4. MONITORING NETWORKS

This chapter discusses the planned monitoring networks needed to guide the Cuyama Basin Groundwater Sustainability Agency (CBGSA) toward their sustainability goals. Monitoring networks need to be established for each sustainability indicator either directly or through monitoring through a proxy. This section satisfies Subarticle 4 of the Sustainable Groundwater Management Act (SGMA) regulations. This chapter also discusses the following:

- Monitoring network objectives
- Existing monitoring programs used to develop the network in the 2020 GSP
- Development of revised monitoring networks for the 2025 GSP Update
- Monitoring network establishment for each sustainability indicator
- Monitoring network data gaps, and a plan to fill data gaps if they are present for each monitoring network

4.1 Useful Terms

This chapter describes groundwater wells, water quality measurements, subsidence stations, and other related components. Technical terms are defined below. Figure 4-1 is a diagram of a monitoring well with well-related terms identified on the diagram. Terms are defined here to guide readers through this chapter, and are not a definitive definition of each term:

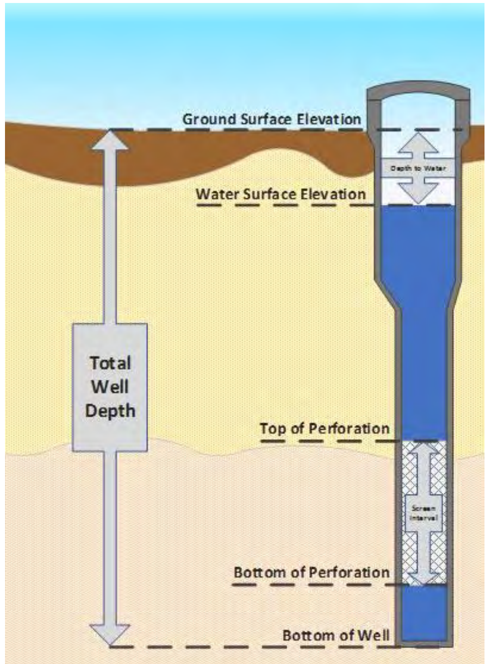

Figure 4-1: Well Completion Diagram

4.1.1 Well-Related Terms

- **Bottom perforation –** The distance to the bottom of the perforation from the ground surface elevation.
- **Depth to water –** The distance from the ground surface or the well' to where water is encountered inside the well
- **Ground surface elevation –** The elevation in feet above mean sea level at the well's location.
- **Screened interval** – The portion of a well casing that is screened to allow water from the surrounding soil into the well pipe. There can be several screened intervals within the same well. Screened interval is usually reported in feet below ground surface (bgs) for both the upper most limit and lower most limit of the screen.
- **Top perforation –** The distance to the top of the perforation from the ground surface elevation.
- **Total well depth** – The depth that a well is installed to. This is often deeper than the bottom of the screened interval.
- **Water surface elevation –** The elevation above mean sea level that water is encountered inside the well

4.1.2 Other Terms

- **Best management practice** – Refers to a practice, or combination of practices, that are designed to achieve sustainable groundwater management and have been determined to be technologically and economically effective, practicable, and based on best available science (Title 23 of the California Code of Regulations [CCR], Article 2).
- **Constituent** – Refers to a water quality parameter measured to assess groundwater quality.
- **Data gap** – Refers to a lack of information that significantly affects the understanding of the Basin setting or evaluation of the efficacy of Plan implementation and could limit the ability to assess whether a Basin is being sustainably managed (Title 23 of the CCR, Article 2).
- **Depth to groundwater –** This is the distance from the ground surface to groundwater typically reported at a well.
- **Historical high groundwater elevations –** This is the highest recorded measurement of static groundwater elevation (closest to the ground surface) in a monitoring well. Measurements of groundwater elevation are used to indicate the elevation of groundwater levels in the area near the monitored well.
- **Historical low groundwater elevations –** This is the lowest measurement of static groundwater elevation (furthest from the ground surface) in a monitoring well that was recorded. Measurements of groundwater elevation are used to indicate the elevation of groundwater levels in the area near the monitored well.
- **Hydrograph –** A hydrograph is a graph that shows the changes in groundwater elevation over time for each monitoring well. Hydrographs show how groundwater elevations change over the years and indicate whether groundwater is rising or descending over time.
- **Representative monitoring** – Refers to a monitoring site within a broader network of sites that typifies one or more conditions within the Basin or an area of the Basin (Title 23 of the CCR, Article 2).
- **Subsidence** – Refers to the sinking or downward settling of the earth's surface, not restricted in rate, magnitude, or area involved, and is often the result of over-extraction of subsurface water. For more information, see the Groundwater Conditions chapter.

4.2 Monitoring Network Objectives

This chapter describes the Cuyama Valley Groundwater Basin (Basin) monitoring networks for the five sustainability indicators that apply to the Basin. The objective of these monitoring networks is to detect undesirable results in the Basin, as described in Chapter 3, using the sustainability thresholds described in Chapter 5. Other related objectives of the monitoring network are defined via the SGMA regulations as follows:

- Demonstrate progress toward achieving measurable objectives described in the GSP

- Monitor impacts to the beneficial uses or users of groundwater
- Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds
- Quantify annual changes in water budget components

The monitoring network plan provided to the Basin is intended to monitor:

- Chronic lowering of groundwater levels
- Reduction in groundwater storage
- Degraded water quality
- Land subsidence
- Depletions of interconnected surface water

The monitoring networks described in this chapter were developed for the 2020 GSP using data provided by the California Department of Water Resources (DWR), the United States Geological Survey (USGS), participating counties, and private landowners. The monitoring network consisted of wells that are already being used for monitoring in the Basin. These monitoring networks have been revised for the 2025 GSP Update as described in the sections below.

4.2.1 Basin Conditions Relevant to Measurement Density and Frequency

This section summarizes key Basin conditions that influence the development of monitoring networks. These key conditions include hydrogeologic considerations, land use considerations, and historical groundwater conditions.

The Basin, as described in Section 2.1, is composed of one principal aquifer comprised of three geologic groups: Younger Alluvium, Older Alluvium, and Morales Formation. The majority of groundwater in the aquifer is stored in the Younger and Older alluvium. While there are many faults in the Basin, there are no major stratigraphic aquitards or barriers to vertical groundwater movement among the alluvium and Morales Formation. The aquifer has a wide range of thicknesses that vary spatially, with median reported hydraulic conductivity ranges from 1.22 to 72.1 feet per day (see Table 2-1 in Chapter 2 for detailed values). Figures 2-19 and 2-20 in Chapter 2 show the extent of these formations throughout the Basin.

The largest groundwater uses in the Basin are for irrigated agriculture. The figures shown in Chapter 1, Section 1.2, Plan Area show the extent of land used for irrigated agriculture in the Basin. Based on the most recent data from 2022, there are approximately 53 square miles of agricultural land in the Basin out of approximately 378 square miles, equaling approximately 14 percent of the Basin's land.

Data provided in Chapter 2, Section 2.2 shows the historical decline groundwater levels in the Basin's central portion. Groundwater elevations in this portion of the Basin have decreased by more than 400 feet from the 1940s to the present, as shown in Figure 4-2.

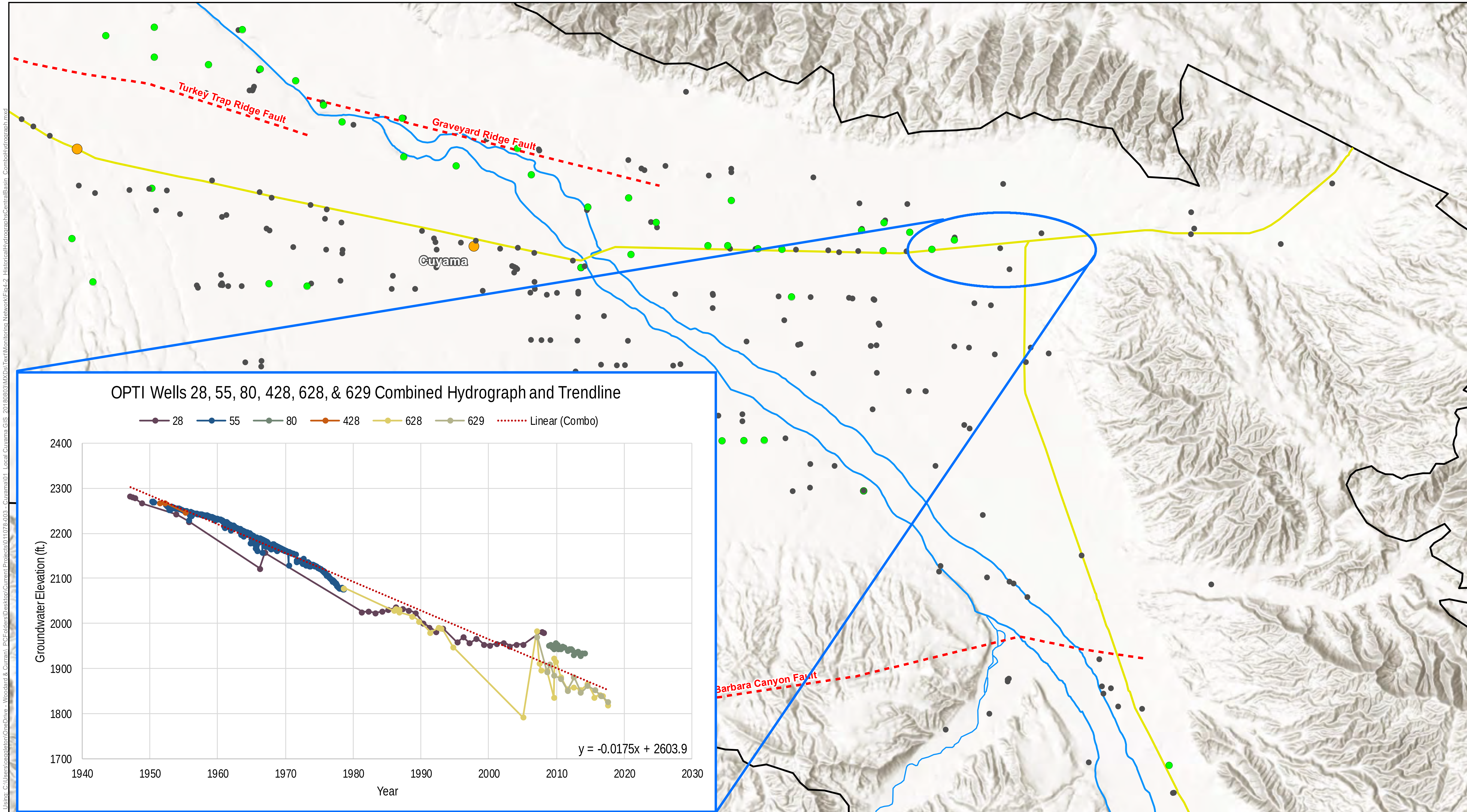

Figure 4-2: Cuyama GW Basin Central Basin with Combined Hydrograph

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

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WOODARD & CURRAN

Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- Faults
- Currently Monitored Wells
- Not Currently Monitored

N

0 0.5 1 2 Miles

4.3 Existing Monitoring Used Prior to 2020 GSP Adoption

4.3.1 Groundwater Level Monitoring

This section describes groundwater level monitoring conducted by agencies and private landowners in the Basin prior to GSP adoption in January 2020. Since 2020, the CBGSA has performed its own groundwater level monitoring using the monitoring network approved in the GSP.

DWR, Statewide Dataset/California Statewide Groundwater Elevation Monitoring (CASGEM)

The State of California has several water-related database portals accessible online. These include the following:

- CASGEM Program
- Water Data Library
- Groundwater Information Center Interactive Map Application

The data for these portals are organized and saved in one master database, where each portal accesses and displays data depending on the search criteria and portal used.

The CBGSA contacted DWR directly to acquire all available data related to the Basin. DWR provided a customized hyperlink for CBGSA representatives to download the State's database in whole. Cuyama Basin data were then extracted from this dataset.

Although the master dataset was used to collect initial data, the CASGEM portal was used throughout the planning process to verify that data (DWR CASGEM Online System, 2018). The CASGEM Program is tasked with tracking seasonal and long-term groundwater elevation trends in groundwater basins throughout the State. In 2009, Senate Bill x7-6 established collaboration between local monitoring parties and DWR, enabling DWR to collect groundwater elevation data, and ultimately establishing the CASGEM Program.

The CASGEM Program allows local agencies to be designated as CASGEM monitoring entities for groundwater basins throughout the State (CASGEM Brochure, 2018). CASGEM monitoring entities can measure groundwater elevations or compile data from other agencies to fulfill a monitoring plan, and each entity is responsible for submitting that data to DWR. Three monitoring entities operate as CASGEM monitoring entities in the Cuyama Basin as follows:

- Santa Barbara County Water Agency (SBCWA)
- Ventura County Watershed Protection District (VCWPD)
- San Luis Obispo Flood Control & Water Conservation District (SLOFC & WCD)

The CASGEM Program includes two kinds of wells in its database as follows:

- CASGEM wells, all of which include well construction information
- Voluntary wells that are included in the CASGEM database on a volunteer basis; well construction may not be identified or made public

The Basin has six CASGEM wells and 107 voluntary wells. Figure 4-3 shows the locations of these wells.

Most wells are measured on either a semi-annual or annual schedule. Summary statistics about these wells are listed below.

- Number of CASGEM wells: 6
- Number of voluntary wells: 107
- Total number of DWR and CASGEM wells: 222
- Earliest measurement year: 1946
- Longest period of record: 68 years
- Median period of record: 12 years
- Median number of records for a single well: 19

The greatest well density among current wells is in the central portion of the Basin and in the area around Ventucopa. There are also several monitoring wells in the southeastern portion of the Basin upstream of Ventucopa. CASGEM data are sparser along the north facing slopes of the main Cuyama Valley and the western portion of the Basin, as can be seen in Figure 4-3.

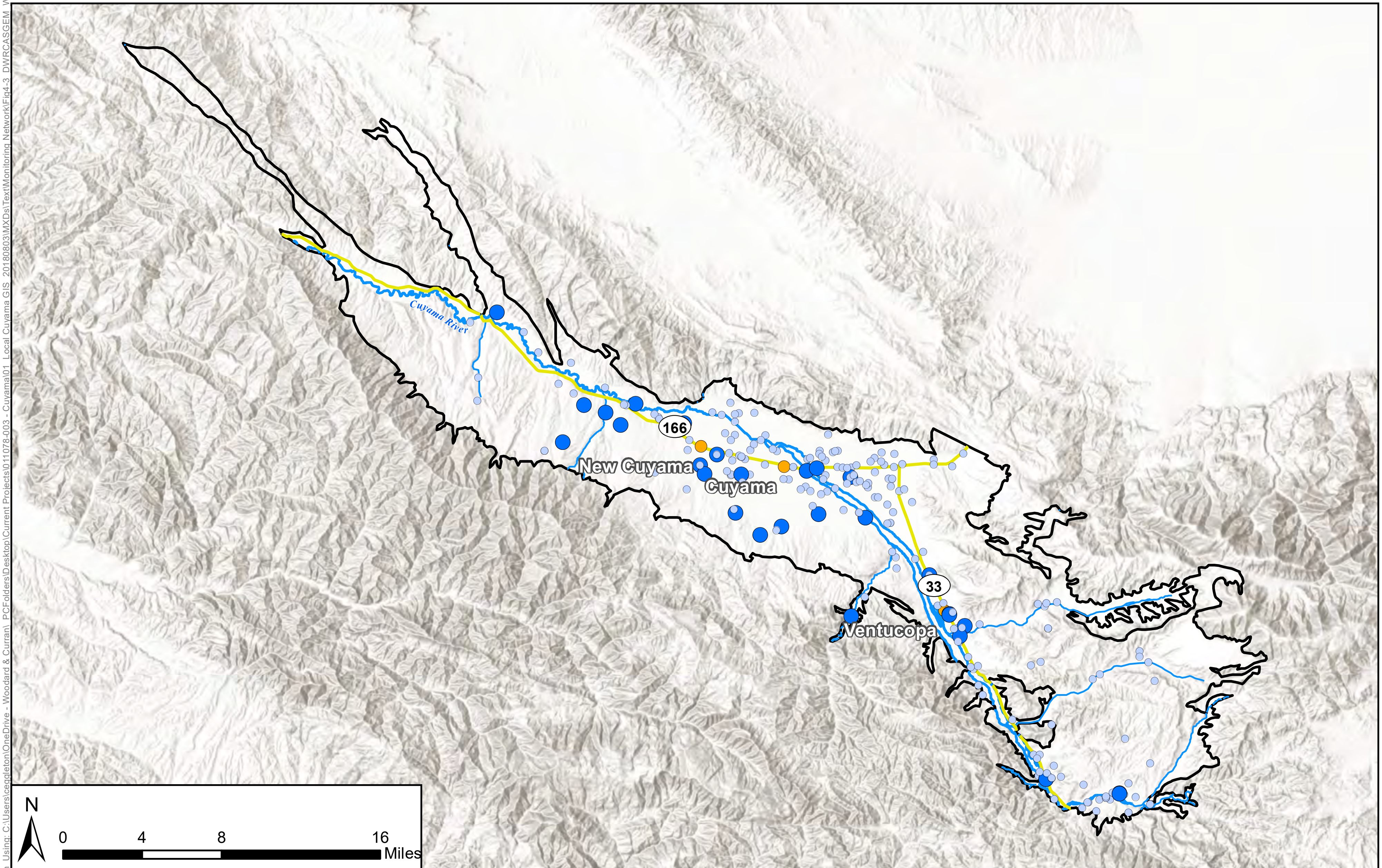

Figure 4-3: Cuyama GW Basin Wells with Monitoring Data Provided by DWR

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

April 2019

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Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- DWR Database Wells Last Measured in 2017-2018
- DWR Database Wells Last Measured 2016 and Earlier

Figure Exported: 1/25/2019 By: ceggleton Using: C:\Users\ceggleton\OneDrive - Woodard & Curran_PCFolders\Desktop\Current Projects\011078-003 - Cuyama\01_Local Cuyama GIS_20180803\MXDs\Text\Monitoring Network\Fig4-3_DWRCASGEM_Wells.mxd

United States Geological Survey

The USGS has the most groundwater elevation monitoring locations in the Basin. Many of these wells were installed for a 1966 groundwater study and have since been retired.

There are significant overlaps between the DWR provided datasets and the USGS provided datasets. Approximately 106 wells appear in both downloaded datasets. Overlapping data is discussed below.

USGS data may be accessed through their online portals for the National Ground-Water Monitoring Network, Groundwater Watch, and the National Water Information System (NWIS).

The USGS online data portals provide approved data that has been quality-assured and deemed fit to be published by USGS. The portals also provide provisional data that is unverified and subject to revision. The CBGSA contacted USGS directly and coordinated download of USGS monitoring records in the Basin. The CBGSA used the USGS URL Generation tool was used to download all provisional and approved data about the Basin.

USGS has approximately 476 wells in the Basin. Summary statistics about these wells are listed below.

- Total number of USGS wells: 476
- Earliest measurement date: 1946
- Longest period of record: 68 years
- Median period of record: 2 years
- Median number of records for a single well: 2 years

A significant portion of the wells included in the USGS dataset are located near the Cuyama River and are in the central portion of the Basin. Wells are also found along many of the tributaries that feed the Cuyama River, recording data during large precipitation events. Figure 4-4 shows well locations included in the USGS dataset.

