulative change in storage against annual groundwater uses developed in the water budget and water year type.

Figure ES-1: Historical Annual Water Budget and Cumulative Change in Storage



[1] "Change in Storage" is placed on the chart to balance the water budget. For instance, if annual outflows (-) are greater than inflows (+), there is a decrease in storage, and this is shown on the positive side of the bar chart to balance out the increased outflows on the negative side of the bar chart.

Source: Water year types based on San Joaquin Valley Water Year Index (DWR, 2021a)*, but 2020 has been assumed to be "D" (dry) due to runoff values below the previous threshold for dry years while waiting for DWR to publish a final 2020 value.*

Land Subsidence

Subsidence remains an ongoing concern in the basin. Subsidence is measured at static GPS control points throughout the San Joaquin Valley monitored by the US Bureau of Reclamation (USBR) as part of the San Joaquin River Restoration Program. Measurements have been recorded biannually in July and December of each year to monitor ongoing subsidence since 2011. Subsidence values in the last year have remained below the minimum threshold (-0.75 ft/year), but all four representative sites were above the long-term measurable objective (-0.25 ft/year) from December 2019 to December 2020.

Groundwater Quality

The GSAs established a minimum threshold of 1,000 mg/L of Total Dissolved Solids (TDS) at representative monitoring sites for the degraded water quality sustainability indicator. The measurable objective and all interim milestones were set at 500 mg/L TDS. No wells in the GSP monitoring network were found to have a TDS concentration above the minimum threshold during the period covered by this annual report.

In addition to monitoring for TDS, the GSAs will be conducting water quality coordination activities for other water quality constituents. These activities include review of monitoring reports published by other monitoring programs as well as a review of data submitted by Department of Pesticide Regulation (DPR), Division of Drinking Water (DDW), Department of Toxic Substances Control (DTSC), and GeoTracker to the Groundwater Ambient Monitoring and Assessment (GAMA) database. The purpose of these reviews is to monitor the status of constituent concentrations throughout the Subbasin with respect to typical indicators such as applicable maximum contaminant level (MCL) or secondary maximum contaminant levels (SMCL). The GSAs have collected information from GAMA and will use this information to assess whether there is a need for changes to existing sustainable management criteria or developing additional sustainable management criteria for water quality.

Plan Implementation Progress

The GSAs made meaningful progress in GSP implementation in 2020 despite challenges presented by COVID-19 and dry year conditions.

Implementation of Projects

The GSP identifies 12 priority projects. Substantial progress was made on the top three projects. Remaining projects are actively seeking funding, including through a January 2021 Proposition 68 implementation grant application. Updates to specific projects are described in Section 3.3 of this annual report.

Implementation of Management Actions

The Merced Subbasin GSP includes two Management Actions. For the water allocation framework, an Ad Hoc Working Group was established with GSA staff and representatives to conduct discussions on an initial framework. Ad hoc committee level discussions are ongoing. It is anticipated that allocation framework discussions at GSA Board and public meetings will occur starting in 2021. The MSGSA Demand Reduction Program: is being initiated in recognition of the need to reduce groundwater pumping in the basin. Development of this program is still in initial phases: the GSA is in the process of analyzing groundwater demand and conditions throughout the jurisdiction and considering near and long-term activities at both committee and board levels. Future implementation activities will include analysis, policies and procedures adoption, establishing monitoring and reporting tools, and conducting outreach.

Additional Implementation Support Activities

In addition to projects and management actions, the GSAs undertook a number of activities to support GSP implementation. This included updating the MercedWRM model with the most recent monitoring data, initiating development of a Data Gaps Plan, and initiating development of a remote-sensing decision support tool. The GSAs coordinated on a joint Proposition 68 Sustainable Groundwater Management (SGM) Implementation Grant application to fund two priority GSP projects that will improve groundwater levels in the southern portion of the Merced Subbasin through direct and in-lieu groundwater recharge, while also reducing flood risk to underrepresented communities.

Furthermore, various entities within the Merced Subbasin applied for a permanent water permit for flood water from the Merced River and local streams that historically flooded the basin. The application provides opportunity for implementing a Flood-Managed Aquifer Recharge (Flood-MAR) program for the entire basin, through natural and man-made facilities, some of which are outlined in the Merced Subbasin GSP.

Activities Anticipated for the Coming Year

The Merced GSAs intend to continue activities necessary to implement the GSP and put the basin on a path toward sustainable management. COVID-19 created some challenges and delays in 2020, particularly related to conducting coordination and stakeholder outreach meetings. The GSAs have now pivoted to virtual Coordination Committee meetings and in early 2021 conducted a solicitation process to re-establish a Stakeholder Advisory Committee focused on GSP implementation. Key efforts anticipated in 2021 include developing the Data Gaps Plan, transitioning from biannual to monthly monitoring, developing the Remote-Sensing Decision Support Tool, and making progress on a plan for pumping reductions and a water allocation framework.

At its March 10, 2021 meeting, MIUGSA launched the development of principal guidelines to implement the GSP within its boundaries. Potential policies will focus on reducing groundwater extraction, groundwater exchange and credits, measurement, and enforcement.

In 2021, the Merced Subbasin GSA anticipates continuing to develop activities for implementation of the GSP and reduction of groundwater consumption, supported by the continued refinement and analysis of data. Activities may include adding monitoring wells to address data gaps, finalizing sustainability zones and further consideration and development of near- and long-term demand reduction options, within the boundary of the GSA.

1. INTRODUCTION

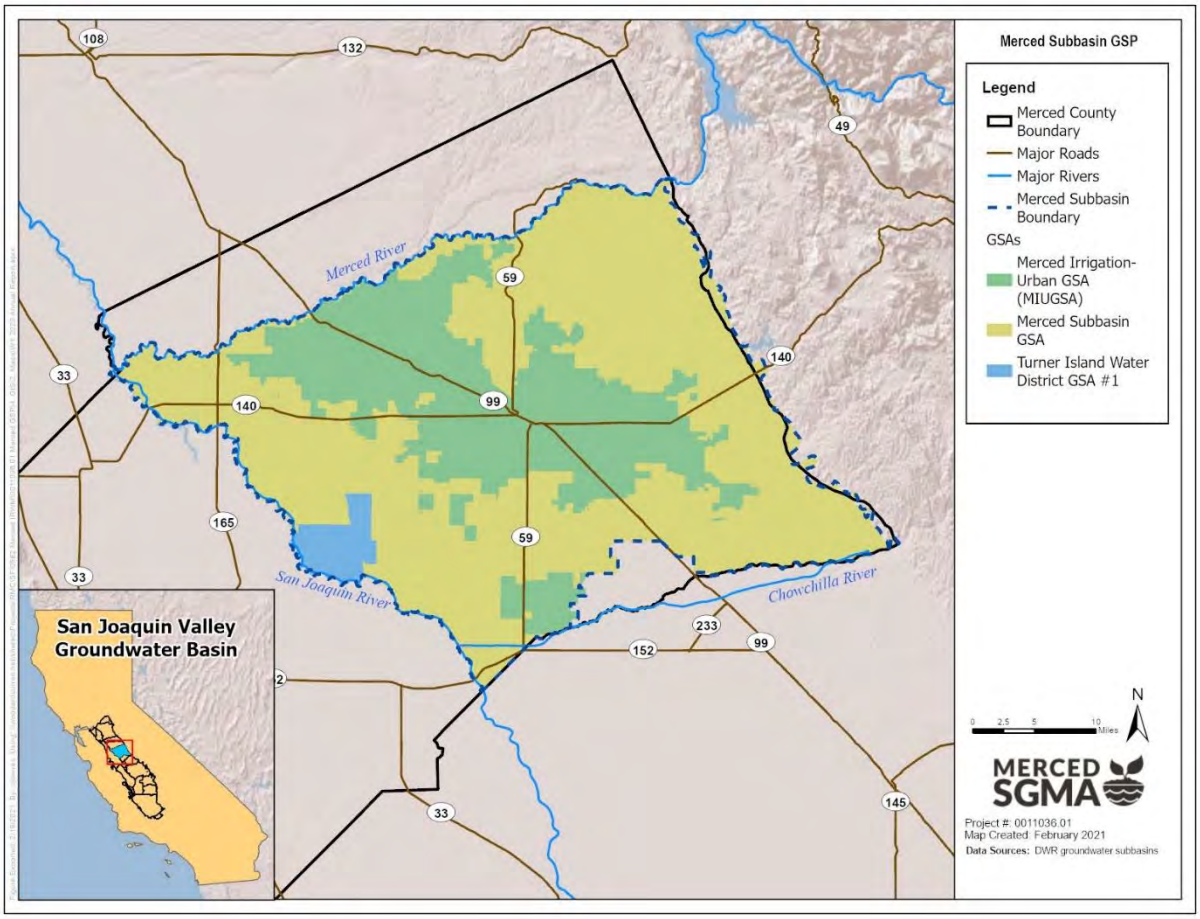
The Merced Groundwater Subbasin (Subbasin) Groundwater Sustainability Plan (GSP) was adopted in late 2019 by the three Groundwater Sustainability Agencies (GSAs) that were formed in accordance with the Sustainable Groundwater Management Act (SGMA) to coordinate, develop, and implement the GSP: Merced Irrigation-Urban Groundwater Sustainability Agency (MIUGSA), Merced Subbasin Groundwater Sustainability Agency (MSGSA), and Turner Island Water District Groundwater Sustainability Agency #1 (TIWD GSA-1) (MIUGSA, MSGSA, & TIWD GSA-1, 2019). The GSP was submitted to the California Department of Water Resources (DWR) in January 2020, ahead of the January 31, 2020 regulatory deadline for submission of GSPs for critically overdrafted subbasins.

California Water Code (CWC) §356.2 requires the submission of an annual report to DWR by April 1 of each year following the adoption of the GSP. The first Annual Report was submitted on March 31, 2020 and provided an update on basin conditions and plan implementation progress within the Merced Subbasin for water years 2016-2019 (October 1, 2015 – September 30, 2019). This annual report covers water year 2020 (October 1, 2019 – September 30, 2020). CWC §356.2 requires annual reports include information about groundwater elevations (contour maps and hydrographs), groundwater extraction, surface water supply, changes in groundwater storage, and a description of progress towards implementation of the GSP since the previous annual report.

The annual report is organized into two sections: Basin Settings and Plan Implementation. Basin Settings provides updates to water budgets and other basinwide information for water year 2020. The Plan Implementation section discusses progress on implementation of the GSP since its adoption in December 2019 with a focus on updates on the status of projects and management actions identified in the GSP.

Figure 1-1 shows a map of the Merced Subbasin and the extent of the three GSAs. An inset map shows the location of the Merced Subbasin within the larger San Joaquin Valley Groundwater Basin located in the Central Valley of California. A more detailed description of the Merced Subbasin can be found in the GSP's Section 1.2 (Plan Area) and Section 2.1 (Hydrogeologic Conceptual Model).

Figure 1-1: Location Map



2. BASIN SETTING

2.1 Groundwater Elevations

According to DWR's San Joaquin Valley Water Year Index, the previous water year (2019) was classified as a wet year (DWR, 2021a). DWR has not yet published a final index value for 2020, but with 2.4 MAF of runoff reported in the San Joaquin Valley Water Year Type Index (DWR, 2021b), it has been assumed to be dry year[1] for the purpose of this annual report. Generally, groundwater levels declined during water year 2020 for the Above and Outside Corcoran Clay Principal Aquifers while they stayed approximately the same in the Below Corcoran Clay Principal Aquifer. No groundwater levels fell below the minimum threshold at representative wells and thus no undesirable results were triggered according to the sustainable management criteria set in the GSP. The GSP defines undesirable results as "during GSP implementation when November groundwater levels at greater than 25 percent of representative monitoring wells (at least 7 of 25) fall below their minimum thresholds for two consecutive years where both years are categorized hydrologically as below normal, above normal, or wet."

Based on data from 10 wells in the Above Corcoran Clay Principal Aquifer, average groundwater level change was -2.9 ft from fall 2019 to fall 2020. Based on data from 12 wells in the Below Corcoran Clay Principal Aquifer, average groundwater level change was +0.6 ft from fall 2019 to fall 2020. Based on data from 11 wells in the Outside Corcoran Clay Principal Aquifer, average groundwater level change was -3.4 ft/yr from fall 2019 to fall 2020. These values do not take into account that monitoring wells are not evenly distributed throughout the Subbasin, but the overall values still function to provide an overview of trends based on available data. Figure 2-1 shows the location of the wells in the Merced Subbasin GSP monitoring network for groundwater levels. Individual hydrographs for these wells can be found in Appendix A. All available data are shown, except for measurements flagged for quality control reasons. Hydrographs for representative monitoring wells also display the minimum threshold and measurable objective that were developed in Chapter 3 (Sustainability Indicators) of the GSP. The hydrographs also show a water year type indicator according to the San Joaquin Valley Water Year Hydrologic Classification Index. As previously stated, at the time of publishing, DWR has not yet announced the water year type designation for 2020, but for the purpose of this annual report it has been estimated to be "D" (dry). Monitoring network data have been uploaded to the Merced data management system and SGMA Portal.

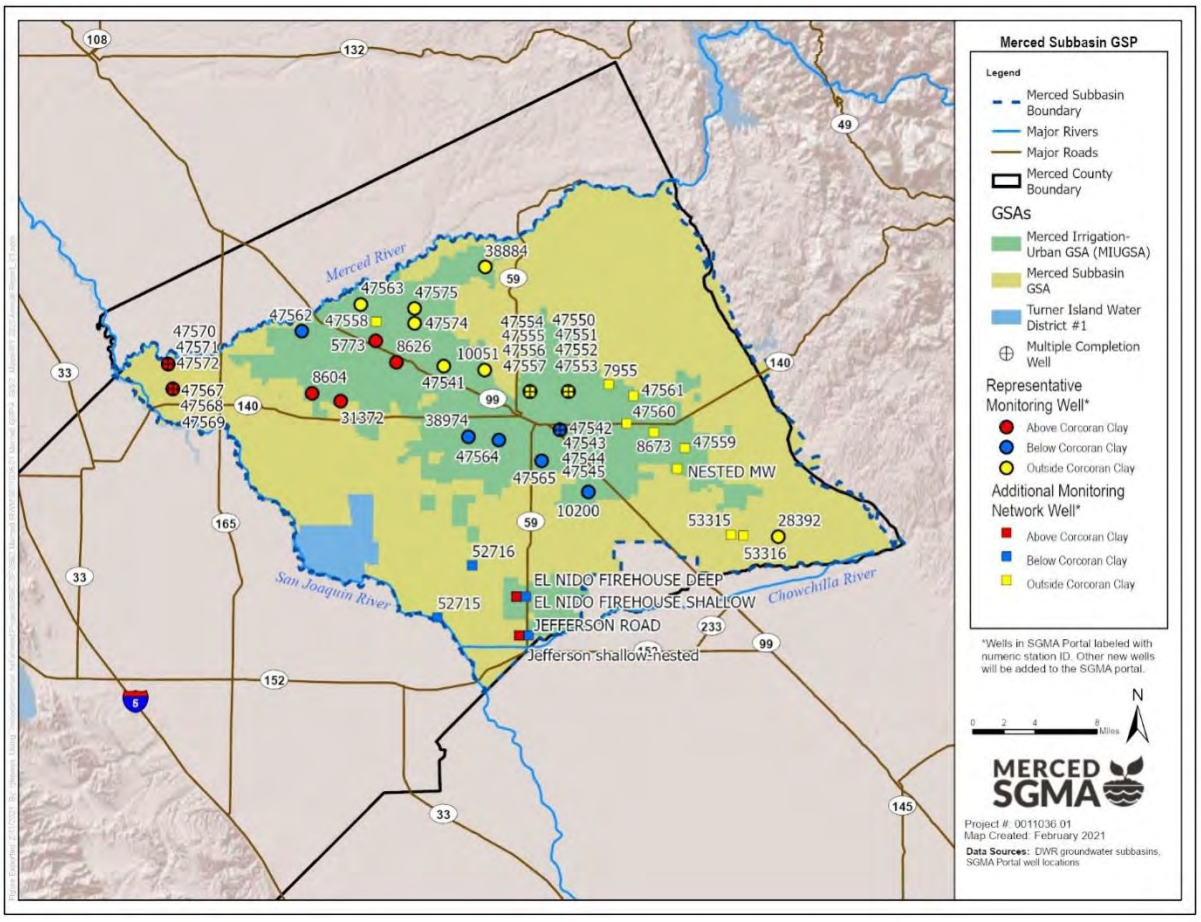
The following changes were made to the groundwater level monitoring network since the publication of the previous Annual Report:

- Multiple completion Well Site 3 (Station IDs 47546, 47547, 47548, and 47549) was removed from the monitoring network, including representative monitoring well 47546. There is continuous pumping nearby this well which means the measurements at these wells are not reflective of actual groundwater conditions. These sites were located in the center of the Subbasin in the Below Corcoran Clay Principal Aquifer where there are several nearby monitoring wells.
- Two existing wells were added to the monitoring network (Station IDs 53315 and 53316) in the Outside Corcoran Clay Principal Aquifer. Each recently began recording measurements in 2018.
- Two new monitoring well sites have been installed and added to the monitoring network in the El Nido region (each site has one multiple completion monitoring well in the Above Corcoran Clay Principal Aquifer, and one single completion monitoring well in the Below Corcoran Clay Principal Aquifer). Regular monitoring data is anticipated to be collected starting in early 2021.

[1] Runoff (unimpaired flow) of greater than 2.1 MAF but equal to or less than 2.5 MAF is considered hydrologically "dry".

- One new multiple completion (nested) monitoring well was installed as part of the Planada Pilot Recharge Basin project and added to the network. It is located in the Outside Corcoran Clay Principal Aquifer. Regular monitoring data is anticipated to be collected staring in early 2021.

Figure 2-1: Groundwater Level Monitoring Network



Appendix B shows contour maps of seasonal high (spring) and seasonal low (fall) groundwater elevations for each of the three principal aquifers for spring 2020 and fall 2020 (fall 2019 was included in the previous WYs 2016-2019 Annual Report). Groundwater level data were obtained from the SGMA Data Viewer and GSP monitoring network for groundwater levels[2]. Groundwater levels reported by both monitoring network wells and other voluntary wells in the Merced, Turlock, Delta-Mendota, Chowchilla, and Madera Subbasins were used to develop contours. Measurements from neighboring subbasins were included to provide spatial coverage for contoured groundwater levels along the edges of the Merced Subbasin. The contour maps for the Above Corcoran Clay and Outside Corcoran Clay Principal Aquifers show hatched areas labeled "Area of increased uncertainty due to data limitations" which indicate regions with a relatively lower density of monitoring wells. Contours were developed based on available surrounding data, but

[2] TIWD GSA-1 also provided additional static water level measurements for wells within the GSA boundary that are not part of the SGMA Data Viewer system.

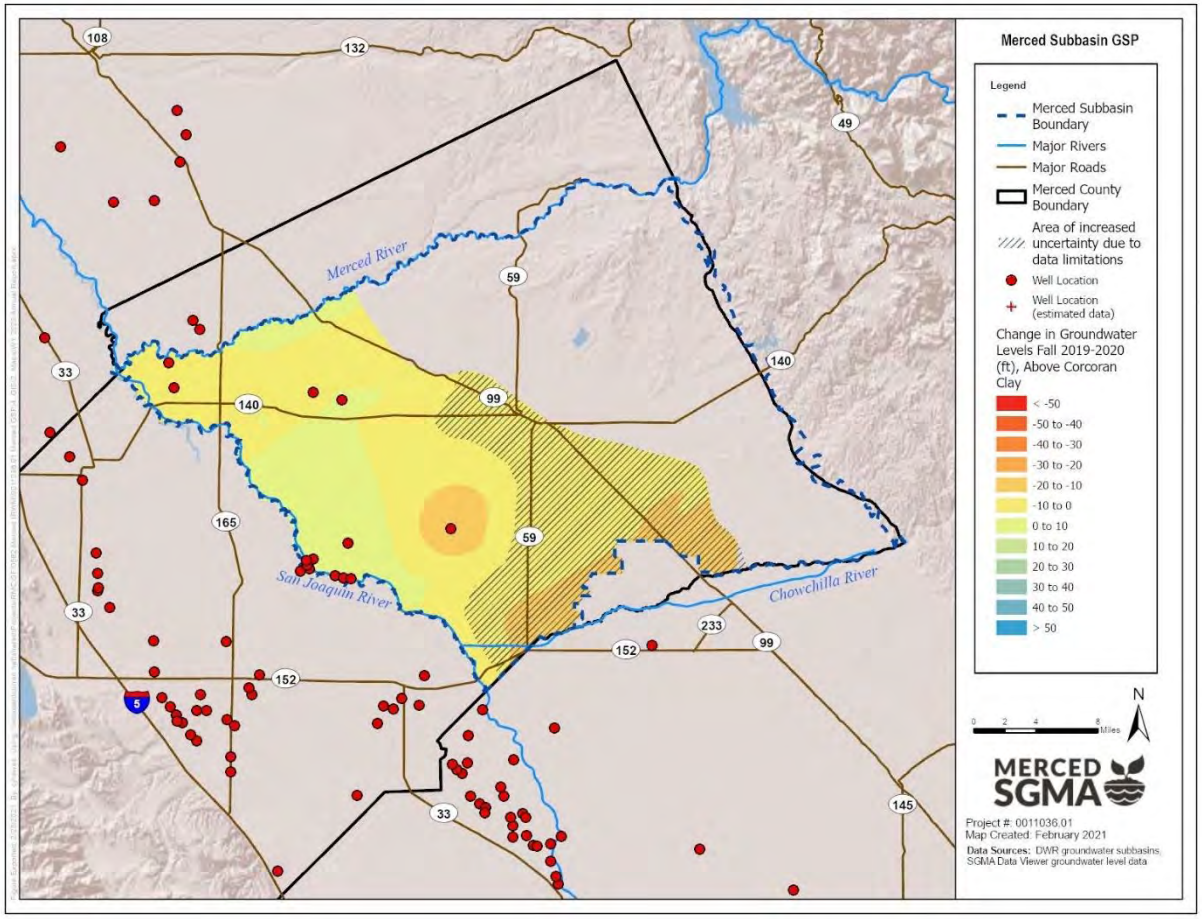
the change in groundwater levels are considered to have a higher level of uncertainty in this area due to the data limitations. The GSP identifies this as a data gap and the GSAs are developing a plan to address critical data gaps in the basin.

Groundwater level contours at 20-foot intervals were developed using an extrapolation method of inverse distance weighting, with local averaging performed to generate smoother contour lines. Groundwater level measurements were classified as spring if they were recorded in the month of March (± 5 days) and classified as fall if they were recorded in the month of October (± 5 days). Contour maps for each season and principal aquifer can be found in Appendix B.

Many voluntary wells do not consistently report groundwater elevations each spring and fall. In some cases, measurements for monitoring network wells were discounted due to nearby pumping or another data quality flag. A linear regression was applied to estimate the groundwater elevations for the missing seasons for wells with missing seasonal data located within the Merced Subbasin. The estimate is necessary to provide consistent results between time periods, despite variability in available data. The linear regression was applied separately at each well for fall and spring measurements where there were several years of historical data for each respective season. Wells at which groundwater elevation was estimated for the purpose of developing contours are called out in the contour maps in Appendix B.

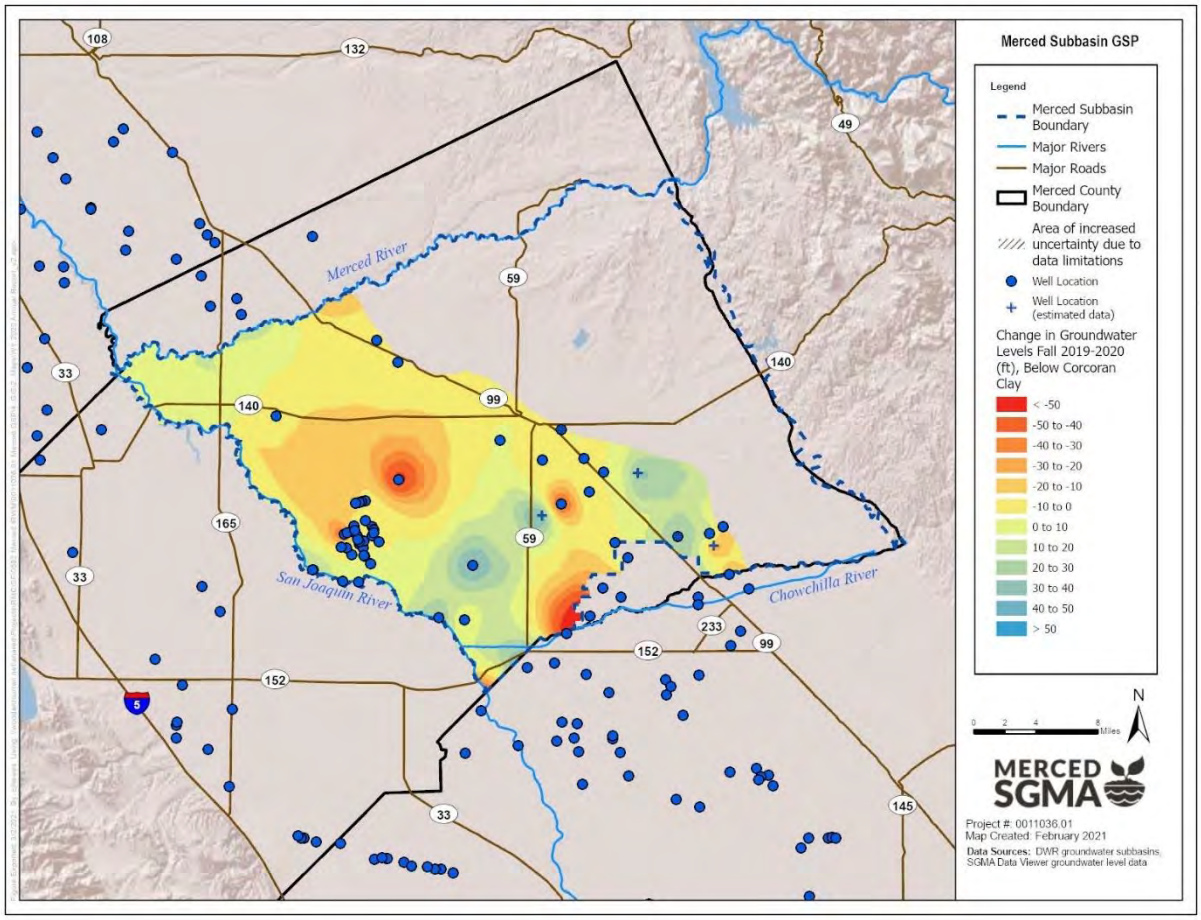
Figure 2-2 through Figure 2-4 show the total change in groundwater levels between fall 2019 and fall 2020 for each principal aquifer, based on comparing the interpolated groundwater level surfaces. The Above Corcoran Clay Principal Aquifer generally shows a net decrease in groundwater levels throughout most of the aquifer. The Below Corcoran Clay Principal Aquifer shows moderate increases in groundwater levels in the south-western/central portion, with decreases in the northern and central portion of the principal aquifer. An area of decreasing groundwater levels is shown along part of the southern edge of the principal aquifer. In the Outside Corcoran Clay Principal Aquifer, groundwater levels were found to decrease across most of the aquifer, with some increase along the northern edge.

Figure 2-2: Total Change in Groundwater Levels Fall 2019 to Fall 2020, Above Corcoran Clay



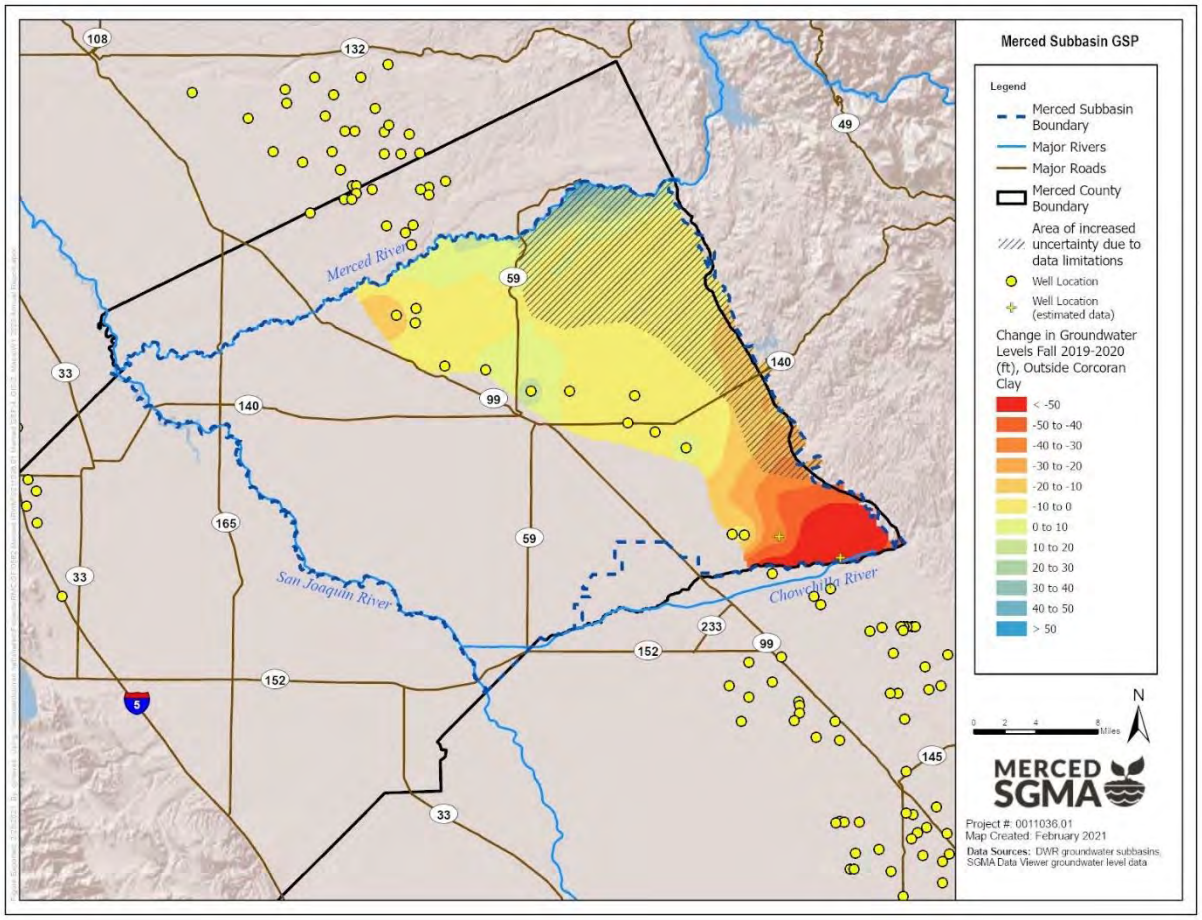
1. *For additional details on change in groundwater levels in specific areas, please refer to contour maps for each season developed in Appendix B.*
2. *The hatched area labeled "Area of increased uncertainty due to data limitations" indicates a region with a relatively lower density of monitoring wells. Contours were developed based on available surrounding data, but the change in groundwater levels are considered to have a higher level of uncertainty in this area due the data limitations. The GSP identifies this as a data gap and the GSAs are developing a data gaps plan to address it in 2021.*

Figure 2-3: Total Change in Groundwater Levels Fall 2019 to Fall 2020, Below Corcoran Clay



1. *For additional details on change in groundwater levels in specific areas, please refer to contour maps for each season developed in Appendix B.*

Figure 2-4: Total Change in Groundwater Levels Fall 2019 to Fall 2020, Outside Corcoran Clay



1. *For additional details on change in groundwater levels in specific areas, please refer to contour maps for each season developed in Appendix B.*
2. *The hatched area labeled "Area of increased uncertainty due to data limitations" indicates a region with a relatively lower density of monitoring wells. Contours were developed based on available surrounding data, but the change in groundwater levels are considered to have a higher level of uncertainty in this area due the data limitations. The GSP identifies this as a data gap and the GSAs are developing a data gaps plan to address it in 2021.*

Table 2-1 lists the representative monitoring wells for the sustainability indicator of chronic lowering of groundwater levels, with a comparison of most recent fall 2020 groundwater elevations against minimum threshold, measurable objective, and interim milestone 2025 elevations.