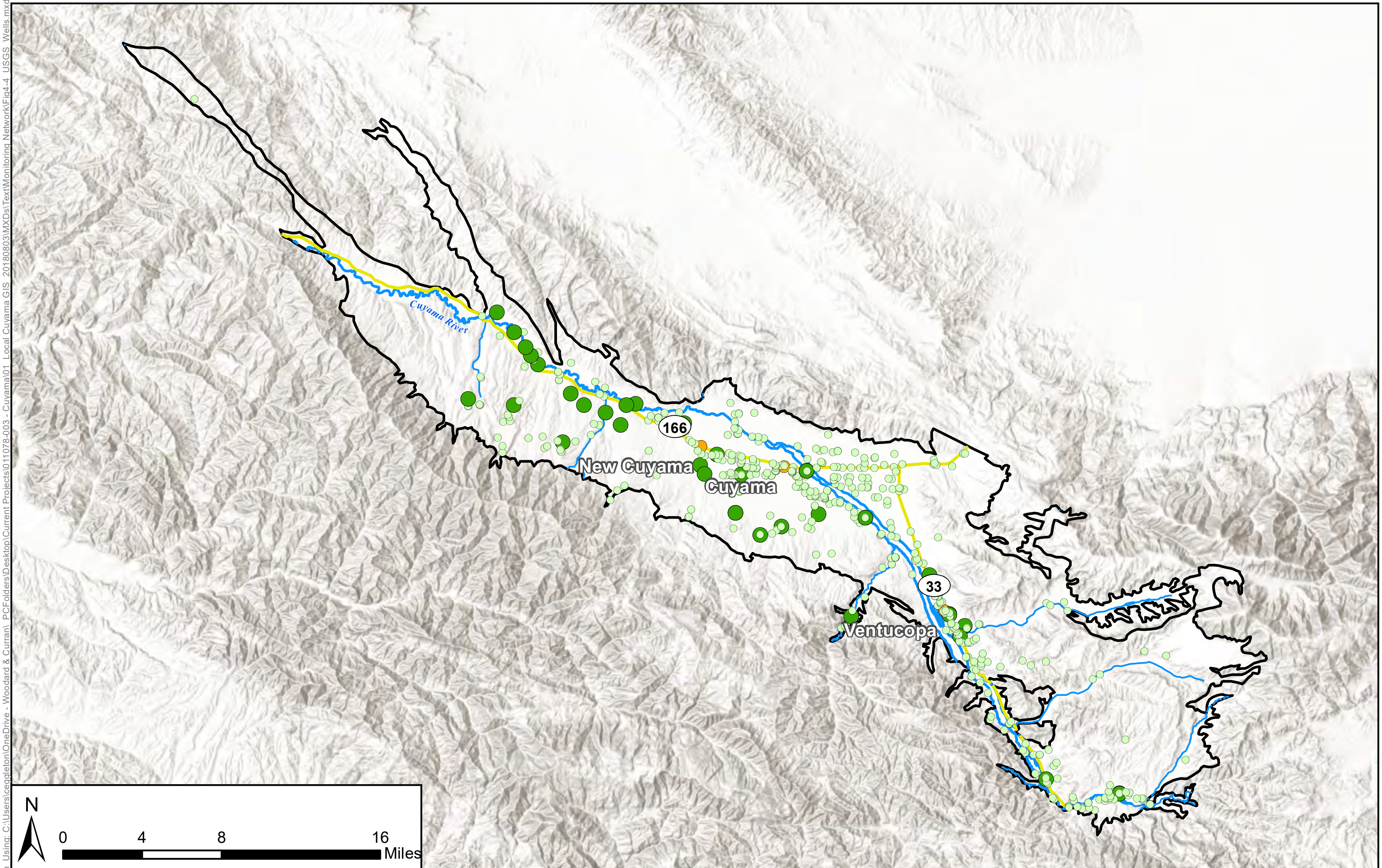

Figure 4-4: Cuyama GW Basin Wells with Monitoring Data Provided by USGS

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

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Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- USGS Database Wells Last Measured in 2017-2018
- USGS Database Wells Last Measured 2016 or Earlier

Santa Barbara County Water Agency

SBCWA maintains data for 36 wells in the Cuyama Basin. Some of those wells are owned by private land owners, and others are owned by local agencies such as the California Department of Transportation and the California Department of Fish and Wildlife. Summary statistics about these wells are listed below.

- Number of SBCWA-monitored wells: 36
- Earliest measurement date year: 1950
- Longest period of record: 68 years
- Median period of record: 2 years
- Median number of records for a single well: 8

Wells included in the SBCWA dataset are in Santa Barbara County near the Cuyama River, and in the hills to the south of the river. Figure 4-5 shows the locations of these wells.

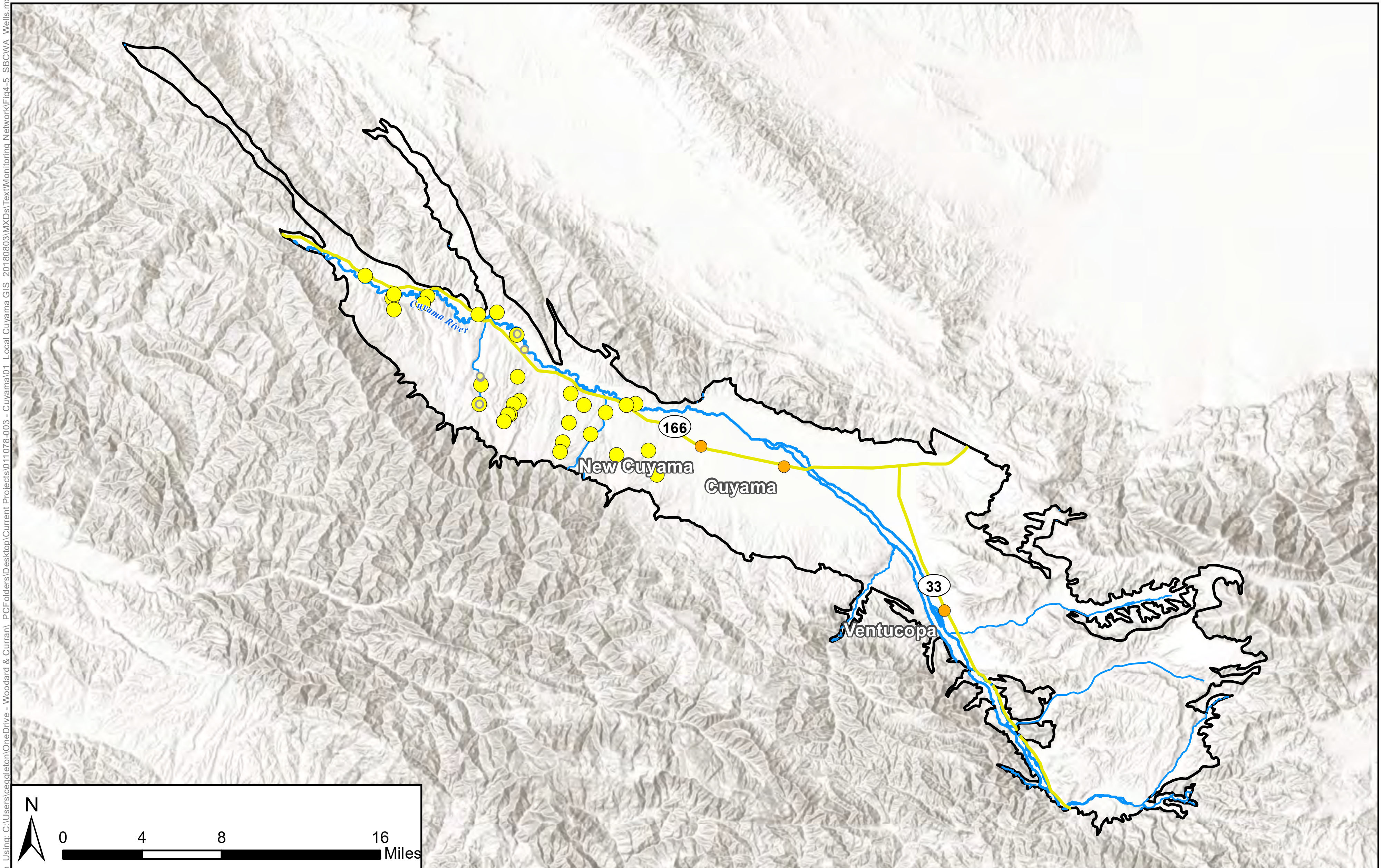

Figure 4-5: Cuyama GW Basin Wells with Monitoring Data Provided by SBCWA

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

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Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- Santa Barbara County Database Wells Last Measured in 2017-2018
- Santa Barbara County Database Wells Last Measured 2016 or Earlier

San Luis Obispo County Flood Control & Water Conservation District

SLOCFC & WCD maintains data for two wells within the Basin. SLOCFC & WCD also reports these data to DWR; all data are for the wells is incorporated through the DWR CASGEM Program dataset.

These wells are in the central portion of the Basin, north of the Cuyama River and west of State Route (SR) 33. Both wells meet the minimum requirements for inclusion in the monitoring network, and summary statistics about these wells are listed below.

- Number of SLOCFC&WCD-monitored wells: 2
- Earliest measurement year: 1990
- Longest period of record: 28 years
- Median period of record: 18 years
- Median number of records for a single well: 35

Figure 4-6 show the well locations.

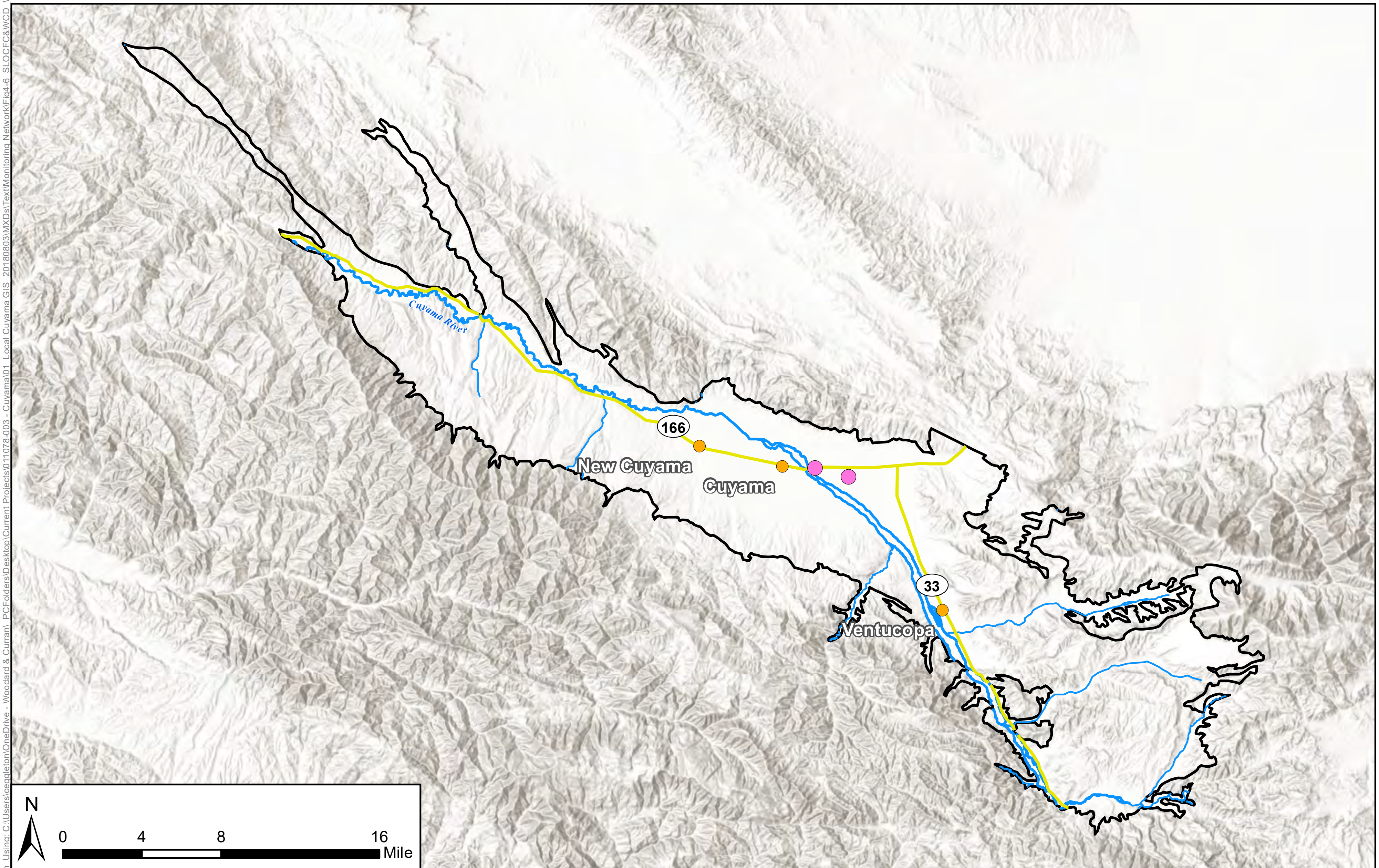

Figure 4-6: Cuyama GW Basin Wells with Monitoring Data Provided by SLOCFC&WCD

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

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WOODARD & CURRAN

Legend

- Cuyama Basin
- San Luis Obispo County Wells Last Measured in 2017-2018
- Towns
- Highways
- Cuyama River
- Streams

Ventura County Water Protection District

VCWPD manages 22 groundwater elevation monitoring wells in the Basin. A total of 20 wells are incorporated in the DWR CASGEM Program dataset.

The majority of wells managed by VCWPD are discontinued, and no longer measure groundwater elevations. Of the 22 wells, five have measured elevation data during the last decade. Summary statistics about these wells are listed below.

- Number of VCWPD-monitored wells: 22
- Earliest measurement year: 1971
- Longest period of record: 46 years
- Median period of record: 5.8 years
- Median number of records for a single well: 21.5

The wells included in the VCWPD dataset are in the southeastern portion of the Basin that intersects with Ventura County. The wells are primarily found near the Cuyama River close to agricultural land. Figure 4-7 shows well locations.

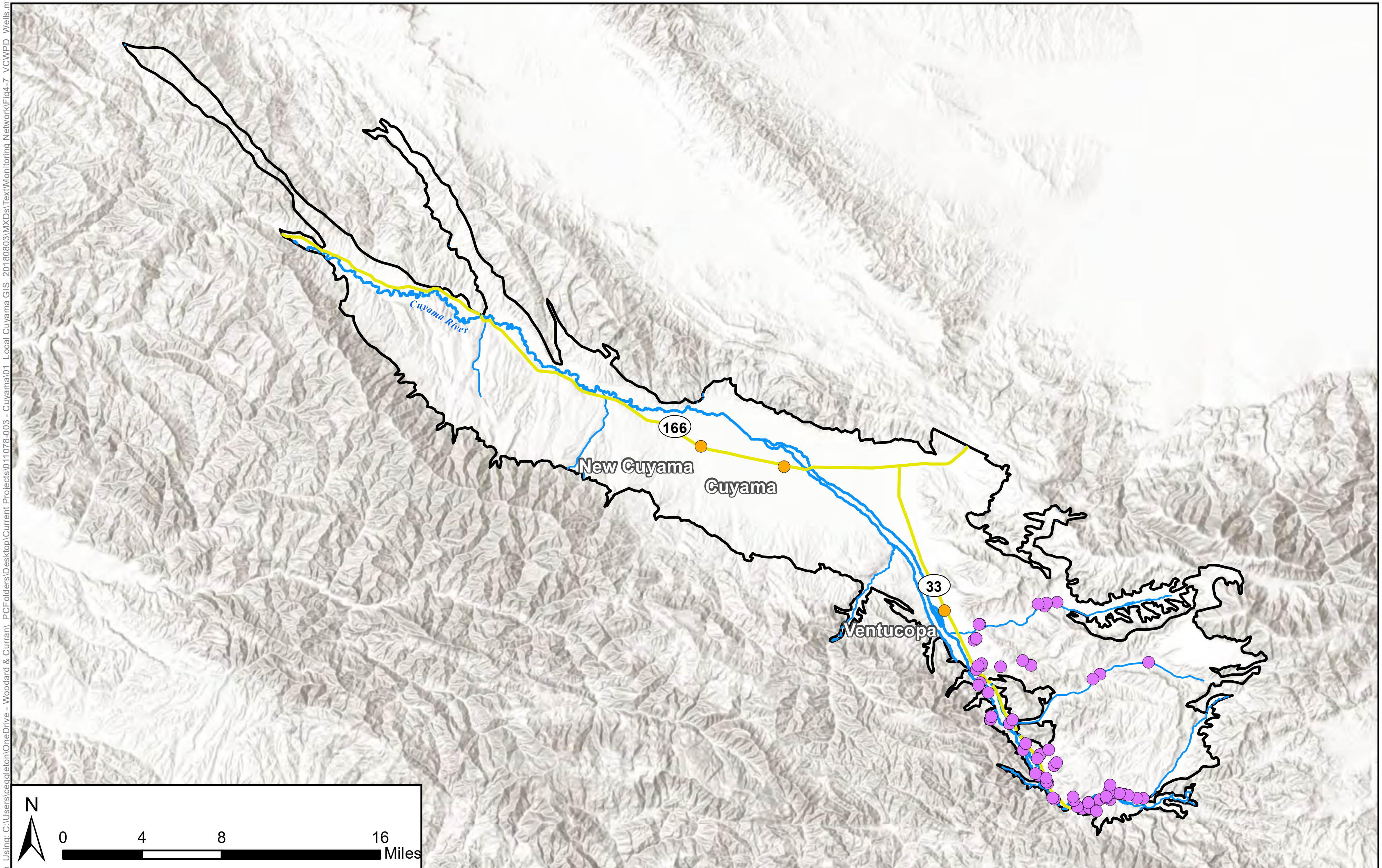

Figure 4-7: Cuyama GW Basin Wells with Monitoring Data Provided by VCWPD

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

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Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- Ventura County Watershed Protection District

Cuyama Community Services District

The Cuyama Community Services District (CCSD) performs monitoring on its two production wells, one of which has been retired. The CCSD wells are just south of the CCSD. Data for these wells are included in the SBCWA dataset, and in the DWR and USGS datasets. Summary statistics about these wells are listed below. Figure 4-8 shows the location of these wells.

- Number of CCSD-monitored wells: 2
- Earliest measurement year: 1981
- Longest period of record: 37 years
- Median period of record: 26.5 years
- Median number of records for a single well: 79

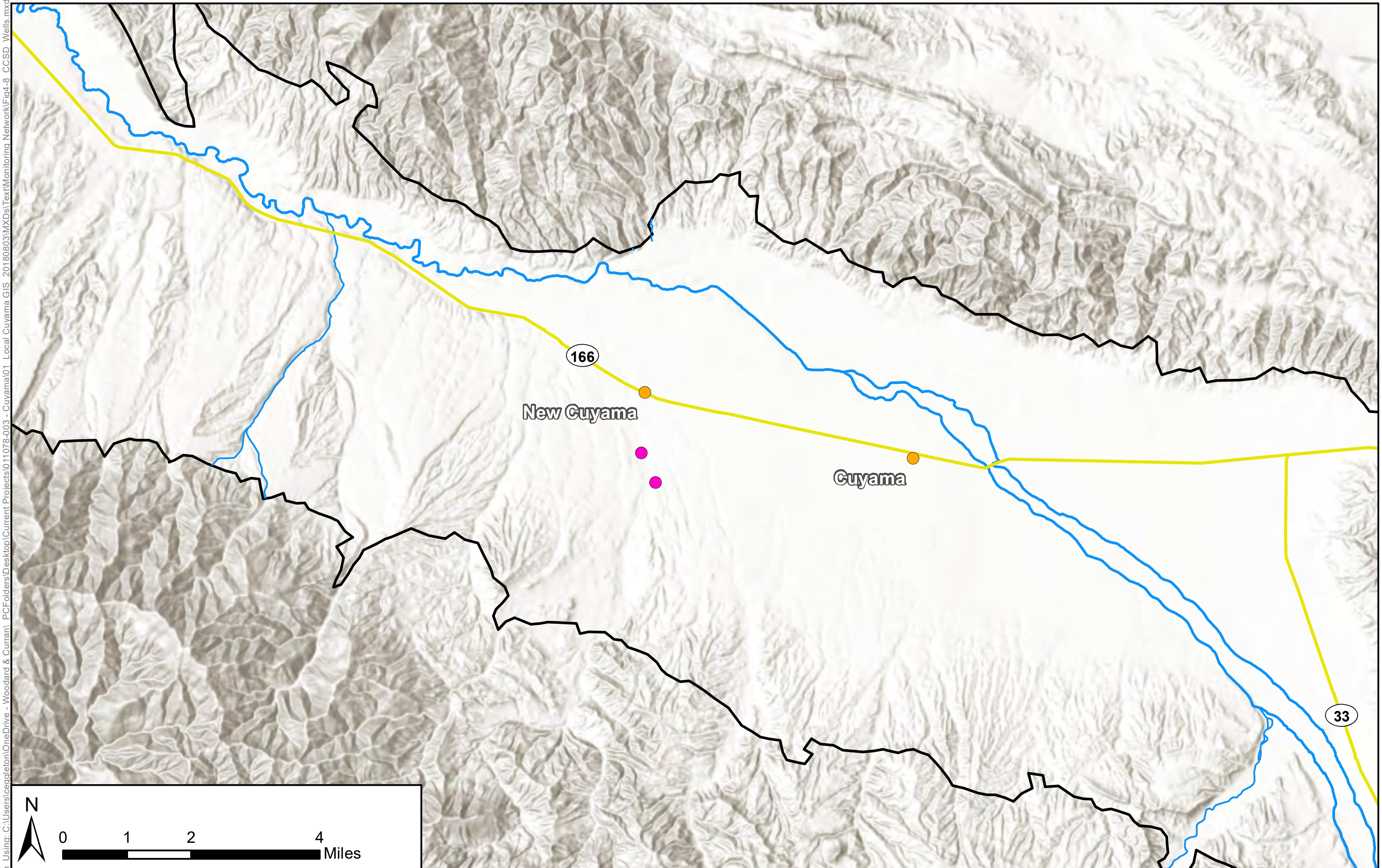

Figure 4-8: Cuyama GW Basin Wells with Data Provided by CCSD

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

April 2019

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Legend

- Cuyama Basin
- CCSD Wells
- Towns
- Highways
- Cuyama River
- Streams

Private Landowners

Private landowners in the Basin own and operate large numbers of wells, primarily for irrigation and domestic use. Many wells owned by private landowners are included in the databases described above. In addition, and at the request of CBGSA, these landowners have provided additional monitoring data about 99 private wells. Summary statistics about these wells are listed below.