Table 2-1: Groundwater Elevation at Representative Monitoring Wells

State Well ID	Site Code	Station ID	Principal Aquifer	Fall 2020 GW Elevation[1]	Minimum Threshold Elevation[1]	Measurable Objective Elevation[1]	Interim Milestone 2025[1]
06S12E33D001M	373732N1206679W001	5773	Above	50.49	-102.5	50.4	46.5
07S11E07H001M	373388N1207968W001	8454	Above	NA[2]	-17.4	72.6	50.5
07S11E15H001M	373243N1207424W001	8604	Above	57.42	-112.0	63.6	31.2
07S12E03F001M	373532N1206432W001	8626	Above	52.93	4.9	41.5	41.5
07S13E30R002M	372907N1205779W001	10213	Above	NA[2]	-28.9	41.1	41.1
07S11E24A001M	373166N1207091W001	31372	Above	55.33	-27.2	54.9	50.8
07S10E17D003M	373278N1209054W002	47569	Above	64.68	-43.0	66.3	70.2
07S10E06K002M	373510N1209113W001	47571	Above	60.29	-39.8	63.6	49.9
06S12E29L002M	373796N1206777W001	5226	Below	NA[2]	-156.0	54.4	36.1
08S14E15R002M	372335N1204199W001	10200	Below	73.16	-52.8	5.5	5.5
07S13E32H001M	372838N1205602W001	38974	Below	90.7	-55.6	34.3	34.3
07S14E35E001M	372904N1204207W001	47542	Below	4.94	-31.1	10.4	10.4
06S11E27F001M	373821N1207551W001	47562	Below	68.42	-107.2	69.0	58.8
07S13E34G001M	372806N1205241W001	47564	Below	85.9	-50.3	21.8	-101.5
08S14E06G001M	372617N1204747W001	47565	Below	69.46	-15.1	12.5	12.5
07S14E12N001M	373327N1203960W001	7955	Outside	108.8	56.0	81.0	105.3
07S13E09A001M	373457N1205429W001	10051	Outside	69.54	-27.5	34.0	34.0
08S16E34J001M	371902N1201985W001	28392	Outside	NA[3]	-88.5	-51.9	-51.9
06S13E04H001M	374421N1205407W001	38884	Outside	78.61	-35.7	70.8	69.3
07S12E07C001M	373496N1205890W001	47541	Outside	44.12	14.7	39.7	39.7
07S14E16F004M	373260N1204432W004	47553	Outside	81.44	-21.1	14.9	61.2
07S13E13H004M	373260N1204880W004	47557	Outside	-0.23	-23.2	9.2	9.2
07S15E30D001M	372734N1203071W002	47560	Outside	115.82	62.9	87.9	101.8
06S12E17M001M	374074N1206859W001	47563	Outside	65.08	-126.5	68.5	29.4
06S12E23P001M	370000N1200000W001	47574	Outside	44	-75.0	46.9	46.9
06S12E23C001M	370000N1200000W002	47575	Outside	55	-89.0	58.7	58.7

2. *All elevations reported in feet above sea level, datum NAVD88.*

3. *Station IDs 8454, 10213, & 5226 were not recorded in 2020.*

4. *For Station ID 28392, the "fall" 2020 measurement of -46.5 ft was recorded in December instead of October and also had a Questionable Measurable flag of "nearby pump operating".*

2.2 Groundwater Extractions

Table 2-2 summarizes monthly groundwater extractions for water year 2020 by water use sector and method of measurement. Groundwater extraction data were requested from groundwater agencies located in the Merced Subbasin, listed below:

- City of Atwater
- City of Livingston
- City of Merced
- Merced Irrigation District (MID)
- Turner Island Water District GSA #1
- Stevinson Water District
- Merquin County Water District
- Planada Community Services District
- Lone Tree Mutual Water Company
- American Water, Meadowbrook
- Winton Water and Sanitary District
- Le Grand Community Services District
- Merced National Wildlife Refuge

All reported values from agencies were directly measured. Data are a mixture of metered data and some data from pump tests using run time data. Quantitative estimates of accuracy of measurement (e.g., by percentage or +/- AF) were requested from each agency but not provided by all. Directly measured data are expected to have a qualitative high level of accuracy.

Groundwater extractions from private irrigators and domestic wells are estimated by the Merced Water Resources Model (MercedWRM) based on factors including land use, evapotranspiration, and population. Details about the MercedWRM can be found in the GSP, while recent updates to the model can be found in Section 3.5.2 of this annual report. A map illustrating the general location and volume of groundwater extractions as estimated by the MercedWRM for water year 2020 can be found in Figure 2-5. These estimated data are expected to have a qualitative medium level of accuracy.

Table 2-2: Monthly Groundwater Extractions (in AF), Water Year 2020

Month	Sector					Total
	Agriculture		Urban		Habitat[4]	
	Agency Pumping[1]	Private Pumping[2]	Agency Pumping[1]	Private Pumping[3]	Merced National Wildlife Refuge	
Oct-2019	2,964	63,711	3,580	933	1,923	73,111
Nov-2019	1,773	2,235	2,845	731	2,124	9,708
Dec-2019	92	8	2,153	567	2,003	4,822
Jan-2020	9	0	2,047	532	2,225	4,813
Feb-2020	1,392	0	2,321	604	1,848	6,166
Mar-2020	4,677	36,099	2,560	673	1,637	45,646
Apr-2020	1,741	56,562	2,752	690	410	62,154
May-2020	6,710	61,398	4,090	1,014	293	73,506
Jun-2020	11,705	86,801	4,723	1,164	554	104,948
Jul-2020	11,931	94,064	5,092	1,285	447	112,819
Aug-2020	11,168	99,011	4,849	1,203	702	116,933
Sep-2020	5,343	75,611	4,061	1,025	725	86,764
TOTAL	59,505	575,499	41,074	10,422	14,891	701,391

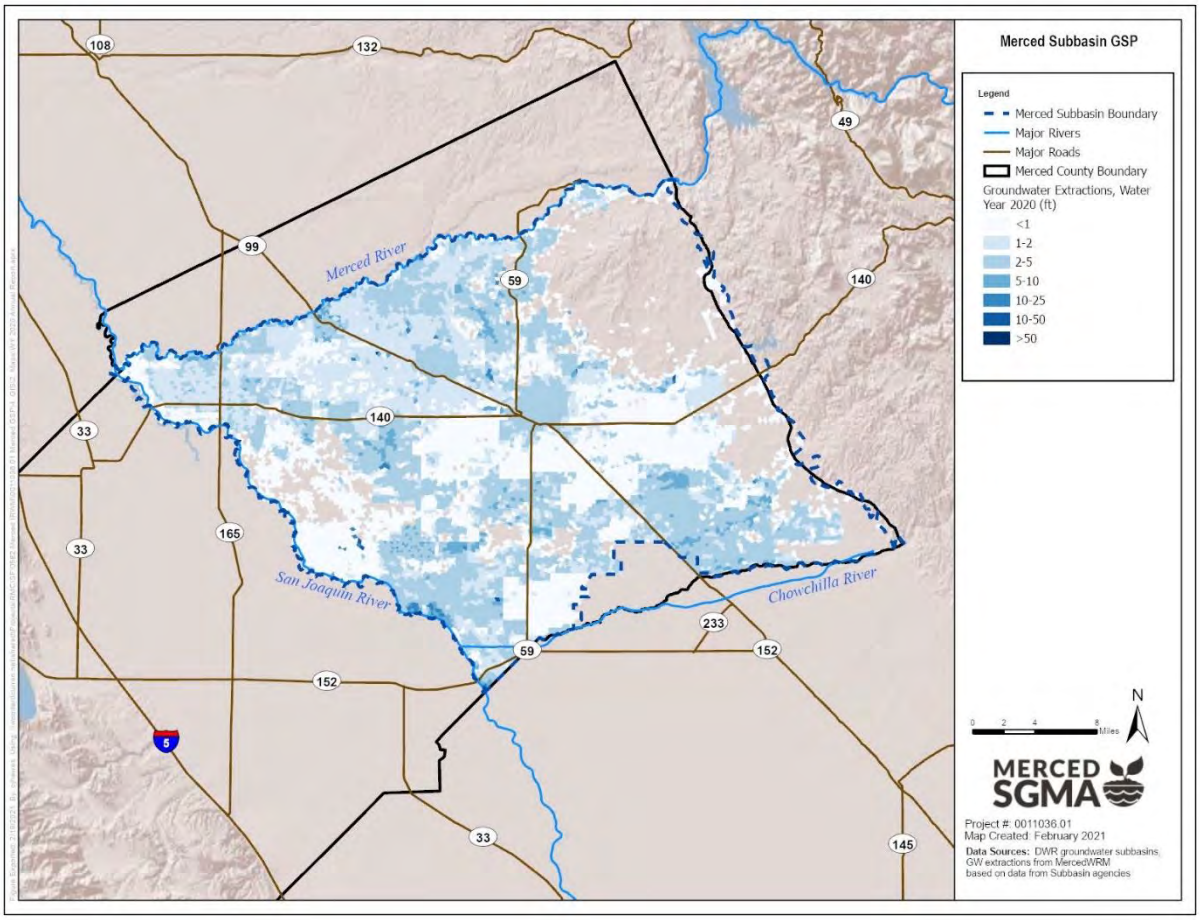
1. *"Agency Pumping" indicates direct measurements of volumes of pumped groundwater reported by agricultural purveyors and urban water suppliers. Directly measured data are expected to have a qualitative high level of accuracy.*

2. *"Private Pumping" for the agricultural sector is estimated by the MercedWRM based on land use and evapotranspiration data. See Section 3.5.2 - MercedWRM Update (Water Year 2020). These estimated data are expected to have a qualitative medium level of accuracy.*

3. *"Private Pumping" for the urban sector (primarily from domestic wells in rural regions) is estimated by the MercedWRM based on census data for population multiplied by a volumetric water use factor averaged from the urban regions. See Section 3.5.2 - MercedWRM Update (Water Year 2020). These estimated data are expected to have a qualitative medium level of accuracy.*

4. *The "Habitat" sector includes only directly measured volumes of groundwater extractions at Merced National Wildlife Refuge. Directly measured data are expected to have a qualitative high level of accuracy. Groundwater pumping for other wetland/habitat areas are included in the "Agriculture" sector due to a lack of information for demands from these wetlands/habitat areas. Demands were estimated based on DWR land use categorizations of native vegetation or agricultural land.*

Figure 2-5: Map of Groundwater Extractions (Water Year 2020)



2.3 Surface Water Supply

SGMA requires that the GSP annual report tabulate "*Surface water supply used or available for use…*" (emphasis added, CCR §356.2 [b] [3]). Table 2-3 summarizes total monthly surface water available for use for water year 2020, broken down by method of measurement. These tables report total surface water diversions and not surface water used, which is difficult to parse out by sector. Direct measurements were provided by MID, Stevinson Water District, TIWD, and Lone Tree Mutual Water Company. Directly measured data are expected to have a qualitative high level of accuracy. Note that MID diversions include surface water ultimately used by Stevinson Water District, Merquin County Water District, Merced National Wildlife Refuge, Le Grand-Athlone Water District, and Lone Tree Mutual Water Company, which fall under the various agricultural, urban, and habitat sectors. Diversions made by Lone Tree Mutual Water Company are exclusively flood flow diversions.

Note also that there are several riparian diverters in the Subbasin whose diversions have not been captured for the purpose of the annual report because they divert a relatively small volume of surface water compared to the diversions made by agencies. It is anticipated that some of these data will be incorporated into future reports, as data will become available as a result of increased compliance with Senate Bill 88 (SB-88).

Table 2-3: Monthly Surface Water Available for Use (in AF), Water Year 2020

Month	Method of Measurement[1]	Total
	Direct	
Oct-2019	36,190	36,190
Nov-2019	3,160	3,160
Dec-2019	2,603	2,603
Jan-2020	2,663	2,663
Feb-2020	6,689	6,689
Mar-2020	29,161	29,161
Apr-2020	32,475	32,475
May-2020	77,902	77,902
Jun-2020	91,097	91,097
Jul-2020	104,781	104,781
Aug-2020	82,136	82,136
Sep-2020	45,941	45,941
TOTAL	514,798	514,798

1. *This table reports total surface water diversions and not surface water used, which can be difficult to parse out by sector. Note that MID diversions include surface water ultimately used by Stevinson Water District, Merquin County Water District, Merced National Wildlife Refuge, Le Grand-Athlone Water District, and Lone Tree Mutual Water Company, which fall under the various agriculture, urban, and habitat sectors.*

2.4 Total Water Use

Table 2-4 summarizes monthly combined groundwater use (Table 2-2) and surface water available for use (Table 2-3) for water year 2020 by water use sector and method of measurement. The same qualifications for method of measurement and sector of use apply from Table 2-2 and Table 2-3.

Table 2-4: Monthly Total Water Use, Water Year 2020

Month	Sector					Total
	Agriculture		Urban		Habitat	
	Direct[1]	Estimate[2]	Direct	Estimate[2]	Direct	
Oct-2019	39,154	63,711	3,580	933	1,923	109,301
Nov-2019	4,933	2,235	2,845	731	2,124	12,868
Dec-2019	2,695	8	2,153	567	2,003	7,425
Jan-2020	2,672	0	2,047	532	2,225	7,476
Feb-2020	8,081	0	2,321	604	1,848	12,854
Mar-2020	33,838	36,099	2,560	673	1,637	74,807
Apr-2020	34,216	56,562	2,752	690	410	94,629
May-2020	84,612	61,398	4,090	1,014	293	151,408
Jun-2020	102,802	86,801	4,723	1,164	554	196,045
Jul-2020	116,712	94,064	5,092	1,285	447	217,600
Aug-2020	93,304	99,011	4,849	1,203	702	199,070
Sep-2020	51,283	75,611	4,061	1,025	725	132,705
TOTAL	574,302	575,499	41,074	10,422	14,891	1,216,188

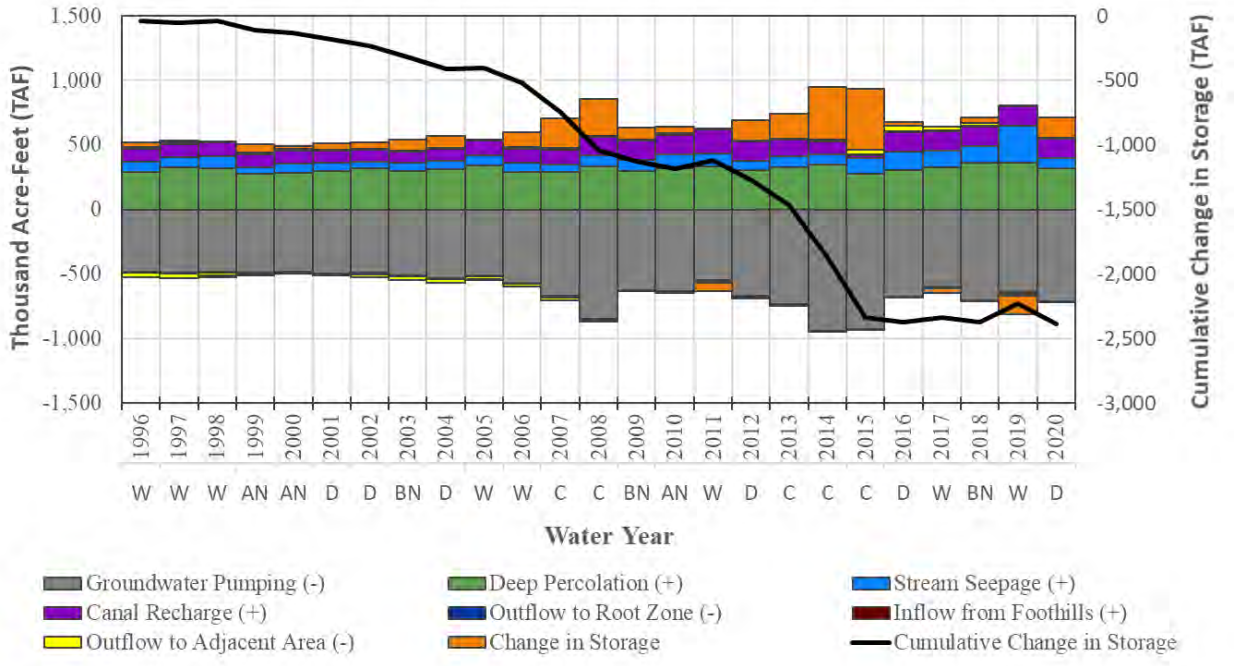
1. *Surface water diversions have been reported under the category of Agriculture, Direct. As described in Table 2-3, this includes total surface water diversions and not surface water used, which can be difficult to parse out by sector. Surface water diversions account for approximately 90% of this column.*
2. *While direct volumes were provided by reporting agencies, the estimate column is calculated estimates provided by the MercedWRM (for groundwater, see Table 2-2).*

2.5 Change in Groundwater Storage

The Merced Water Resources Model (MercedWRM) was used to estimate historical change in storage of the Merced Subbasin from water years 1996-2015 for the Merced GSP and then extended through 2020 to support quantification of storage change for this annual report. See Section 3.5.2 for more information about the recent model update for this annual report. Note that the time period of 2006-2015 was originally selected as the historical water budget time period reported in the Merced GSP as representative of average precipitation and capturing recent Subbasin operations. After extending the historical water budget through water year 2020, the current (2020) total fresh groundwater storage was estimated as 45.8 MAF and the cumulative change in storage from water years 2006-2020 was estimated as -1.98 MAF, or an average reduction of 132 TAF per year. During water year 2020, the change in storage was estimated as a reduction of 157 TAF, which exceeds the average by approximately 25 TAF. Figure 2-6 shows the cumulative change in storage for 1996-2020 against groundwater uses developed in the water budget and water year type.

Sustainable management criteria were not developed for this sustainability indicator because significant and unreasonable reduction of groundwater storage is not present and not likely to occur in the Subbasin. The 2006-2020 cumulative change in storage described above, which includes both representative dry and wet years, reflects a rate of overdraft of approximately 0.2 percent per year. It is not reasonable to expect that the available groundwater in storage would be exhausted.

Figure 2-6: Historical Annual Water Budget – Groundwater System, Merced Subbasin



[1] "Change in Storage" is placed on the chart to balance the water budget. For instance, if annual outflows (-) are greater than inflows (+), there is a decrease in storage, and this is shown on the positive side of the bar chart to balance out the increased outflows on the negative side of the bar chart.

Source: Water year types based on San Joaquin Valley Water Year Index (DWR, 2021a)*, but 2020 has been assumed to be "D" (dry) due to runoff values below the previous threshold for dry years while waiting for DWR to publish a final 2020 value.*

Figure 2-7 through Figure 2-9 show the total change in groundwater storage by principal aquifer for water year 2020 in a spatial format as estimated by outputs from the MercedWRM. The change in storage is shown in units of feet. The MercedWRM calculates a change in volume per area of model element. Since the model elements vary in size, visually displaying a map of volume change per model element is not spatially intuitive, so the results have been normalized to show change in depth by dividing the volume by area per model element.

While net Subbasin storage decreased marginally during the 2020 water year, the figures below show areas of relative decrease in storage (negative change in depth shown in green shades) and relative increase in storage (positive change in depth shown in blue shades).

Figure 2-7: Change in Storage Water Year 2020 (AF), Above Corcoran Clay

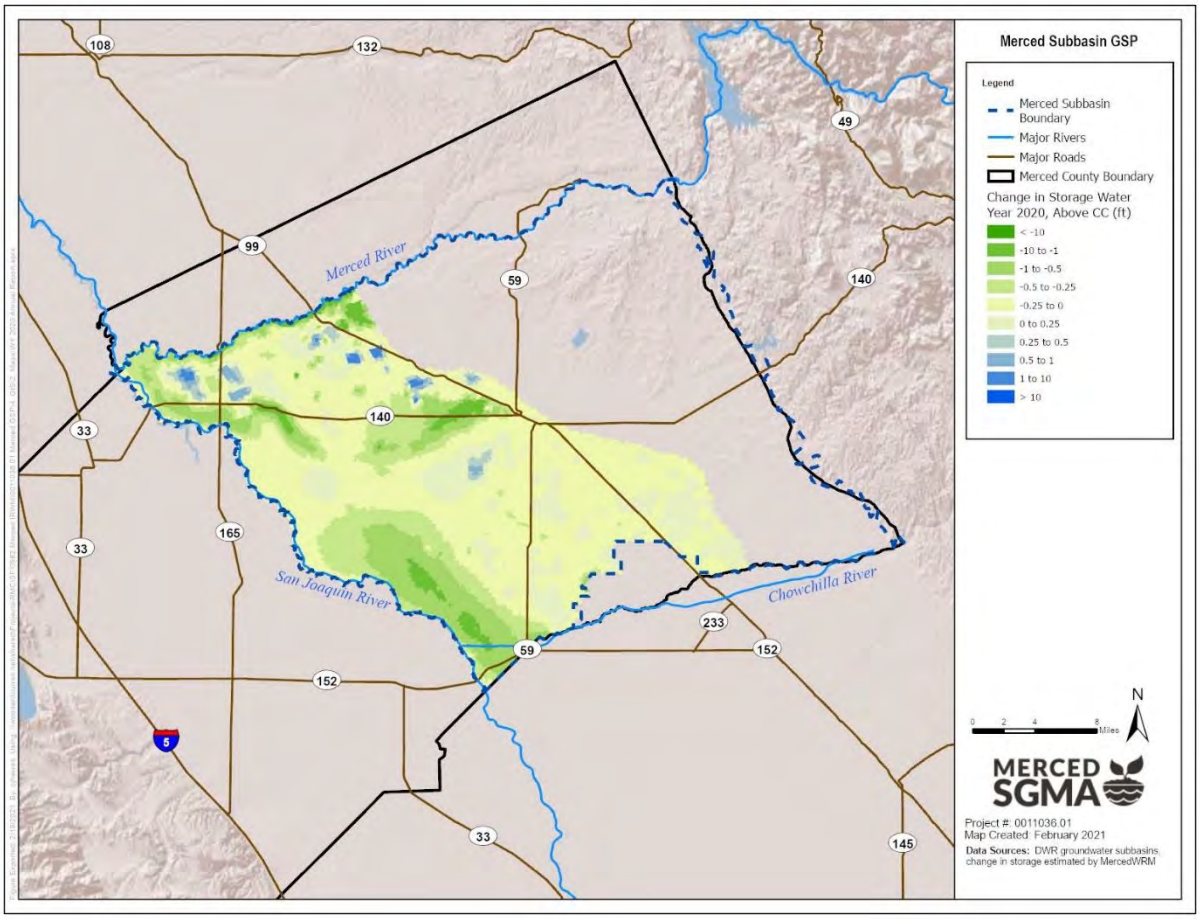


Figure 2-8: Change in Storage Water Year 2020 (AF), Below Corcoran Clay

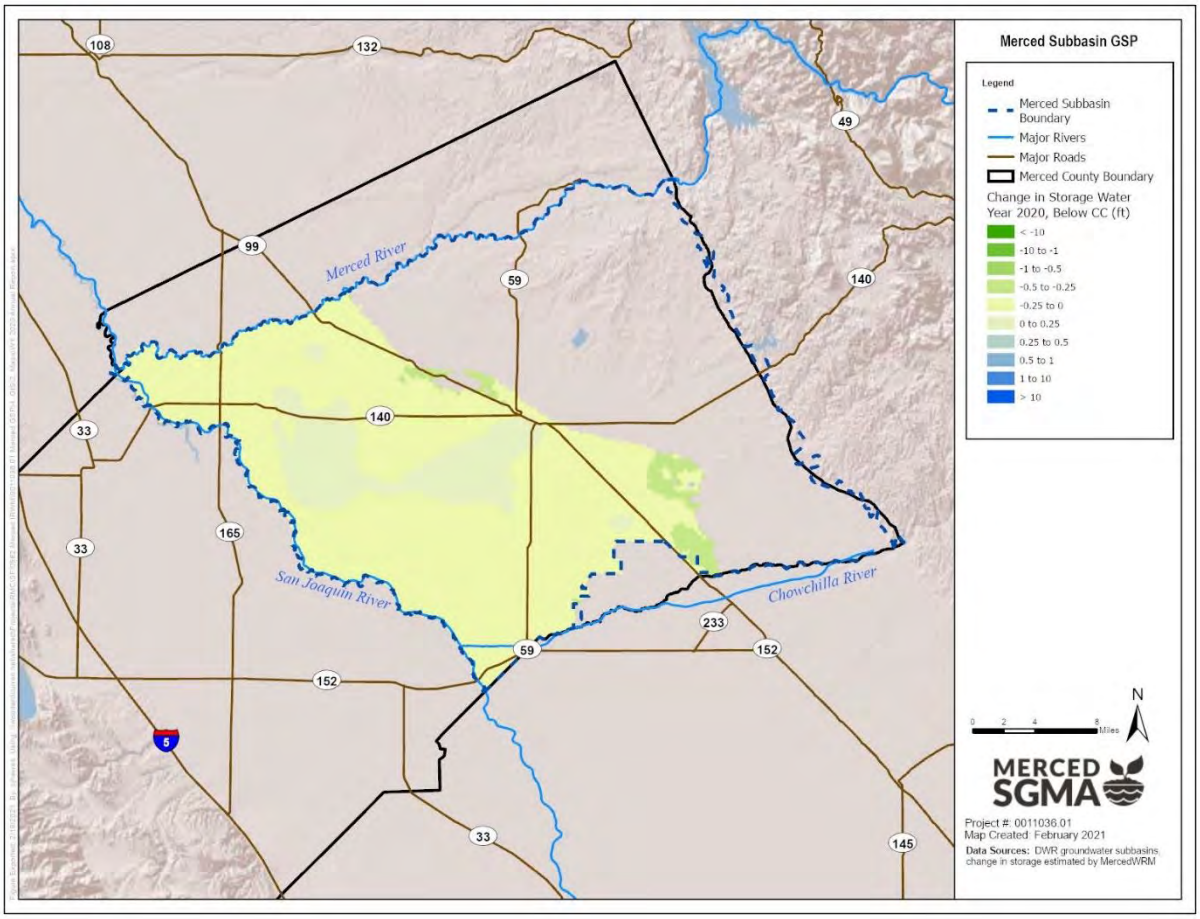
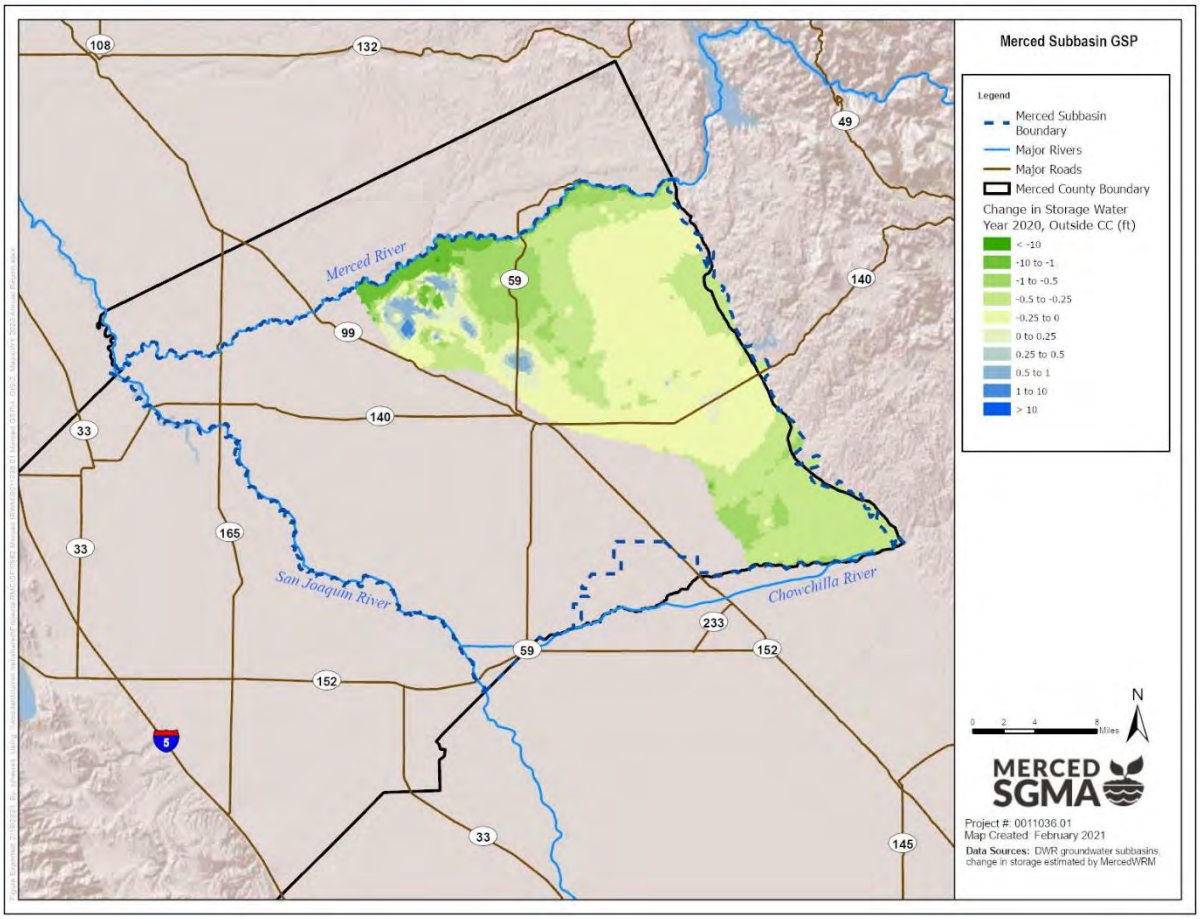


Figure 2-9: Change in Storage Water Year 2020 (AF), Outside Corcoran Clay



1. *The eastern portion of the Outside Corcoran Clay Principal Aquifer is a region with a relatively lower density of monitoring wells and thus higher level of uncertainty due the data limitations. The GSP identifies this as a data gap and the GSAs are developing a data gaps plan to address it in 2021.*

2.6 Land Subsidence

This section provides maps of the most recent subsidence measurements taken in and around the Subbasin and compares them to the GSP's sustainable management criteria. Subsidence is measured at static GPS control points throughout the San Joaquin Valley monitored by the US Bureau of Reclamation (USBR) as part of the San Joaquin River Restoration Program. Measurements have been recorded biannually in July and December of each year to monitor ongoing subsidence since 2011. Figure 2-10 shows the total subsidence occurring from December 2019 to December 2020. Figure 2-11 shows the average subsidence occurring from December 2012 through December 2020. December 2012 is shown as the starting point rather than December 2011 when USBR monitoring began due to many additional data points added in December 2012 that were not recorded in December 2011.