- Number of private landowner wells with monitoring data: 99
- Earliest measurement date year: 1975
- Longest period of record: 42 years
- Median period of record: 15 years
- Median number of records for a single well: 16

The private landowner wells are distributed throughout the Basin. The majority of wells are located in the central portion of the Basin near the Cuyama River and SR 166. There is an additional cluster of wells toward the western portion of the Basin running along the Cuyama River. Figure 4-9 shows private landowner wells.

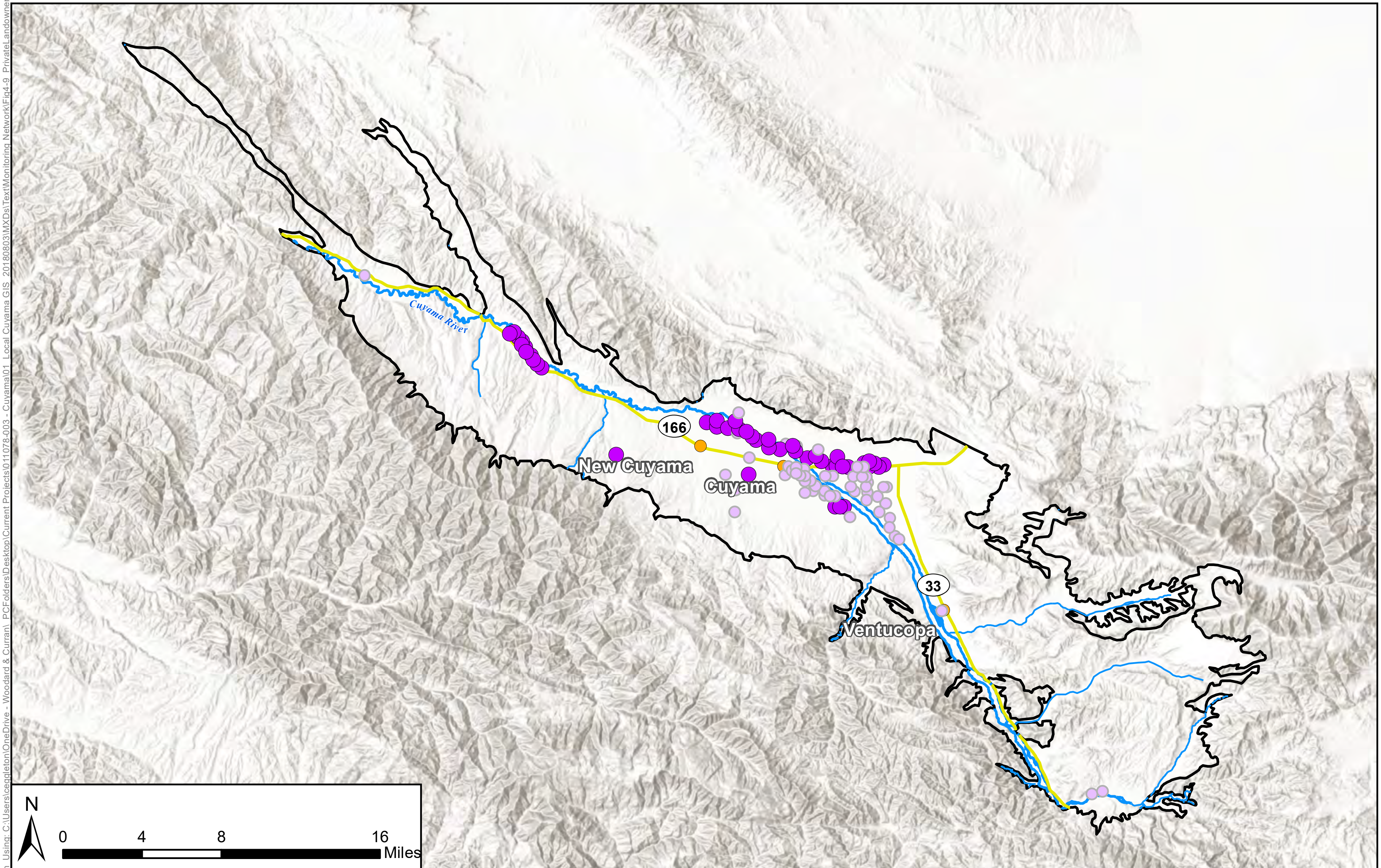

Figure 4-9: Cuyama GW Basin Wells with Monitoring Data Provided by Private Landowners

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

April 2019

WOODARD & CURRAN

Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- Private Landowner Reported Wells Last Measured in 2017-2018
- Private Landowner Reported Wells Last Measured 2016 and Earlier

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4.3.2 Overlapping and Duplicate Data

Many of the data sources used to compile and create the Cuyama Basin database contain duplicate entries for wells, metadata, groundwater level measurements, and groundwater quality measurements. Much of the well information managed by counties in the Basin is also provided and incorporated into the DWR dataset. Many of the USGS wells and DWR wells overlap between datasets.

To avoid duplicate entries when compiling the Cuyama Basin database, wells were organized by their State Well Number, Master Site Code, USGS identification number, local name, and name. Analysts identified duplicates and removed or combined entries as necessary. Each unique well was then assigned an OPTI ID which was used as the primary identification number for all other processes and mapping exercises. Additional information about the management of well data is provided in Chapter 6.

OPTI IDs were used to identify Basin wells in the database because not all data sources use similar identification methods, as shown in Table 4-1 below.

Table 4-1: Well Identification Matrix

Data Maintaining Entity	State Well Number	CASGEM ID	USGS ID	Master Site Code	Local Name	Name
DWR	✓ (green)	✓ (green)		✓ (green)		
USGS	✓ (black)		✓ (green)		✓ (red)	
SLOCFC&WCD	✓ (green)					
SBCWA	✓ (black)		✓ (red)		✓ (black)	
VCWPD	✓ (green)					
Private Landowners					✓ (black)	✓ (green)

✓ (green) = All wells had this information, ✓ (black) = Some wells had the information, ✓ (red) = Few wells had the information

4.3.3 Groundwater Quality Monitoring (Combined Existing Programs)

This section discusses existing groundwater quality monitoring programs in the Cuyama Basin.

National Water Quality Monitoring Council (NWQMC)/USGS/ Irrigated Land Regulatory Program (ILRP)

The NWQMC was created in 1997 to provide a collaborative, comparable, and cost-effective approach for monitoring and assessing the United States' water quality. Several organizations contribute to the database, including the Advisory Committee on Water Information, the United States Department of Agriculture's (USDA's) Agricultural Research Service, the United States Environmental Protection Agency (EPA), and USGS (NWQMC, 2018).

A single online portal provides access to data from the contributing agencies. Data are included from the USGS NWIS, the EPA Storage and Retrieval Data Warehouse, and the USDA's Agricultural Research

Service Program, Sustaining The Earth's Watersheds – Agricultural Research Database System. Data incorporates hundreds of different water quality constituents from the different contributing agencies. Initial water quality data for the Cuyama Basin was downloaded through NWQMC and included data about USGS monitoring sites and ILRP monitoring sites. ILRP was initiated in 2003 to prevent agricultural runoff from impairing surface waters, and in 2012, groundwater regulations were added to the program. ILRP water quality measurements are sampled from surface locations (DWR ILRP, 2018). There are currently five ILRP measurement sites in the Cuyama Basin. ILRP uses the California Environmental Data Exchange Network (CEDEN) to manage associate program data. CEDEN data are then integrated with USGS data, and then included in the NWQMC database (DWR CEDEN, 2018).

The NWQMC database provides TDS data about 180 water quality monitoring sites. This database also provides data for a variety of constituents not included here.

Summary statistics for the NWQMC, USGS, and ILRP monitoring sites is shown below.

- Number of measurement sites: 180
- Earliest measurement date year: 1940
- Longest period of record: 53 years
- Median period of record: less than 1 year
- Median number of records for a single site: 2

The majority of the water quality monitoring sites included in the NWQMC database are located in the central portion of the Basin and along the Cuyama River as it follows SR 33. Figure 4-10 shows these monitoring sites.

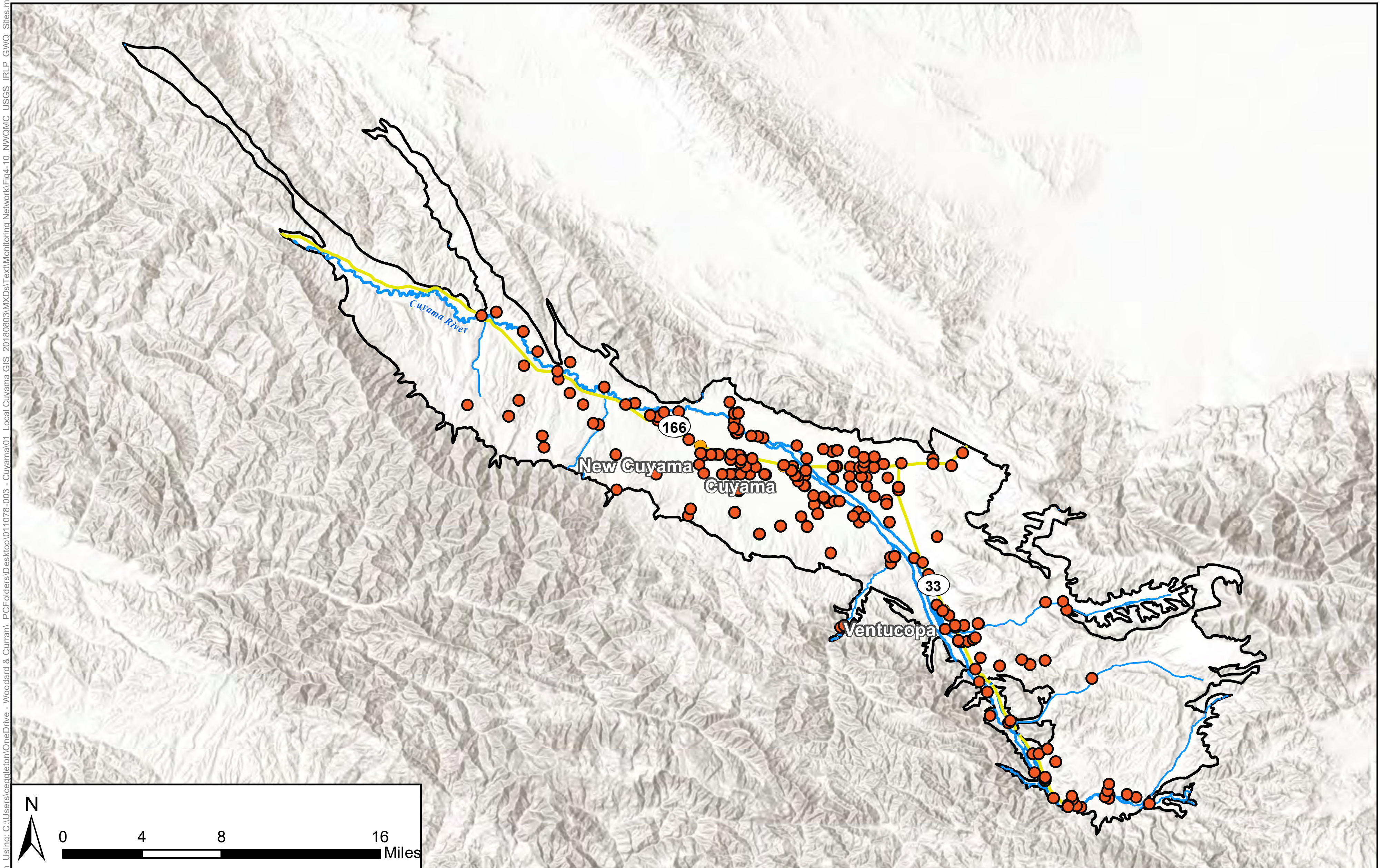

Figure 4-10: Cuyama GW Basin USGS/NWQMC/ IRLP Groundwater Quality Monitoring Sites

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

April 2019

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Legend

- Cuyama Basin
- USGS/NWQMC/IRLP Groundwater Quality Sites
- Towns
- Highways
- Cuyama River
- Streams

Groundwater Ambient Monitoring and Assessment (GAMA) Program/DWR

The GAMA Program is the State of California's groundwater quality monitoring program created by the State Water Resources Control Board in 2000. Assembly Bill 599 later expanded the Groundwater Quality Monitoring Act of 2001 (DWR GAMA, 2018). The purpose of GAMA is to improve statewide comprehensive groundwater monitoring and increase the availability of information to the general public about groundwater quality and contamination information. Additionally, the GAMA Program aims to establish groundwater quality on basin-wide scales, continue with groundwater quality sampling and studies, and centralize the information and data for the public and decision makers to enhance groundwater resource protection.

DWR also publishes statewide water quality data via the California Natural Resources Agency. Access to DWR and GAMA information and data are accessible through separate online portals.

There are 213 GAMA and DWR groundwater quality monitoring sites in the Basin. Summary statistics for these sites are shown below.

- Number of measurement sites: 213
- Earliest measurement date year: 1942
- Longest period of record: 41 years
- Median period of record: less than 1 year
- Median number of records for a single site: 2

The GAMA/DWR groundwater quality monitoring locations are spread throughout the Basin, loosely following the Cuyama River. There are 60 water quality monitoring sites per 100 square miles in the Basin. Figure 4-11 shows these locations.

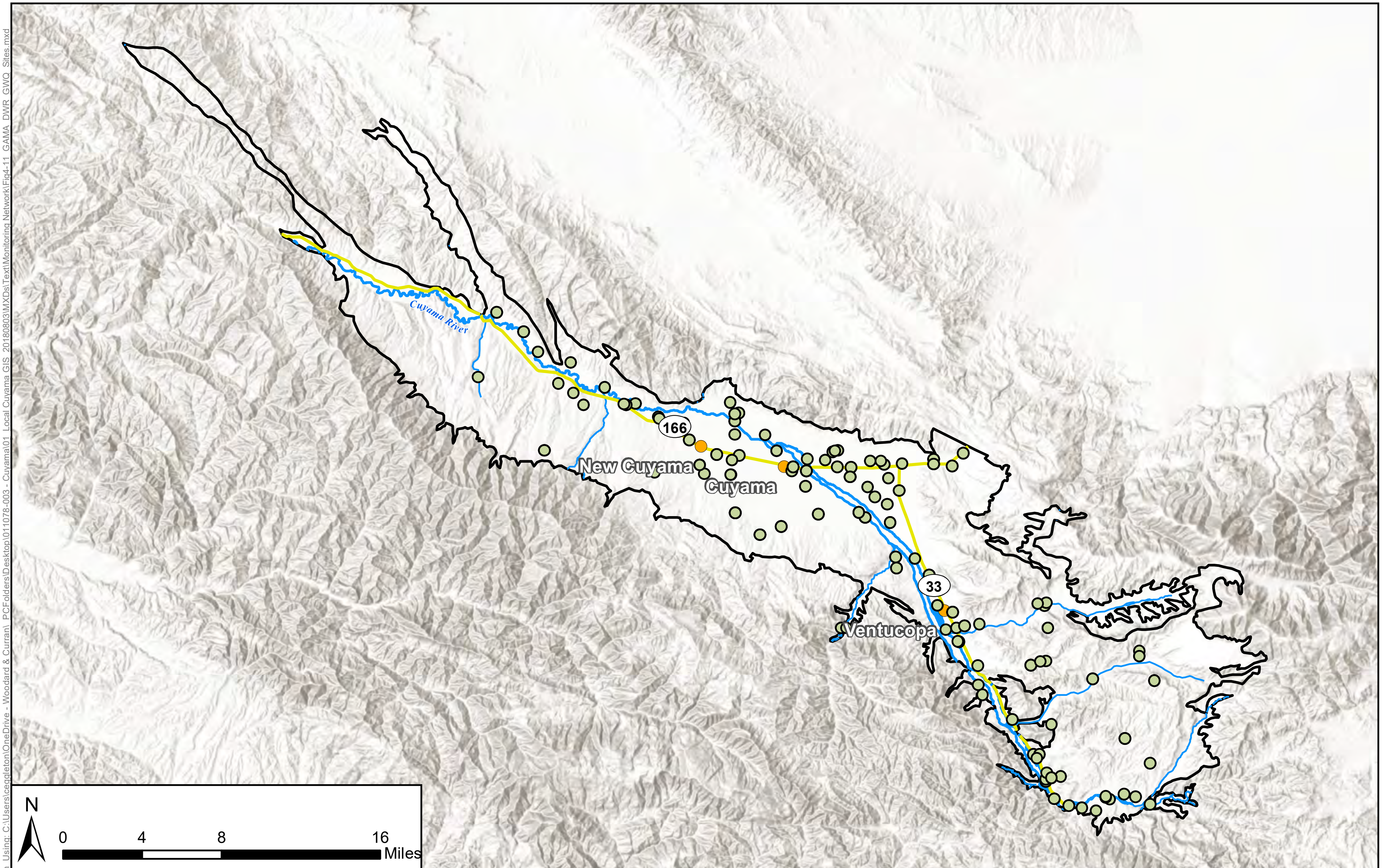

Figure 4-11: Cuyama GW Basin GAMA/DWR Groundwater Quality Monitoring Sites

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

April 2019

WOODARD & CURRAN

Legend

- Cuyama Basin
- GAMA/DWR Groundwater Quality Sites
- Towns
- Highways
- Cuyama River
- Streams

Cuyama Community Services District

CCSD currently operates one production well for residential distribution in the Basin. Although some data for this well are included in the NWQMC dataset, annual Consumer Confidence Reports from 2011 to 2017 were processed for additional water quality data measurements. Summary statistics for the CCSD well are listed below and the well location is shown in Figure 4-12.

- Number of measurement sites: 1
- Earliest measurement date: 2008
- Period of record: 10 years
- Number of records: 21

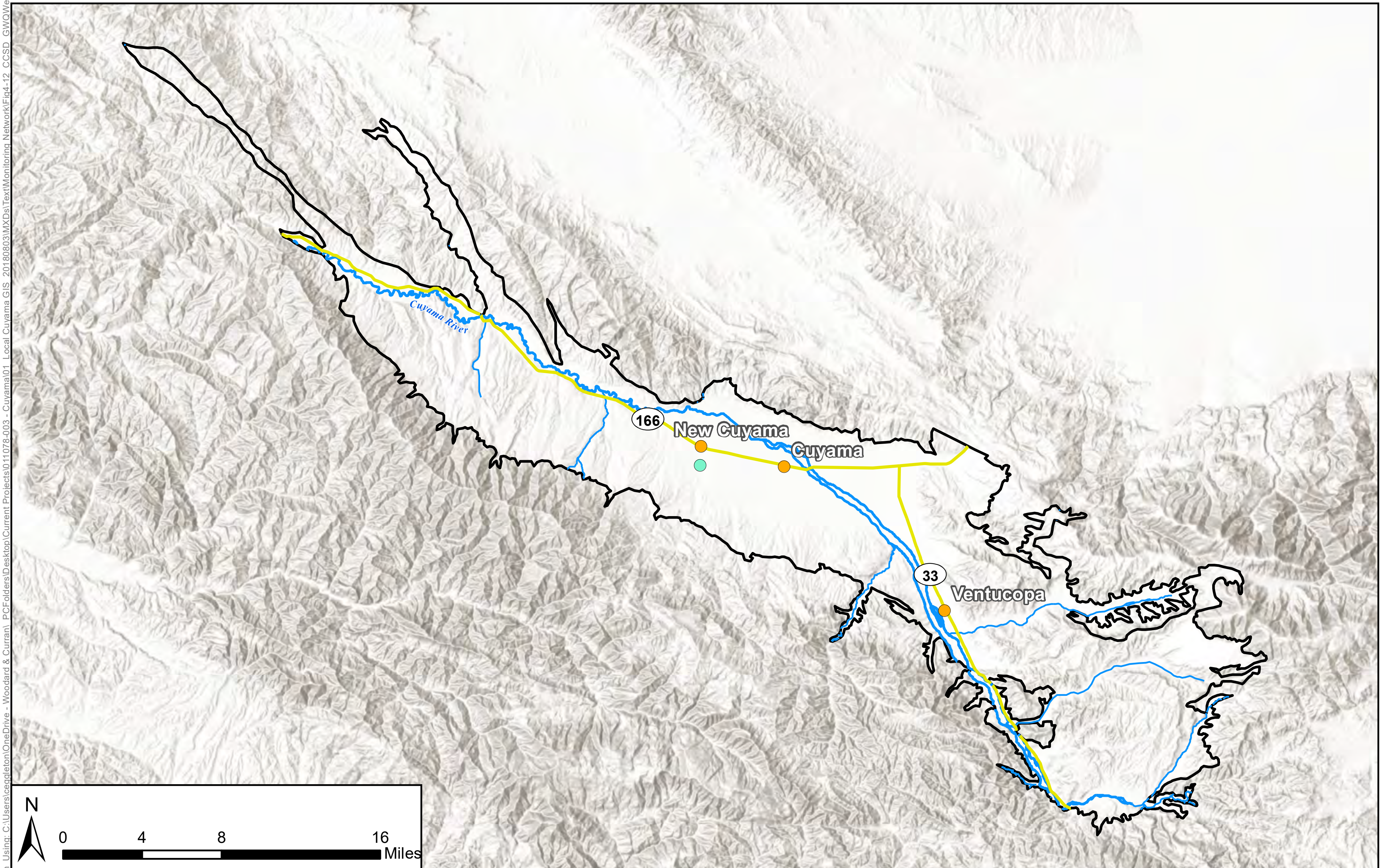

Figure 4-12: Cuyama GW Basin
CCSD Groundwater Quality Well

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

April 2019

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Legend

- Cuyama Basin
- Cumaya Community Services District Water Quality Monitoring Well
- Towns
- Highways
- Cuyama River
- Streams

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Ventura County Water Protection District

VCWPD has 51 groundwater wells that are used for groundwater quality monitoring in the Basin. All of the wells are incorporated into the DWR, GeoTracker, or USGS datasets. Sampling data include numerous water quality constituents; however, this GSP only addresses TDS. Summary statistics for the wells are listed below, and locations of these wells are included in Figure 4-13.

- Number of measurement sites: 51
- Earliest measurement date: 1957
- Longest period of record: 45
- Median period of record: 7
- Median number of records for a single site: 5

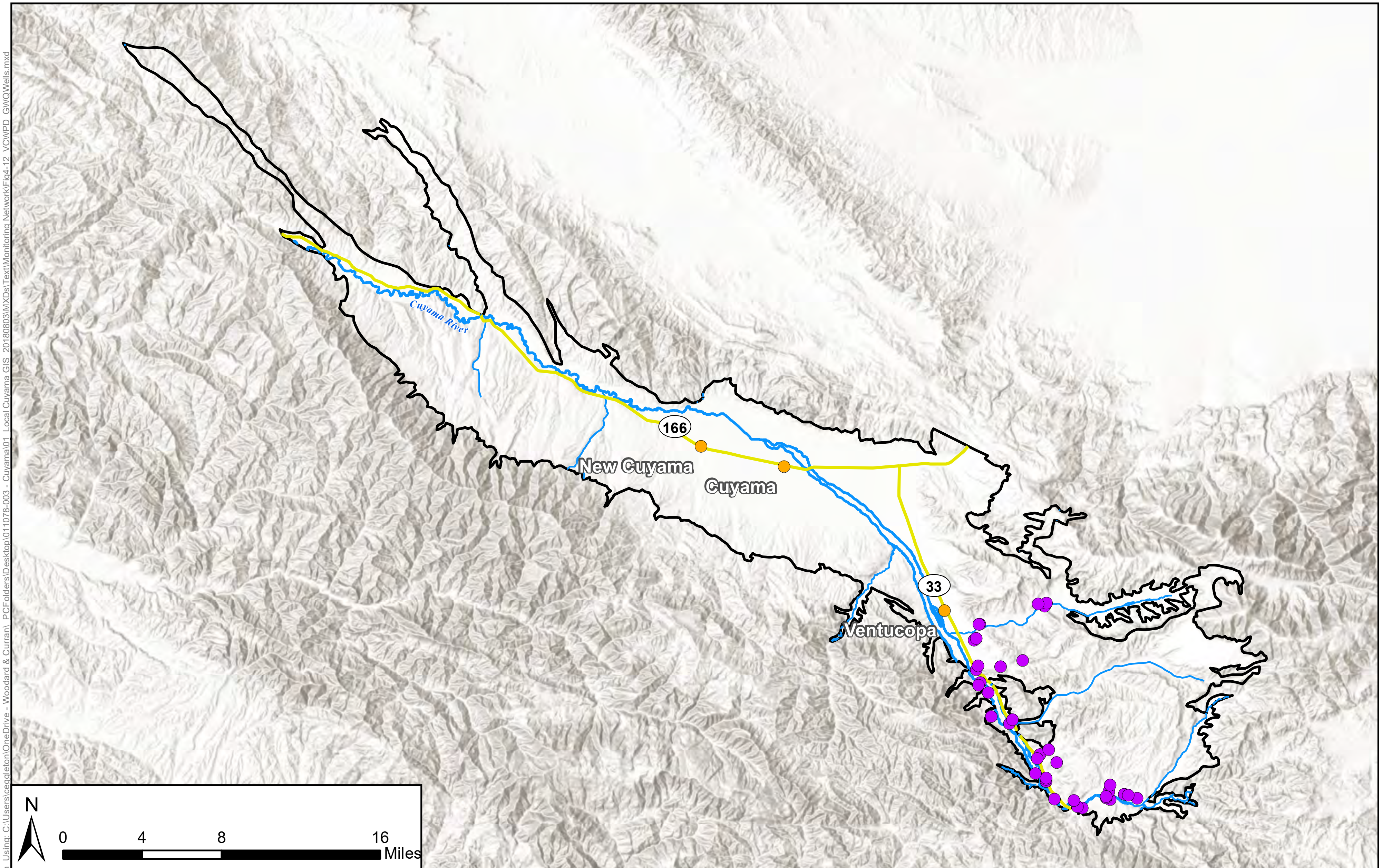

Figure 4-13: Cuyama GW Basin VCWPD Groundwater Quality Wells

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

April 2019

WOODARD & CURRAN

Legend

- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- Ventura County Watershed Protection District Groundwater Quality Monitoring Wells

Private Landowners

Private landowners in the Basin conducted groundwater quality testing, which has been incorporated into this document and associated analysis. In 2015, 11 wells measured for TDS. Summary statistics about these wells are listed below, and locations are shown in Figure 4-14.

- Number of measurement sites: 11
- Earliest measurement date: January 12, 2015
- Longest period of record: Not applicable
- Median period of record: Not applicable
- Median number of records for a single site: 1

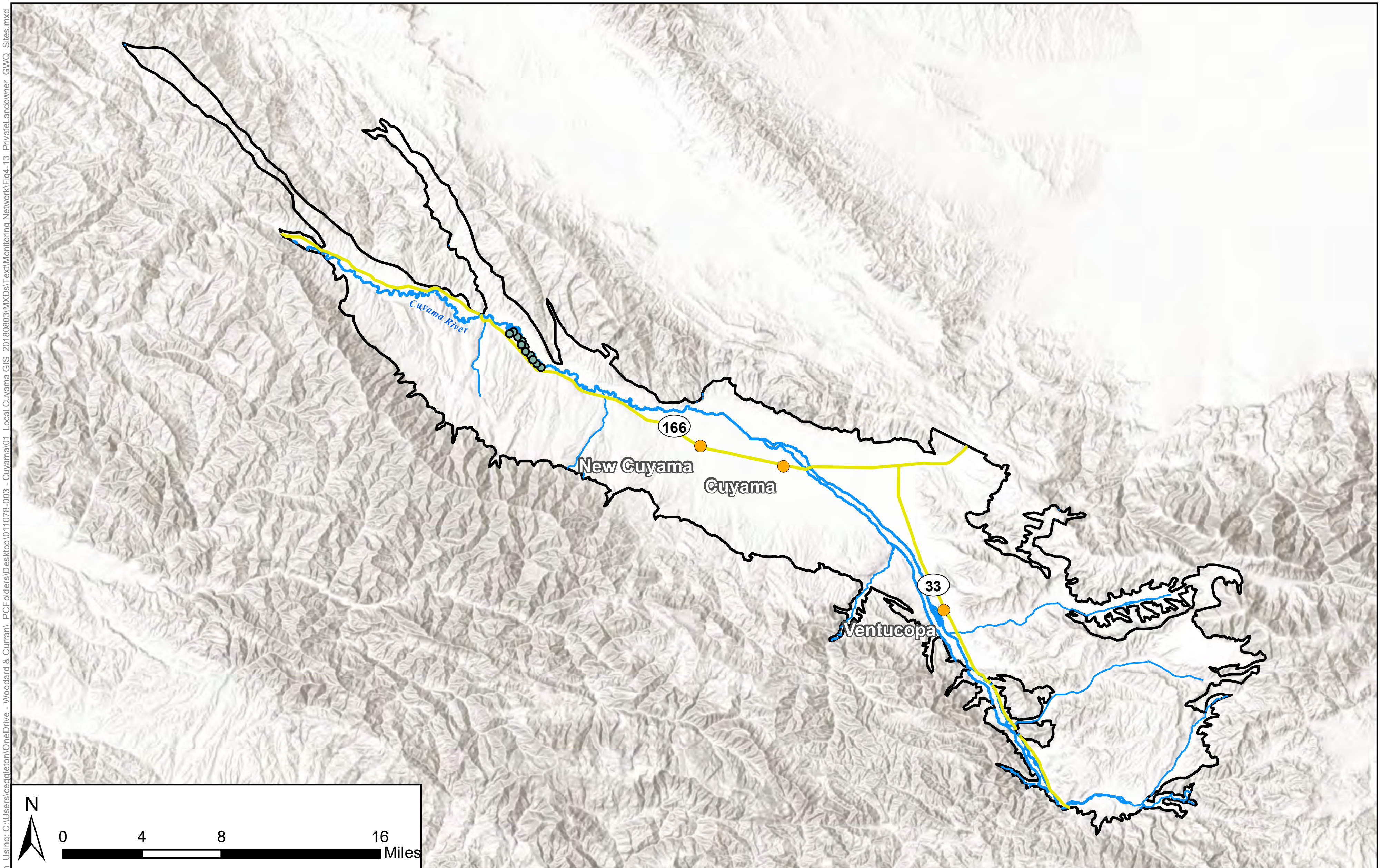

Figure 4-14: Cuyama GW Basin Private Land-owner Groundwater Quality Monitoring Sites

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

April 2019

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Legend

- Cuyama Basin
- Private Landowner Groundwater Quality Monitoring Sites
- Towns
- Highways
- Cuyama River
- Streams

4.3.4 Subsidence Monitoring

Subsidence is the sinking or downward settling of the earth's surface and is often the result of over-extraction of subsurface water. Subsidence can be directly measured using a few different methods, such as light detection and ranging (LiDAR), interferometric synthetic aperture radar (InSAR), continuous geographic positioning system (CGPS), extensometers, and spirit leveling. For more information, see Appendix B in Chapter 2, which contains further information about these methods and the physics behind land subsidence. The subsidence monitoring network described below assumes the use of extensometers to monitor subsidence in the Basin. However, the CBGSA should evaluate other methods, including LiDAR and InSAR during the implementation phase to identify an optimal approach.

The Basin hosts two CGPS stations, and three others are just outside the Basin's boundary. CGPS stations measure surface movement in all three axis directions (i.e., up, down, east, west, north, and south). CGPS stations are in the center of the Cuyama Valley, and measure subsidence, while others are placed on ridges around the valley to also measure tectonic movement.

4.3.5 Surface Water Monitoring

Surface water monitoring in the Basin is conducted through stream and river gages placed along the Cuyama River or one of its tributaries. USGS manages most flow gages in California and currently operates one active stream gage along Santa Barbara Creek. There is a gage (1136800) along the Cuyama River downstream of the Basin before Twitchell Reservoir; however, this gage also receives water from non-Cuyama Basin watershed areas. In 2021, the CBGSA worked with USGS to reactivate a gage on the Cuyama River near Ventucopa (11136500), which had previously been active from 1945-1958 and from 2009-2014, and to install a new gage on the Cuyama River near New Cuyama (11136710). Data for surface flow gages are obtained through the NWIS Mapping portal (USGS NWIS, 2023). Existing and discontinued gages are shown in Figure 4-15.

USGS had previously operated two additional gages in the Basin; however, those gages were discontinued in the 1970s.

Figure 4-15: Rivers, Streams, and Surface Flow Gages

Cuyama Valley Groundwater Basin

Legend

Cuyama Watershed
- Contributes to Cuyama GW Basin
- Does not Contribute to Cuyama GW Basin
- Active Flow Gages
- New Active Flow Gages
- Inactive
- Highway
- Local Road
- Town
- Cuyama River
- Creek
- Cuyama Basin

N

0 1.75 3.5 7 Miles

Woodard & Curran

Cuyama Basin Groundwater Sustainability Agency

Map Created: December 2023

Figure Exported: 12/27/2023 By: DHunt Using: \\woodardcurran.net\shared\Projects\CA Cuyama Basin GSA\0011078.01 GSP\wip\Z. GIS\2. Maps\2025 GSP Update\01_Agency_Info_Plan Area_Com\21_surface_flow_gage\SurfaceFlowGage.aprx

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4.4 Monitoring Rationales

This section discusses the reasoning behind monitoring network selection. Monitoring networks in the CBGSA area were developed to ensure they could detect changes in Basin conditions so CBGSA could manage the Basin and ensure sustainability goals were met. Additionally, monitoring can help assure that no undesirable results are present after 20 years of sustainable management.

The monitoring networks were selected specifically to detect short-term, seasonal, and long-term trends in groundwater levels and storage. The monitoring networks were also selected to include information about temporal frequency and spatial density so the CBGSA can evaluate information about groundwater conditions necessary to evaluate project effectiveness and the effectiveness of any management actions undertaken by the CBGSA.

Chapter 8 describes how each monitoring network is being developed and implemented as individual projects by the GSA as part of GSP implementation. The schedule and costs associated with developing and implementing each monitoring network are discussed in Chapter 8.

4.5 Groundwater Level Monitoring Network

Groundwater level monitoring is conducted through a groundwater well monitoring network. This section will provide information about how the level monitoring network was developed for the 2020 GSP and subsequently revised for the 2025 GSP Update, the criteria for selecting representative wells, monitoring frequency, spatial density, summary protocols, and identification and strategies to fill data gaps.

4.5.1 Monitoring Wells Selected for Monitoring Network

The 2020 GSP utilized a tiering network to create the groundwater level monitoring well network. These well-tiering criteria were created to rank existing groundwater level measuring sites in the Basin, which were arranged into six different tiers that were defined based on the availability of metadata and consistent water elevation data that were operational and functional. The tiering allowed for different thresholds and requirements around well metadata and frequency of monitoring. All wells that were evaluated were active and functioning. This tiering protocol resulted in a monitoring network of 101 wells from the monitoring entities described earlier in this chapter. Utilizing these wells for monitoring purposes requires consent agreements with each well owner. Since 2020, the CBGSA has worked with local landowners and monitoring entities to reach consent agreements to sample the wells that were included in the monitoring network. The monitoring network from the 2020 GSP is shown in Figure 4-16.

Since the GSP adoption in 2020, the CBGSA has continued the process of refining and improving the groundwater monitoring network within the Basin. Monitoring has been ongoing in the Basin since August 2020, and the information gathered is continuously evaluated. Based on the information gathered to date, the CBGSA board determined at its January 2021 Board meeting to reduce the monitoring network to eliminate spatially redundant wells from the network. This revised the monitoring network to

62 wells at 50 locations, including six multi-completion wells. These included nine new wells at three multi-completion well locations installed as part of DWR's Technical Support Services (TSS) program. The refinement of the monitoring network decreased the spatial density to 16.4 wells per 100 square miles, still greater than the recommended threshold of 0.2-10 wells per 100 square miles. This monitoring network refinement is documented in the Annual Report for the 2019-2020 Water Year (CBGSA 2021).

To refine the monitoring network for the 2025 GSP Update, the CBGSA completed a comprehensive review of the groundwater levels network and the monitoring program for all representative and non-representative wells. The review included identification of field sampling issues at each well. These included a lack of landowner agreement for monitoring, access issues due to issues at the well site, and access issues due to winter flooding. Other factors were also considered, such as if the well is projected to go dry between now and 2030, whether the well is an active pumping well and the magnitude of pumping, and whether a nearby or similar well shows similar groundwater level changes and therefore makes the well redundant. Figure 4-17 shows the results of this analysis and the sampling analysis for each well. The review concluded that all issues related to onsite access and weather at the wellsite were temporary and did not preclude the well from continued inclusion in the monitoring network. In addition, no wells were identified for removal due to redundancy. However, there were three wells (98, 121, and 124) where the GSA was unable to obtain an access agreement with the landowner; therefore, these three wells have been removed from the monitoring network. Furthermore, monitoring wells that have been identified as active pumping wells are recommended for long-term replacement; this is discussed in the data gaps section below.

In addition, the CBGSA has worked to address the spatial gaps identified in the 2020 GSP. The CBGSA is using funding available from a SGMA implementation grant agreement with DWR to install three piezometers in the vicinity of groundwater dependent ecosystems (GDEs) as well as multi-completion wells at seven other locations within the Basin. The multi-completion wells are expected to have 2 to 3 completions at each location. Two existing wells have also been offered to the CBGSA by landowners for monitoring and have been added to the groundwater levels monitoring network. These additional wells are allowing the CBGSA to fill many of the data gaps identified in the 2020 GSP.