Figure 2-10: Total Subsidence December 2019 to December 2020

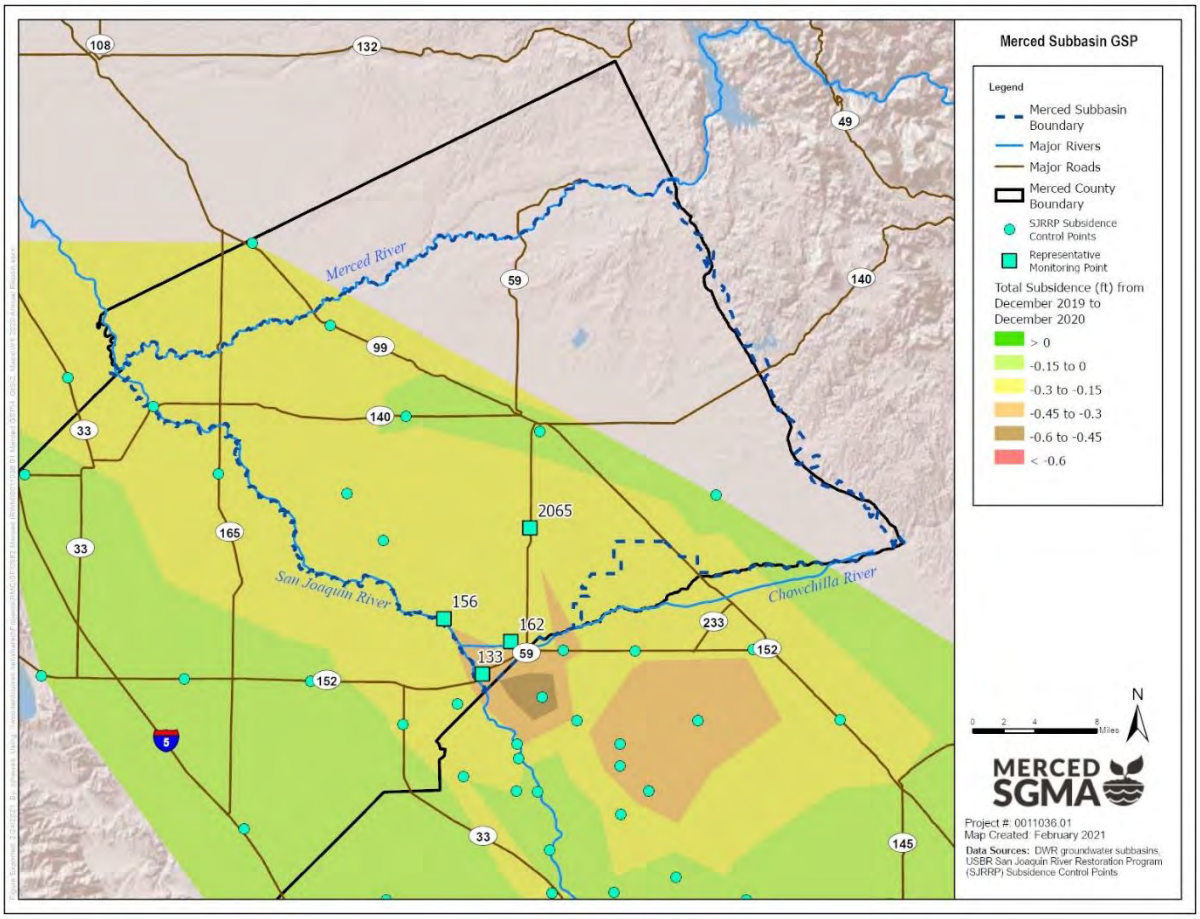
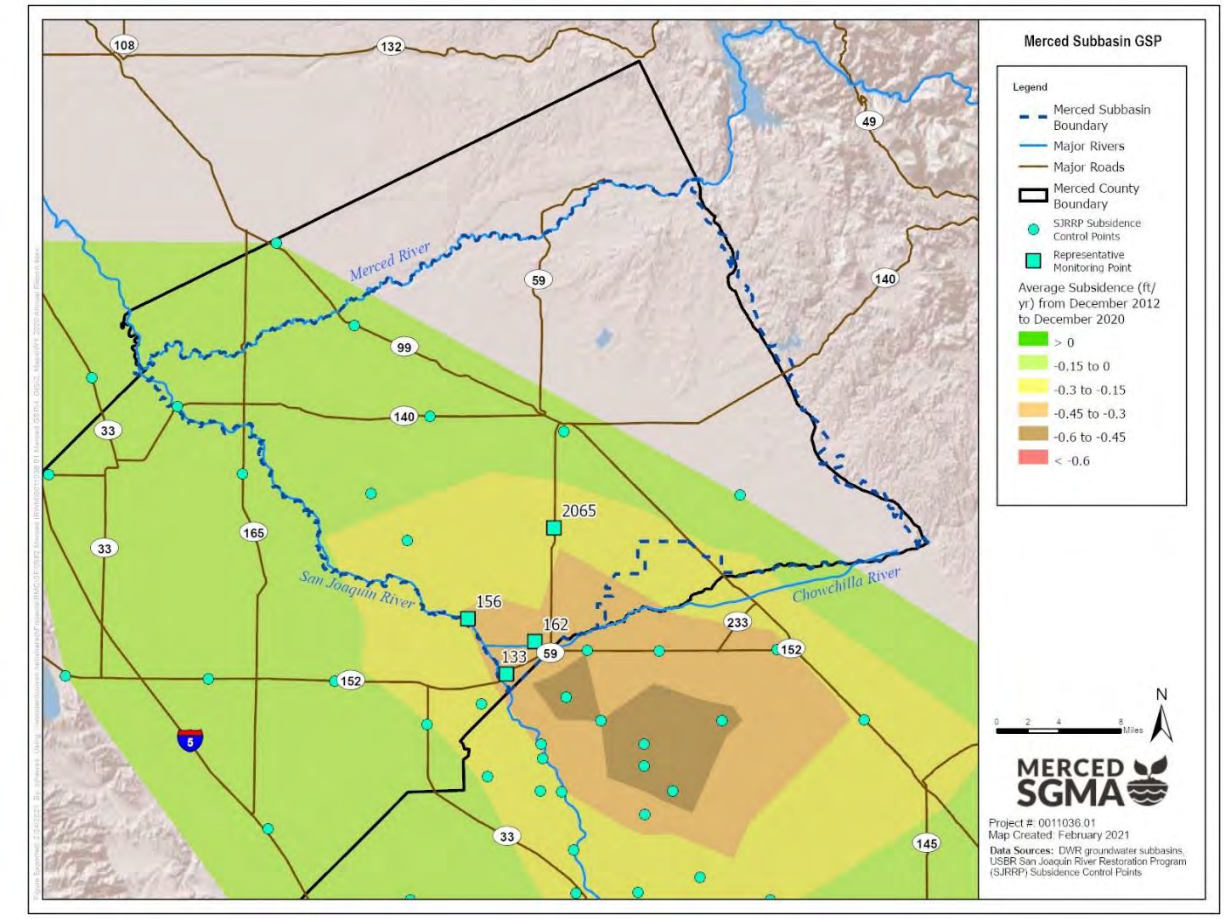


Figure 2-11: Average Subsidence Rate December 2012 to December 2020



In the GSP, the GSAs established a minimum threshold of -0.75 ft/year at four representative monitoring stations based on data review of subsidence between 2011 and 2018. The measurable objective and all interim milestones are -0.25 ft/year of subsidence. The GSP identifies undesirable results for subsidence as "exceedances of minimum threshold rates of land subsidence at three or more monitoring sites out of four for two consecutive years, where both years are categorized hydrologically as below normal, above normal, or wet".

As shown in Table 2-5, subsidence values in the last four years have not exceeded the minimum threshold (i.e., the magnitude of subsidence is less than the minimum threshold). In six cases in the last four years, the magnitude of annual subsidence has exceeded the long-term measurable objective (i.e., the magnitude of subsidence is greater than the measurable objective; Stations 133 and 156 in 2017-18 and all four stations in 2019-2020). Work is currently underway to better understand how to stabilize subsidence in the Subbasin. Subsidence is a gradual process that takes time to develop and time to halt. As a result, some level of future subsidence, likely at rates similar to those currently experienced, is likely to be underway already and will not be able to be prevented.

Table 2-5: Subsidence at Representative Monitoring Stations

Point ID	Station Name	Subsidence (ft)				Minimum Threshold (ft/yr)	Measurable Objective / Interim Milestone (ft/yr)
		Dec 2016 - Dec 2017	Dec 2017 - Dec 2018	Dec 2018 - Dec 2019	Dec 2019 - Dec 2020		
133	H 1235 RESET	-0.18	-0.30	-0.24	-0.39	-0.75	-0.25
162	RBF 1057	-0.07	-0.17	-0.10	-0.26	-0.75	-0.25
2065	W 938 RESET	-0.16	-0.17	-0.14	-0.30	-0.75	-0.25
156	W 990 CADWR	0.01	-0.32	-0.07	-0.28	-0.75	-0.25

2.7 Groundwater Quality

In addition to comparing water quality monitoring to the GSP's interim milestones and other sustainable management criteria, this section provides a summary of ongoing water quality coordination activities being conducted by the GSAs.

2.7.1 Representative Monitoring

In the GSP, the GSAs established a minimum threshold of 1,000 mg/L of Total Dissolved Solids (TDS) at representative monitoring sites for the degraded water quality sustainability indicator. The measurable objective and all interim milestones were set at 500 mg/L TDS. Undesirable results are defined in the GSP as "during GSP implementation when at least 25 percent of representative monitoring wells (5 of 19 sites) exceed the minimum threshold for degraded water quality for two consecutive years."

Figure 2-12 through Figure 2-14 show the spatial distribution of TDS concentration measurements in the three principal aquifers based on TDS data reported in the Groundwater Ambient Monitoring & Assessment (GAMA) database within water year 2020 for wells in the Merced Subbasin monitoring network. Figure 2-15 shows concentrations for which the principal aquifer is unknown due to a lack of well construction data (e.g., lacking total well depth or screened interval). The GSP monitoring network includes both designated representative wells as well as any Public Water Supply (PWS) wells that report data to the Division of Drinking Water (DDW).

While elevated TDS concentrations (greater than 1,000 mg/L) did show up in monitoring data for water year 2020, they were confirmed to be at a small number of locations where either raw water was measured at a municipal well before treatment or samples were collected at environmental monitoring wells monitored by regulated facilities. The Merced GSP also describes that there are pockets of the Subbasin known to have such elevated concentrations and water use behaviors have already shifted to accommodate these concentrations. For example, agriculture has focused on more salt-tolerant crops, and more saline water supplies are blended with less saline water supplies. As a result, TDS concentrations in excess of 1,000 mg/L where currently experienced are not unexpected. There is, however, a desire on the part of Subbasin stakeholders to limit increases in salinity in parts of the Subbasin where TDS is below 1,000 mg/L to prevent undesirable results such as requirements to change cropping, blending supplies, etc.

Figure 2-12: Average TDS Concentration Water Year 2020, Above Corcoran Clay Principal Aquifer

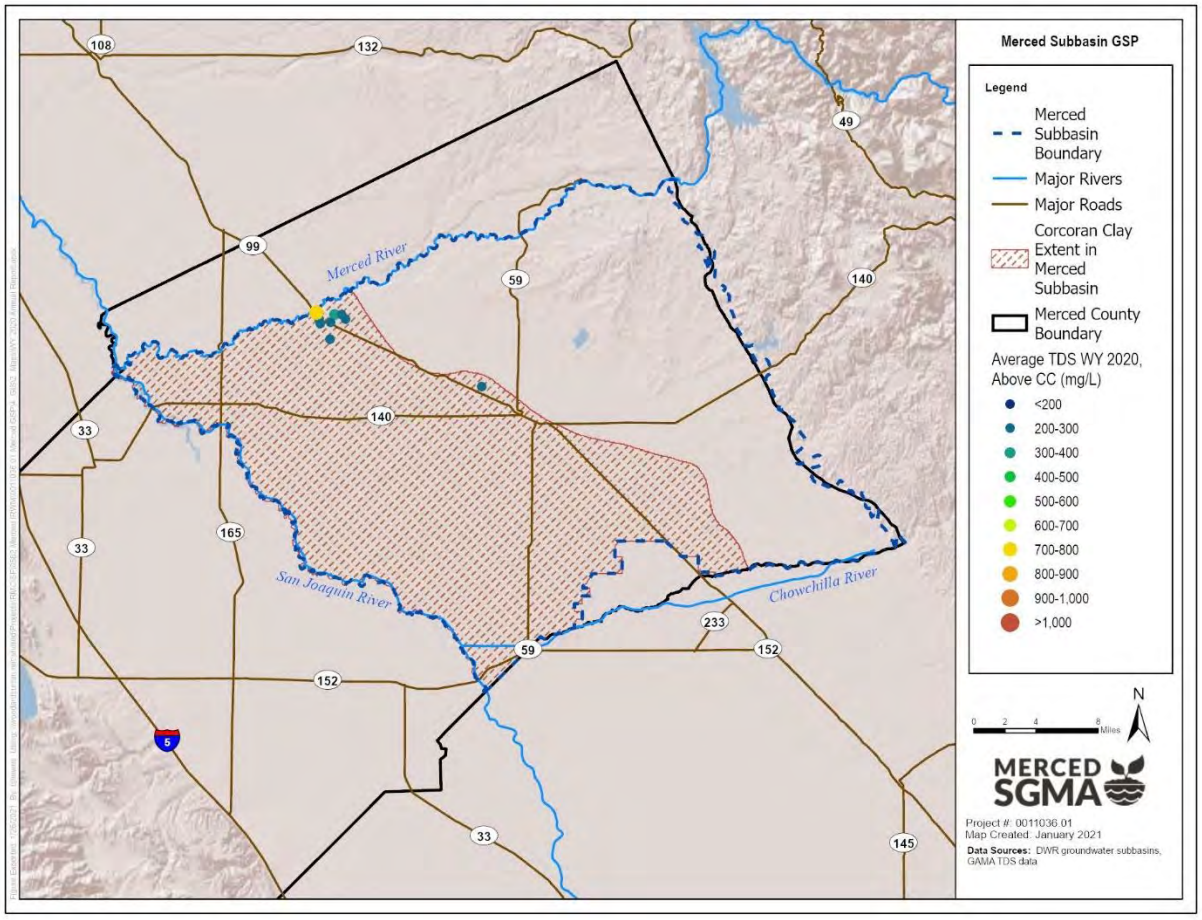


Figure 2-13: Average TDS Concentration Water Year 2020, Below Corcoran Clay Principal Aquifer

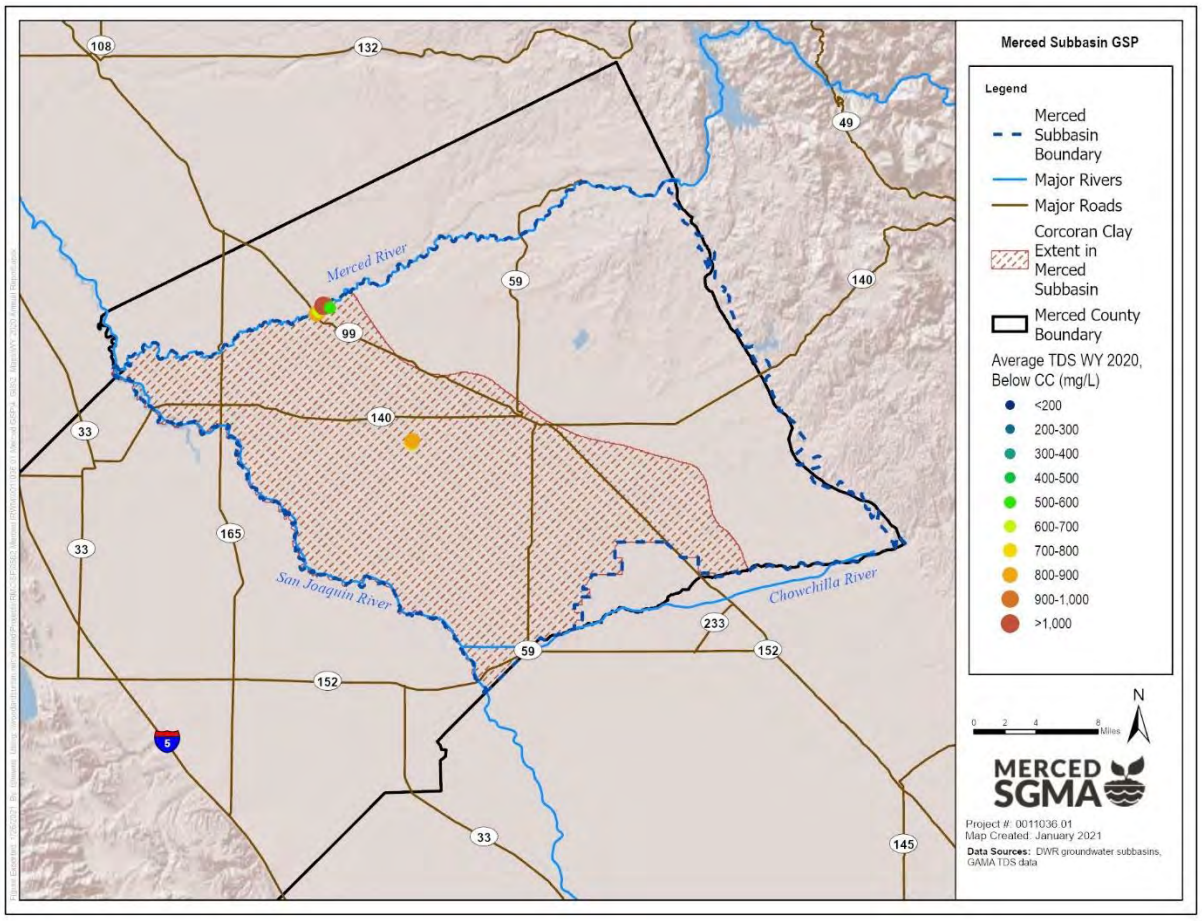


Figure 2-14: Average TDS Concentration Water Year 2020, Outside Corcoran Clay Principal Aquifer

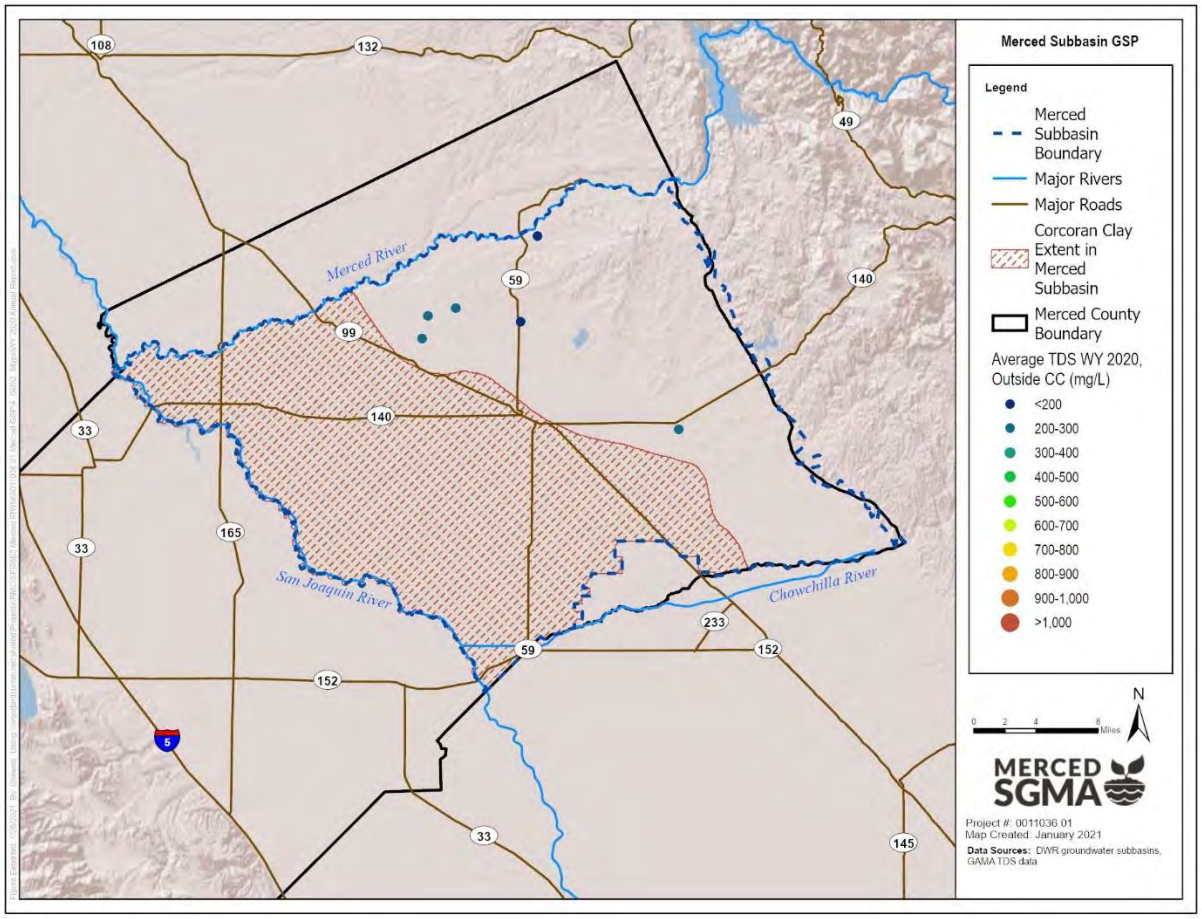
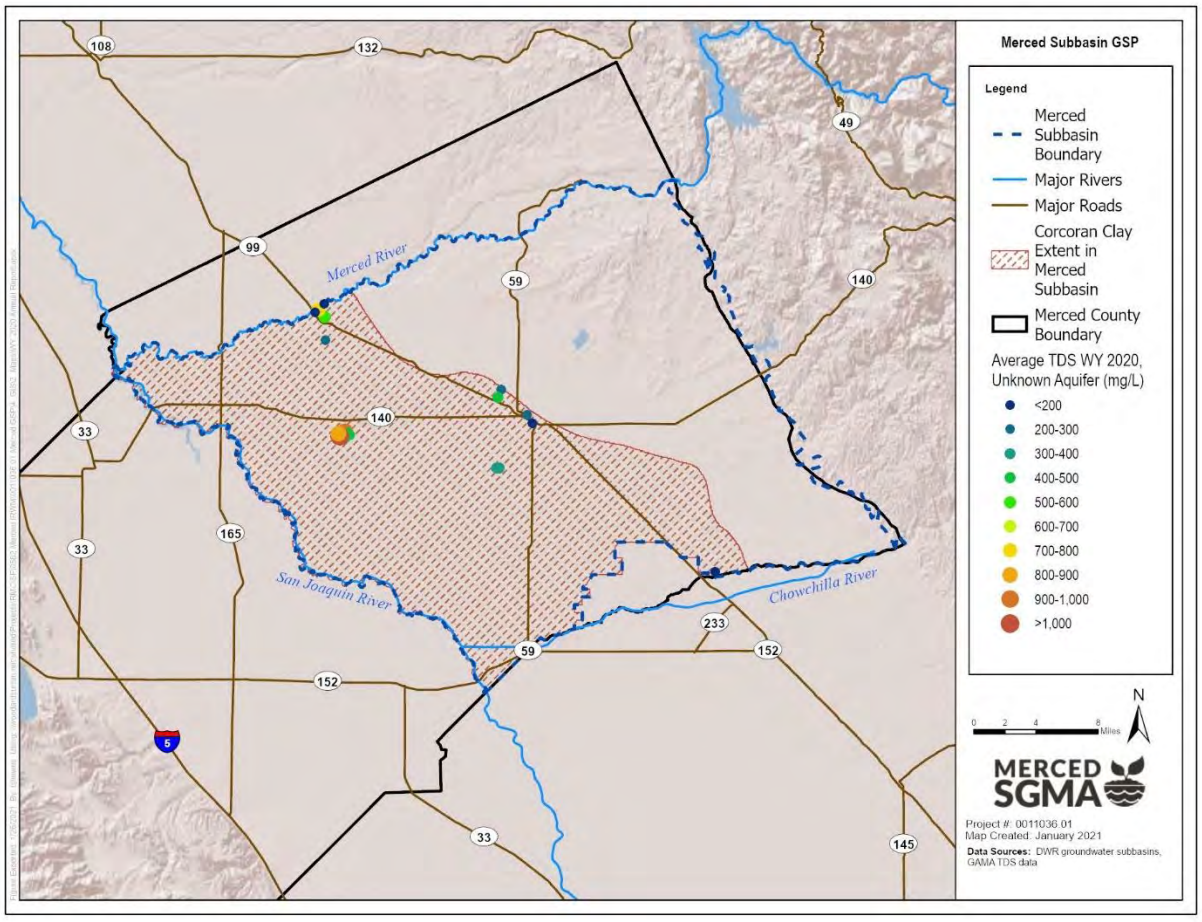


Figure 2-15: Average TDS Concentration Water Year 2020, Unknown Principal Aquifer



The East San Joaquin Water Quality Coalition (ESJWQC) is a group of agricultural interests and growers formed to represent dischargers who own or operate irrigated lands east of the San Joaquin River within Madera, Merced, Stanislaus, Tuolumne, and Mariposa Counties, as well as portions of Calaveras County. The ESJWQC has developed a Groundwater Quality Trend Monitoring Program (GQTMP) as part of the Irrigated Lands Regulatory Program (ILRP), which includes a targeted set of domestic wells (denoted as principal wells) supplemented by public water system wells (denoted as complementary wells) (ESJWQC, 2018). There are six principal wells and 14 complementary wells in the Merced Subbasin that are designated as representative monitoring wells in the Merced GSP at which sustainable management criteria are established (shown in Table 2-6). A new principal well (P19) was added in 2019 in the northwestern corner of the Subbasin (ESJWQC, 2020).

ESJWQC published a 2020 Annual Report for the GQTMP based on data collected in 2019 (ESJWQC, 2020). Data were submitted to GAMA. ESJWQC monitors electrical conductivity (EC) @ 25°C, pH, dissolved oxygen (DO), temperature, and nitrate + nitrate as N annually. TDS and other constituents are monitored every five years. For all but the most recently installed principal well, TDS was last recorded in October 2018. Most recent concentrations for Merced GSP representative wells are summarized in Table 2-6. None of the wells with reported data have TDS concentrations above the minimum threshold. Two wells show a TDS concentration that is above the measurable objective and interim milestones. Note that for the 14 complementary wells (identified with GQTMP Well ID beginning with "C"), only 6 had TDS data reported in GAMA for the reporting period.

Table 2-6: TDS Concentrations at Representative Monitoring Wells

GQTMP Well ID	GAMA Well ID	TDS (mg/L)	Date of Measurement(s)	Minimum Threshold (mg/L TDS)	Measurable Objective and Interim Milestones (mg/L TDS)	Principal Aquifer
P06	AGC100012331-ESJQC00006	240	10/31/2018	1,000	500	Outside Corcoran Clay
P07	AGC100012331-ESJQC00007	180	10/31/2018	1,000	500	Below Corcoran Clay
P08	AGC100012331-ESJQC00008	330	10/30/2018	1,000	500	Outside Corcoran Clay
P09	AGC100012331-ESJQC00009	410	10/30/2018	1,000	500	Below Corcoran Clay
P10	AGC100012331-ESJQC00010	890	10/30/2018	1,000	500	Below Corcoran Clay
P19	AGC100012331-ESJQC00019	600	7/23/2019	1,000	500	Below Corcoran Clay
C35	2400172-001			1,000	500	Above Corcoran Clay
C41	2400220-001			1,000	500	Above Corcoran Clay
C45	2400089-001			1,000	500	Above Corcoran Clay
C38	2410004-011	250	6/9/2020	1,000	500	Below Corcoran Clay
C44	2400218-001	320	3/8/2012	1,000	500	Below Corcoran Clay
C40	2410001-006	290	3/16/2006	1,000	500	Outside Corcoran Clay
C42	2400046-002	400	6/28/2016	1,000	500	Outside Corcoran Clay
C43	2410007-005	280	4/9/2019	1,000	500	Outside Corcoran Clay
C46	2410007-002	208.8	1/31/1991	1,000	500	Outside Corcoran Clay

GQTMP Well ID	GAMA Well ID	TDS (mg/L)	Date of Measurement(s)	Minimum Threshold (mg/L TDS)	Measurable Objective and Interim Milestones (mg/L TDS)	Principal Aquifer
C47	2400194-001			1,000	500	Outside Corcoran Clay
C39	2400119-001			1,000	500	Outside Corcoran Clay
C48	2410011-005	200	7/30/2019	1,000	500	Outside Corcoran Clay
C49	2400172-012	199	9/22/2017	1,000	500	Unknown
C50	2400079-001	270	2/9/2017	1,000	500	Unknown

2.7.2 Water Quality Coordination Activities

In addition to monitoring for TDS (see Section 2.7.1 - Representative Monitoring), the GSAs will be conducting ongoing water quality coordination activities to address other water quality constituents. These activities include review of monitoring reports published by other monitoring programs as well as a review of data submitted by Department of Pesticide Regulation (DPR), Division of Drinking Water (DDW), Department of Toxic Substances Control (DTSC), and GeoTracker to the GAMA database. The purpose of these reviews is to evaluate the status of constituent concentrations throughout the Subbasin with respect to typical indicators such as applicable maximum contaminant level (MCL)[3] or secondary maximum contaminant levels (SMCL)[4].

Established in 2000, the GAMA Program monitors groundwater quality throughout California. GAMA is intended to create a comprehensive groundwater monitoring program throughout the state and increase public availability and access to groundwater quality and contamination information. Agencies submit data from monitoring wells for 244 constituents. GAMA data for the Merced Subbasin contains wells monitored or regulated by the DDW, DPR, DWR, USGS, and environmental monitoring wells monitored by regulated facilities. The GSAs have collected information from GAMA and will use this information to document regional groundwater quality and to assess whether there is a need for changes to existing sustainable management criteria or developing additional sustainable management criteria for water quality as part of the GSP 5-year update.

[3] MCLs are drinking water standards that are adopted as regulations and describe the highest level of a contaminant allowed in drinking water, based on health risks and also detectability, treatability, as well as the costs of treatment.

[4] Secondary MCLs are established by the USEPA and then adopted by the SWRCB. The secondary MCL is a Secondary Drinking Water Standard that is established for aesthetic reasons such as taste, odor, and color and is not based on public health concerns.

3. PLAN IMPLEMENTATION PROGRESS

3.1 Overview of Implementation Support Activities

This section of the Annual Report provides updates on projects, and management actions, and other implementation support activities.

3.2 Interim Milestones

Interim Milestones were identified in Chapter 3 (Sustainable Management Criteria) of the GSP for all Sustainability Indicators and provided in tabular form for Groundwater Elevations and Groundwater Quality Sustainability Indicators (see Tables 3-1 and 3-2 in GSP). These Interim Milestones are anticipated to be achieved over the course of GSP implementation in increments of five years, pursuant to the CCR definition "*Target values representing measurable groundwater conditions, in increments of five years, set by an Agency as part of a Plan*" [CCR Title 23, Division 2, §351(q)]. Progress toward achieving Interim Milestones since submitting the 2019 GSP are provided in Sections 2.1 (Groundwater Elevations), 2.6 (Land Subsidence), and 2.7 (Groundwater Quality). Further updates are expected in the first Five Year Assessment for the Merced Subbasin GSP, with status checks provided in future annual reporting.