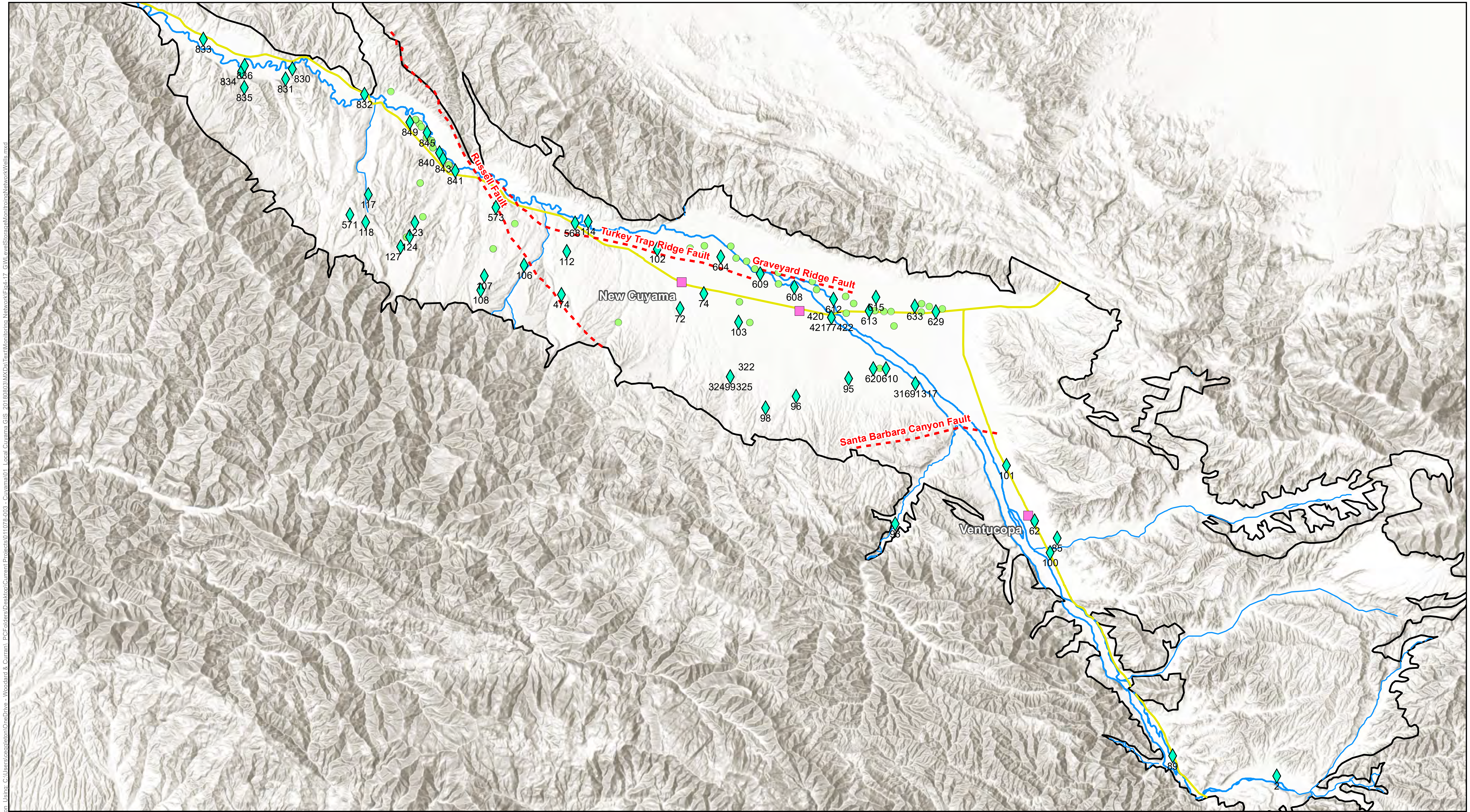

Figure 4-16: Cuyama GW Basin Groundwater Level Monitoring Network Wells (2020)

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

April 2019

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Legend

- Cuyama Basin
- Towns
- Faults
- Highways
- Cuyama River
- Streams

Monitoring Network Wells

- Representative Wells
- Monitoring Network Wells

N

0 1.75 3.5 7 Miles

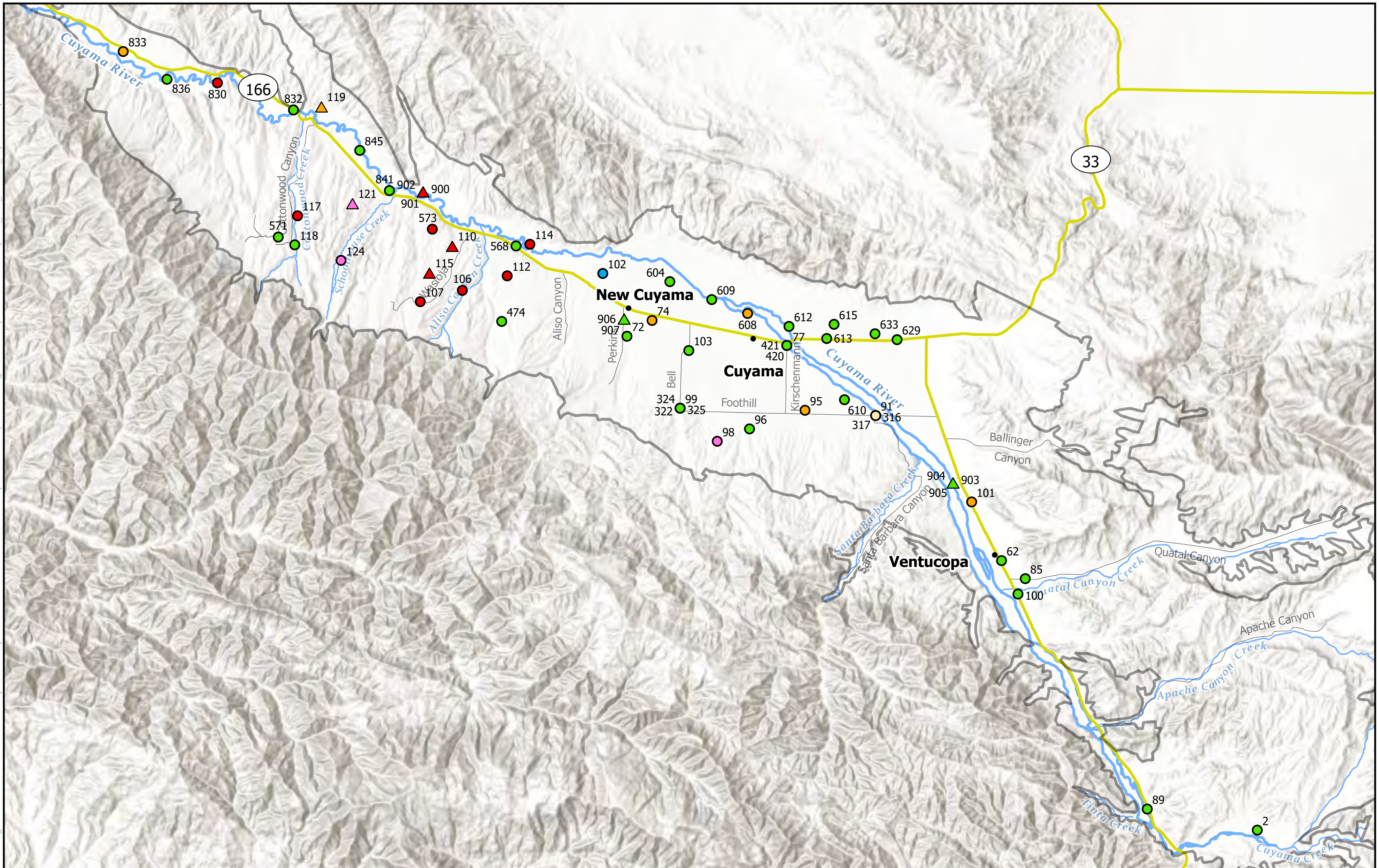

Figure 4-17: Groundwater Level Monitoring Network Review

Cuyama Valley Groundwater Basin

Legend

Representative
- No Issues
- Onsite Issues (Access)
- Onsite Issues (Flooding)
- Tranducer Issues
- Well Access Agreement
- At Risk of Going Dry

Non-Representative
- No Issues
- Onsite Issues (Access)
- Onsite Issues (Flooding)
- Well Access Agreement

- Highway
- Local Road
- Town
- Cuyama River
- Creek
- Cuyama Basin

N

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CUYAMA BASIN GROUNDWATER SUSTAINABILITY AGENCY

0 1.25 2.5 5 Miles

Map Created: December 2023

Figure Exported: 12/27/2023 By: DHunt Using: \\woodardcurran.net\shared\Projects\CA Cuyama Basin GSA\0011078.01 GSP\wip\Z. GIS\2. Maps\Monitoring Network Adjustments 2023\Cuyama_well_network_adjustment.aprx

4.5.2 Monitoring Frequency

A successful monitoring frequency and schedule should allow the monitoring network to adequately interpret fluctuations over time in the groundwater system based on shorter-term and longer-term trends and conditions. These changes may be the result of storm events, droughts, or other climatic variations, seasons, and anthropogenic activities such as pumping.

Monitoring frequency must, at a minimum, occur within the same designated time-period for all wells to ensure that measurements represent the same condition for the aquifer.

The *Monitoring Networks and Identification of Data Gaps Best Management Practices* (BMPs) published by DWR provides guidance for monitoring frequency based on the discussion presented in the *National Framework for Ground-water Monitoring in the United States* (Advisory Committee on Water Information, 2013). This analysis and discussion provide guidance on monitoring frequency based on aquifer properties and degree of use, as shown in Table 4-2.

The BMP guidance recommends that initial characterization of monitoring locations use frequent measurements to establish the dynamic range at each monitoring site and to identify external stresses affecting groundwater levels. An understanding of these conditions based on professional judgement should be reached before normal monitoring frequencies are followed.

Table 4-2: Monitoring Frequency Based on Aquifer Properties and Degree of Use

Aquifer Type	Nearby Long-Term Aquifer Withdrawals		
	Small Withdrawals	Moderate Withdrawals	Large Withdrawals
Unconfined Aquifer			
Low recharge (<5 inches/year)	Quarterly	Quarterly	Monthly
High recharge (>5 inches/year)	Quarterly	Monthly	Daily
Confined Aquifer			
Low hydraulic conductivity (<200 feet/day)	Quarterly	Quarterly	Monthly
High hydraulic conductivity (>200 feet/day)	Quarterly	Monthly	Daily

The Basin is an unconfined aquifer with large withdrawals, with a low recharge rate of less than 5 inches per year. According to the data in Chapter 2, provided by DWR, the Basin's groundwater monitoring frequency should be monthly. The 2020 GSP recommended monthly monitoring of the groundwater level network initially and consideration of reducing monitoring frequency to quarterly measurements after allowing time for the monitoring program to be evaluated. Monthly monitoring was conducted for two years from August 2020 through July 2022, with a quarterly monitoring schedule starting in October 2022. Each quarterly sampling event for groundwater levels is routinely completed within 2-3 days.

4.5.3 Spatial Density

Spatial density of the monitoring network was considered both for the selection of the entire monitoring network, and for the selection of representative wells (Section 4.5.4). The goal of the groundwater level monitoring network is to provide adequate coverage of the entire Basin aquifer. This includes the ability to monitor and identify groundwater changes across the Basin over time. Consideration of the spatial location of monitoring wells should include proximity to other monitoring wells and ensure adequate coverage near other prominent features, such as faults or production wells. Monitoring wells in close proximity to active pumping wells could be influenced by groundwater withdrawals, thus skewing static level monitoring.

The *Monitoring Networks and Identification of Data Gaps BMP* published by DWR provides different sources and condition dependent densities to guide monitoring network implementation (Table 4-3). This information was adapted from the *CASGEM Groundwater Elevation Monitoring Guidelines* (DWR, 2010). While these estimates provide guidance to monitoring well site spatial densities, monitoring points should primarily be influenced by local geology, groundwater use, and GSP-defined undesirable results. Professional judgment is essential when determining final locations.

Table 4-3: Monitoring Well Density Considerations

Reference	Monitoring Well Density (wells per 100 square miles)
Heath (1976)	0.2-10
Sophocleous (1983)	6.3
Hopkins (1994)	
Basins pumping more than 10,000 acre-feet per year per 100 square miles	4.0
Basins pumping between 1,000 and 10,000 acre-feet per 100 square miles	2.0
Basins pumping between 250 and 1,000 acre-feet per year per 100 square miles	1.0
Basins pumping between 100 and 250 acre-feet per year per 100 square miles	0.7

The Basin has 378 square miles of area. According to Hopkins (1994) well density estimate guidelines, the Basin should have four monitoring wells per 100 square miles. Sophocleous (1983) recommends 6.3 monitoring wells per 100 square miles. According to Heath (1976), the Basin should have between 0.2 and 10 monitoring wells per 100 square miles. Due to geologic and topographic variability in the Basin, the severity of groundwater declines, and hydrogeologic uncertainty in various portions of the Basin, this GSP recommends a density greater than the most conservative estimate of 10 wells per 100 square miles, which is over 38 monitoring wells. The current monitoring network is comprised of 79 wells equating to a well density of 20 wells per 100 square miles. This exceeds the GSP recommended density.

4.5.4 Representative Monitoring

There are two categories of wells identified within the monitoring network as follows:

- **Representative Wells.** These wells will be used to monitor sustainability in the Basin. Minimum thresholds and measurable objectives will also be calculated for these wells.
- **Non Representative wells.** Other wells are included in the monitoring network to provide redundancy for representative wells, and to maintain a robust network for evaluation as part of five-year GSP updates.

Representative monitoring wells were selected as part of monitoring network development. Representative monitoring wells are wells that represent conditions in the Basin and are in locations that allow monitoring to indicate long-term, regional changes in its vicinity.

Representative groundwater level and groundwater storage sites were selected by several different criteria. These criteria include the following:

- **Adequate Spatial Distribution –** Representative monitoring does not require the use of all wells that are spatially grouped together in a portion of the Basin. Adequately spaced wells will provide greater Basin coverage with fewer monitoring sites.
- **Robust and Extensive Historical Data –** representative monitoring sites with longer and more robust historical data provide insight into long-term trends that can provide information about groundwater conditions through varying climatic periods such as droughts and wet periods. Historical data may also show changes in groundwater conditions through anthropogenic effects. While some sites chosen may not have extensive historical data, they may still be selected because there are no wells nearby with longer records.
- **Increased Density in Heavily Pumped Areas –** Selection of additional wells in heavily pumped areas such as in the central portion of the Basin and other agriculturally intensive areas will provide additional data where the most groundwater change occurs.
- **Increased Density near Areas of Geologic, Hydrologic, or Topologic Uncertainty** – Having a greater density of representative wells in areas of uncertainty, such as around faults or large elevation gradients may provide insightful information about groundwater dynamics to improve management practices and strategies.
- **Wells with Multiple Depths** – The use of wells with different screen intervals is important for collecting data about groundwater conditions at different elevations in the aquifer. This can be achieved by using wells with different screen depths that are close to one another, or by using multi-completion wells.
- **Consistency with BMPs –** Using published BMPs provided by DWR will ensure consistency across all basins and ensure compliance with established regulations.

- **Adequate Well Construction Information –** Well information such as perforation depths, construction date, and well depth should be considered and encouraged when considering wells to be included.
- **Professional Judgment** – Professional judgment is used to make the final decision about each well, particularly when more than one suitable well exists in an area of interest.
- **Maximum Coverage** – Any monitoring network well that was suitable for use in the representative network was used to maximize spatial and vertical density of monitoring.

4.5.5 Groundwater Level Monitoring Network

Figure 4-18 shows the updated groundwater level monitoring network, including representative and non-representative wells. Existing wells are labeled with their Opti identification (ID) number. Locations of wells currently being installed with grant funding are labeled on the map either as a GDE well or as a multi-completion monitoring (MW) well.

Table 4-4 lists the wells in the updated groundwater level monitoring network. Representative wells, which include those with sufficient data and representative trends within the Basin to develop sustainability criteria, are identified with the asterisk (*) next to the OPTI ID and are sorted first. Metadata for the wells are also included. With the removal of the three wells identified above and the addition of the newly installed wells, the revised network includes 79 wells, 47 of which are representative wells. However, the table does not currently include the wells that will be installed with the DWR grant funding as Opti ID numbers have not been assigned for these wells.

This network of 79 wells, including the wells that are planned to be drilled, equates to a well density of 20 wells per 100 square miles. This monitoring network provides a spatial density that adequately covers the primary aquifer in the Basin and is useful for determining flow directions and hydraulic gradients, as well as changes in storage calculations for use in future water budgeting efforts in portions of the Basin with significant land use.

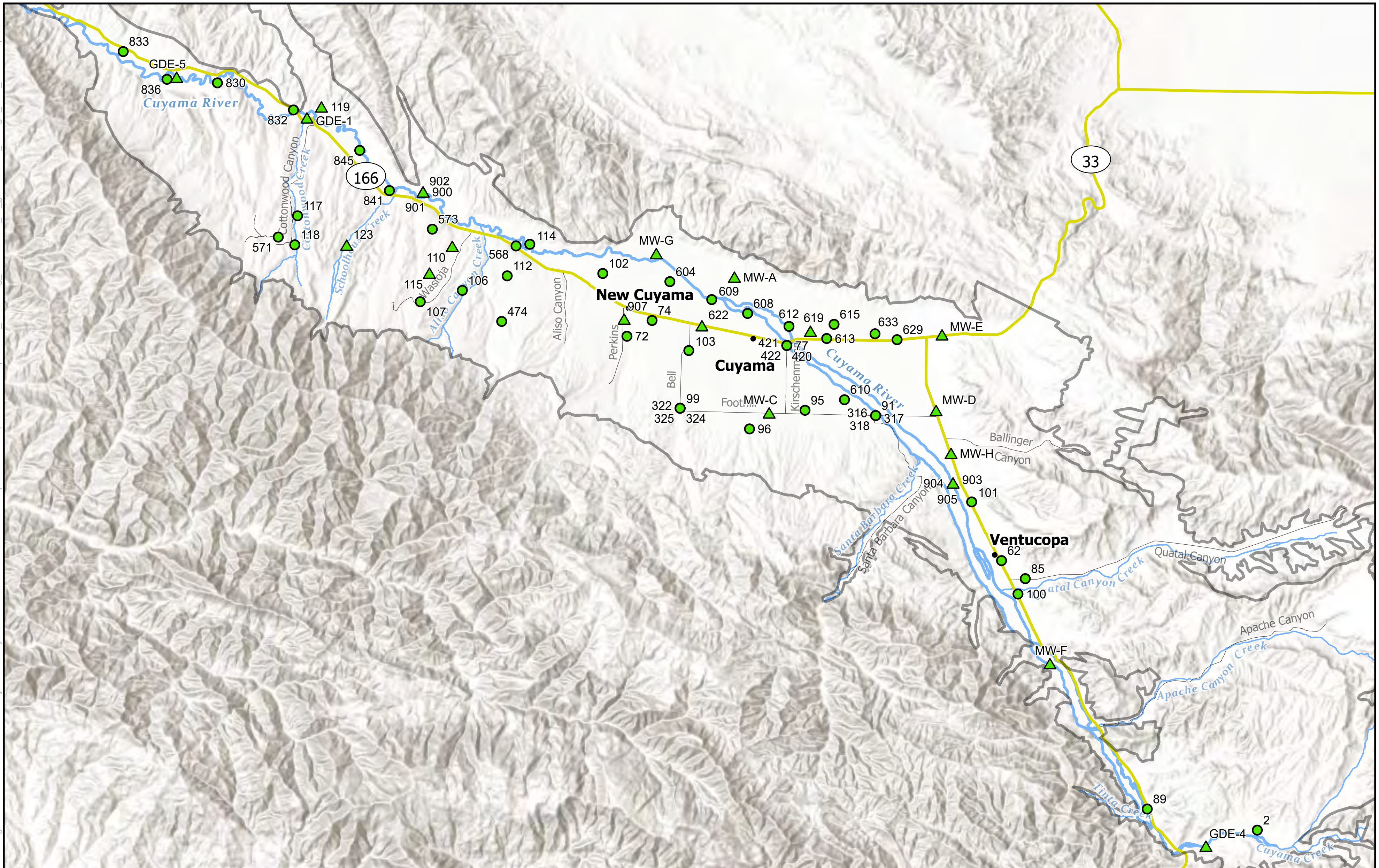

Figure 4-18: Updated Groundwater Level Monitoring Network

Cuyama Valley Groundwater Basin

Legend

Network Well

- Representative Monitoring
- Non-representative Monitoring

Highway

Local Road

Town

Cuyama River

Creek

Cuyama Basin

N

0 1.25 2.5 5 Miles

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Cuyama Basin Groundwater Sustainability Agency

Map Created: December 2023

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Any reliance upon the map or data contained herein is at the users' sole risk. **Data sources: CA DWR, esri, USGS. Monitoring well data available in the Opti data catalog: https://opti.woodardcurran.com/cuyama/login.php**

Table 4-4: Groundwater Level and Storage Monitoring Network

OPTI ID	Well Construction Date	Well Depth (Feet)	Hole Depth (Feet)	Screen Interval (Feet)	Well Elevation (Feet above mean sea level)	Transducer
2*	-	73	-	-	3720	No
62*	-	212	-	-	2920	Yes
72*	1/1/1980	790	820	350-340	2172	No
74*		-	-	-	2193	No
77*	12/4/2008	980	1003	980-960	2283	Yes
85*	1947	233	-	-	3049	No
89*	1/1/1965	125	-	-	3456	No
91*	9/29/2009	980	1000	980-960	2478	Yes
95*	4/9/2009	805	825	-	2458	No
96*	2/1/1980	500	-	-	2609	No
99*	9/10/2009	750	906	750-730	2503	No
100*	11/1/1988	284	302	-	3009	No
101*	-	200	220	-	2749	No
102*	-	-	-	-	2044	No
103*	7/23/2010	1030	1040	-	2288	Yes
106*	-	228	-	-	2319	No
107*	1/1/1950	200	-	-	2494	No
112*	-	441	-	-	2131	No
114*	1/1/1947	58	-	-	1927	No
117*	-	212	-	-	2,098	No
118*	-	500	-	-	2264	No
316*	9/29/2009	830	1000	-	2478	Yes
317*	9/29/2009	700	1000	-	2478	Yes
322*	4/9/2009	850	906	-	2503	No
324*	9/10/2009	560	906	-	2503	No
325*	9/10/2009	380	906	-	2503	No
420*	12/4/2008	780	1003	-	2283	Yes
421*	12/4/2008	620	1003	-	2283	Yes

OPTI ID	Well Construction Date	Well Depth (Feet)	Hole Depth (Feet)	Screen Interval (Feet)	Well Elevation (Feet above mean sea level)	Transducer
474*	-	213	-	-	2367	No
568*	1/1/1948	188	188	-	1914	No
571*	1/1/1951	280	-	-	2317	Yes
573*	-	404	-	404-100	2084	No
604*	-	924	-	924-470	2118	No
608*	6/10/1905	745	-	745-305	2215	No
609*	6/15/1905	970	-	970-494	2168	No
610*	-	780	--	780-352	2442	No
612*	-	1070	-	1070-413	2273	No
613*	-	830	-	830-500	2329	No
615*	-	865	-	865-385	2324	No
629*	-	1000	-	1000-500	2380	No
633*	-	1000	-	1000-500	2365	No
830*	-	77	-	-	1562	No
832*	-	132	-	-	1641	No
833*	-	504	-	-	1457	No
836*	-	325	-	-	1510	No
841*	11/21/2014	600		580-170	1764	Yes
845*	7/17/2015	380		360-100	1713	Yes
110	1/1/1948	603	-	560-224	2052	No
115	-	1200	-	-	2278	No
119	1949	92	-	-	1702	No
123	7/10/1976	138	-	-	2165	No
619	1920	1040	-	1040-471	2306	No
622	1947	1200	-	1200-400	-	No
900	7/15/2021	605	-	60-50	-	Yes
901	7/15/2021	605	-	205-165	-	Yes
902	7/15/2021	605	-	365-325	-	Yes
903	7/23/2021	587	-	305-265	-	Yes

OPTI ID	Well Construction Date	Well Depth (Feet)	Hole Depth (Feet)	Screen Interval (Feet)	Well Elevation (Feet above mean sea level)	Transducer
904	7/23/2021	587	-	400-360	-	Yes
905	7/23/2021	587	-	570-540	-	Yes
906	8/27/2021	670	-	150-130	-	Yes
907	8/27/2021	670	-	525-515	-	Yes
908	8/27/2021	670	-	60-650	-	Yes

4.5.6 Monitoring Protocols

Monitoring protocols will use DWR's *Monitoring Networks and Identification of Data Gaps BMP*, which sites the DWR's 2010 publication *California Statewide Groundwater Elevation Monitoring (CASGEM) Program Procedures for Monitoring Entity Reporting* (Appendix A) for the groundwater level sampling protocols. This publication includes protocols for equipment selection, setup, use, field evaluation, and sample collection techniques.

4.5.7 Data Gaps

The 2020 GSP identified data gaps in the groundwater level monitoring network. As noted above, the CBGSA has installed new wells to address many of these data gaps using funding from DWR's TSS and SGMA grant programs. These new wells have filled all of the spatial data gaps identified in the 2020 GSP. However, there continue to be some data gaps that should be addressed by the CBGSA in the future:

- Several wells that are currently included in the monitoring network are active pumping wells, some of which are used for a significant level of pumping each year; these wells should be replace with dedicated monitoring wells

- Well construction information is not available for many wells in the Basin. Monitoring wells with construction information featuring total depth and screened interval are preferred for inclusion in the monitoring network, because that information is useful in understanding what monitoring measurements mean in terms of Basin conditions at different depths.

4.5.8 Plan to Fill Data Gaps

This GSP identifies some ways to refine the groundwater level monitoring network and improve reporting:

- Seek additional grant funding to install monitoring wells to replace active pumping wells that are currently included in the monitoring network. Alternatively, transducers could be installed in these wells to better understand the temporal effects of pumping on groundwater levels.

- Apply for additional assistance from DWR's Technical Support Services (TSS), which provides support to GSAs as they develop GSPs. TSS opportunities include help installing new monitoring wells, and downhole video logging services.

- Improve understanding of well construction information through digital entry of data from well completion reports into the data management system.

4.6 Groundwater Storage Monitoring Network

Groundwater in storage is monitored through the measurement of groundwater levels. Therefore, the groundwater storage monitoring network will use the groundwater level monitoring network. Thresholds for groundwater storage are discussed in Chapter 5.

4.7 Seawater Intrusion Monitoring Network

The Basin is geographically and geologically isolated from the Pacific Ocean and any other large source of saline water. As a result, the Basin is not at risk for seawater intrusion. Salinity (i.e., total dissolved solids, or TDS) is monitored as part of the groundwater quality network, but seawater intrusion is not a concern for the Basin.

4.8 Groundwater Quality Monitoring Network

Salinity (measured as TDS), arsenic, and nitrates have all been identified by local stakeholders as potentially being of concern for water quality in the Basin. However, in contrast to salinity, there is no evidence to suggest a causal nexus between potential actions under the CBGSA's authority and arsenic or nitrates. In the case of arsenic, the high concentration measurements have been taken either at CCSD Well 2, which is no longer in operation, or at groundwater depths of greater than 700 feet, which is outside of the range of pumping for drinking water. Because arsenic occurs in the subsurface at different elevations and densities throughout the Basin, arsenic issues are localized and different at each well location. Since the CBGSA is only granted authority to affect the amount of water pumped across portions of the Basin, it is not possible for the CBGSA to successfully manage arsenic levels, and setting thresholds on an unmanageable constituent could cause unnecessary intervention by the California State Water Resources Control Board (SWRCB). Therefore, the groundwater quality network included in the 2020 GSP was established to monitor for salinity but did not consider arsenic or nitrates at that time.

The CBGSA began collecting groundwater quality data in early 2021 and collects TDS measurements once a year. In addition, nitrate and arsenic measurements were also collected in 2022 to establish a baseline understanding of nitrate and arsenic concentrations in the Basin. It is the intent of the CBGSA to continue to collect TDS measurements in monitoring network wells on an annual basis. For nitrate and arsenic, the CBGSA intends to download and utilize data that is collected by other monitoring entities on an ongoing basis. The CBGSA will cooperate with other agencies that may perform monitoring of other constituents to the extent possible. In addition, the CBGSA will collect nitrate and arsenic data in conjunction with the collection of TDS measurements once every five years.

4.8.1 Management Areas

Management Areas were not used for the 2025 GSP update. Management Areas could allow flexibility in establishing monitoring networks both spatially and temporally to match conditions and use in the Management Area. The CBGSA will utilize the same monitoring network selection criteria across the entire groundwater Basin. This allows the Basin to be managed together to meet Basin-wide sustainability thresholds.

4.8.2 Monitoring Sites Selected for Monitoring Network

Salinity (Measured as TDS)

As part of the 2020 GSP, the CBGSA created a TDS monitoring network using wells that other entities had monitored from 2008-2018. These entities included NWQC, USGS, IRLP, GAMA, DWR, BCWPD, and private landowners. It was assumed that wells that had previously been monitored for salinity prior to 2008 were unlikely to be monitored again by that monitoring agency. There were 64 selected groundwater-quality network wells. The utilization of these wells for monitoring purposes requires consent agreements with each landowner. Since the 2020 GSP, the CBGSA has dedicated significant time reaching out to landowners via emails, phone conversations, and site visits to reach agreements to conduct sampling. The 2020 water quality monitoring network is shown on Figure 4-19.

The CBGSA has collected three years of annual sampling data and conducted an evaluation of the existing network to see if any refinement or improvements could be made as part of this GSP 2025 update. A comprehensive review was conducted on the monitoring network with respect to the following issues: lack of landowner agreements for monitoring, access issues at the well sites, access issues due to weather. Furthermore, analysis was conducted to determine if the wells were projected to go dry between now and 2030 and if any wells are spatially redundant with other wells in the network. The result of this analysis is shown on Figure 4-20, which shows the sampling flags for each well. Based on this analysis, 32 wells were removed from the network; in most cases because the CBGSA had been unable to secure an agreement with the landowner. In November of 2023, the CBGSA board approved a revised monitoring network, which will include 58 wells, 27 of which are representative wells. This includes nine new TSS wells that were installed under the DWR's Technical Support Services (TSS) program and will be equipped by DWR with permeant transducers to provide electroconductivity measurements for TDS. In addition, new monitoring wells are currently being installed at 10 locations using grant funding from DWR with 1-3 completions per well. These wells will also be equipped with transducers and be included in the TDS water quality network as non-representative wells.

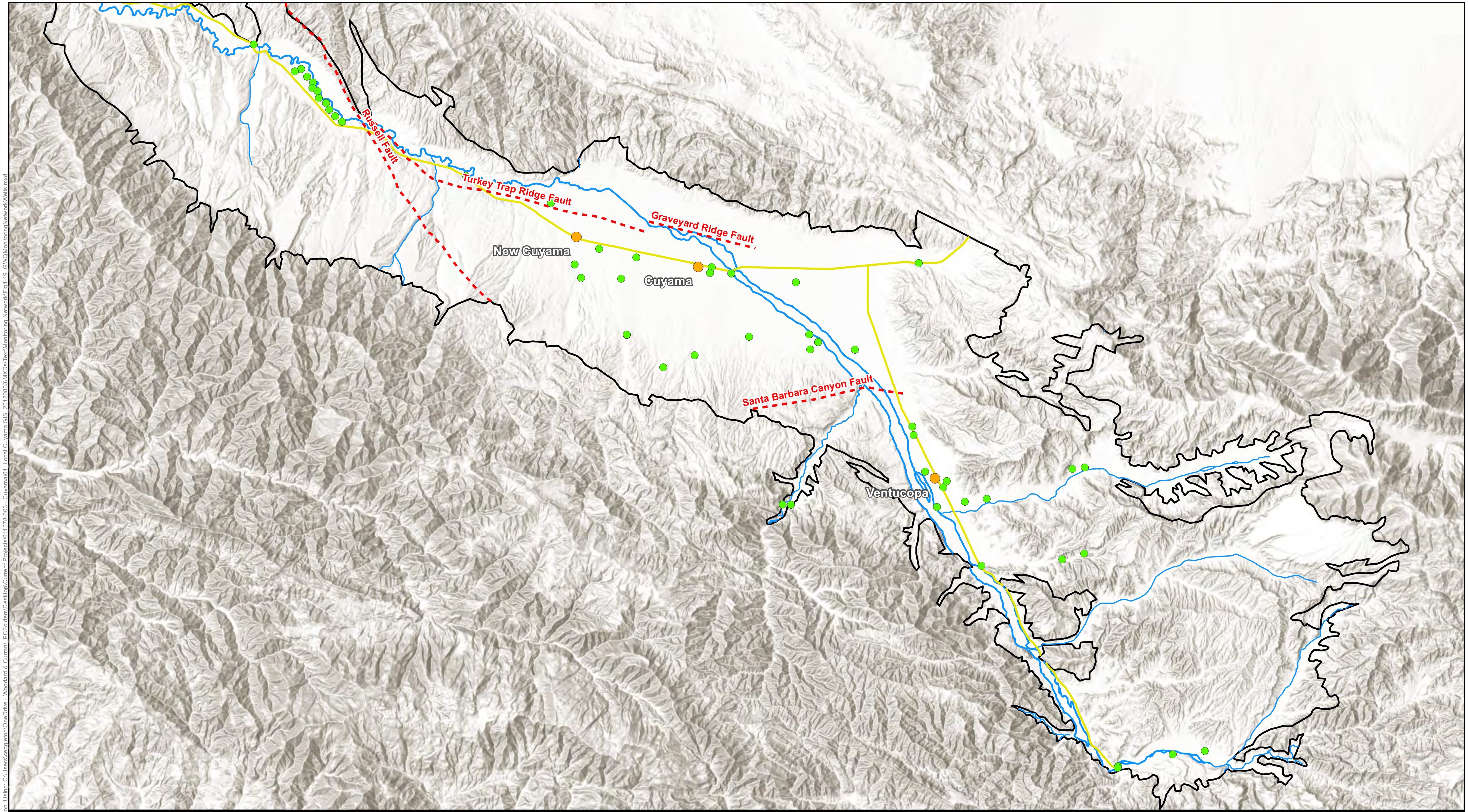

Figure 4-19: Cuyama GW Basin Groundwater Quality Monitoring Network Wells (2020)

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- Cuyama Basin
- Towns
- Highways
- Cuyama River
- Streams
- Faults
- Representative Wells and Groundwater Quality Monitoring Network Wells

All wells included in the Groundwater Quality Monitoiring Network have been measured since 1/1/2008. Wells measured prior to 2008 are not included.

N

0 1.75 3.5 7 Miles

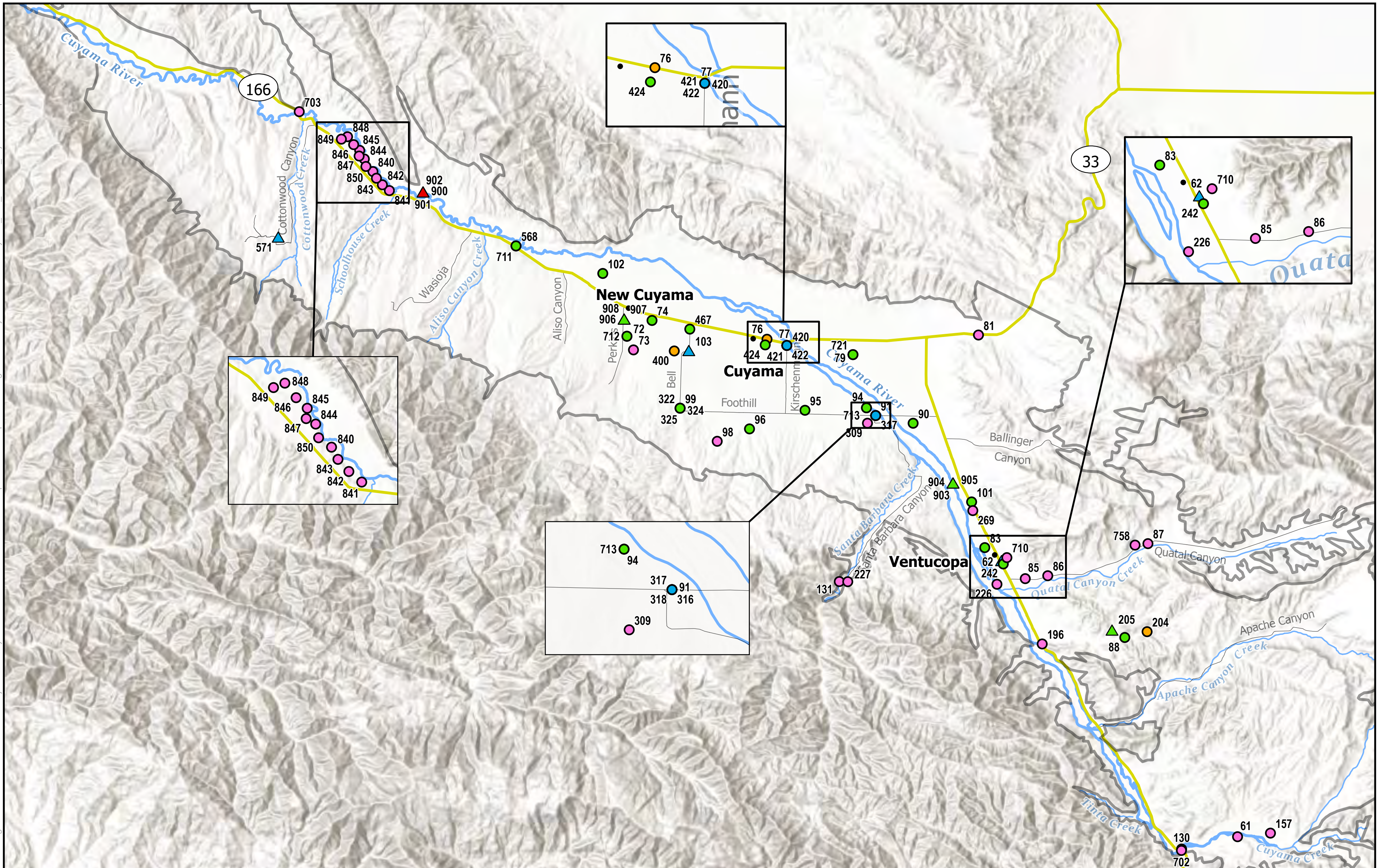

Figure 4-20: Groundwater Quality Monitoring Network Review

Cuyama Valley Groundwater Basin

Legend

Representative	Monitoring		
No Access Agreement	Access Issue (weather)	Highway	Cuyama River
No Issues	No Issues	Local Road	Creek
Onsite Access Issue	Transducer	Town	Cuyama Basin
Transducer			

N

0 1.25 2.5 5 Miles

Map Created: December 2023

Woodard & Curran

Cuyama Basin Groundwater Sustainability Agency

Nitrate

Nitrate measurements will be taken by the CBGSA at water quality monitoring network wells once every five years.

In addition, to gain a better understanding of nitrate in the Basin, the CBGSA will download arsenic monitoring measurements collected by third party sources, especially SWRCB GAMA Database, on an annual basis. The GAMA database includes data collected by USGS, California Natural Resources Agency, National Quality Monitoring Council Water Quality Portal, as well as other sources as shown in Table 4-5.

Table 4-5: GAMA Databases and Frequency of Updates

Data Set Name	Dataset Abbreviation	Update Frequency (Approximate)
Department of Pesticide Regulation	DPR	Yearly
Department of Water Resources	DWR	Yearly
Division of Drinking Water	DDW	Quarterly
GAMA Domestic Well	GAMA_DOM	No longer updated
GAMA Local Groundwater Projects	GAMA_LOCALGW	Various
GAMA Special Studies	GAMA_SP-STUDY	No longer updated
GAMA US Geological Survey	GAMA_USGS	Quarterly
Local Groundwater Projects	LOCALGW	Monthly
US Geological Survey - National Water Information System	USGS_NWIS	Quarterly
Water Board Cleanup and Permitted Sites	WB_CLEANUP	Monthly
Water Board Irrigated Lands Regulatory Programs	WB_ILRP	Monthly
Water Replenishment District	WRD	Yearly

Figure 4-21 shows the locations where nitrate monitoring has occurred over the past 10- and 5-year Periods. A total of 104 wells were sampled over the 10-year period from 2013-2023. The majority of Nitrate data is collected through the California Central Coast Water Board Irrigated Lands Regulatory Program (ILRP). The Central Coast Water Board regulates discharges from irrigated agricultural lands to protect surface water and groundwater through Order 4.0 (RE-2021-0040). In 2023, in the Cuyama Basin, the ILRP program had 16 operations and 88 ranches enrolled in the program reporting Nitrate data. Parties enrolled in the program are required to monitor and report results for the primary irrigation wells to GeoTracker annually, which is updated to GAMA.

Arsenic

Arsenic measurements will be taken by the CBGSA at water quality monitoring network wells once every five years.

In addition, to gain a better understanding of arsenic in the Basin, the CBGSA will download arsenic monitoring measurements collected by third party sources, especially SWRCB GAMA Database, on an annual basis. The GAMA database includes data collected by USGS, California Natural Resources Agency, National Quality Monitoring Council Water Quality Portal, as well as other sources as shown in Table 4-5 above. Most arsenic monitoring is conducted by public water systems on municipal supply wells. Arsenic is a regulated chemical for drinking water sources with monitoring and compliance requirements under Title 22 Section 64431.

The CBGSA will utilize the GAMA database to monitor arsenic water quality in the Basin. Arsenic samples are taken at seven wells, all municipal and domestic. These samples are from DDW, GAMA USGS, and USGS NWIS. The Cuyama Groundwater Basin has two public water systems according to the System Area Boundary Layer (SABL) tool developed by the SWRCB. The first public water system is called the Cuyama Community Services District water system number CA4210009, which serves a population of 700. This public water system is classified as a community water system. The second is Cuyama Mutual Water Company water system number CA4200514, which serves a population of 48 and is classified as a transient noncommunity water system. All wells were sampled in the past five years. These two water systems provide 87% of the sampling results for arsenic in the Basin taken over the 10-year period from 2013-2023. There have been 87 samples from these 7 wells taken over the past 10 years. These locations are shown in Figure 4-22.

4.8.3 Monitoring Frequency

The CBGSA will collect salinity samples once a year and nitrate and arsenic samples once every five years. In addition, nitrate and arsenic data will be downloaded from GAMA on an annual basis.

Although DWR does not provide specific recommendations on the frequency of monitoring in relationship to the described groundwater characteristics, concentrations of groundwater quality, especially salinity, do not fluctuate significantly over a year to require multiple samples per year. CBGSA will therefore continue to monitor its water quality network at the same frequency.