3.3 Implementation of Projects

The GSP identifies 12 priority projects. These were selected for inclusion in the GSP based on their ability to address a list of priorities identified by the Stakeholder Advisory and Coordination Committee members and the public. These priorities are listed in Chapter 6 (Projects and Management Actions to Achieve Sustainability Goal) in the GSP. The priorities are:

- Addressing Disadvantaged Communities (DACs) and or Severely Disadvantaged Communities (SDACs)
- Addressing areas with known data gaps
- Providing basin-wide benefits (i.e., benefits all GSAs)
- Addressing a subsidence area
- Focusing on recharge
- Focusing on conveyance
- Addressing and or prioritizing drinking water
- Addressing and or prioritizing water for habitat
- Focusing on monitoring, reporting, and data modeling activities for data collection to be gathered in the first 5 years
- Providing incentives to reduce pumping and to capture surface water (e.g., including flood flows)
- Including projects that are beyond planning phase
- Including projects that already have a dedicated funding mechanism
- Including projects that are identified as priority projects by at least one GSA

Substantial progress was made on the first three projects. For most of the remaining projects, project proponents are actively seeking funding, including recent Prop 1 and Prop 68 grant applications. Table 3-1 is a summary of updated project information for priority projects since the first annual report, as provided by project proponents.

Table 3-1: Description of Project Implementation Updates

Project Name	Project Update Description
Project 1: Planada Groundwater Recharge Basin Pilot Project	Cone Penetration Tests did not show favorable geologic conditions for a recharge basin; Pursuing alternative approaches to a traditional recharge basin, like installation of dry well(s). Proposed permanent monitoring well installed in September 2020. This well will be added to the Merced Subbasin's Monitoring Network.
Project 2: El Nido Groundwater Monitoring Wells	All planned well site installations have been completed. These wells will be added to the Merced Subbasin's Monitoring Network.
Project 3: Meadowbrook Water System Intertie Feasibility Study	Draft Feasibility Study technical memorandum discussing system capacities, potential tie-in locations, and estimated costs, was completed in October 2020 and had a 30-day public comment period following public workshops. Study completed in January 2021.
Project 4: Merquin County Water District Recharge Basin	This basin has not been constructed nor have design documents been completed. Merquin County Water District (MCWD) has very constrained financial resources and cannot proceed with the project without significant grant funding which has not been forthcoming to date. MCWD is evaluating ways to provide groundwater recharge to the District and may proceed with a project once resources are available.
Project 5: Merced Irrigation District to Lone Tree Mutual Water Company Conveyance Canal	Project timeline extended to 2022. Currently in conceptual stage, working on obtaining agreements for easements.
Project 6: Merced IRWM Region Climate Change Modeling	No update of information in 2019 GSP to report at this time.
Project 7: Merced Region Water Use Efficiency Program	No update of information in 2019 GSP to report at this time.
Project 8: Merced Groundwater Subbasin LIDAR	Funding for this project was awarded under the Proposition 1 Round 1 IRWM Implementation Grant in 2020. LIDAR data was collected in December 2020.
Project 9: Study for Potential Water System Intertie Facilities from MID to LGAWD and CWD	The study has been completed. The GSAs have applied for Proposition 68 Implementation Grant funding for a portion of this work. DWR has recommended a full funding award for this application, final funding awards are anticipated to be announced in April 2021.
Project 10: Vander Woude Dairy Offstream Temporary Storage	This project is not being actively pursued due to funding constraints.

Project Name	Project Update Description
Project 11: Mini-Big Conveyance Project	Combined with Project 9 Study for Potential Water System Intertie Facilities from MID to LGAWD and CWD due to substantial overlap in scope.
Project 12: Streamlining Permitting for Replacing SubCorcoran Wells	The study has been completed and is being used to support well permitting from below to above the Corcoran Clay in the Subsidence area.

3.4 Implementation of Management Actions

The Merced Subbasin GSP includes two Management Actions. This has not changed as of the current Annual Reporting period. The two Management Actions are:

- Management Action 1: Water Allocation Framework
- Management Action 2: MSGSA Demand Reduction Program

Water Allocation Framework: An Ad Hoc Coordination Committee Working Group supported by GSA staff, was established to conduct discussions on an initial framework. Discussions are ongoing. It is anticipated that allocation framework discussions at GSA Board and public meetings will occur starting in 2021.

MSGSA Demand Reduction Program: The MSGSA is initiating a demand reduction program in recognition of the need to reduce groundwater pumping in the subbasin. Development of this program is still in initial phases: the GSA is in the process of analyzing groundwater demand and conditions throughout the jurisdiction and considering near and long-term activities. Future implementation activities will include analysis, policies and procedures adoption, establishing monitoring and reporting tools, and conducting outreach.

3.5 Additional Implementation Support Activities

Additional activities have taken place within or just after the Annual Reporting period that contribute to the overall GSP implementation progress. These are described below in Section 3.5.1 which includes various grant-funded activities and Section 3.5.2 which includes the MercedWRM update for water year 2020.

3.5.1 Grant-Funded Activities

Data Gaps Plan: The Merced Subbasin was awarded a Proposition 68 SGM Grant Program Planning Grant which was contracted with DWR in May 2020. The grant funds a GSP Development Project for Addressing Critical Data Gaps which consists of developing a Data Gaps Plan, upgrading & incorporating existing wells into the monitoring network, installing new well(s) in critical locations, and stakeholder outreach. This work has kicked off in early 2021.

Remote Sensing Decision Support Tool: Using funding from the Proposition 68 SGM Grant Program Planning Grant, the GSAs will be developing a remote-sensing decision support tool that can be used to support basin management by quantifying net groundwater use within the Merced Subbasin. Remote-sensing technology will be used to estimate monthly crop evapotranspiration (ETc) at the field scale and combined with data on surface water use to estimate groundwater use.

Proposition 68 SGM Grant Program Implementation Grant: The Merced Subbasin submitted an application for the Proposition 68 SGM Grant Program Implementation Grant in January 2021 for two projects and has received an initial notice that DWR's draft funding recommendations include a fully funded award for this application. Final funding awards are anticipated to be released in April 2021. The "El Nido Conveyance System Improvements" project would provide conveyance improvements at four existing siphons/pipelines in MID's El Nido Conveyance System to

allow more surface water to be diverted from the Mariposa Creek to the El Nido area, an Underrepresented Community[5] suffering from declining groundwater levels and subsidence. The separate "LGAWD Intertie and Recharge Project" would create a new surface water supply by capturing and storing floodwaters that would otherwise be lost by constructing an approximately 2-mile canal to connect MID's Booster Lateral 3 to Dutchman Creek and construct a 10-acre groundwater recharge basin in Le Grand.

3.5.2 MercedWRM Update (Water Year 2020)

The MercedWRM was originally developed and calibrated to model historical groundwater storage from water years (WY) 1996-2015 and then updated with WY 2015-2019 data in the 2021 annual report. The model was updated for the current annual report to reflect more recent data. Data from WY 2020 were collected from the same public and private sources that had provided the historical data through WY 2019 used in the GSP and previous annual report. The historical water budget was extended through WY 2020, including an updated estimate of the change in groundwater storage reflecting the latest data.

The WY 2020 continuation of the historical water budget is intended to verify and further evaluate the aquifer system under a variety of hydrological and anthropogenic conditions. This update is particularly critical to the management of the aquifer system as it reflects the post WY 2013-2015 drought conditions and operations of the Subbasin. The full annual groundwater budget for WY 1996-2020 is shown earlier in Figure 2-6.

Data Sources

Data were requested and received from the following entities in the Subbasin to complete the MercedWRM update:

Agricultural and Environmental Water Purveyors

- Merced Irrigation District
- Stevinson Water District
- Merquin County Water District
- Turner Island Water District
- Lone Tree Mutual Water Company
- Merced National Wildlife Refuge

Municipal Water Purveyors

- City of Merced
- City of Atwater
- City of Livingston
- Le Grand Community Services District
- Planada Community Services District
- Winton Water and Sanitary District
- American Water, Meadowbrook

[5] Underrepresented Communities are defined by the SGM Grant Program as a DAC, SDAC, or EDA; Tribal Lands/Tribes; California Communities Environmental Health Screening Tool Classified DACs (EnvDACs); and Fringe Communities.

Additional publicly-available data were downloaded to complete the MercedWRM update:

State

- DWR Sustainable Groundwater Management Act (SGMA) Data Viewer
- DWR California Data Exchange Center (CDEC)

Federal

- United States Department of Agriculture, Natural Resources Conservation Service, National Agricultural Statistics Service (NRCS): CropScape
- United States Geological Survey (USGS) National Water Information System
- United States Census

Other

- Precipitation-Elevation Regressions on Independent Slopes Model (PRISM) Climate Group, Oregon State University

Updated Components

The above data sources provided the necessary data to ensure the historical model run reflects the most recent conditions. The following components of the model were updated for the annual report.

Surface Water Diversions and Deliveries: Monthly surface water diversions and deliveries were provided for October 2019 through September 2020 by Merced Irrigation District, Turner Island Water District, Stevinson Water District, Merquin County Water District, and Lone Tree Mutual Water Company. MID deliveries were aggregated at the subregional level for both in- and out-of-district sales, whereas the other water agencies were summarized within their boundaries.

Groundwater Pumping: Groundwater extractions from October 2019 to September 2020 were provided by all agricultural and municipal entities listed in Section 2.2. Agency pumping by MID and TIWD were simulated using measured data at each production well whereas other agencies have pumping aggregated evenly across their institutional boundaries based on aggregate reported data. Pumping estimates were made for private agriculture and domestic wells based on land use type and population.

Population: The City of Merced, City of Atwater, and City of Livingston populations were updated based on data publicly available from the US Census online database. Rural populations were extracted from the US Census 2019 American Community Survey, which provides 5-year estimates for each census tract. These populations were spatially assigned throughout the model by land use data.

Land Use: Each element within the MercedWRM is comprised of some fraction of 14 land uses, including 11 agricultural crop categories, native vegetation, riparian vegetation, and urban. For the 2020 update, the model utilizes annual data for each year based on the NRCS CropScape program which provides data throughout the model domain on a gridded resolution of 30 meters.

Precipitation: Monthly precipitation into the Subbasin and its watersheds was derived on a four-kilometer grid using the Precipitation-Elevation Regressions on Independent Slopes Model (PRISM) dataset available online from Oregon State University through a partnership the NRCS National Water and Climate Center.

Streamflow: Monthly inflow to the Merced Subbasin was downloaded for the San Joaquin River from the USGS and from CDEC for Merced River, Bear Creek, Owens Creek, and Mariposa Creek. Non-gauged tributaries into the

Subbasin were estimated internally by the model using the Integrated Water Flow Model (IWFM) small-watershed package.

Boundary Conditions: Groundwater elevation contours were downloaded from DWR's SGMA Data Viewer for the fall 2019 and spring 2020 and used to update the assumed groundwater elevation boundary conditions in the model. As groundwater level contours are only available in semiannual intervals, intermediary months were estimated though linear interpolation.

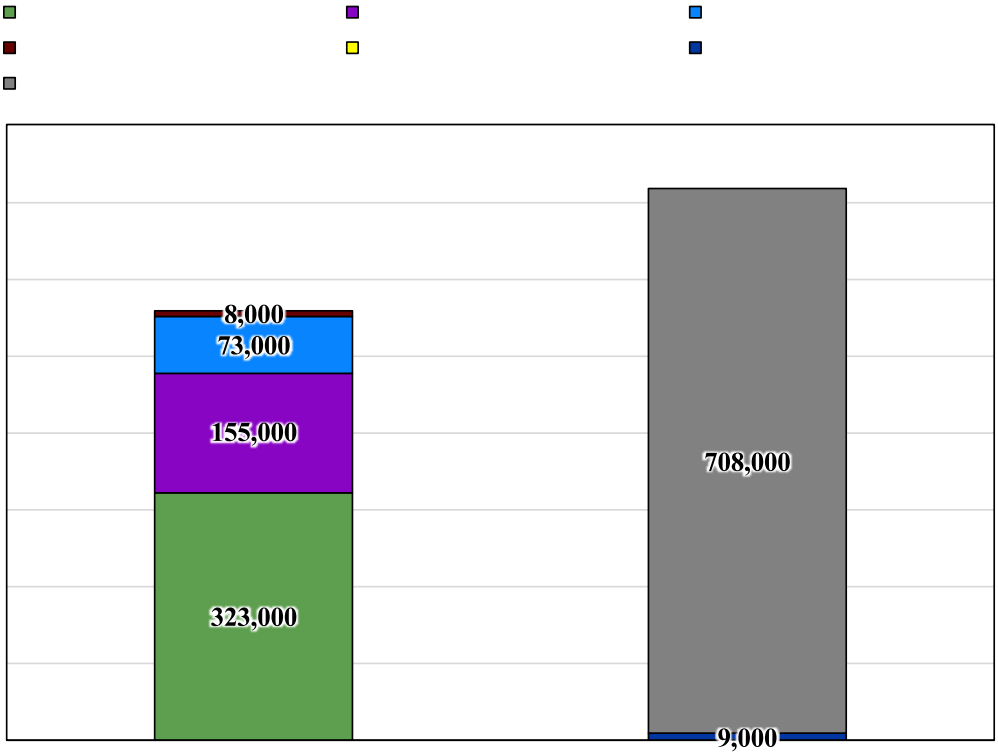
Canal Recharge: The MercedWRM estimates MID canal recharge based on historical monthly diversions and the water year index. An in-depth analysis of MID operations and surficial water budgets will be developed as part of MID's 2020 Agricultural Water Management Plan (AWMP) which is due to DWR by April 1, 2021, at which point the MercedWRM may be updated with further refined datasets. SWD and TIWD have also estimated seepage from unlined canals due to their conveyance of developed supply as described in the GSP Section 6.2.

Interbasin Flows: The MercedWRM simulates groundwater flow between the Merced Subbasin and the neighboring subbasins to the north (Turlock), west (Delta-Mendota) and south (Chowchilla). The rate and direction of this interbasin subsurface flow depends on the groundwater operations and levels during the historical and projected periods on both sides of the boundary. The MercedWRM has been calibrated using limited available for areas in the vicinity of the boundaries in neighboring subbasins. During the development of the Merced Subbasin GSP, there was no information on the projected conditions from the neighboring subbasins. Modeling for the Merced GSP shows net flows from the Merced Subbasin to the Turlock Subbasin. Since the neighboring subbasins have either completed their GSP or are in the process of completing their GSP by January 31, 2022, it is expected that additional data and/or assumptions on the groundwater operations would be available from the neighboring subbasins for future updates of the model and assessments of the Merced Subbasin sustainability conditions. Interbasin coordination meetings have been held with all three surrounding subbasins and coordination agreements have been put in place with the Turlock and Chowchilla Subbasins to facilitate such exchange of data and information.

Results

Evaluation of the 2020 water year (Figure 3-1) shows that the Merced Subbasin experienced net 560,000 AF of inflows and 716,000 AF of outflow. Deep percolation from rainfall and irrigation applied water (323,000 AFY) is the largest contributor of groundwater inflow, followed by net-recharge from the stream and canal systems (228,000 AFY), and net-subsurface inflows from local subbasins and the Sierra Nevada foothills (8,000 AFY). On average, groundwater production (708,000 AFY) accounts for the greatest outflow from the Merced Subbasin, followed by outflow to the root-zone (8,800 AFY).

Figure 3-1: Annual Estimated Groundwater Budget 2020, Merced Subbasin



3.6 Activities Anticipated for the Coming Year

The Merced GSAs intend to continue activities necessary to implement the GSP and put the basin on a path toward sustainable management. COVID-19 created some challenges and delays in 2020, particularly related to conducting coordination and stakeholder outreach meetings. The GSAs have now pivoted to virtual Coordination Committee meetings and in early 2021 conducted a solicitation process to re-establish a Stakeholder Advisory Committee focused on GSP implementation. Key efforts anticipated in 2021 include developing the Data Gaps Plan, incorporating additional wells into the monitoring network, transitioning from biannual to monthly monitoring, developing the Remote-Sensing Decision Support Tool, and making progress on a plan for pumping reductions and a water allocation framework.

4. REFERENCES

DWR. (2021a). *Chronological Reconstructed Sacramento and San Joaquin Valley Water Year Hydrologic Classifications Indices.* Retrieved February 2021, from http://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST

DWR. (2021b). *Water Supply Index (WSI) Forecasts: 2020 Water Year Hydrologic Classification Indicies.* Retrieved February 2021, from http://cdec.water.ca.gov/reportapp/javareports?name=WSI

ESJWQC. (2018, February). Groundwater Quality Trend Monitoring Workplan: Phase III. *Specific Network Wells*. East San Joaquin Water Quality Coalition. Retrieved from https://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/water_quality/coalitions_submittals/east_sanjoaquin/ground_water/2018_0302_esj_gqtmp_ph3.pdf

ESJWQC. (2020). *Annual Groundwater Quality Trend Monitoring Report.*

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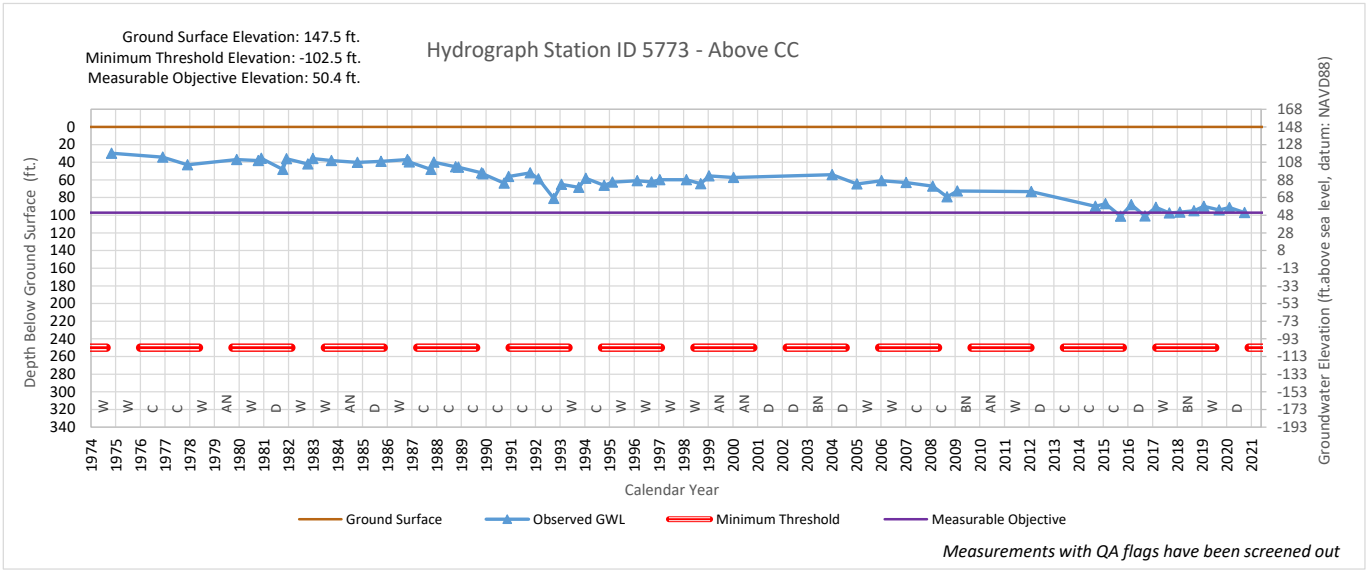
APPENDIX A: HYDROGRAPHS



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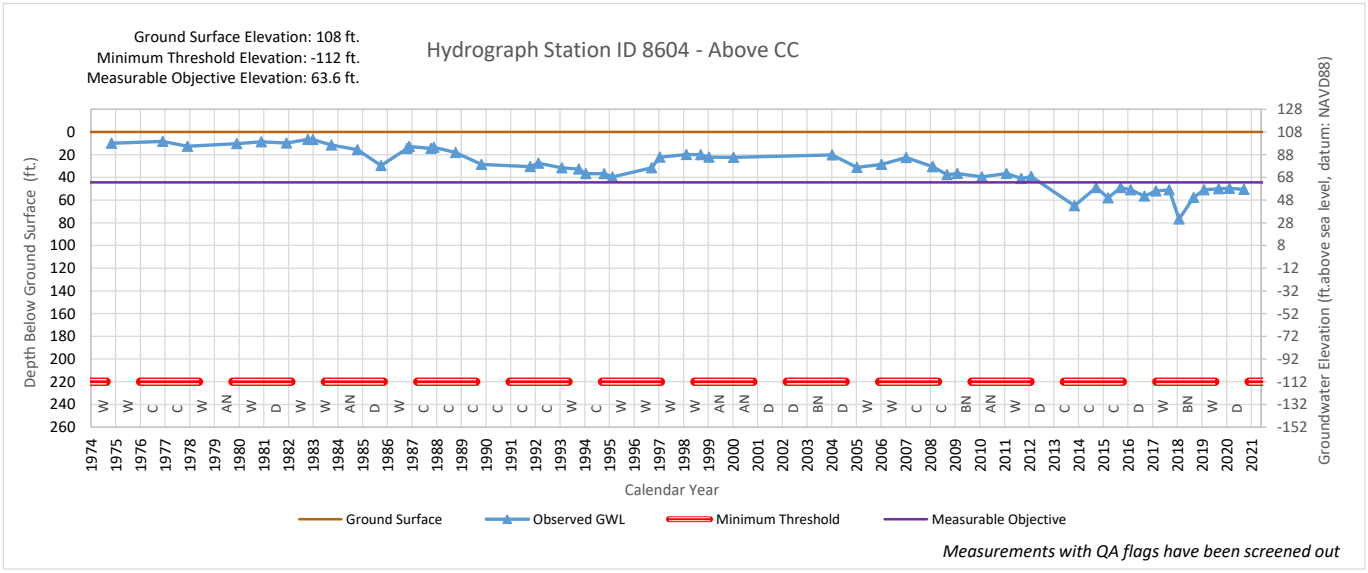
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Ground Surface
Observed GWL
Minimum Threshold
Measurable Objective
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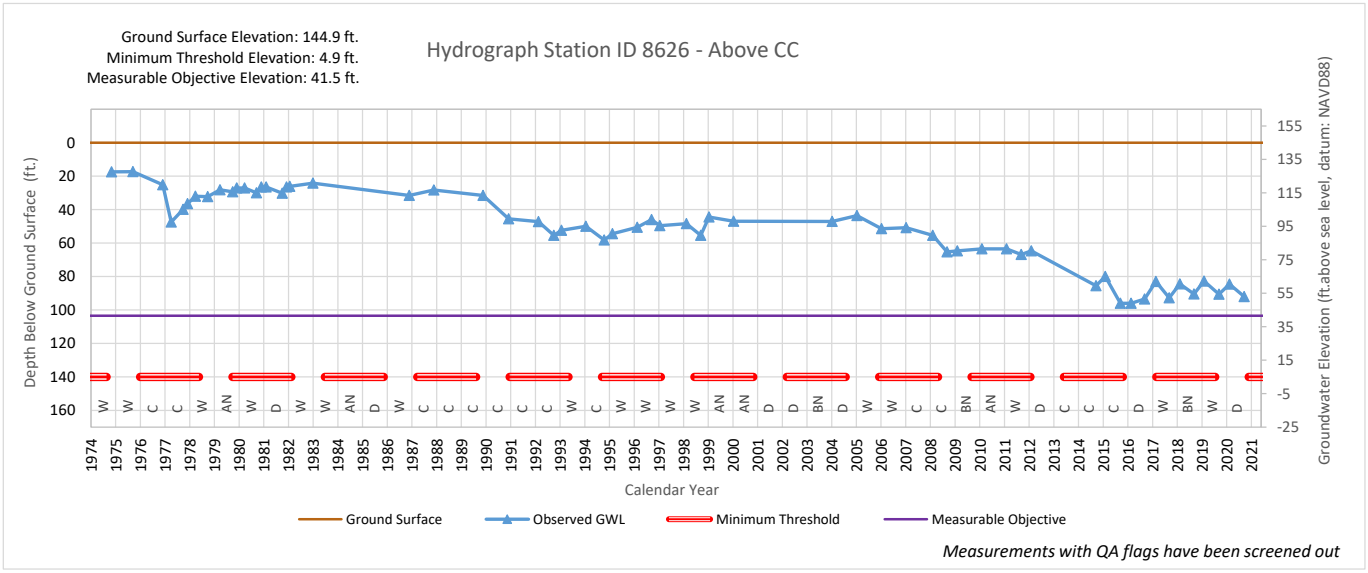
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Groundwater Elevation (ft:above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Minimum Threshold
Measurable Objective
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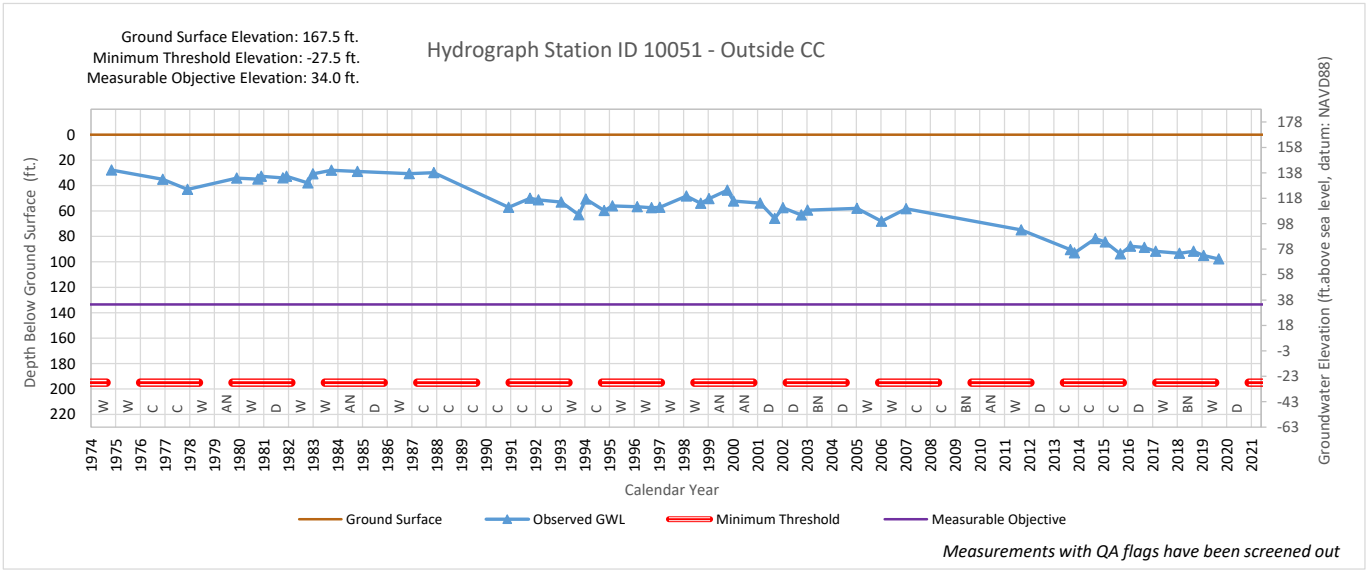
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Ground Surface
Observed GWL
Minimum Threshold
Measurable Objective
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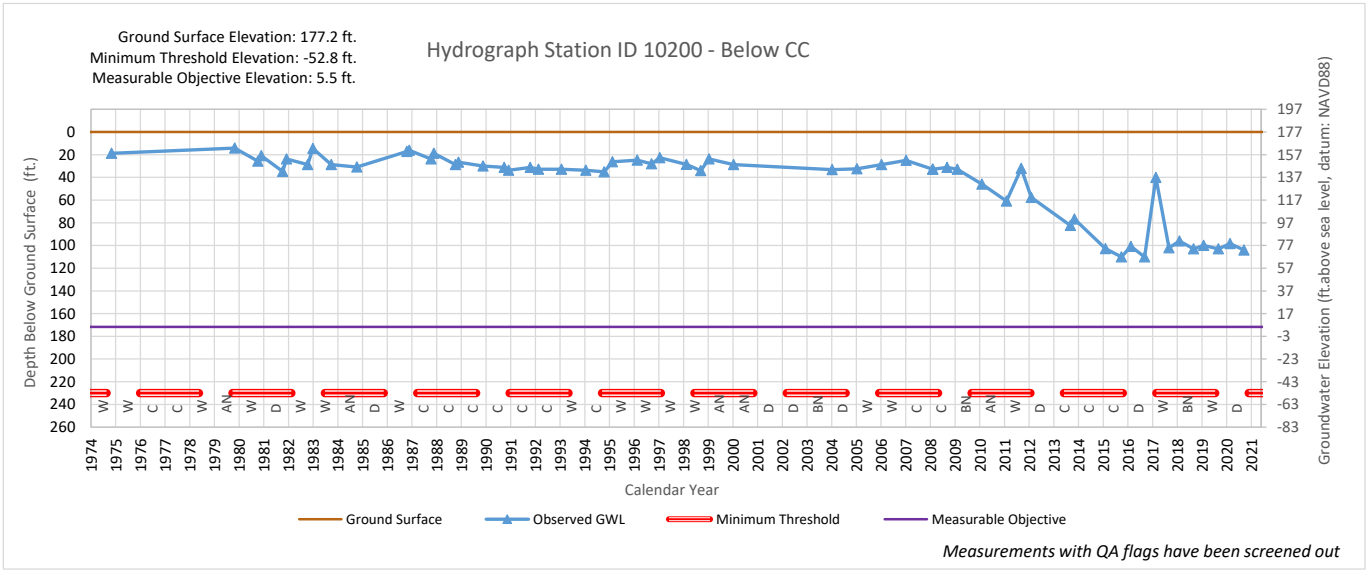
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Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Minimum Threshold
Measurable Objective
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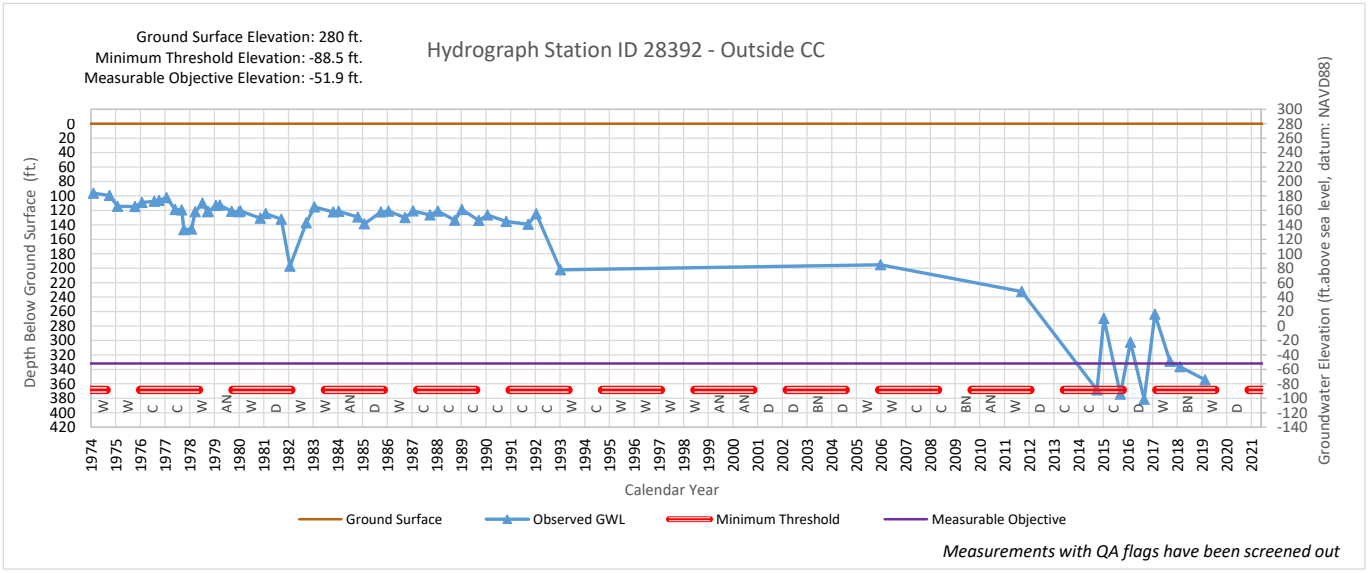

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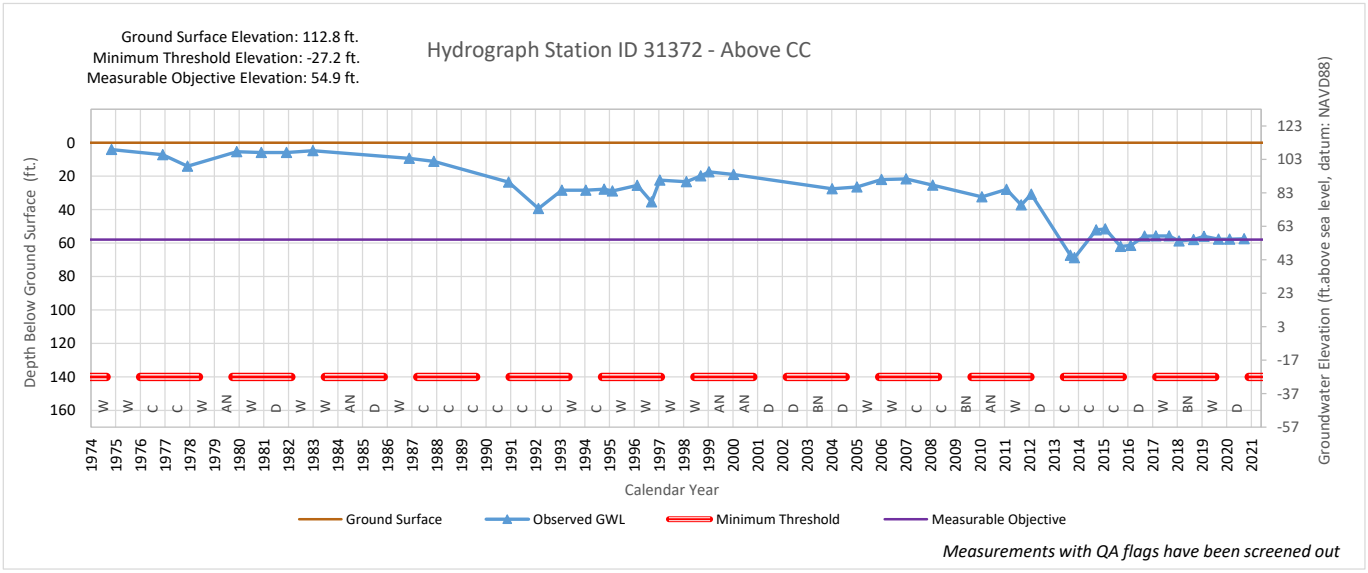

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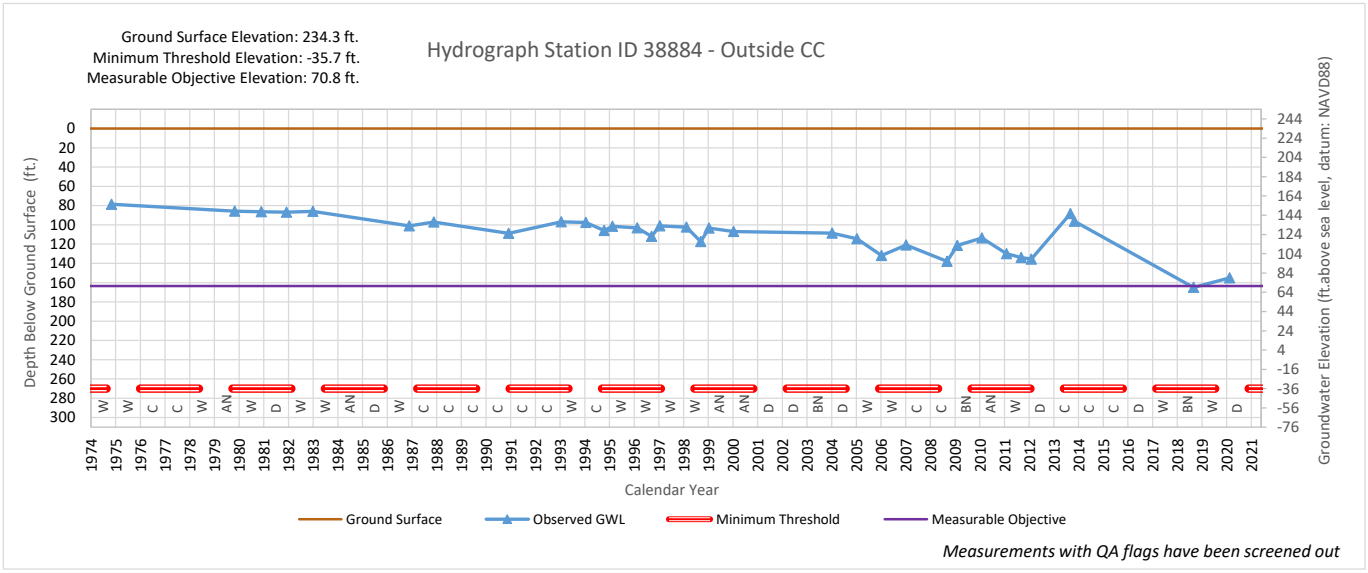
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Groundwater Elevation (ft:above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Minimum Threshold
Measurable Objective
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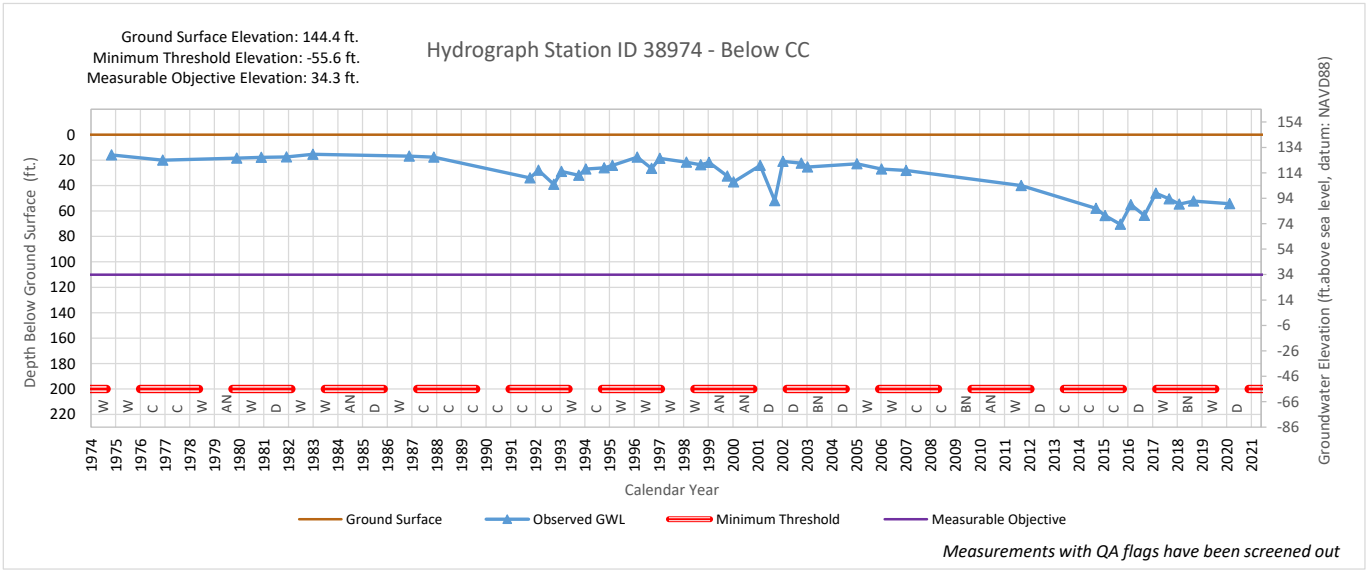
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Calendar Year
Ground Surface
Observed GWL
Minimum Threshold
Measurable Objective
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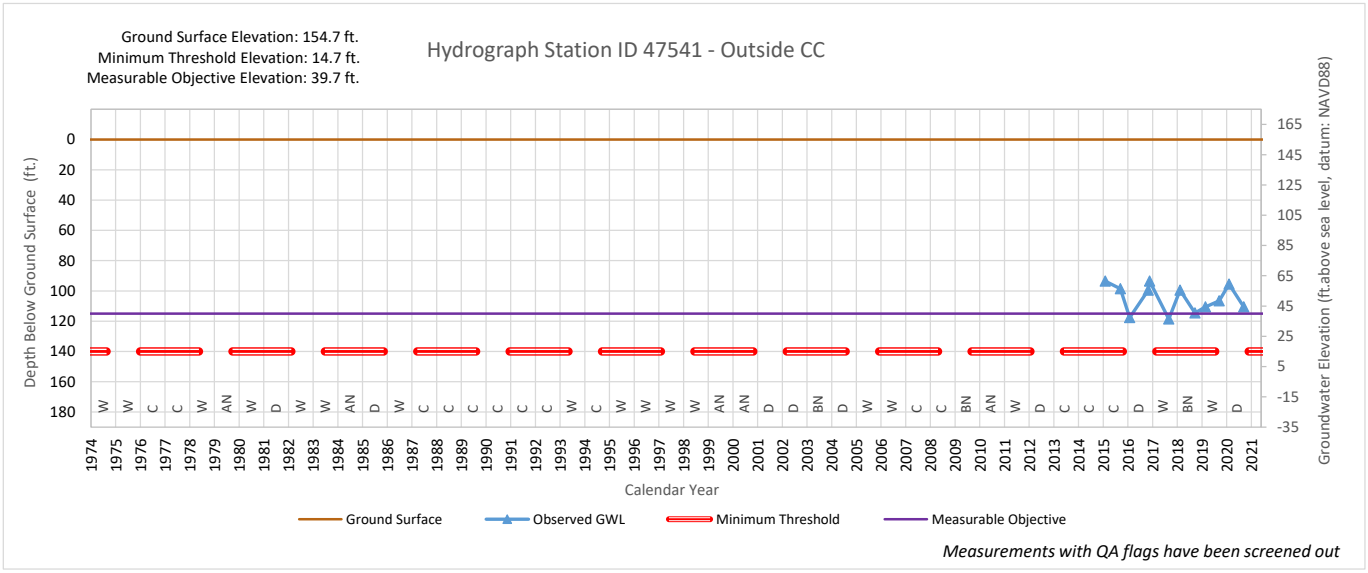
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Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Minimum Threshold
Measurable Objective
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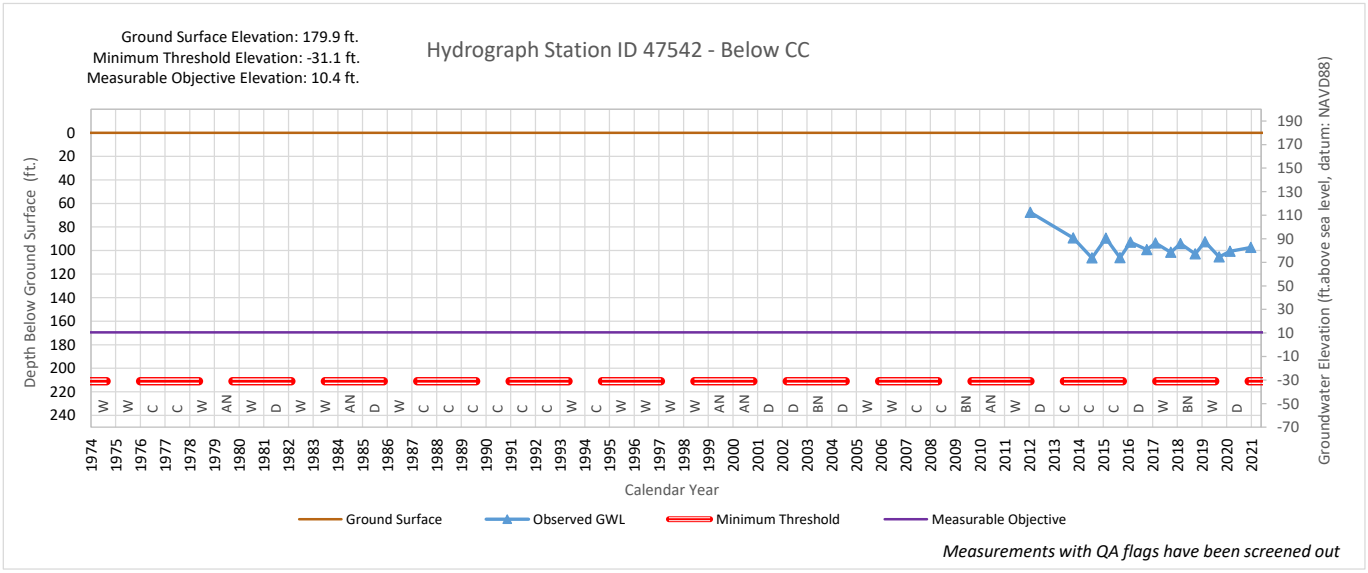
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Calendar Year
Ground Surface
Observed GWL
Minimum Threshold
Measurable Objective
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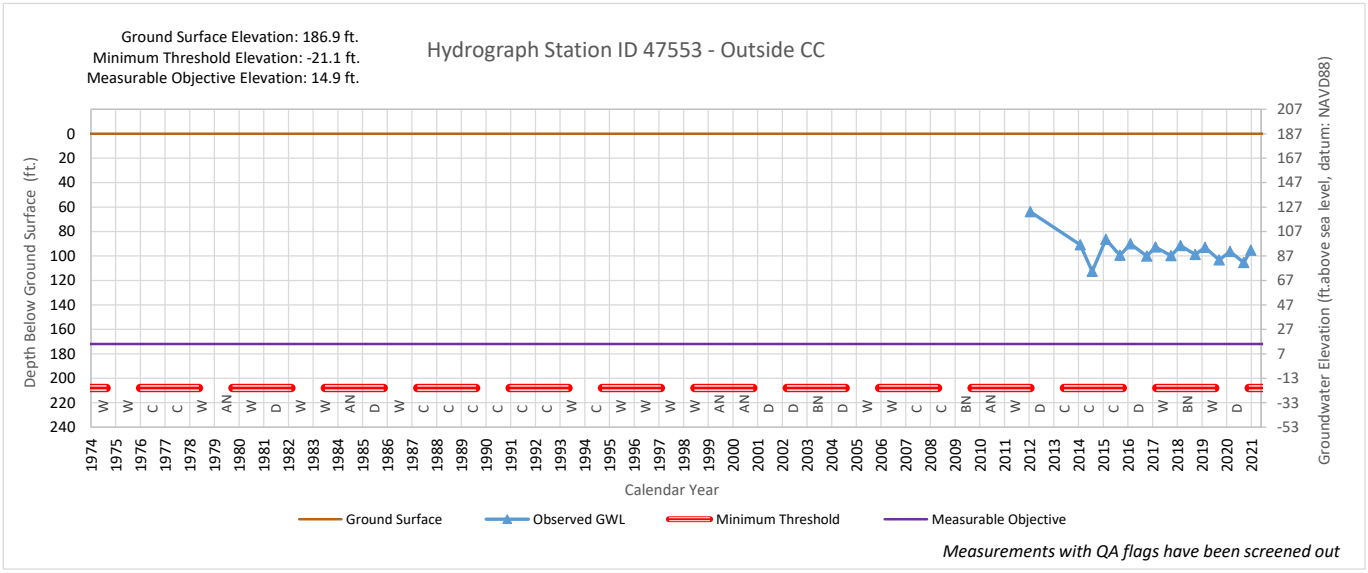
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Calendar Year
Ground Surface
Observed GWL
Minimum Threshold
Measurable Objective
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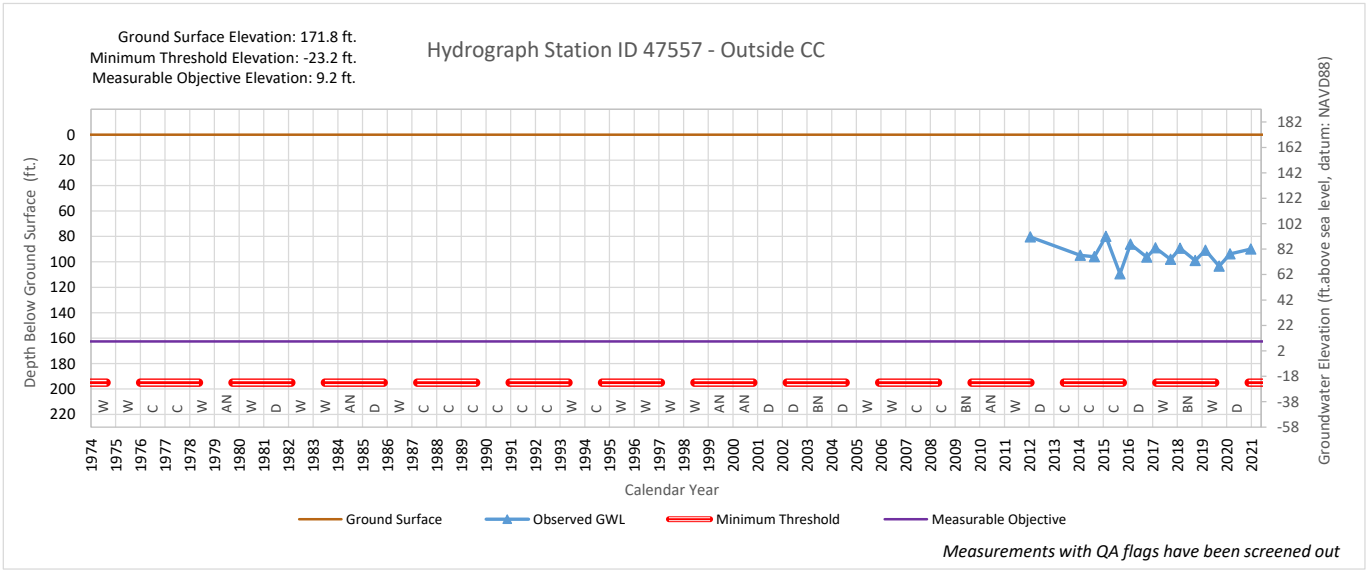
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Calendar Year
Ground Surface
Observed GWL
Minimum Threshold
Measurable Objective
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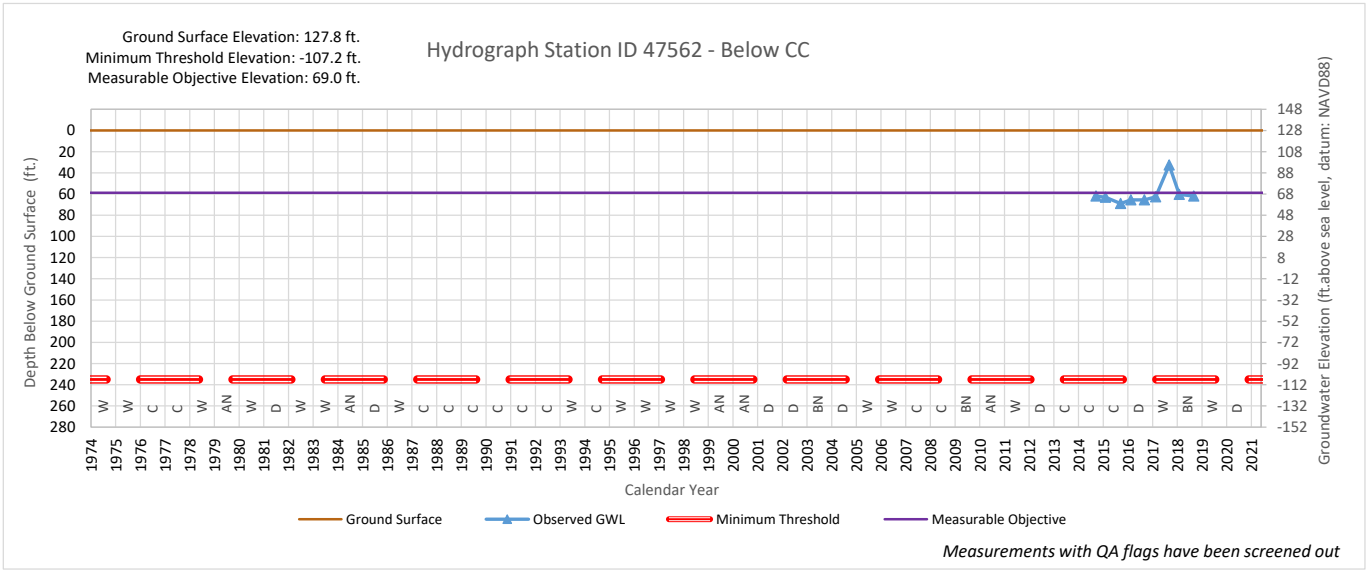
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Calendar Year
Ground Surface
Observed GWL
Minimum Threshold
Measurable Objective
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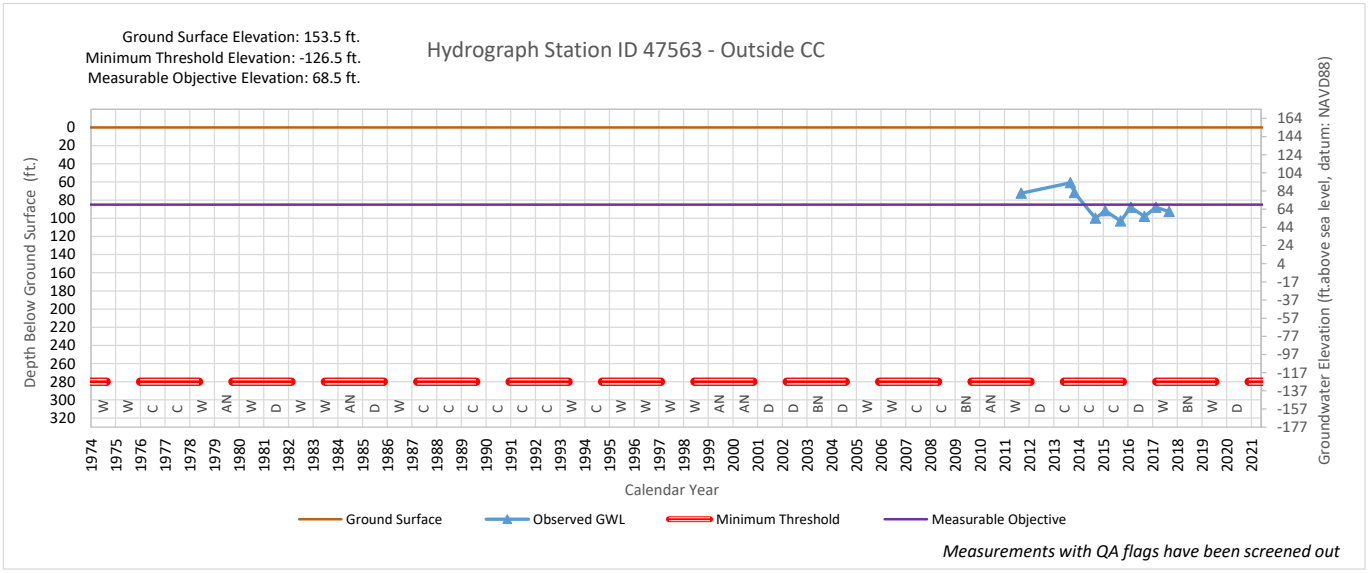
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Calendar Year
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Minimum Threshold
Measurable Objective
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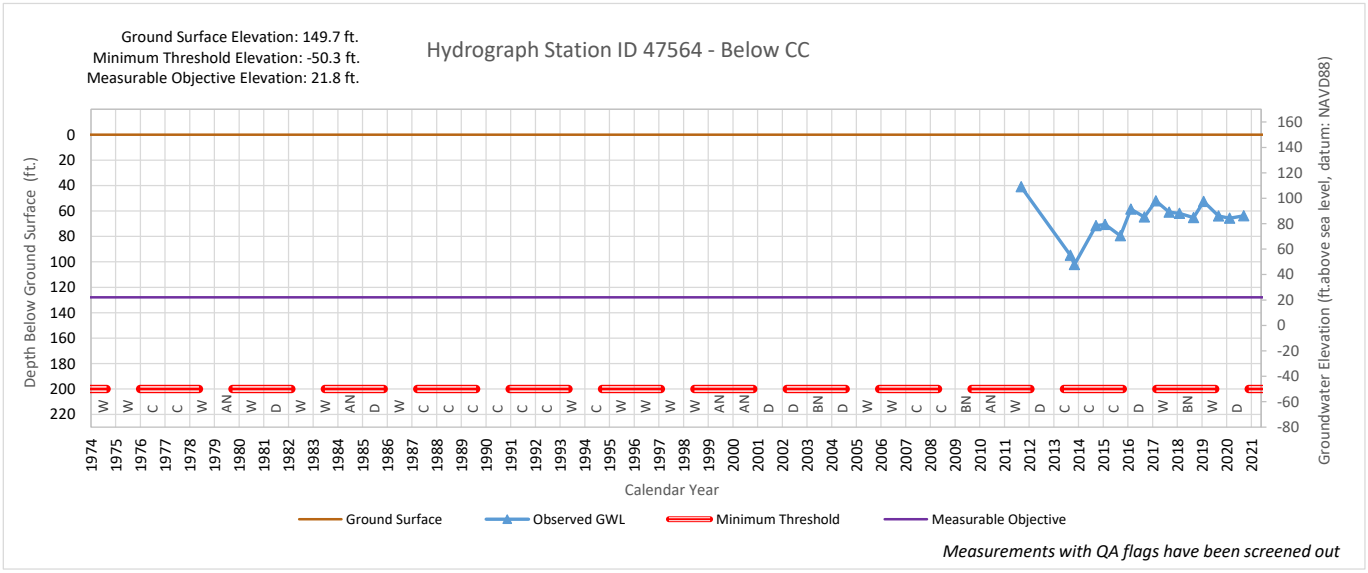
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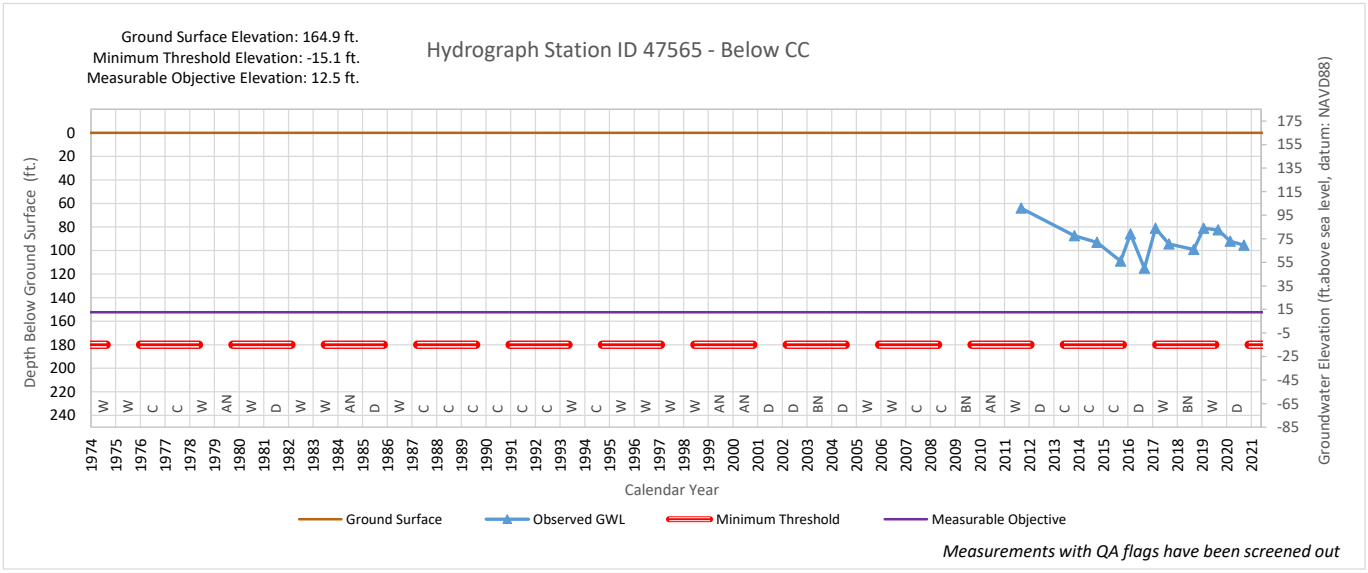
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Calendar Year
Ground Surface
Observed GWL
Minimum Threshold
Measurable Objective
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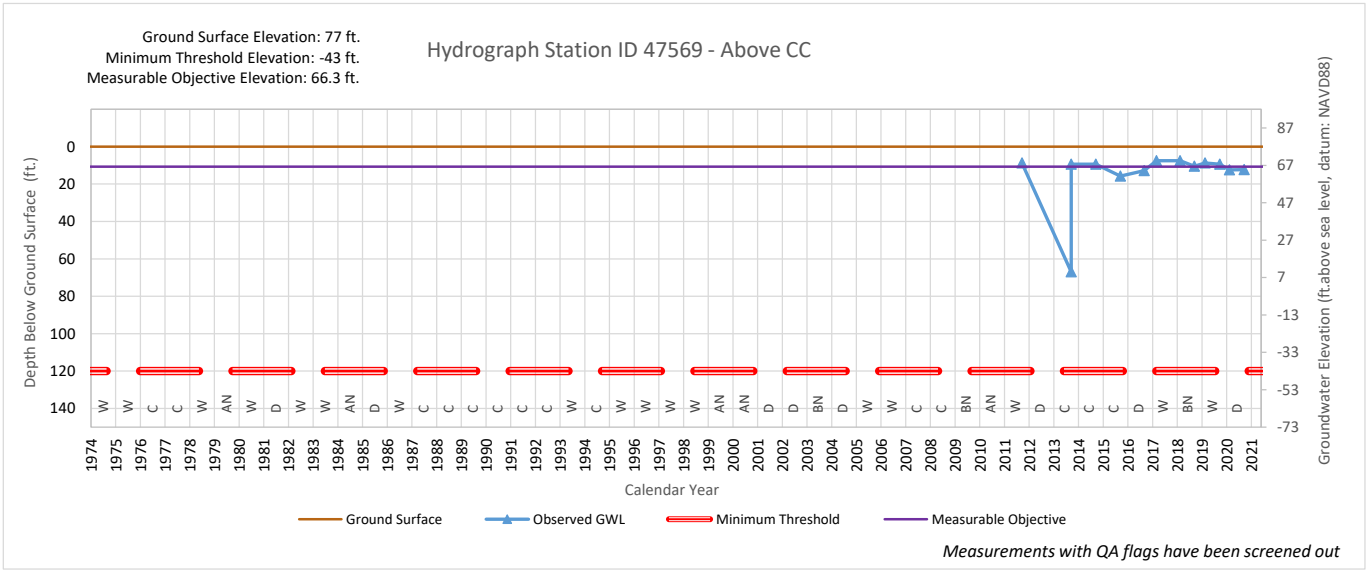
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Observed GWL
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Measurable Objective
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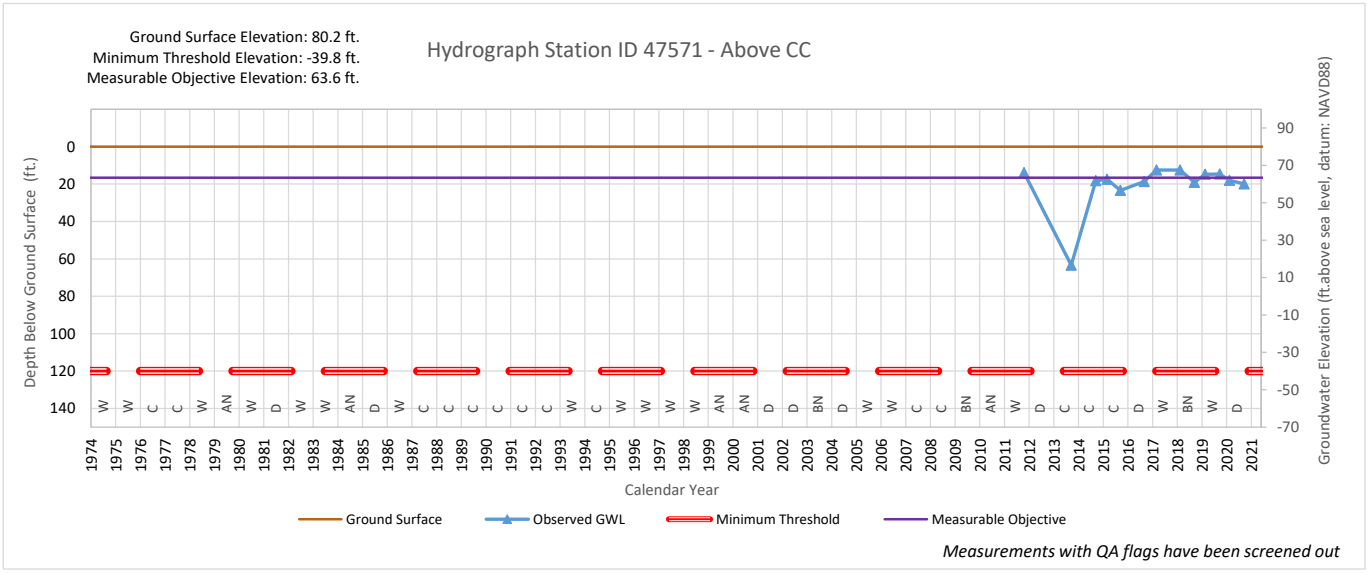
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Ground Surface
Observed GWL
Minimum Threshold
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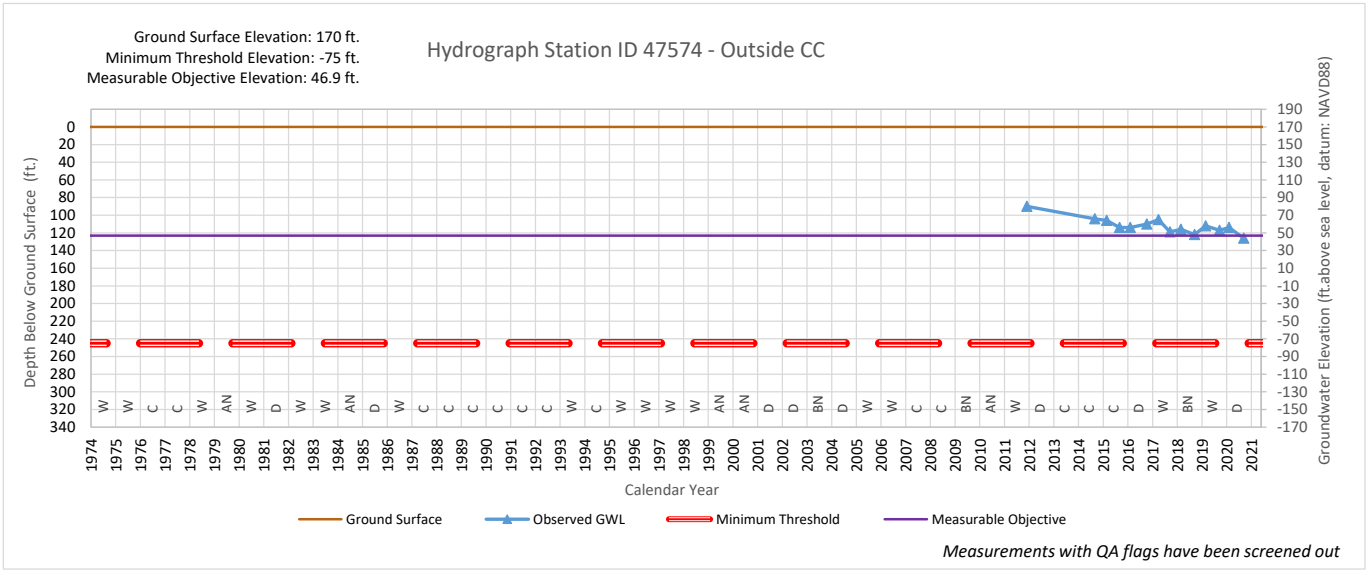
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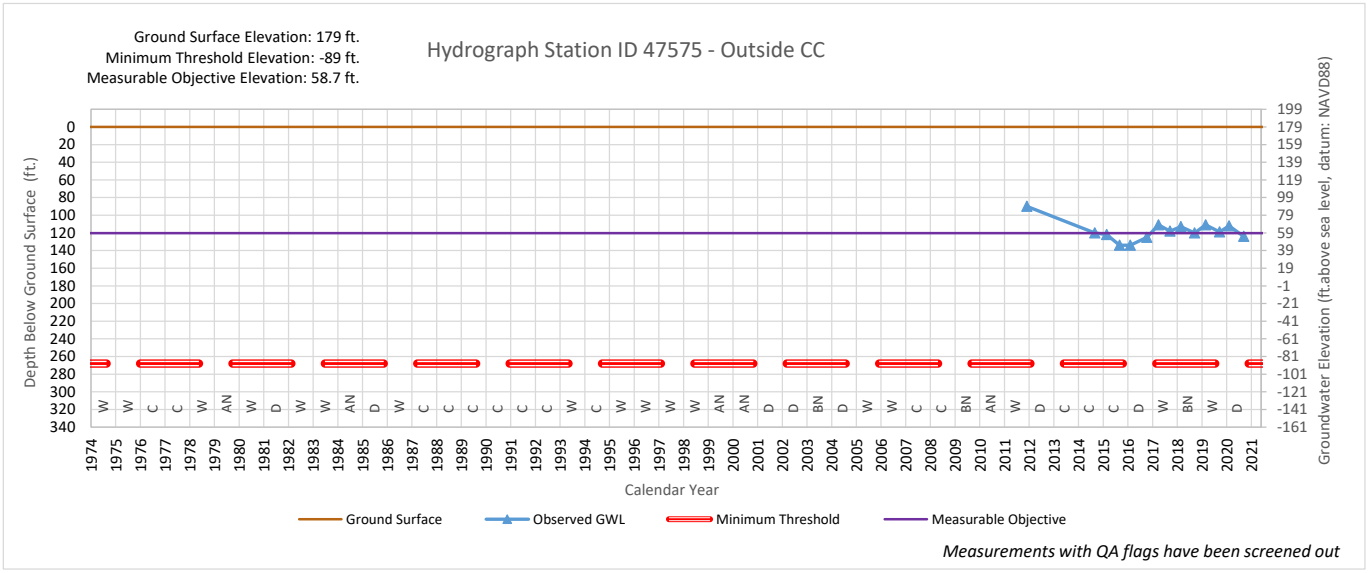