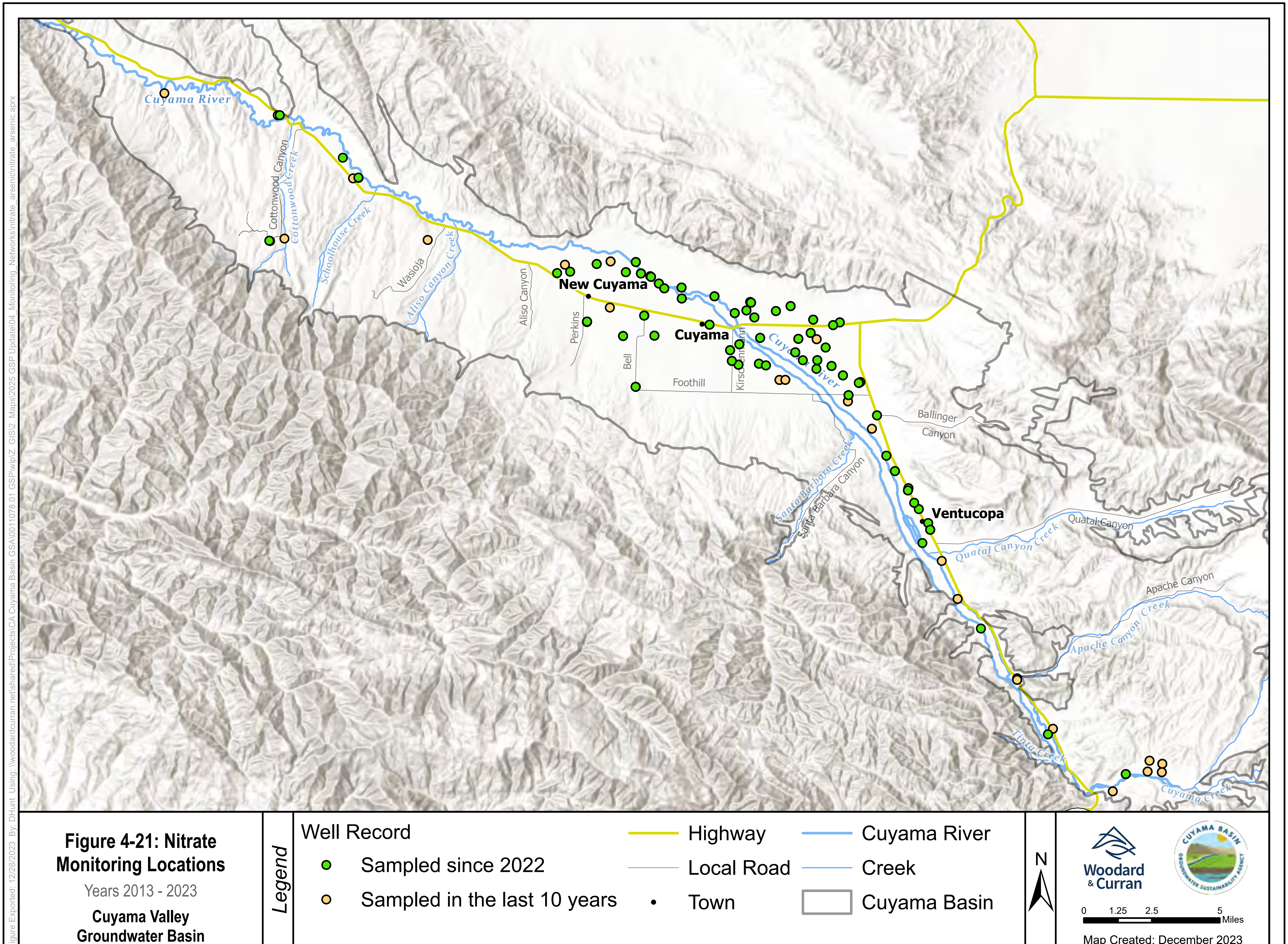

Figure 4-21: Nitrate Monitoring Locations

Years 2013 - 2023

Cuyama Valley Groundwater Basin

Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions. Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data sources: CA DWR, Esri, USGS**

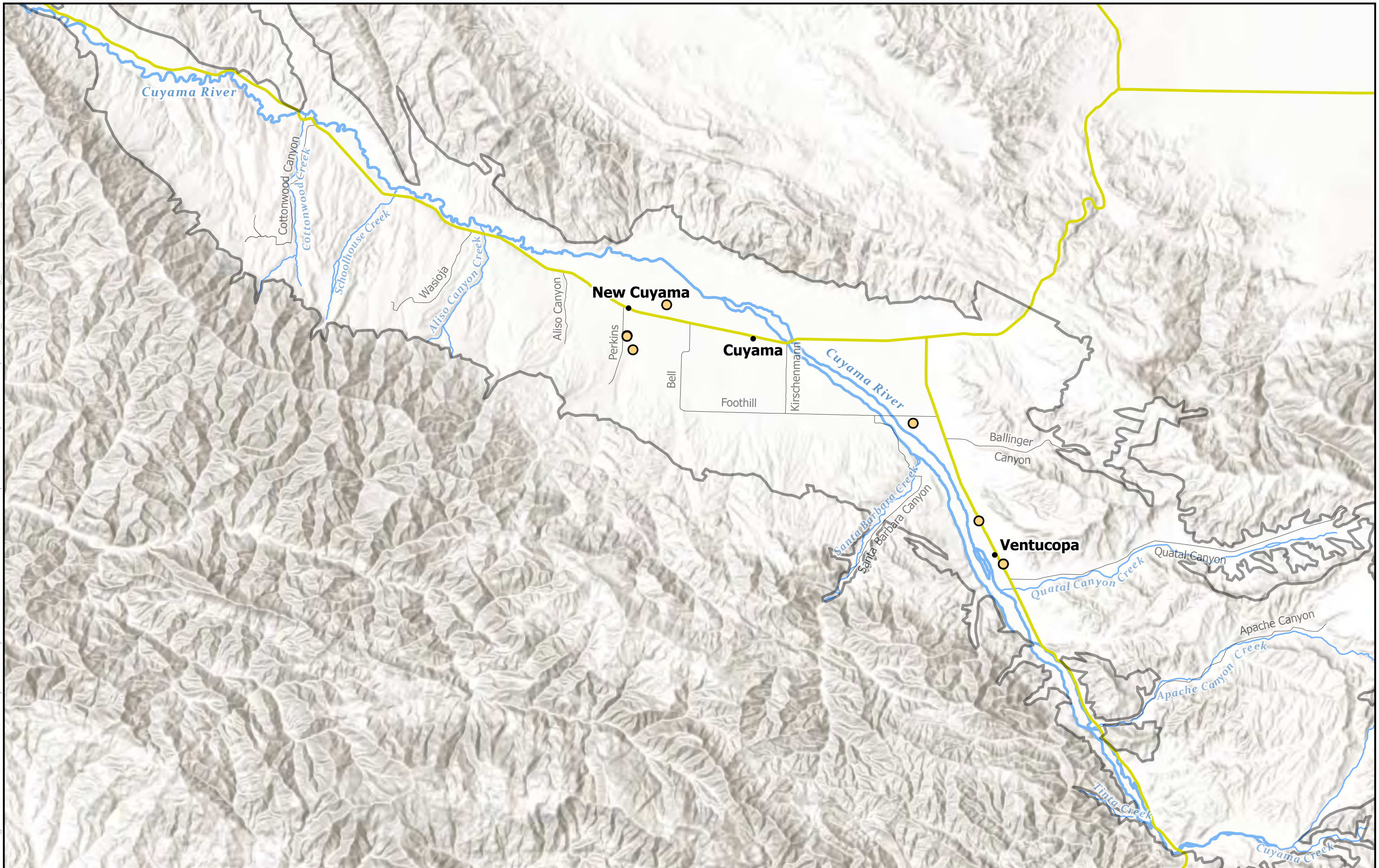

Figure 4-22: Arsenic Monitoring Locations

Years 2013 - 2023

Cuyama Valley Groundwater Basin

Legend

Well Record

- Sampled since 2013
- Town
- Highway
- Local Road
- Cuyama River
- Creek
- Cuyama Basin

N

0 1.25 2.5 5 Miles

Woodard & Curran

Cuyama Basin Groundwater Sustainability Agency

Map Created: December 2023

Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions. Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data sources: CA DWR, Esri, USGS**

Figure Exported: 12/28/2023 By: DHunt Using: \\woodardcurran.net\shared\Projects\CA Cuyama Basin GSA\0011078.01 GSP\wip\Z. GIS\2. Maps\2025 GSP Update\04_Monitoring_Networks\nitrate_arsenic\nitrate_arsenic.aprx

4.8.4 Spatial Density

DWR's *Monitoring Networks and Identification of Data Gaps BMP* states "The spatial distribution must be adequate to map or supplement mapping of known contaminants." Using this guidance, professional judgment was used to identify representative wells in each management area. Heavily pumped areas, such as the central portion of the Basin, require additional monitoring sites, while areas of lower pumping or less agricultural or municipal groundwater use need less monitoring.

The selected groundwater quality representative and monitoring wells provide adequate coverage of the Basin's aquifer. The TDS groundwater quality monitoring network is composed of 58 wells in the Basin, which provides a monitoring site density of 17 sites per 100 square miles. This exceeds the density recommended by reference materials for groundwater level density shown in Table 4-3.

4.8.5 Representative Monitoring

Representative monitoring sites were selected in the 2020 GSP for groundwater quality using the criteria used to select representative groundwater level monitoring wells (Section 4.5.4). Due to the uncertainty of monitoring frequency, all monitoring network wells were selected as representative wells in the monitoring network. For the 2025 GSP Update, existing representative monitoring sites continue to be representative; newly installed sites are considered non-representative because they do not include enough historical data to reliably develop sustainability criteria.

4.8.6 Groundwater Quality Monitoring Network

Figure 4-23 shows the monitoring network, and representative and monitoring sites. Table 4-6 shows the wells in the groundwater quality monitoring network. Representative wells, which include those with sufficient data and representative trends within the Basin to develop sustainability criteria, are identified with the asterisk (*) next to the OPTI ID and are sorted first. Metadata for the wells are also included. The revised network includes 58 wells, 27 of which are representative wells. However, the table does not currently include the wells that are currently being installed with the DWR grant funding as Opti ID numbers have not been assigned for these wells.

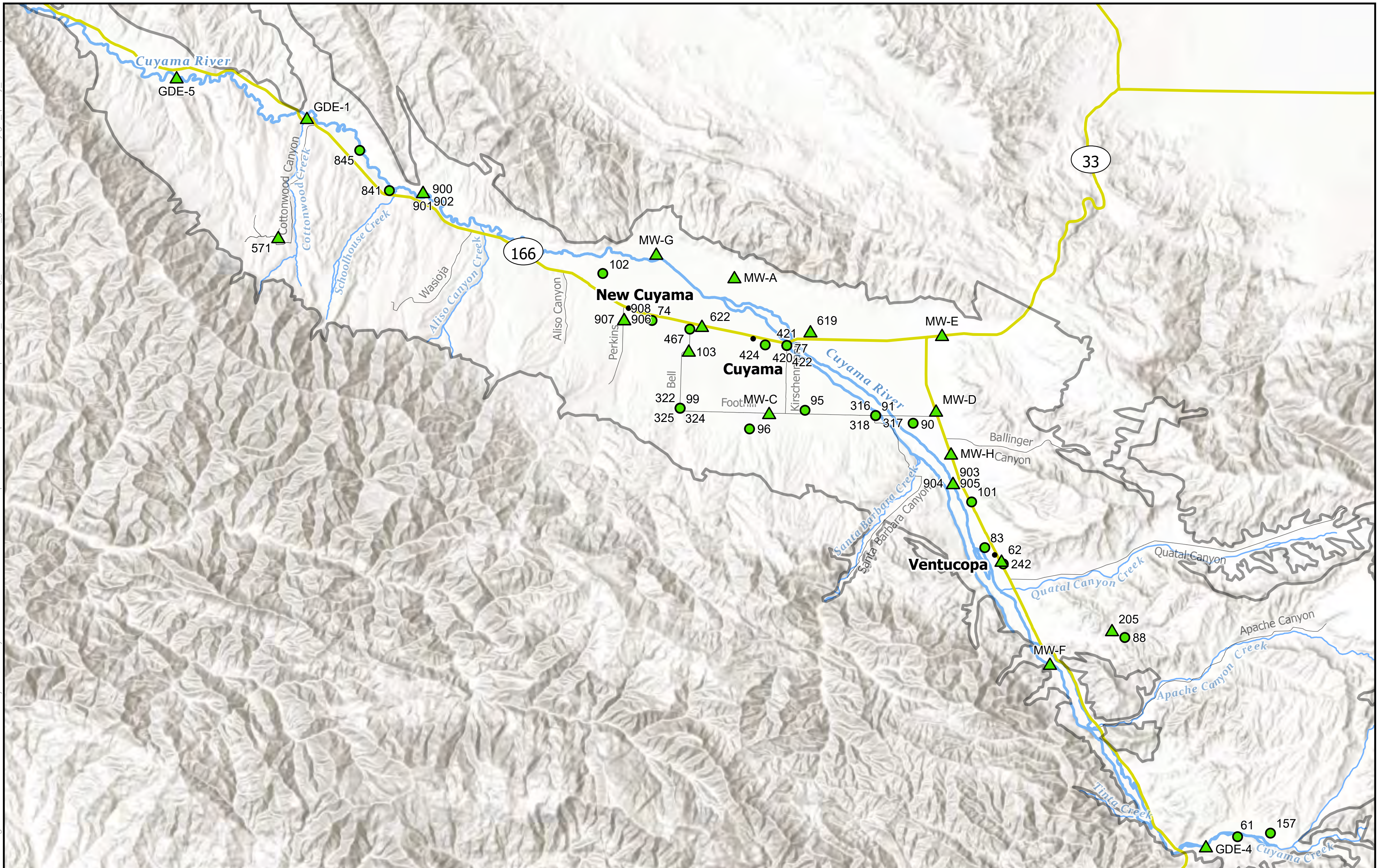

Figure 4-23: Updated Groundwater Quality Monitoring Network

Cuyama Valley Groundwater Basin

Map Created: December 2023

Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions.
Any reliance upon the map or data contained herein shall be at the users' sole risk. **Data sources: CA DWR, Esri, USGS. Monitoring well data available in the Opti data catalog: https://opti.woodardcurran.com/cuyama/login.php**

Table 4-6: Groundwater Quality Monitoring Network

OPTI ID	Well Construction Date	Well Depth (Feet)	Hole Depth (Feet)	Screen Interval (Feet)	Well Elevation (Feet above mean sea level)	Transducer
61*	-	357	-	-	3681	No
62*	-	212	-	-	2920	Yes
74*	-	-	-	-	2193	No
77*	12/4/2008	980	1003	980-960	2283	Yes
83*	1/1/1972	198	-	-	2,858	No
88*	9/4/2007	400	400	-	3549	No
90*	8/8/2006	800	800	-	2552	No
91*	9/29/2009	980	1000	980-960	2478	Yes
96*	2/1/1980	500	500	-	2609	No
99*	9/10/2009	750	906	750-73	2503	No
101*	-	200	220	-	2749	No
102*	-	-	-	-	2044	No
157*	-	71	-	-	3755	Yes
242*	-	155	187	-	2933	No
316*	9/29/2009	830	1000	-	2478	Yes
317*	9/29/2009	700	1000	-	2478	Yes
318*	9/29/2009	610	1000	-	2474	No
322*	4/9/2009	850	906	-	2503	No
324*	9/10/2009	560	906	-	2503	No
325*	1947	380	906	-	2503	No
420*	12/4/2008	780	1003	-	2283	Yes
421*	12/4/2008	620	1003	-	2283	Yes
422*	12/4/2008	460	1003	-	2286	No
467*	1/1/1948	1140	1215	-	2229	No
619*	-	1040	-	1040-471	2306	No
622*	-	1200	-	1200-400	-	No
841*	12/12/2014	600	-	580-170	1764	Yes
845*	7/12/2015	380	-	360-100	1713	Yes

OPTI ID	Well Construction Date	Well Depth (Feet)	Hole Depth (Feet)	Screen Interval (Feet)	Well Elevation (Feet above mean sea level)	Transducer
103	-	1030	1040	-	2288	Yes
205	-	435	440	-	-	No
571	-	280	-	-	2317	Yes
900	7/15/2021	605	-	50-60	-	Yes
901	7/15/2021	605	-	165-205	-	Yes
902	7/15/2021	605	-	325-365	-	Yes
903	7/23/2021	587	-	265-305	-	Yes
904	7/23/2021	587	-	360-400	-	Yes
905	7/23/2021	587	-	540-570	-	Yes
906	8/27/2021	670	-	130-150	-	Yes
907	8/27/2021	670	-	515-525	-	Yes
908	8/27/2021	670		650-660	-	Yes

4.8.7 Monitoring Protocols

The monitoring protocols will use DWR's *Monitoring Networks and Identification of Data Gaps BMP*, which sites the USGS's 1995 publication *Ground-Water Data-Collection Protocols and Procedures for the National Water-Quality Assessment Program: Collection and Documentation of Water-Quality Samples and Related Data* (Appendix B) for the groundwater quality sampling protocols. This publication includes protocols for equipment selection, setup, use, field evaluation, sample collection techniques, sample handling, and sample testing.

4.8.8 Data Gaps

Groundwater quality monitoring data gaps have three components as follows:

- Spatial distribution of the wells
- Well/measurement depths for three-dimensional constituent mapping
- Temporal sampling

With the addition of new wells installed through DWR's TSS program and with grant funding, the spatial distribution of the groundwater quality monitoring network now provides coverage of all of the spatial data gaps that were identified in the 2020 GSP.

With the newly constructed wells, there will now be multiple locations within the Basin that can provide water quality information at multiple depths. This will allow the monitoring network to collect additional information about how salinity may change at different depths in the aquifer. This information needs to be evaluated to determine if additional multi-completion wells will be required to adequately understand three-dimensional constituent mapping within the Basin.

Water quality sampling historically has been inconsistently performed throughout the Basin; as a result, the Basin itself was identified in the 2020 GSP as a groundwater quality monitoring temporal data gap. Since adoption of the GSP, the CBGSP has undertaken its own annual sampling effort, which addressed this previously identified data gap.

4.8.9 Plan to Fill Data Gaps

The CBGSA has filled the temporal and spatial data gaps identified in the 2020 GSP by implementing its own salinity sampling program and has filled the three-dimensional constituent mapping knowledge gap at least partially through installation of new multi-completion monitoring wells.

The CBGSA will evaluate the data collected by the monitoring program going forward to assess whether additional three-dimensional monitoring is needed. This includes an assessment of nitrate and arsenic data collected from GAMA and other data sources.

4.9 Land Subsidence Monitoring Network

4.9.1 Management Areas

Subsidence is managed Basin-wide; as a result, no management areas are used.

4.9.2 Monitoring Sites Selected for Monitoring Network

There are two subsidence monitoring stations in the Basin and three outside of the Basin. Figure 4-24 shows the locations of existing subsidence monitoring stations, which make up the current subsidence monitoring network. The two stations in the Basin, sites CUHS and VCST, are both included in the monitoring network because they are active and provide Basin-specific data. The three stations located outside of the Basin, sites P521, BCWR, and OZST, are also included in the monitoring network. These stations are important for understanding general dynamic movement trends in the Basin because they detect tectonic movement in the Basin.

4.9.3 Monitoring Frequency

Subsidence monitoring frequencies should capture long-term and seasonal fluctuations in ground level changes. DWR's *Monitoring Networks and Identification of Data Gaps BMP* does not provide specific monitoring frequency or interval guidance. However, CGPS stations allow for data sampling several times a minute, which is sufficient for seasonal fluctuations to be captured in the data. Long-term trends are compiled from continuous data. Therefore, the CBGSA will use the same monitoring frequency currently used by the CGPS stations.

4.9.4 Spatial Density

Because there are only two monitoring stations, the current spatial density of subsidence monitoring in the Basin is 0.5 stations per 100 square miles. DWR's *Monitoring Networks and Identification of Data Gaps BMP* does not provide specific spatial density guidelines for subsidence monitoring networks, and thus relies on professional judgment for site identification. Current stations, both in and outside of the Basin, do not adequately cover the Basin for capturing subsidence variations. Potential areas for new stations are discussed below.