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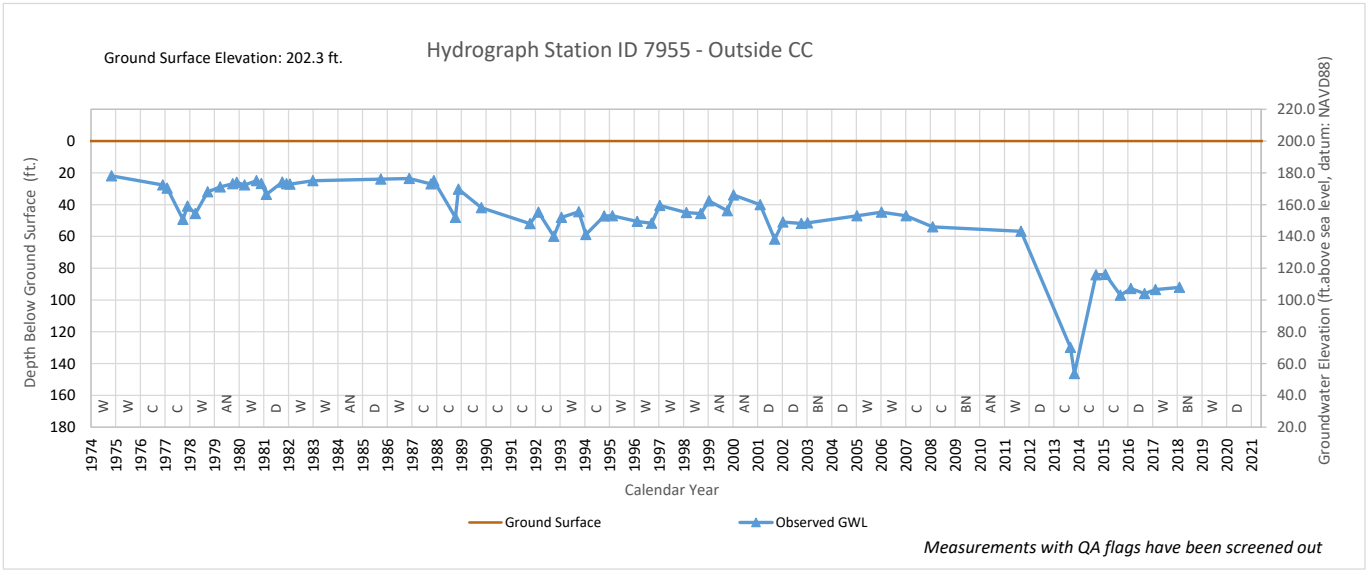
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Calendar Year
Ground Surface
Observed GWL
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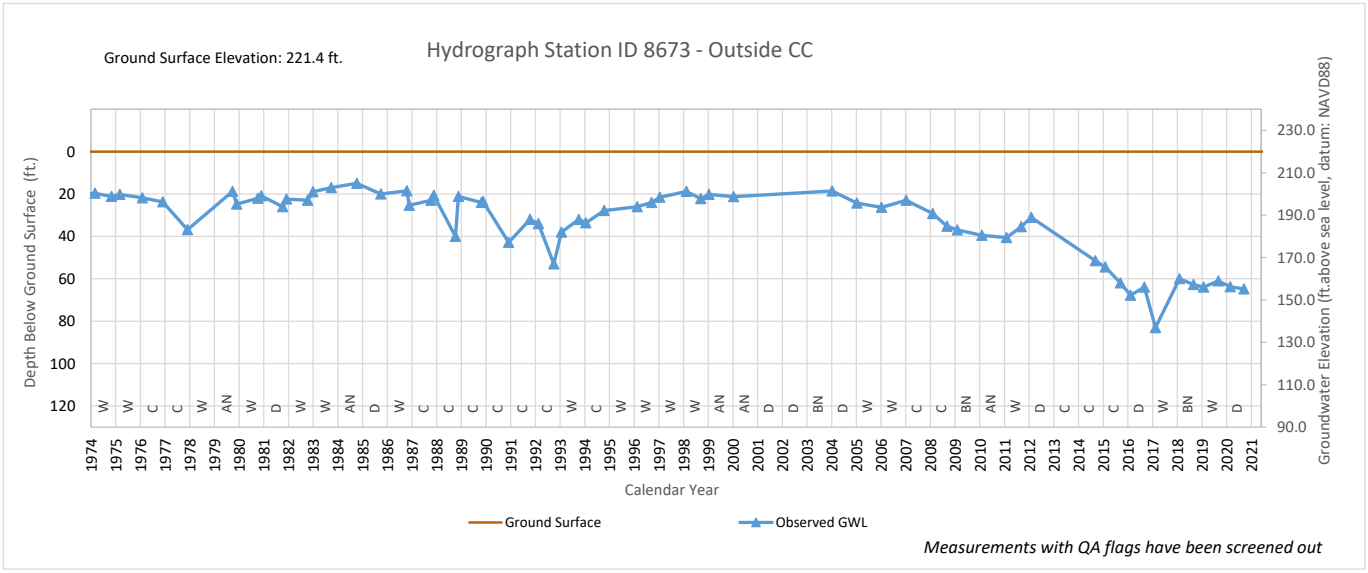
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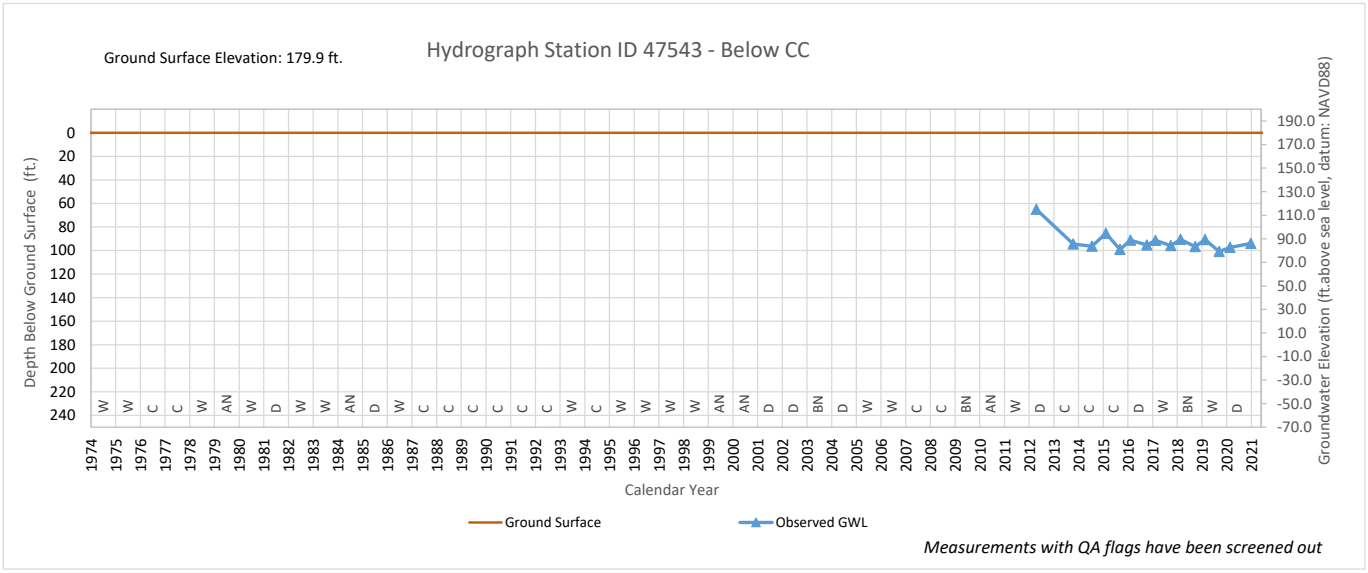
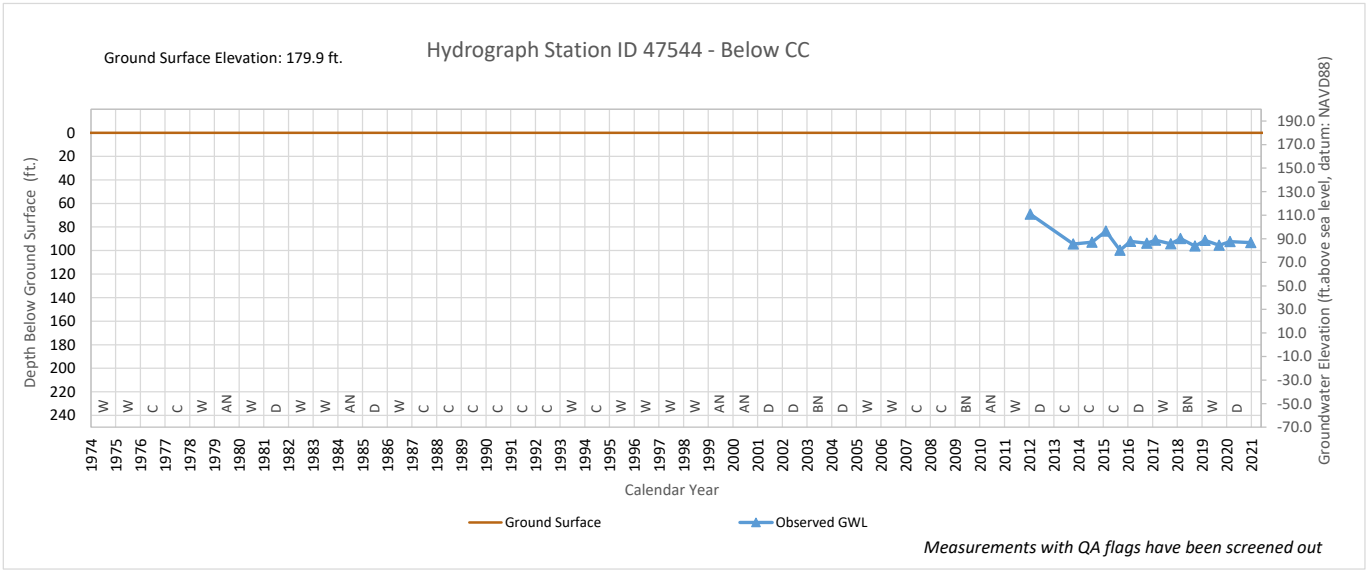
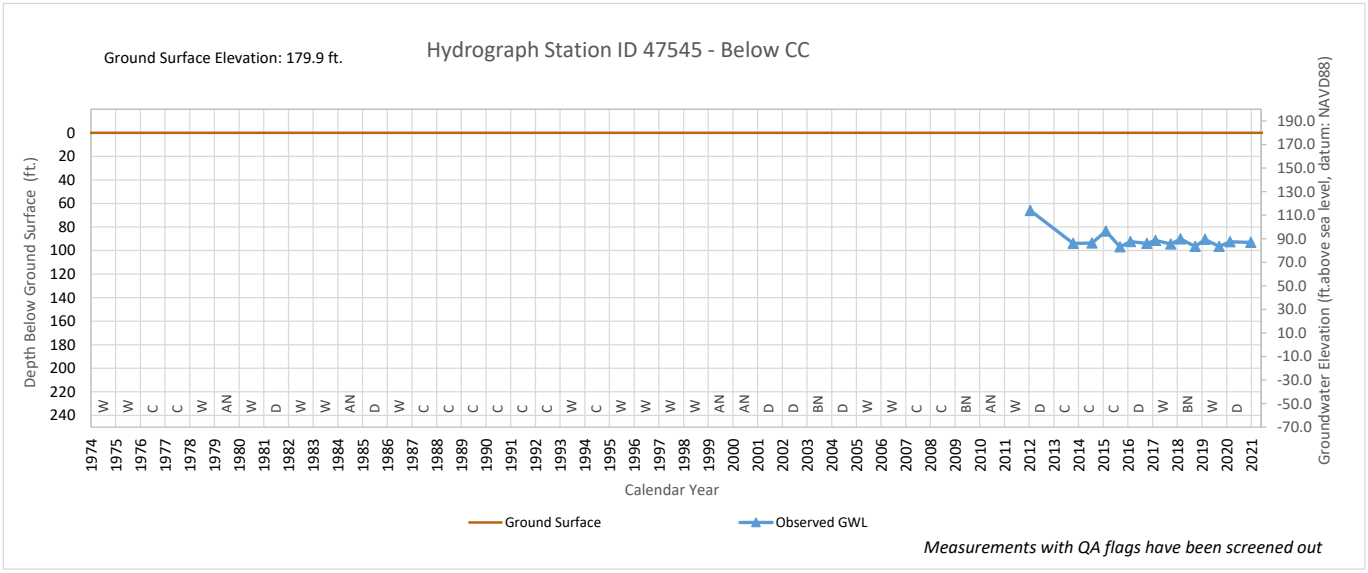
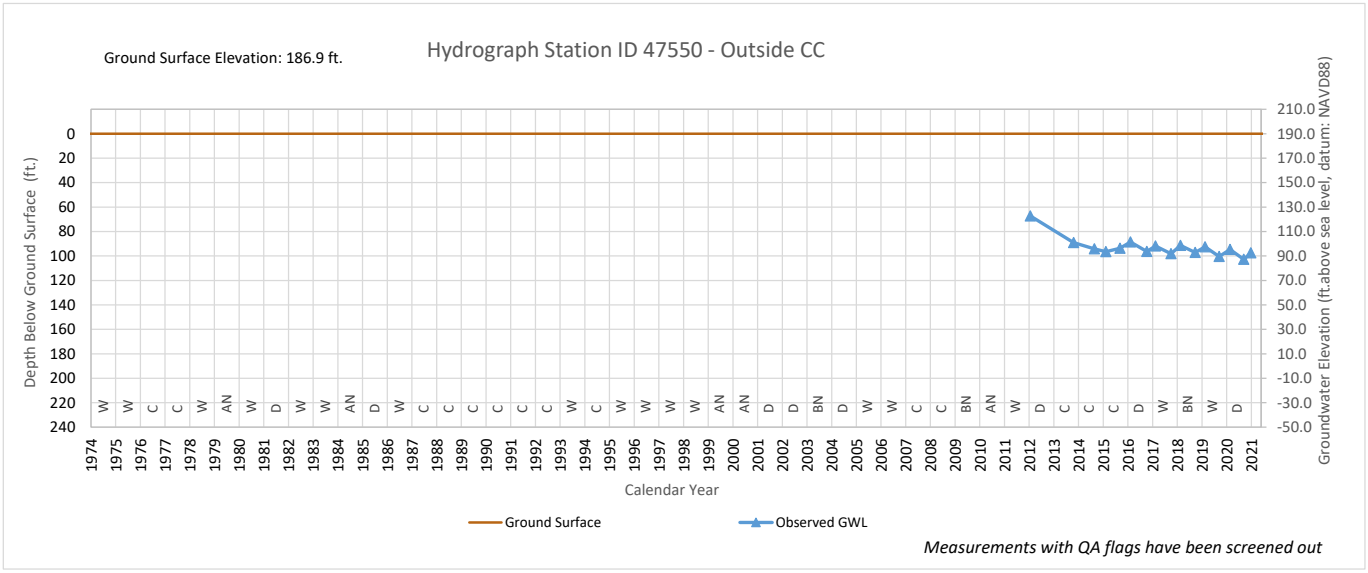
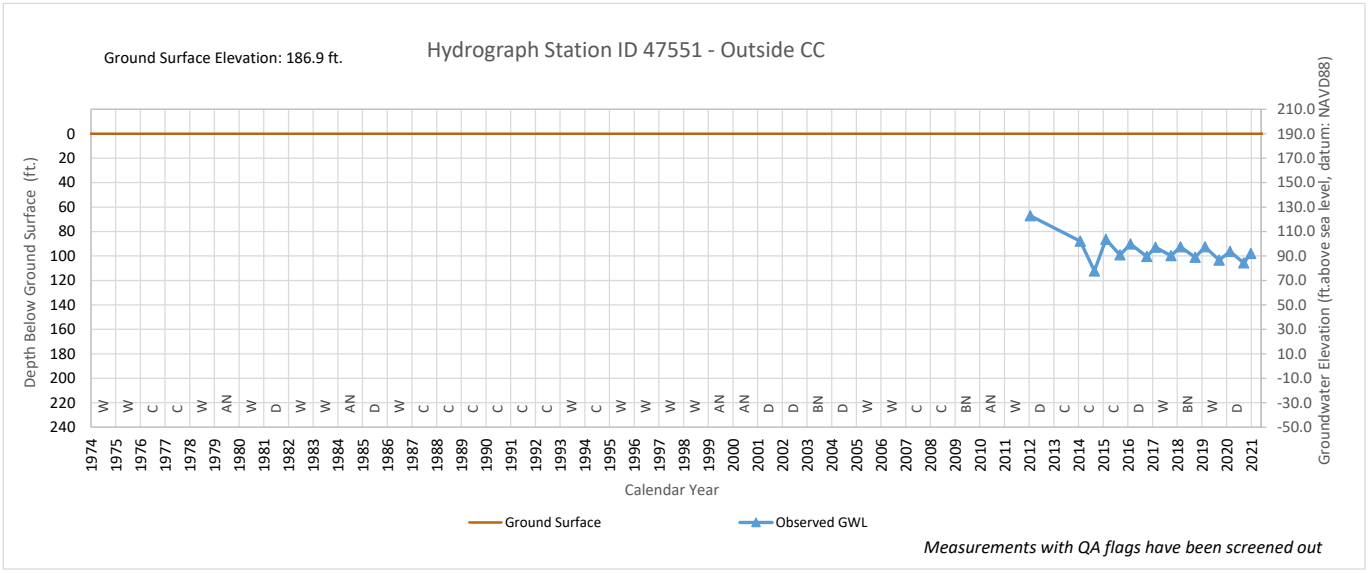
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

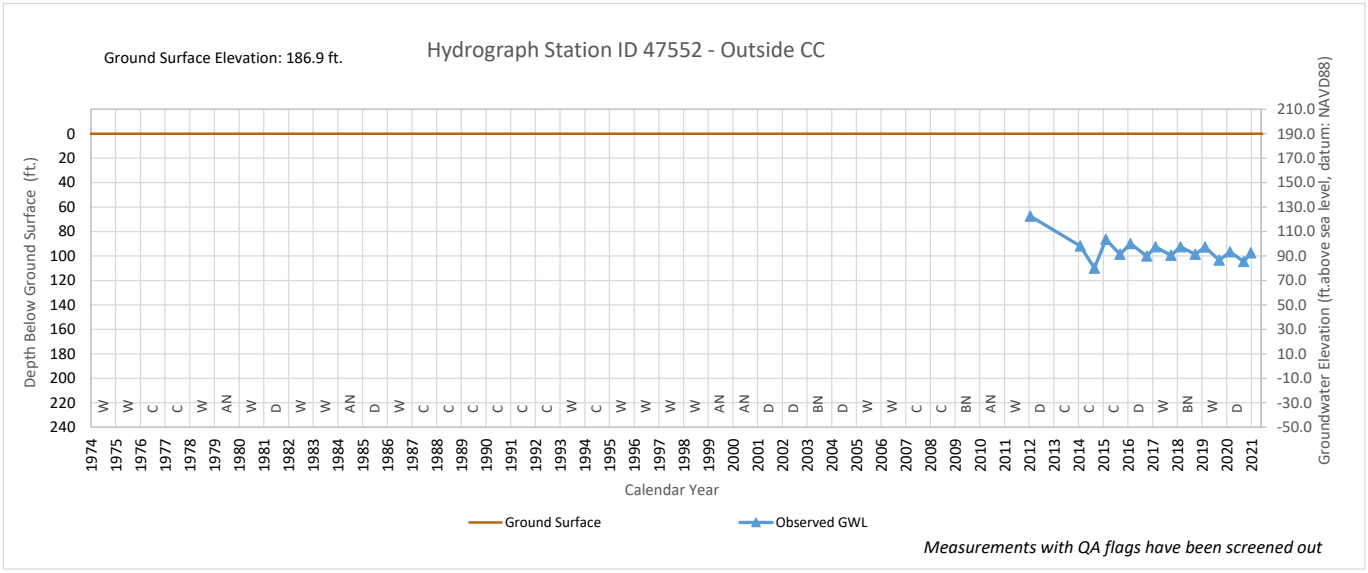

Ground Surface Elevation: 179.9 ft.
Hydrograph Station ID 47543 - Below CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft:above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

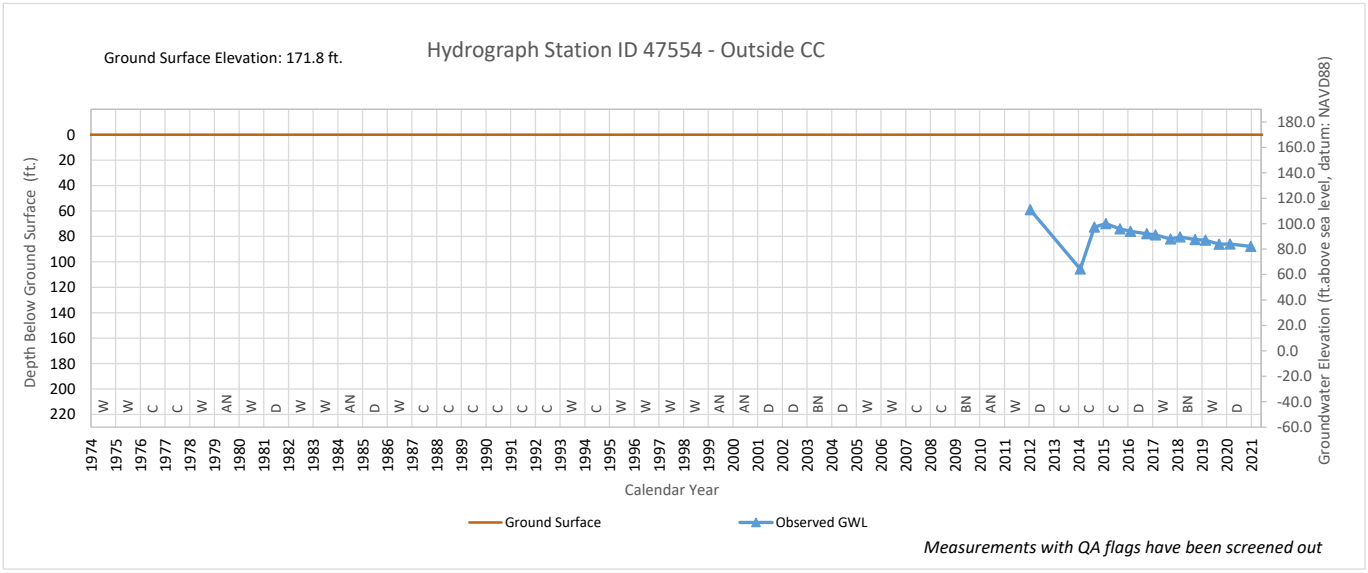

Ground Surface Elevation: 179.9 ft.
Hydrograph Station ID 47544 - Below CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft:above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

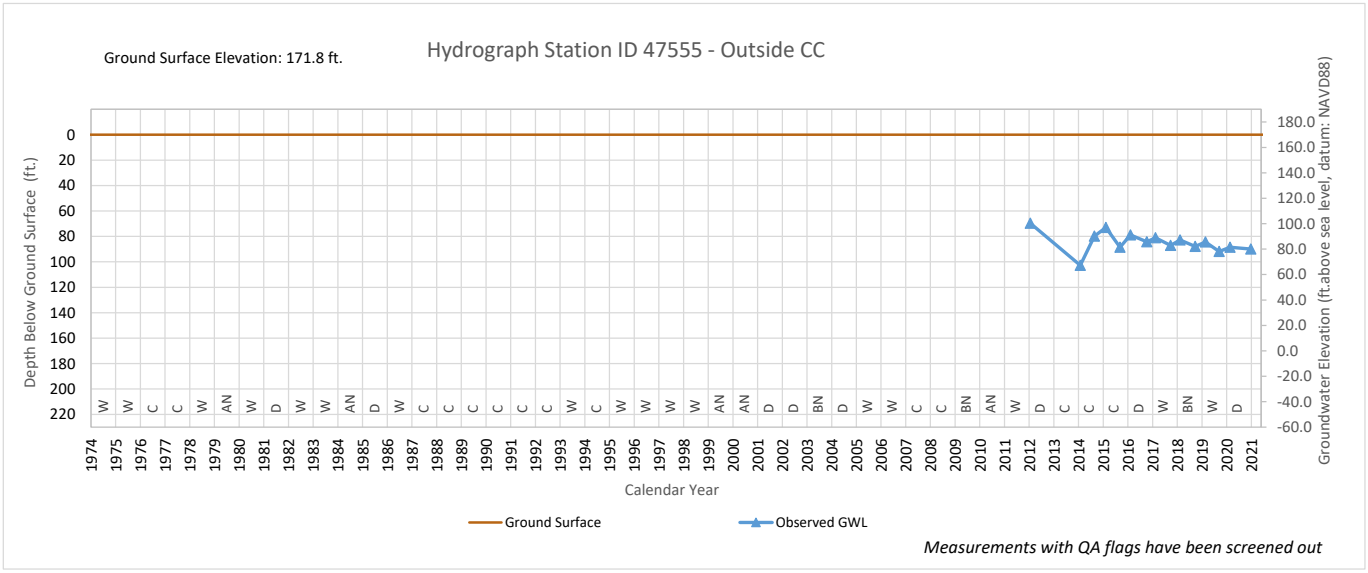

Ground Surface Elevation: 179.9 ft.
Hydrograph Station ID 47545 - Below CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft:above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

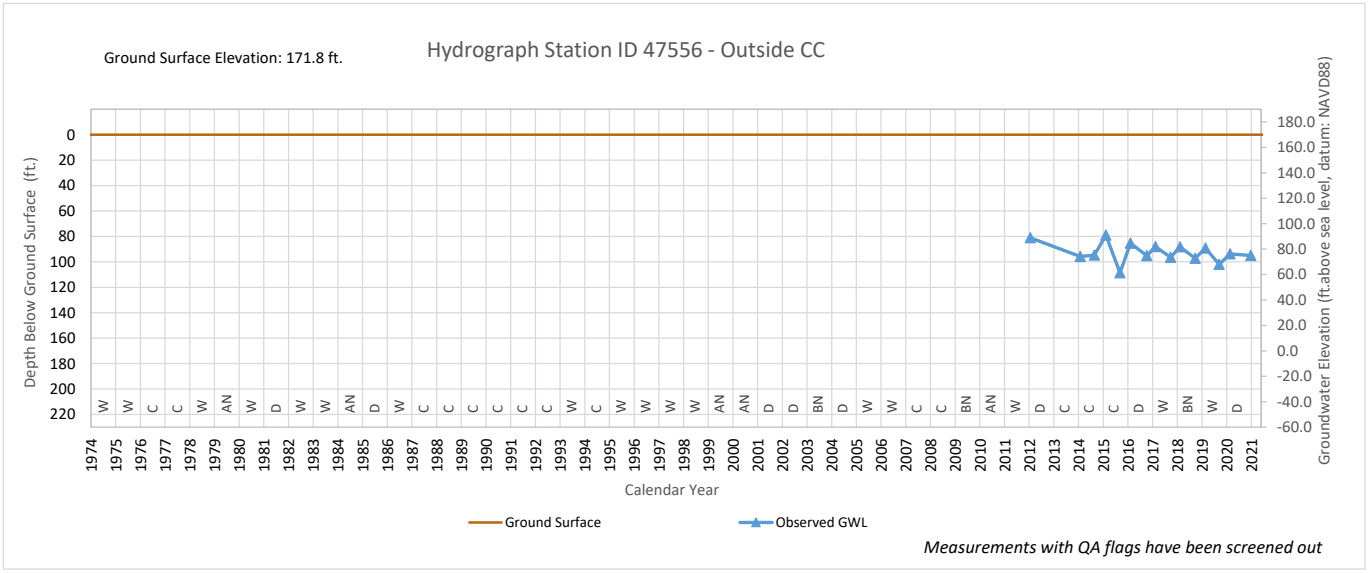

Ground Surface Elevation: 186.9 ft.
Hydrograph Station ID 47550 - Outside CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

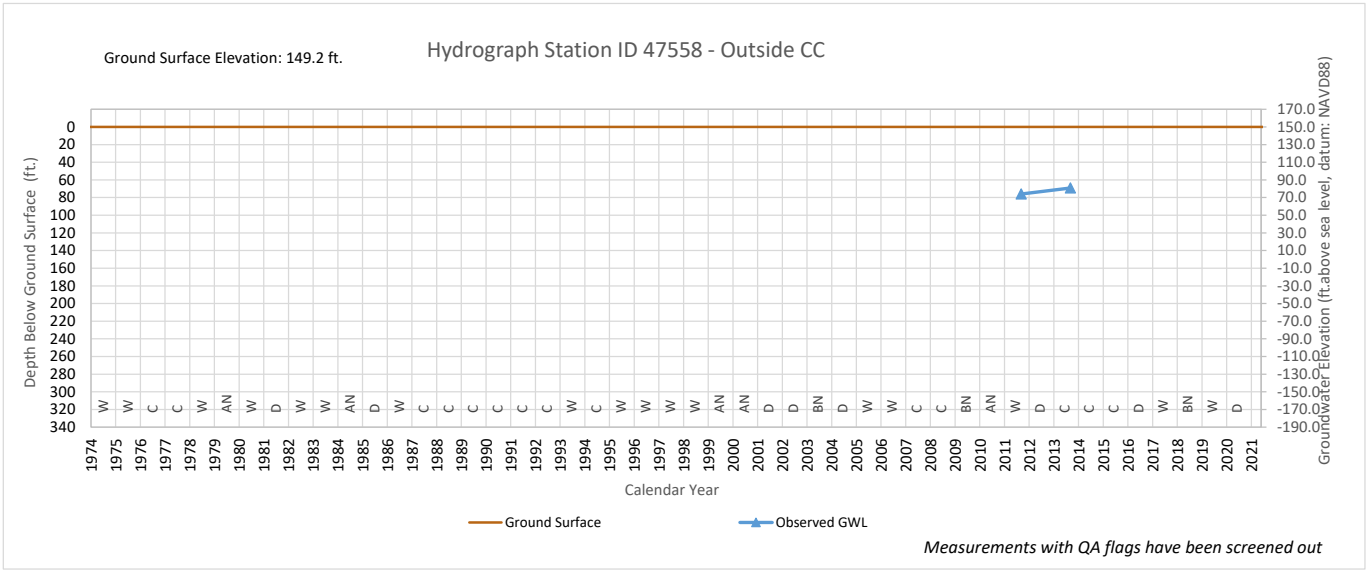

Ground Surface Elevation: 186.9 ft.
Hydrograph Station ID 47551 - Outside CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

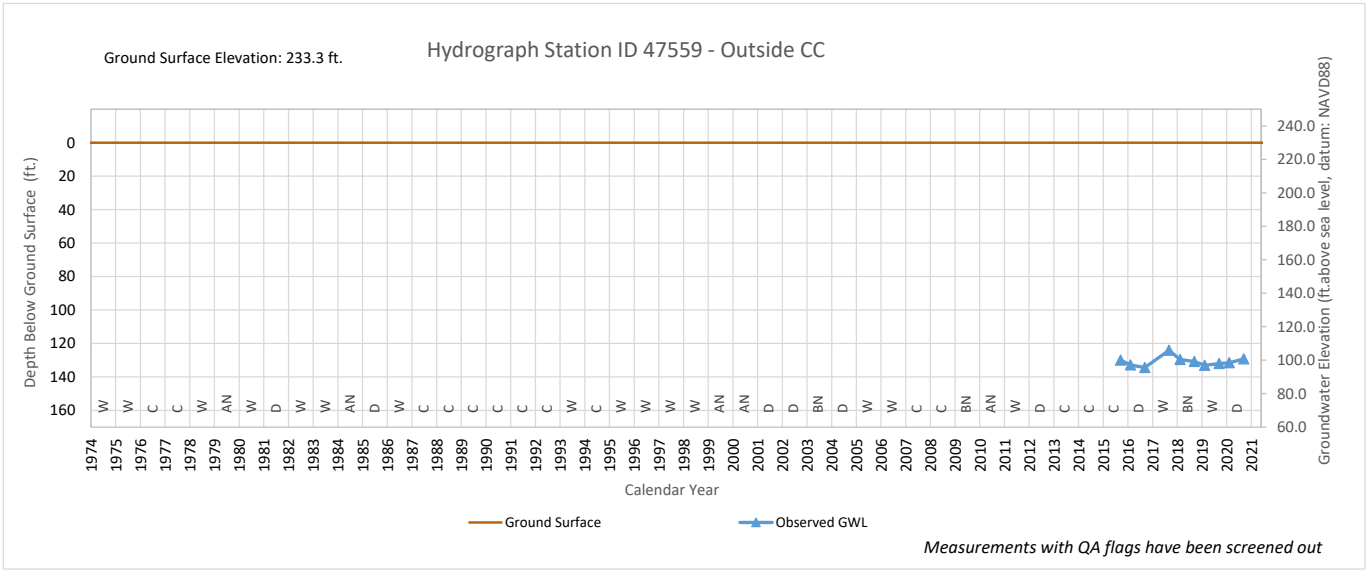

Ground Surface Elevation: 186.9 ft.
Hydrograph Station ID 47552 - Outside CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

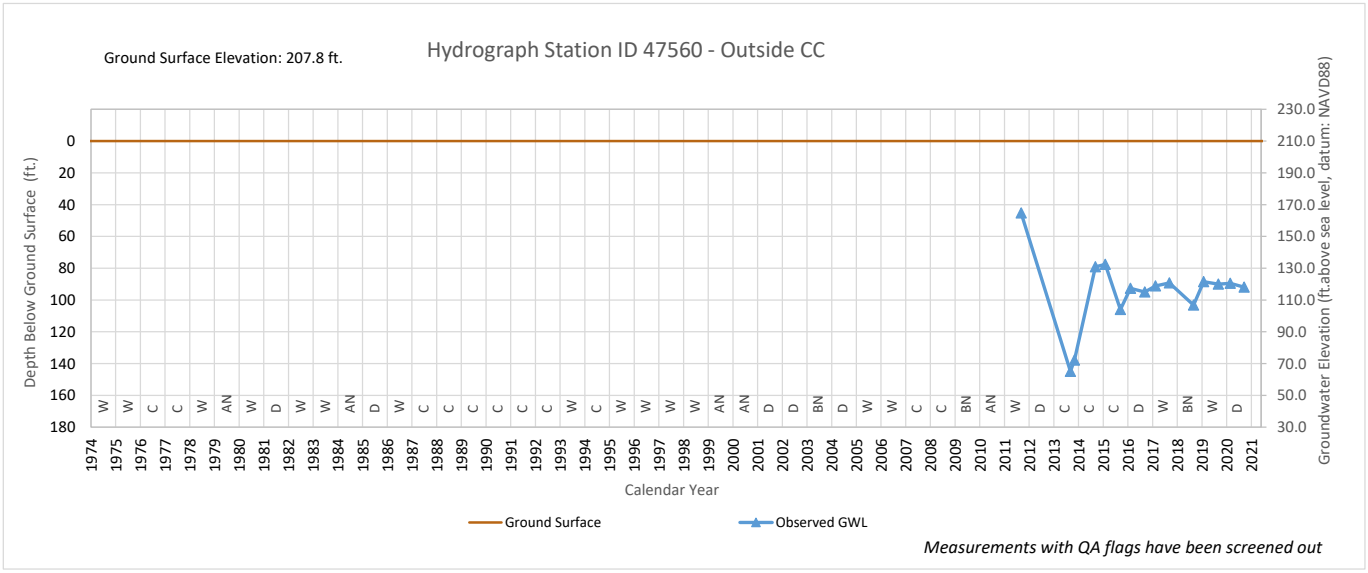

Ground Surface Elevation: 171.8 ft.
Hydrograph Station ID 47554 - Outside CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

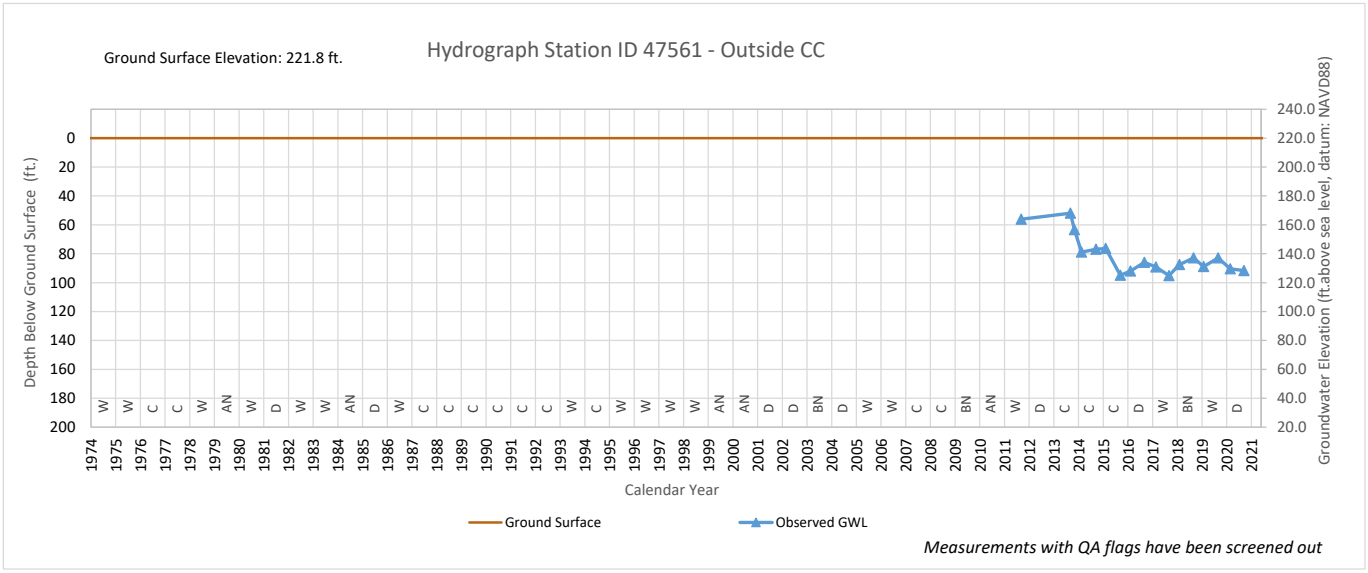

Ground Surface Elevation: 171.8 ft.
Hydrograph Station ID 47555 - Outside CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

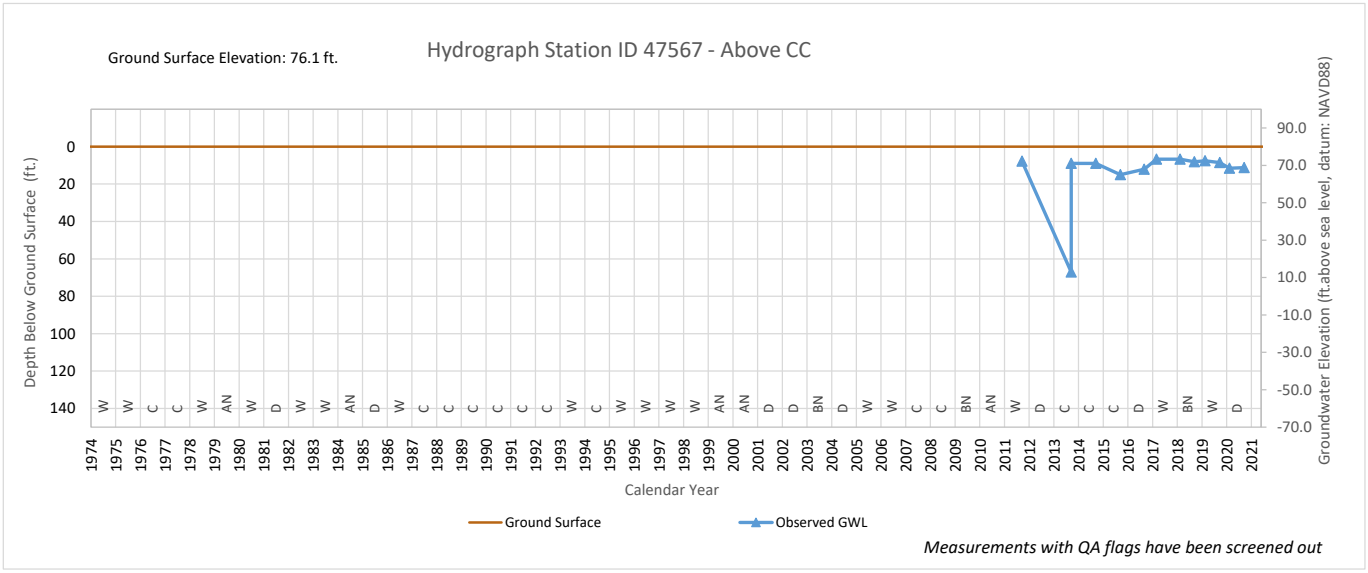

Ground Surface Elevation: 171.8 ft.
Hydrograph Station ID 47556 - Outside CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

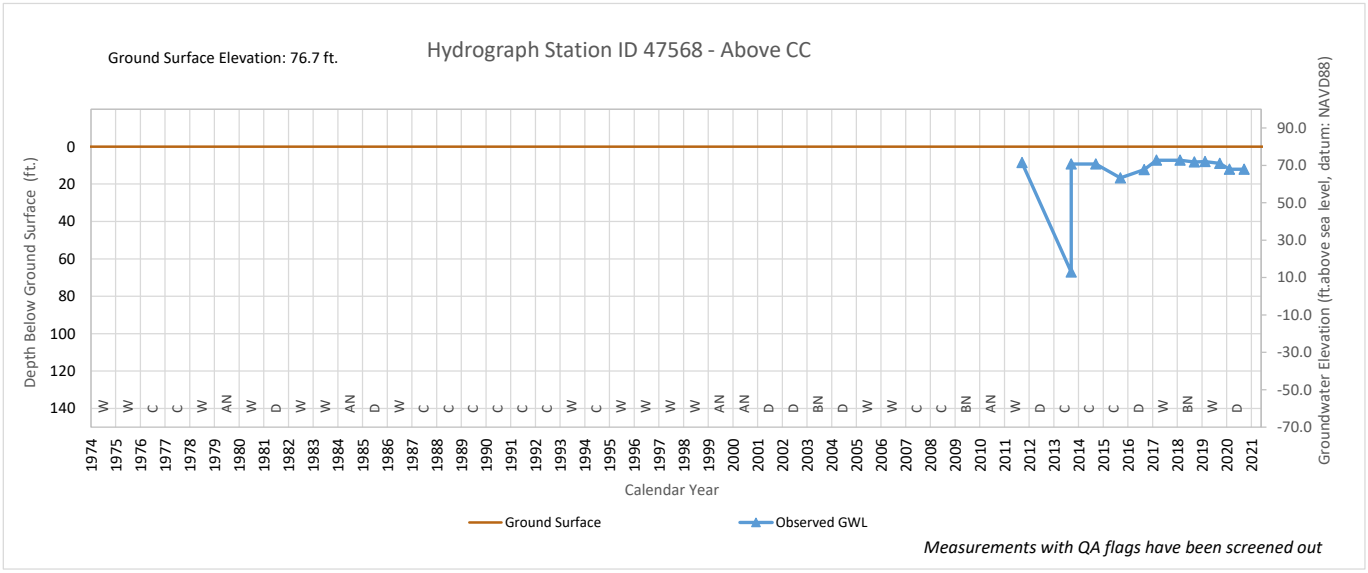

Ground Surface Elevation: 149.2 ft.
Hydrograph Station ID 47558 - Outside CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

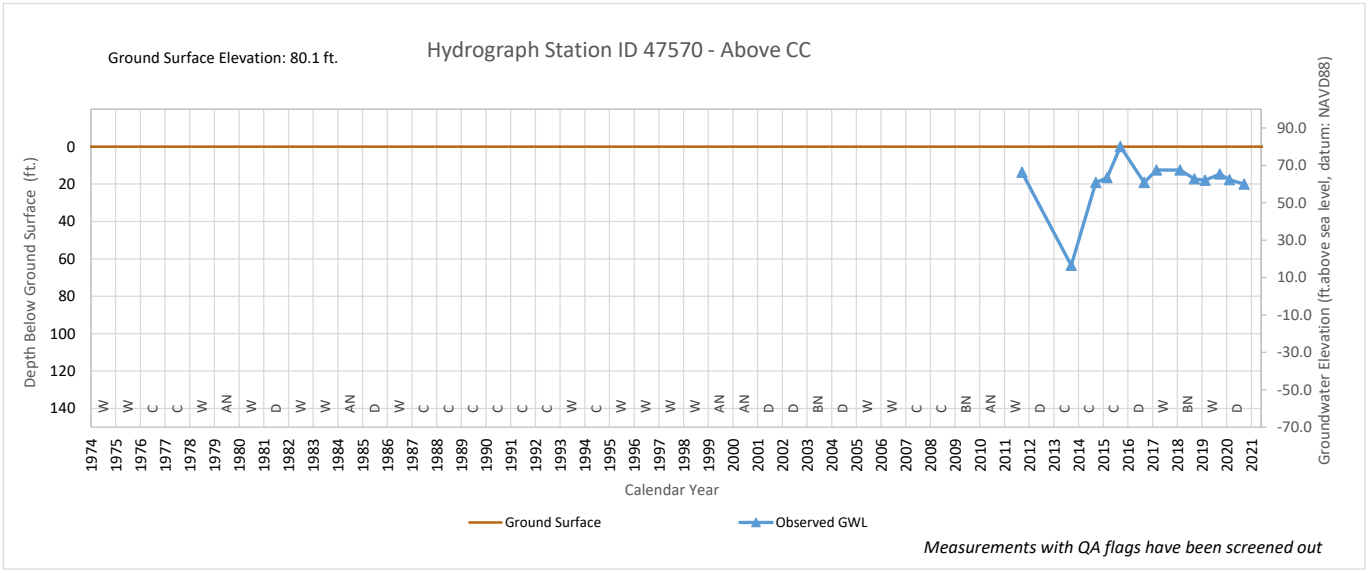

Ground Surface Elevation: 233.3 ft.
Hydrograph Station ID 47559 - Outside CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

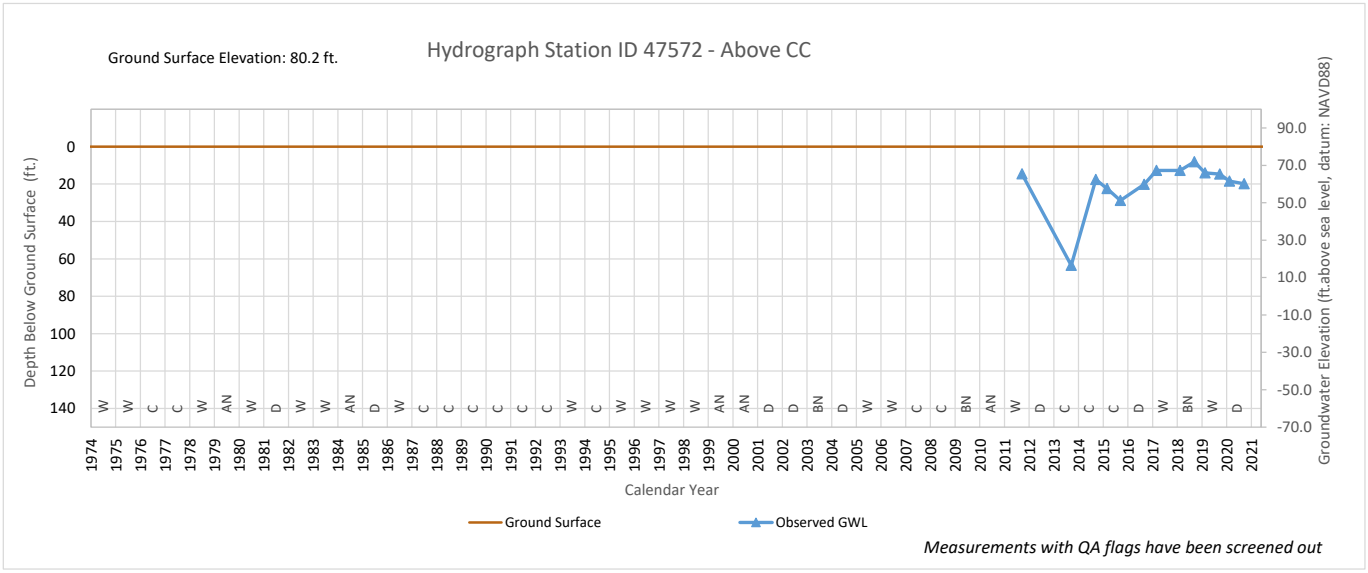

Ground Surface Elevation: 207.8 ft.
Hydrograph Station ID 47560 - Outside CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

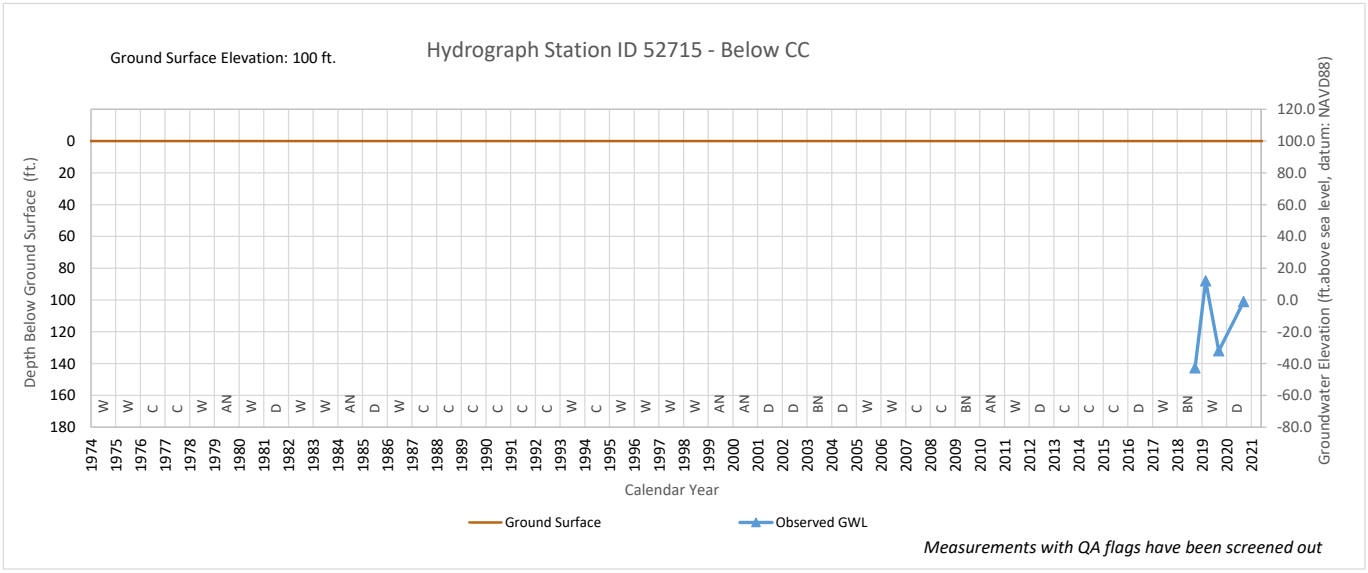

Ground Surface Elevation: 221.8 ft.
Hydrograph Station ID 47561 - Outside CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

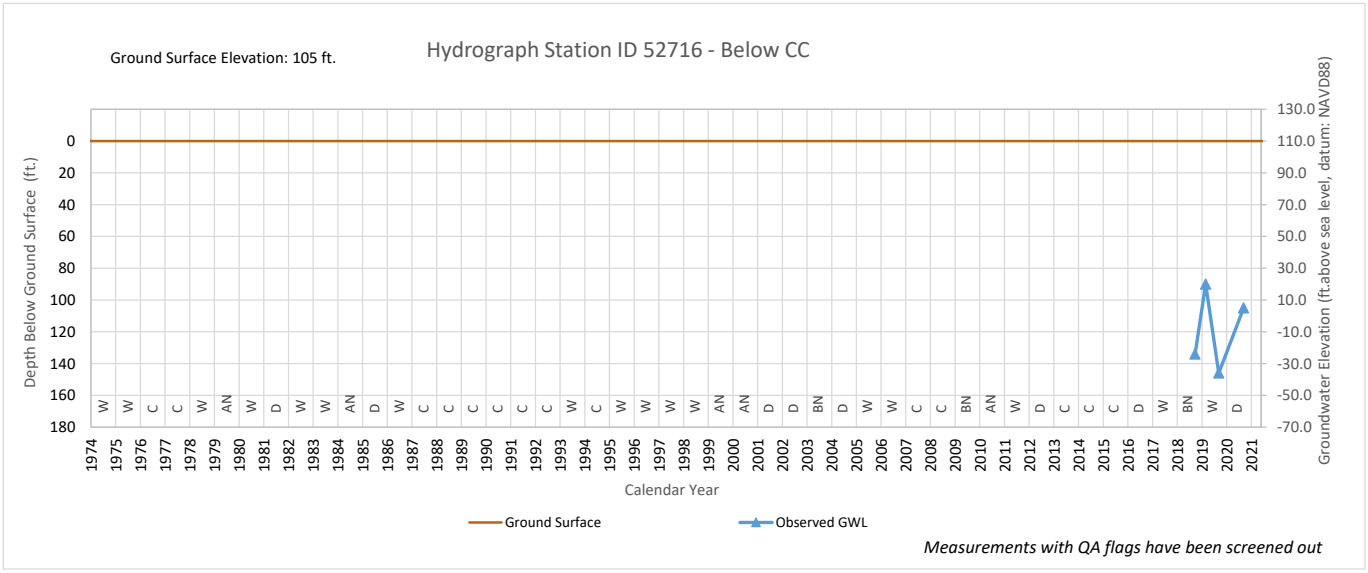

Ground Surface Elevation: 76.1 ft.
Hydrograph Station ID 47567 - Above CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft:above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

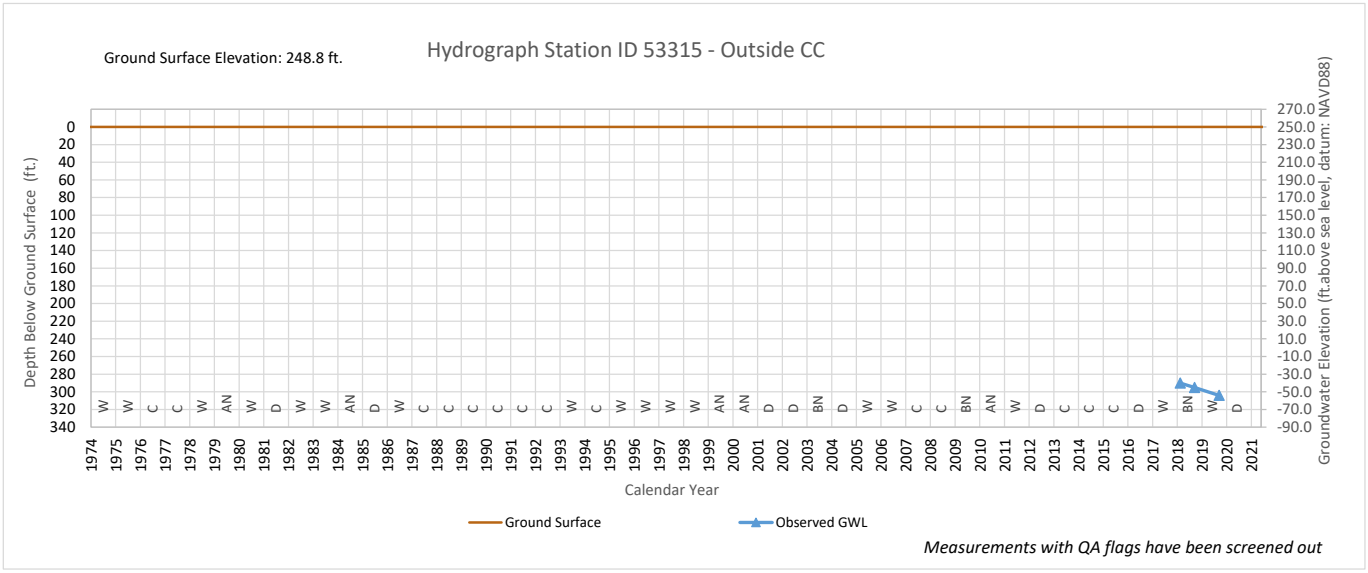

Ground Surface Elevation: 76.7 ft.
Hydrograph Station ID 47568 - Above CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft:above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