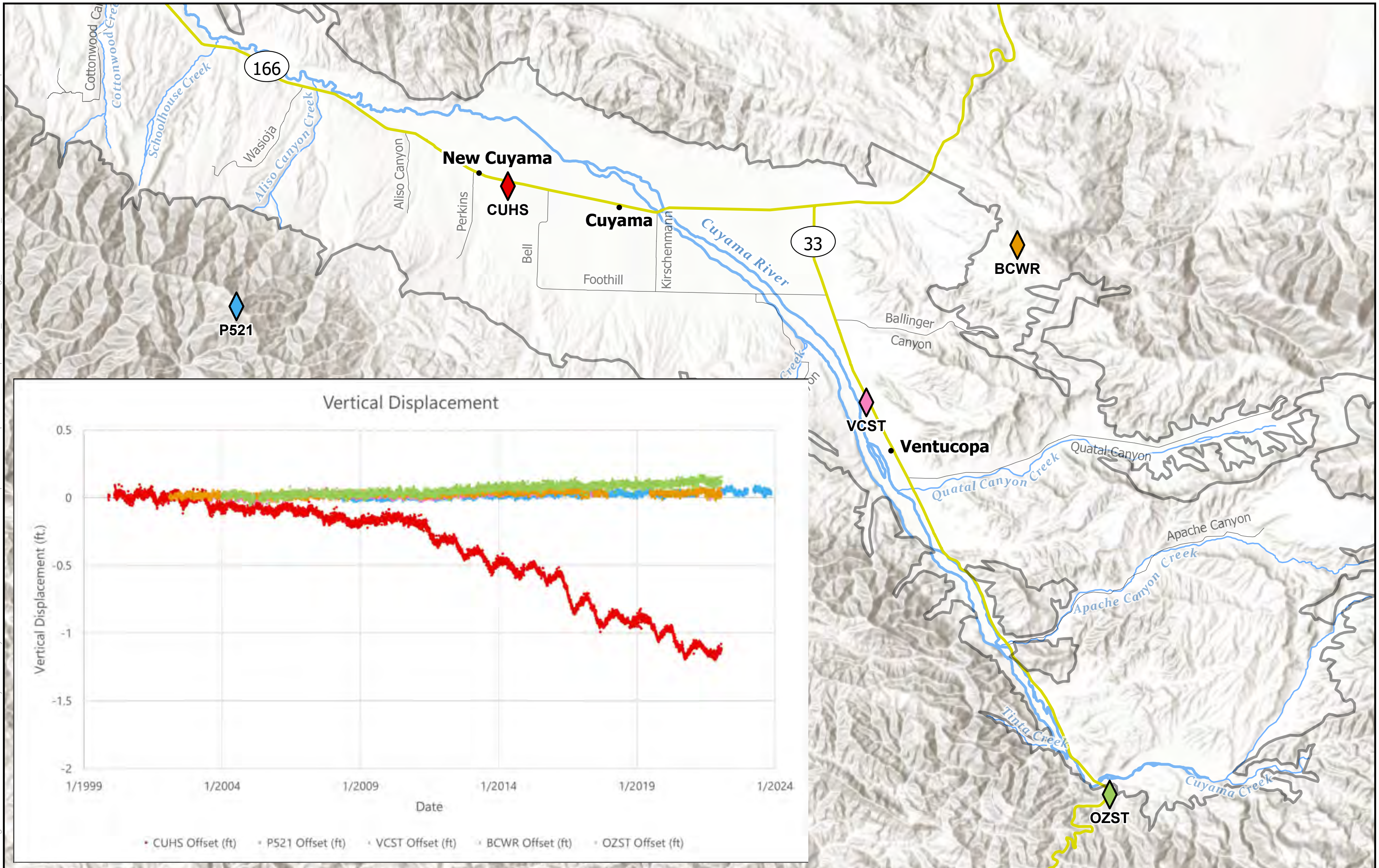

Figure 4-24: Subsidence Monitoring Network

Cuyama Valley Groundwater Basin

Legend

- Plate Boundary Observatory GPS Station
- Highway
- Local Road
- Town
- Cuyama River
- Creek
- Cuyama Basin

N

0 1 2 4 Miles

Map Created: December 2023

 Data sources: CA DWR, Esri, USGS. UNAVCO gps data access from: https://www.unavco.org/data/gps-gnss/data-access-methods/dai1/perm_sta.php

4.9.5 Monitoring Protocols

DWR's provided *Monitoring Networks and Identification of Data Gaps BMP* does not provide specific monitoring protocols for subsidence monitoring networks. CGPS station measurements are logged digitally, and depending on the station and network setup, either require downloading at the physical station site or are uploaded automatically to a server. Data management will also depend on the monitoring agency. Current operating stations will continue to be managed by their current entity, and the CBGSA will be responsible for downloading data on a fixed schedule. The addition of new stations will require developing procedures for downloading and storing data, and for a quality assurance review of the data.

Data should be saved in the Cuyama Basin data management system on a regular annual schedule. All data should be reviewed for quality and logged appropriately.

4.9.6 Data Gaps

New subsidence monitoring sites should be chosen to provide data on areas most at risk for land subsidence. Six potential new locations were identified in the Basin, as shown in Figure 4-25. These locations were identified by focusing on areas with significant or new groundwater pumping that did not have subsidence monitoring nearby. Criteria for selection are as follows:

- Identified as an area with relatively new and increased agricultural activity and pumping with no nearby stations.
- Identified because there are currently no nearby stations and the Russell Fault bisects this area
- Identified because of the CCSD and proximity to the heavily pumped central portion of the Basin
- Identified because this is the most heavily pumped portion of the Basin and there are currently no nearby stations
- Identified because of its proximity to the heavily pumped portion of the Basin, on the north facing slop of the valley; additionally, there are currently no stations nearby
- Identified because this is the transition into the heavily pumped central portion of the Basin near current agricultural pumping; this is also an area with faults

4.9.7 Plan to Fill Data Gaps

New monitoring sites should be located near areas with the greatest groundwater pumping, or where pumping is new. This is because pumping is the driving force for subsidence in the Basin. Although there are multiple ways to measure subsidence, CGPS stations are likely the best option for the Basin. CGPS stations are relatively low cost when compared to gathering data via labor-intensive land surveys, construction of borehole extensometers, and frequent satellite data processing. CGPS stations require comparatively little maintenance and provide continuous information allowing detailed land subsidence analysis.

Increasing data collection about subsidence for the Basin requires addition of several new CGPS stations. These stations could be managed solely by the CBGSA or could be incorporated into the Continuously Operating Reference Station (CORS) via coordination with USGS. Site selection, equipment, and management will require coordination with USGS.

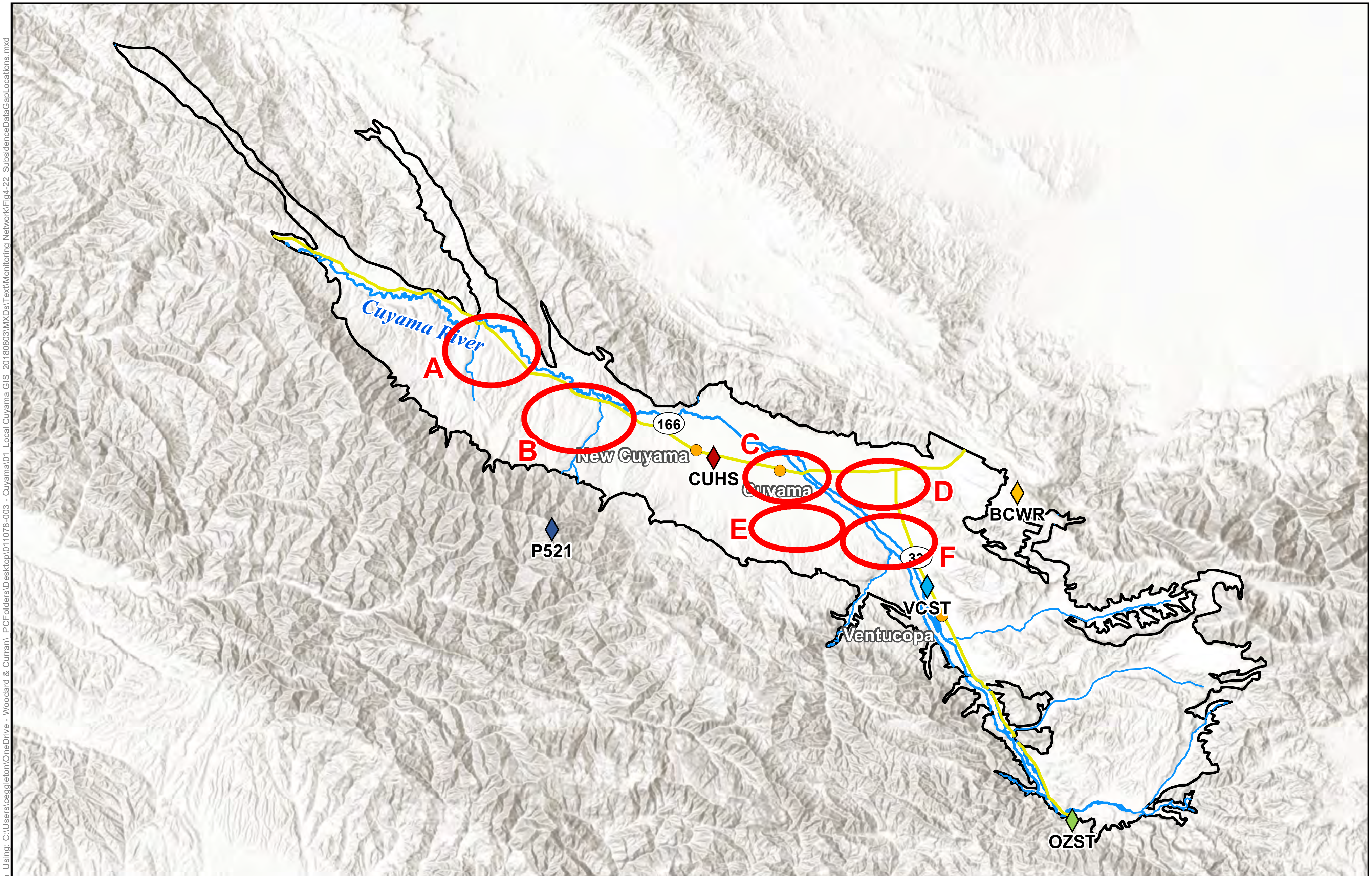

Figure 4-25: Subsidence Monitoring Location Data Gap Areas

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

April 2019

WOODARD & CURRAN

Legend

Cuyama Basin
Towns
Highways
Cuyama River
Streams

N

0 3.5 7 14 Miles

Figure Exported: 9/18/2018 By: ceggleton Using: C:\Users\ceggleton\OneDrive - Woodard & Curran\PCFolders\Desktop\011078-003 - Cuyama\01 Local Cuyama GIS 20180803\MXDs\Text\Monitoring Network\Fig4-22 SubsidenceDataGapLocations.mxd

4.10 Depletions of Interconnected Surface Water Monitoring Network

The following content reflects what was included in the 2020 GSP. DWR is in the process of developing additional guidance documents to assist GSAs in addressing the interconnected surface waters sustainability indicator. At this time, those guidance documents have not been published, but the CBGSA plans to utilize those resources when they become available for future updates to the GSP and for future ISW implementation.

The CBGSA identified a subset of groundwater level representative monitoring wells to use for ISW monitoring and provided a rationale for their selection addressed the monitoring of ISW. Depletions of ISW are related to chronic lowering of groundwater levels via changes in the hydraulic gradient and piezometric surface elevation. Therefore, declines in groundwater elevations in portions of the river system that are hydrologically connected to the river system can lead to increased stream losses and depletion of surface water flows. The primary areas of concern for ISW are on stretches of the Cuyama River upstream of Ventucopa and downstream of the Russell Fault, and on the four major contributing streams to the Cuyama River, including Aliso Creek, Santa Barbara Creek, Quantal Canyon Creek, and Cuyama Creek.

The Cuyama River does not flow during most days of the year and therefore the river is not subject to environmental flow regulations, the primary beneficial uses of Cuyama River streamflows are GDEs and water users who utilize water that may flow into Lake Twitchell downstream of the Basin boundary. Lowering groundwater levels could result in reduced streamflows for beneficial use by these users. Therefore, the intent of the ISW monitoring network and sustainability criteria are to ensure that long-term groundwater level declines do not occur in the vicinity of these interconnected surface water flow reaches of the Cuyama River system.

4.10.1 Management Areas

Depletions of interconnected surface waters is managed Basin-wide; as a result, no management areas are used.

4.10.2 Monitoring Sites Selected for Monitoring Network

To develop an ISW monitoring network, a subset of wells from the groundwater levels representative monitoring network has been used to create a depletion of ISW representative monitoring network. Wells not included in the groundwater levels monitoring network were also considered; but no additional wells were identified that would be suitable for ISW monitoring. After consulting DWR's BMPs for Monitoring Networks and Identification of Data Gaps, the following criteria were used to select wells to be included in the ISW representative network:

1. Wells that are within 1.5-miles of the Cuyama River and/or 1-mile of one of the four major contributing streams to the Cuyama River, including Aliso Creek, Santa Barbara Creek, Quantal Canyon Creek, and Cuyama Creek,

2. Wells that have screen intervals within 100 feet below ground surface (bgs). In some cases, wells without screen interval information but with well depths greater than 100 feet bgs were included, under the assumption that the top of the screen interval was likely to be less than 100 feet bgs. In many of these wells, recent groundwater depth to water measurements were 40 feet bgs or less.

The wells shown in Table 4-7 are the proposed ISW monitoring network. Representative wells are marked with an *. The ISW monitoring network can be found in Figure 4-26. Additionally, the CBGSA was awarded a DWR SMGA grant for installation of piezometers to help monitor groundwater levels. These are also shown in Figure 4-26 as wells 909, 910, and 911.

Table 4-7: Proposed ISW Monitoring Network

Opti ID	Well Depth (Feet bgs)	Screen Interval
2*	73	Unknown
89*	125	Unknown
114*	58	Unknown
568*	188	Unknown
830*	77	Unknown
832*	132	Unknown
833*	504	Unknown
836*	325	Unknown
906*	670	150-130
101	200	Unknown
102	Unknown	Unknown
421	620	Unknown

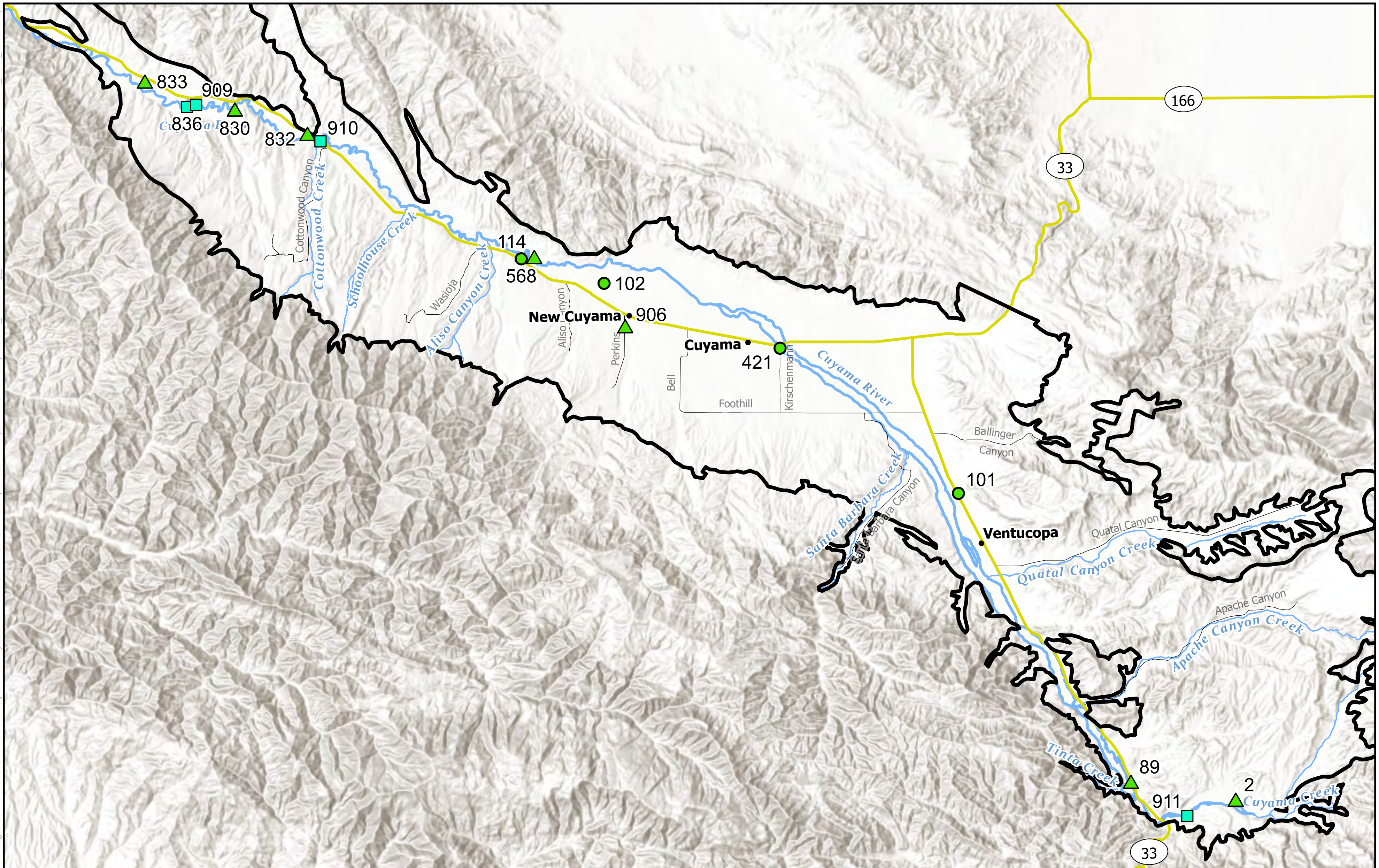

Figure 4-26: Interconnected Surface Water Monitoring Network

Cuyama Valley Groundwater Basin

Legend

- ▲ Representative Monitoring Well
- ● Non-representative Monitoring Well
- ■ GDE Monitoring Well
- Highway
- Local Road
- • Town
- Creek
- Cuyama River
- Cuyama Basin

N

0 1.25 2.5 5 Miles

Map Created: August 2024

4.10.3 Monitoring Frequency

A successful monitoring frequency and schedule should allow the monitoring network to adequately interpret fluctuations over time in the groundwater system based on shorter-term and longer-term trends and conditions. These changes may be the result of storm events, droughts, or other climatic variations, seasons, and anthropogenic activities such as pumping.

ISW uses a subset of groundwater level monitoring wells as a proxy, and therefore utilizes the same monitoring frequency established under the groundwater level monitoring network.

4.10.4 Spatial Density

ISW uses a subset of groundwater level monitoring wells as a proxy, and monitoring sites were chosen based on their suitability in monitoring potential interconnected surface waters based on known groundwater conditions. After consulting DWR's BMPs for Monitoring Networks and Identification of Data Gaps, the following criteria were used to select wells to be included in the ISW representative network:

1. Wells that are within 1.5-miles of the Cuyama River and/or 1-mile of one of the four major contributing streams to the Cuyama River, including Aliso Creek, Santa Barbara Creek, Quantal Canyon Creek, and Cuyama Creek,
2. Wells that have screen intervals within 100 feet below ground surface (bgs). In some cases, wells without screen interval information but with well depths greater than 100 feet bgs were included, under the assumption that the top of the screen interval was likely to be less than 100 feet bgs. In many of these wells, recent groundwater depth to water measurements were 40 feet bgs or less.

4.10.5 Monitoring Protocols

DWR's emergency regulations Section 354.28 (c)(6) states that "The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results. The minimum threshold established for depletions of interconnected surface water shall be supported by the following: (A) The location, quantity, and timing of depletions of interconnected surface water, and (B) A description of the groundwater and surface water model used to quantify surface water depletion."

4.10.6 Data Gaps

DWR BMP Monitoring Networks and Identification of Data Gaps, provides the following guidance for well selection: "Identify and quantify both timing and volume of groundwater pumping within approximately 3 miles of the stream or as appropriate for the flow regime." However, the CBGSA has chosen to use a 1.5-mile buffer around the Cuyama River and a 1-mile buffer around the major contributing streams because the Basin's unique and variable geology and topography require a narrower window so that the ISW monitoring network wells would cover just the portion of the Valley in the vicinity of the River system (and not extend into foothill areas with significant topographic relief and no alluvial aquifers).

Since the emergency regulations require a numerical model to estimate the depletions of interconnected surface water, there is no functional monitoring network that can be used to measure depletions of interconnected surface water. Therefore, the monitoring networks for depletions of interconnected surface water will include two components as follows:

- Groundwater level monitoring to serve as monitoring by proxy of depletions of interconnected surface water
- Pursuit of additional surface water gage stations to improve numerical model accuracy

4.10.7 Plan to Fill Data Gaps

This GSP identifies some ways to refine the groundwater level monitoring network, which in part is used for depletions of interconnected surface waters monitoring, which are described above. Additionally, the CBGSA plans to utilize DWR ISW resources when they become available for future updates to the GSP and for future ISW implementation.

4.11 References

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