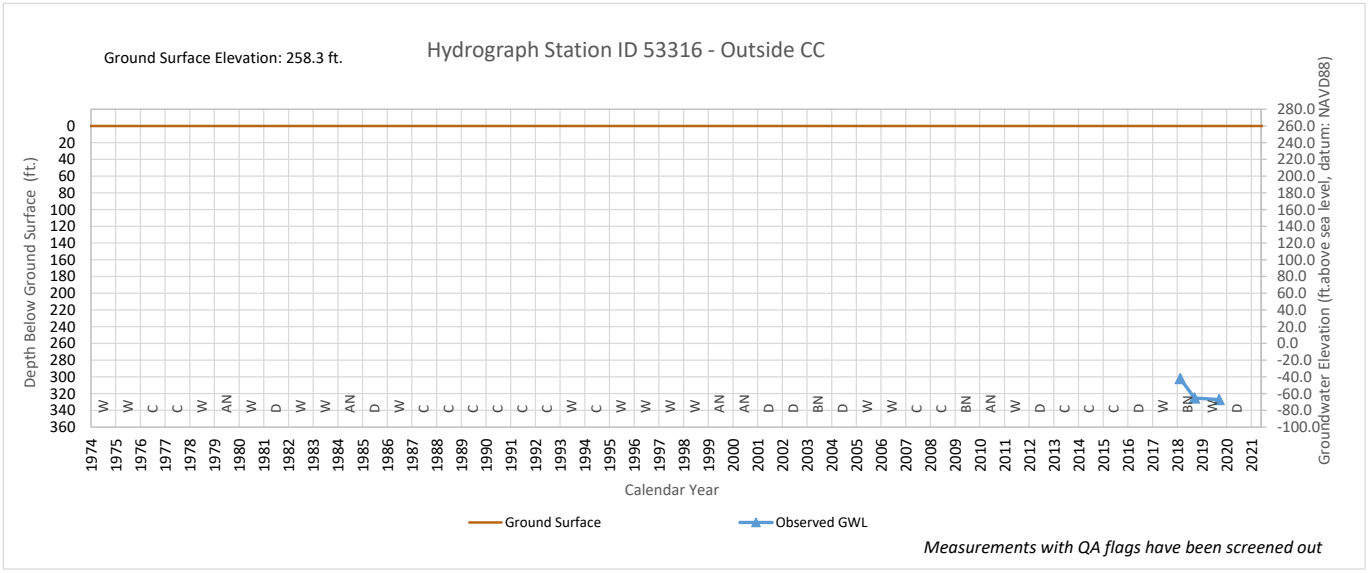

Ground Surface Elevation: 80.1 ft.
Hydrograph Station ID 47570 - Above CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft:above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out


Ground Surface Elevation: 80.2 ft.
Hydrograph Station ID 47572 - Above CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft:above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

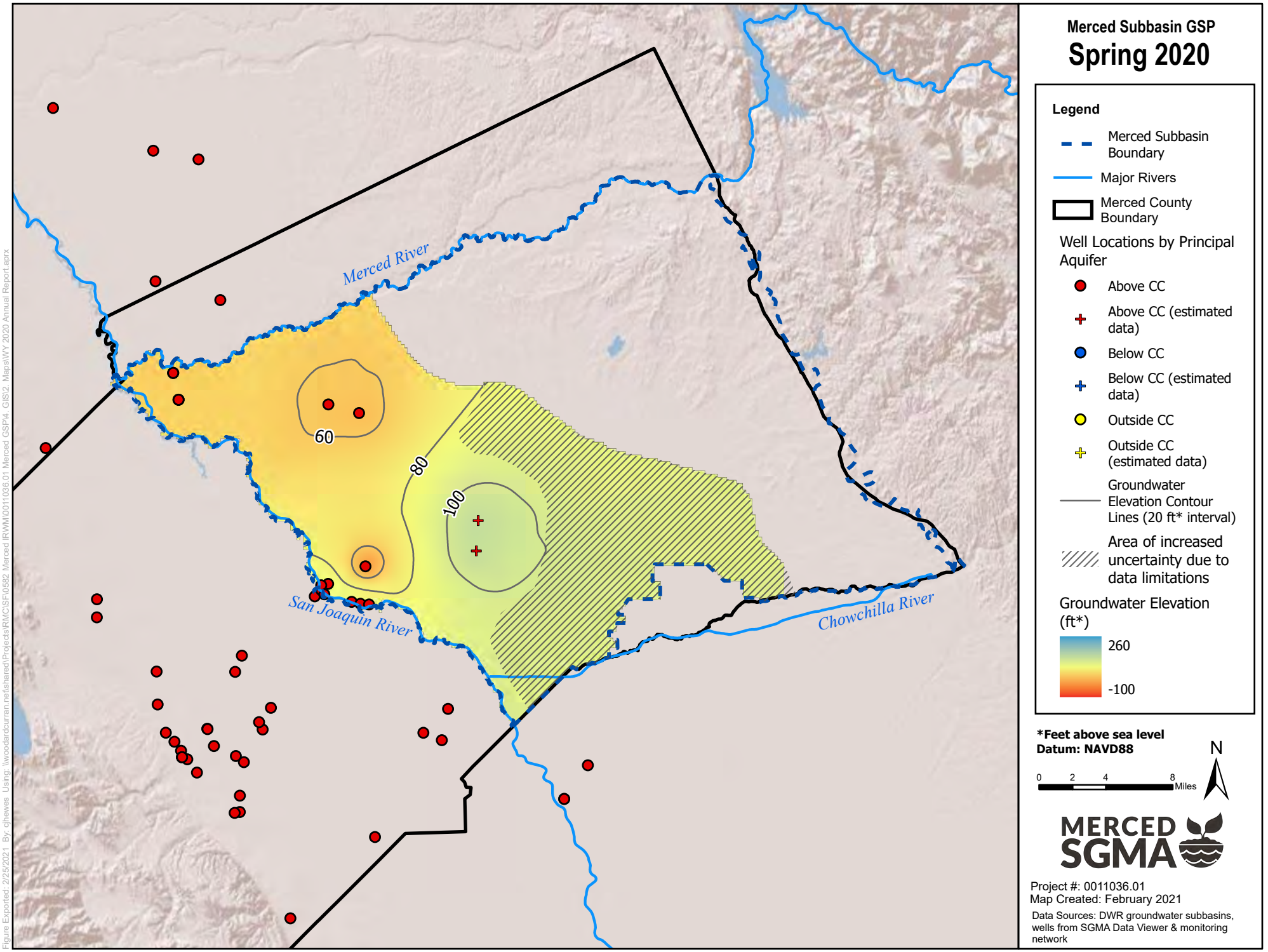

Ground Surface Elevation: 100 ft.
Hydrograph Station ID 52715 - Below CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out


Ground Surface Elevation: 105 ft.
Hydrograph Station ID 52716 - Below CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out


Ground Surface Elevation: 248.8 ft.
Hydrograph Station ID 53315 - Outside CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out


Ground Surface Elevation: 258.3 ft.
Hydrograph Station ID 53316 - Outside CC
Depth Below Ground Surface (ft.)
Groundwater Elevation (ft.above sea level, datum: NAVD88)
Calendar Year
Ground Surface
Observed GWL
Measurements with QA flags have been screened out

APPENDIX B: GROUNDWATER LEVEL CONTOUR MAPS



Merced Subbasin GSP

Spring 2020

Legend

- Merced Subbasin Boundary
- Major Rivers
- Merced County Boundary

Well Locations by Principal Aquifer

- Above CC
- Above CC (estimated data)
- Below CC
- Below CC (estimated data)
- Outside CC
- Outside CC (estimated data)
- Groundwater Elevation Contour Lines (20 ft* interval)
- Area of increased uncertainty due to data limitations

Groundwater Elevation (ft*)

260

-100

***Feet above sea level**
Datum: NAVD88

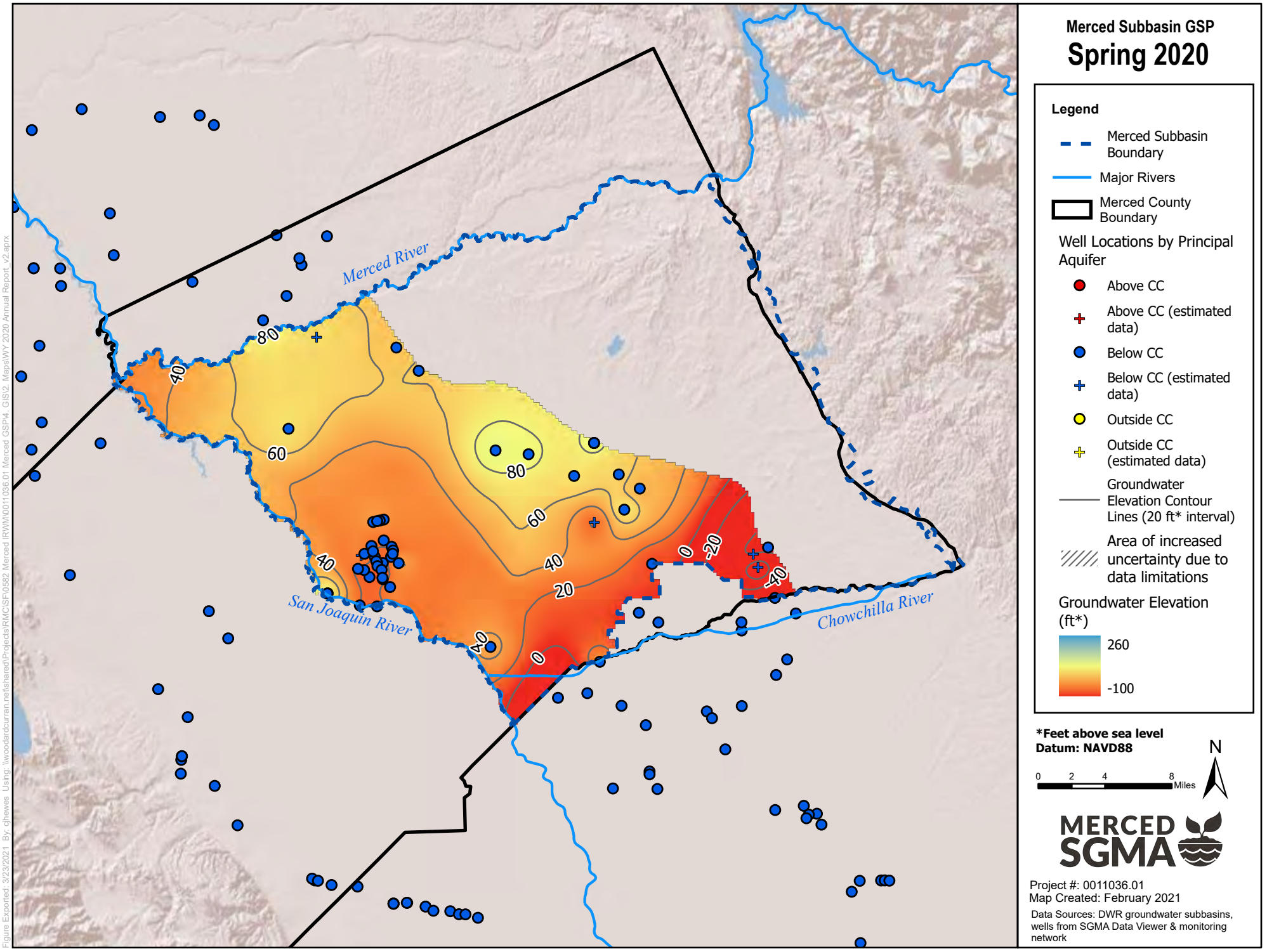
N

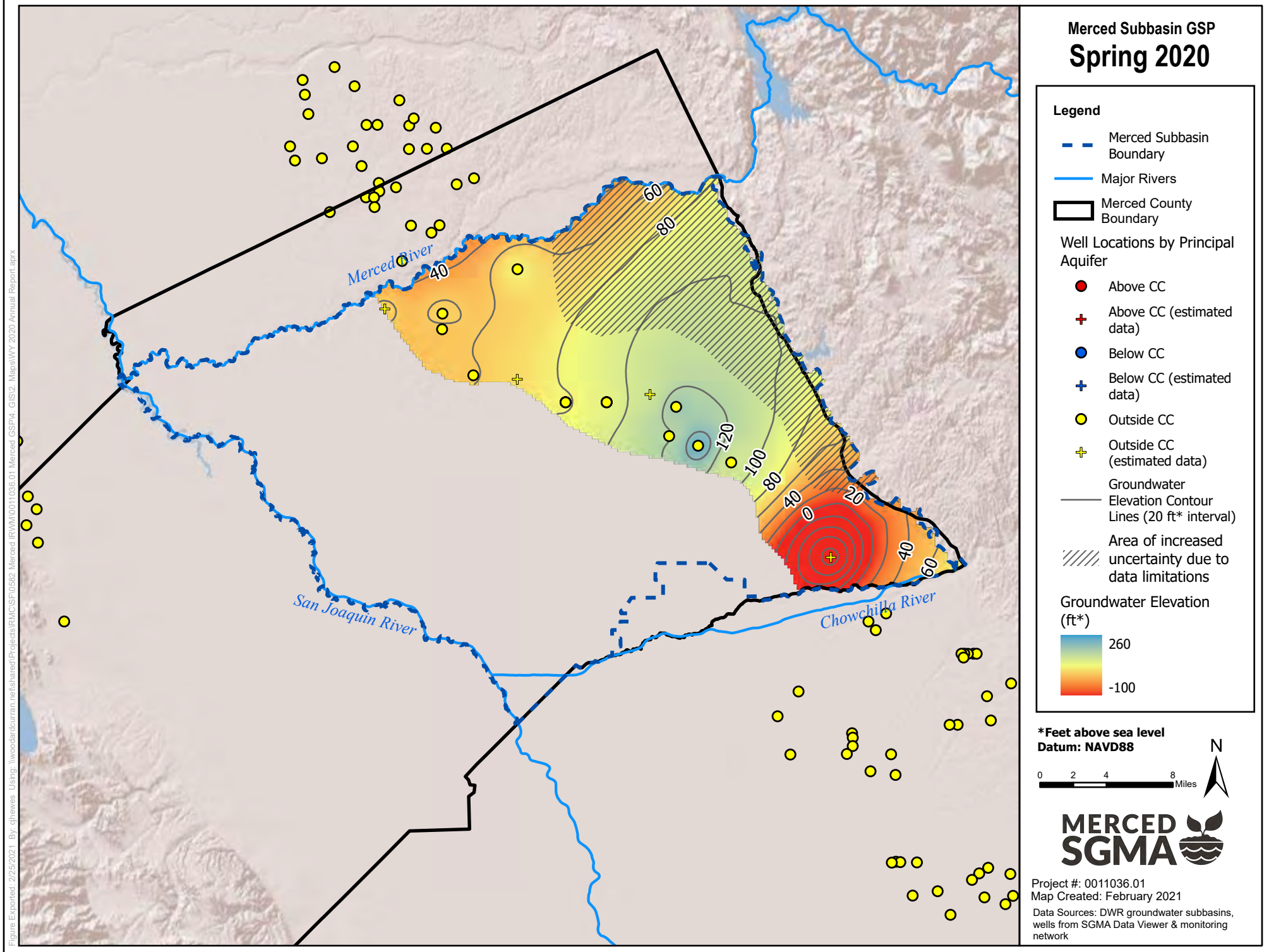
0 2 4 8 Miles

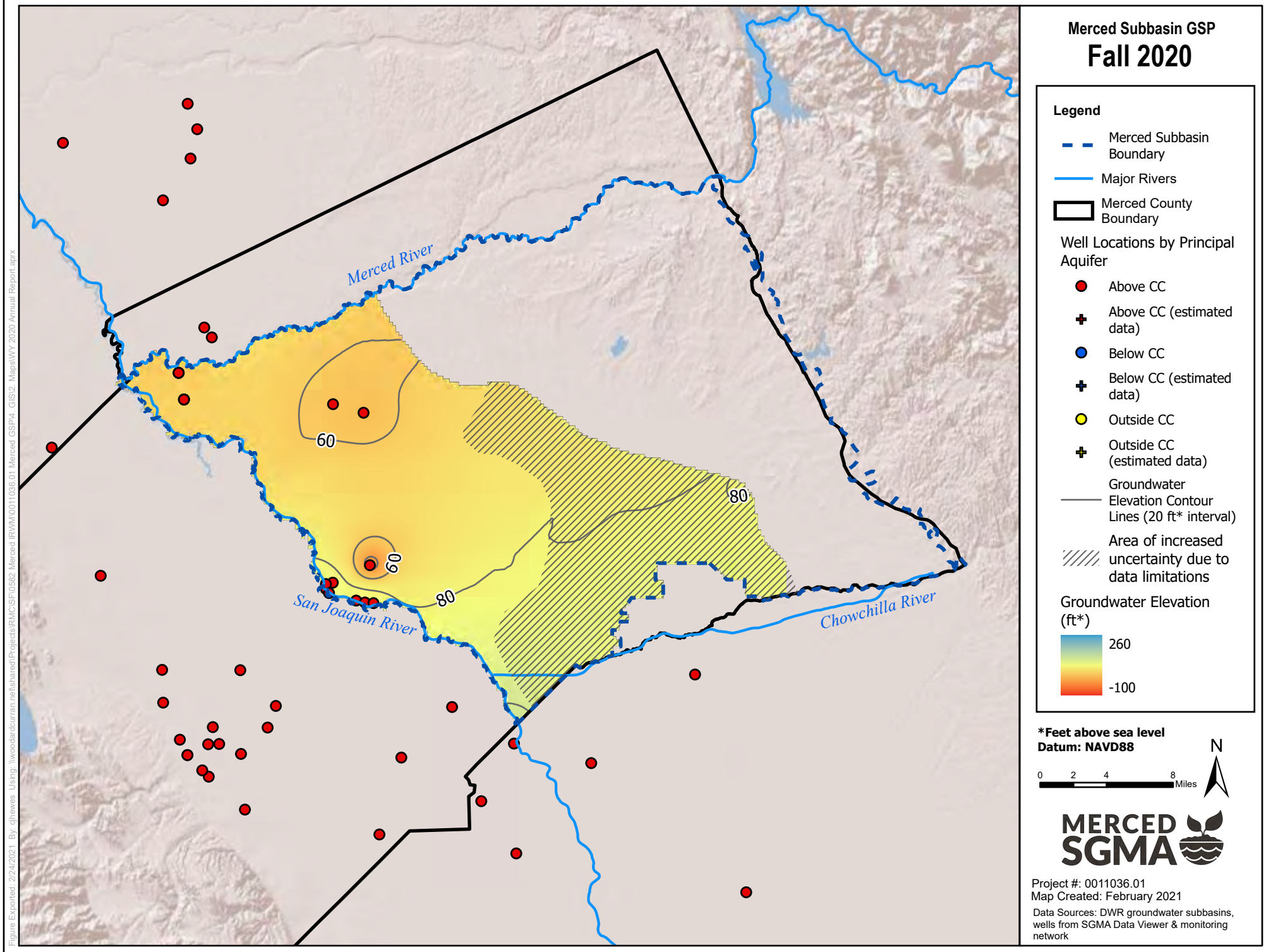
MERCED SGMA

Project #: 0011036.01
Map Created: February 2021

Data Sources: DWR groundwater subbasins, wells from SGMA Data Viewer & monitoring network


Merced Subbasin GSP
Spring 2020
Legend
Merced Subbasin Boundary
Major Rivers
Merced County Boundary
Well Locations by Principal Aquifer
Above CC
Above CC (estimated data)
Below CC
Below CC (estimated data)
Outside CC
Outside CC (estimated data)
Groundwater Elevation Contour Lines (20 ft* interval)
Area of increased uncertainty due to data limitations
Groundwater Elevation (ft*)
260
-100
*Feet above sea level
Datum: NAVD88
N
0 2 4 8 Miles
MERCED SGMA
Project #: 0011036.01
Map Created: February 2021
Data Sources: DWR groundwater subbasins, wells from SGMA Data Viewer & monitoring network
Merced River
San Joaquin River
Chowchilla River
80
40
60
80
60
40
20
0
-20
-40
40
0
Figure Exported: 3/23/2021 By: cjhewes Using: \\woodardcurran.net\shared\Projects\RMC\SF\0582 Merced IRWM\0011036.01 Merced GSP\4_GIS\2_Maps\WY 2020 Annual Report_v2.aprx


Merced Subbasin GSP
Spring 2020
Legend
Merced Subbasin Boundary
Major Rivers
Merced County Boundary
Well Locations by Principal Aquifer
Above CC
Above CC (estimated data)
Below CC
Below CC (estimated data)
Outside CC
Outside CC (estimated data)
Groundwater Elevation Contour Lines (20 ft* interval)
Area of increased uncertainty due to data limitations
Groundwater Elevation (ft*)
260
-100
*Feet above sea level
Datum: NAVD88
N
0 2 4 8 Miles
MERCED SGMA
Project #: 0011036.01
Map Created: February 2021
Data Sources: DWR groundwater subbasins, wells from SGMA Data Viewer & monitoring network
Merced River
San Joaquin River
Chowchilla River
60
80
40
120
100
80
40
0
20
40
60
Figure Exported: 2/25/2021 By: cjhewes Using: \\woodardcurran.net\shared\Projects\RMC\SF\0582 Merced IRWM\0011036.01 Merced GSP\4_GIS\2_Maps\WY 2020 Annual Report.aprx



Merced Subbasin GSP

Fall 2020

Legend

- Merced Subbasin Boundary
- Major Rivers
- Merced County Boundary

Well Locations by Principal Aquifer

- Above CC
- Above CC (estimated data)
- Below CC
- Below CC (estimated data)
- Outside CC
- Outside CC (estimated data)
- Groundwater Elevation Contour Lines (20 ft* interval)
- Area of increased uncertainty due to data limitations

Groundwater Elevation (ft*)

260

-100

***Feet above sea level**
Datum: NAVD88

N

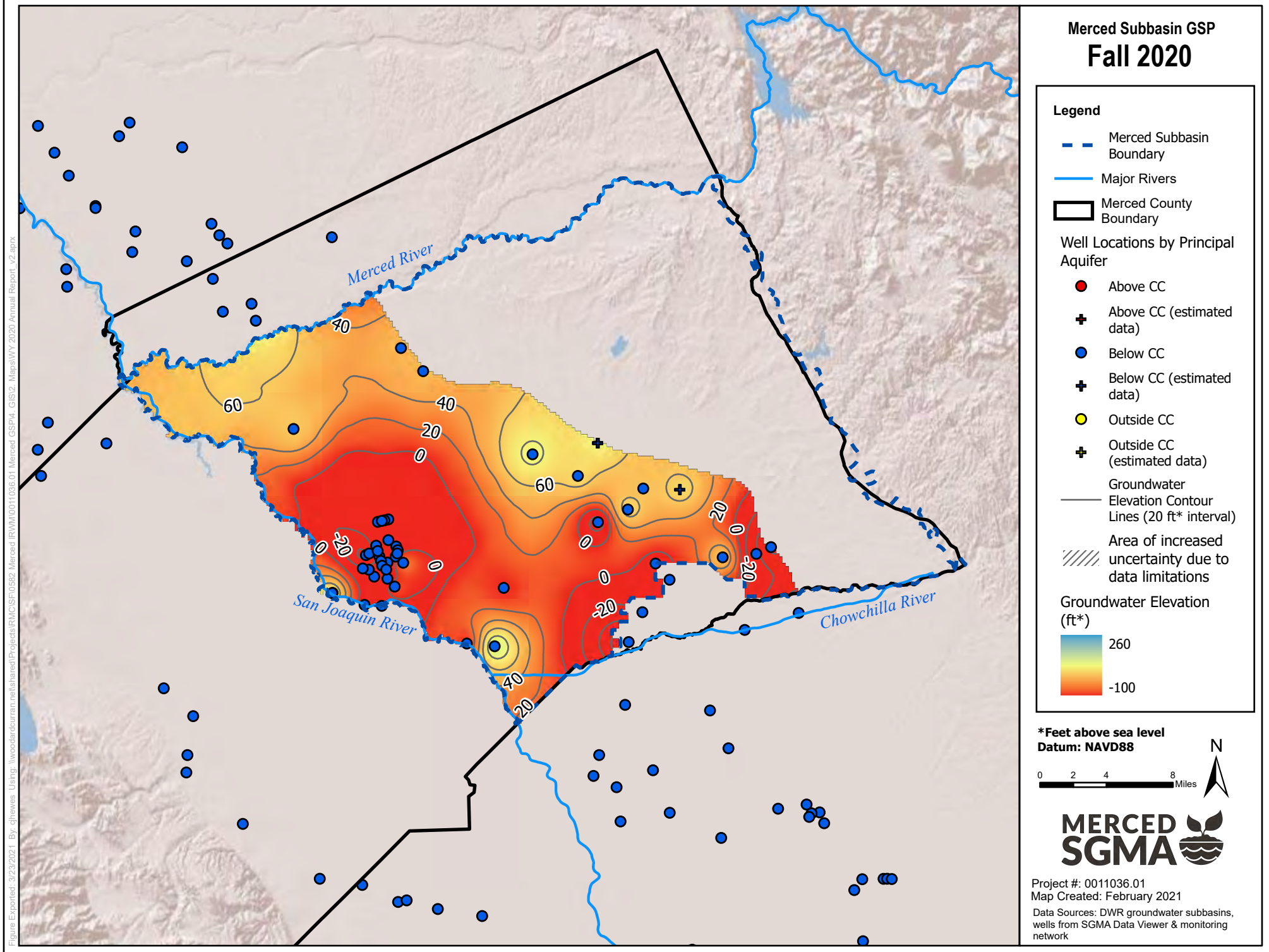
0 2 4 8 Miles

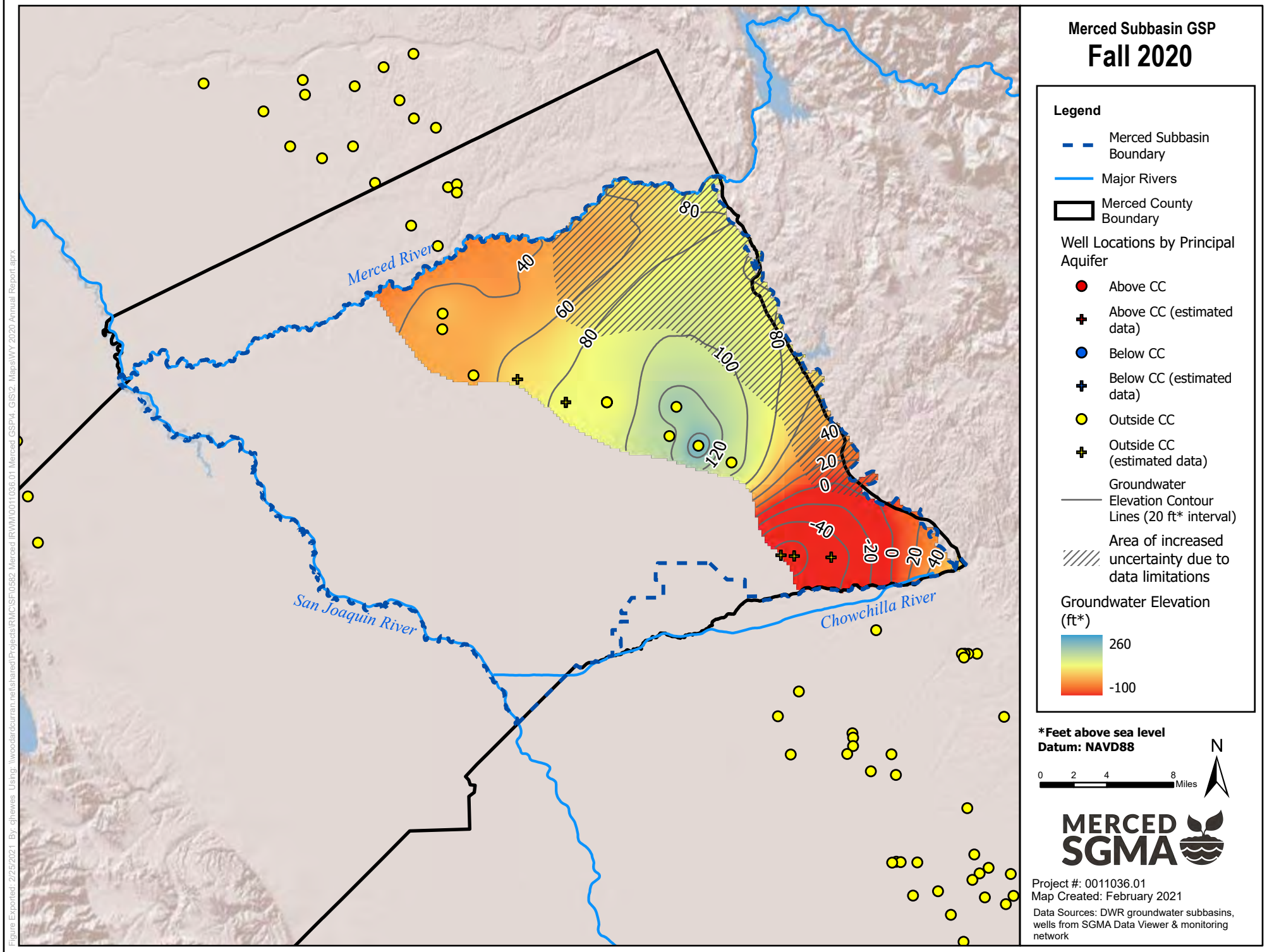
MERCED SGMA

Project #: 0011036.01
Map Created: February 2021

Data Sources: DWR groundwater subbasins, wells from SGMA Data Viewer & monitoring network

Figure Exported: 2/24/2021 By: cjhewes Using: \\woodardcurran.net\shared\Projects\RMC\SF\0582 Merced IRWM\0011036.01 Merced GSP\4_GIS\2_Maps\WY 2020 Annual Report.aprx


Merced Subbasin GSP
Fall 2020
Legend
Merced Subbasin Boundary
Major Rivers
Merced County Boundary
Well Locations by Principal Aquifer
Above CC
Above CC (estimated data)
Below CC
Below CC (estimated data)
Outside CC
Outside CC (estimated data)
Groundwater Elevation Contour Lines (20 ft* interval)
Area of increased uncertainty due to data limitations
Groundwater Elevation (ft*)
260
-100
*Feet above sea level
Datum: NAVD88
N
0 2 4 8 Miles
MERCED SGMA
Project #: 0011036.01
Map Created: February 2021
Data Sources: DWR groundwater subbasins, wells from SGMA Data Viewer & monitoring network
Merced River
San Joaquin River
Chowchilla River
60
40
20
0
-20
-40
Figure Exported: 3/23/2021 By: cjhewes Using: \\woodardcurran.net\shared\Projects\RMC\SF\0582 Merced IRWM\0011036.01 Merced GSP\4_GIS\2_Maps\WY 2020 Annual Report_v2.aprx


Merced Subbasin GSP
Fall 2020
Legend
Merced Subbasin Boundary
Major Rivers
Merced County Boundary
Well Locations by Principal Aquifer
Above CC
Above CC (estimated data)
Below CC
Below CC (estimated data)
Outside CC
Outside CC (estimated data)
Groundwater Elevation Contour Lines (20 ft* interval)
Area of increased uncertainty due to data limitations
Groundwater Elevation (ft*)
260
-100
*Feet above sea level
Datum: NAVD88
N
0 2 4 8 Miles
MERCED SGMA
Project #: 0011036.01
Map Created: February 2021
Data Sources: DWR groundwater subbasins, wells from SGMA Data Viewer & monitoring network
Merced River
San Joaquin River
Chowchilla River
40
60
80
100
120
80
40
20
0
-40
-20
0
20
40

woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

Prepared by:

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Image courtesy: Veronica Adrover/UC Merced