# Contents



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# SECTION 4: Monitoring Networks

## 4.1 Introduction to Monitoring Networks

**§354.32 Introduction to Monitoring Networks. This Subarticle describes the monitoring network that shall be developed for each basin, including monitoring objectives, monitoring protocols, and data reporting requirements. The monitoring network shall promote the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the Plan.**

This section describes the existing monitoring networks within the Basin and includes an explanation of the implementation of the monitoring networks for the Carpinteria GSA's Plan and recommended improvements to the monitoring networks. Together, these monitoring networks will be able to track the GSA's progress toward achieving sustainability by documenting short-term, seasonal, and long-term trends in groundwater conditions. This section includes monitoring objectives, monitoring protocols, assessment and improvement of monitoring networks, representative monitoring sites, and data reporting requirements for each of the monitoring networks.

The monitoring networks presented in this section were developed based on existing sites monitored for decades by the Carpinteria Valley Water District (CVWD) (formerly the Carpinteria County Water District) prior to the passage of the SGMA. During the 20-year Plan implementation period, it may be necessary to expand the existing monitoring networks to fully demonstrate sustainability and improve the Plan. Monitoring networks and data gaps are described for each of the six sustainability indicators. The data gaps will be addressed during Plan implementation to improve the Carpinteria GSA's ability to track progress and demonstrate sustainability.

The selection of wells used in the monitoring networks presented in this section draws on historical groundwater data compiled by the USGS, CVWD, CASGEM, and DWR. The criteria used to determine which wells to use in the monitoring networks are as follows:

- Period of record of historical measurements
- Available well construction information
- Spatial distribution relative to applicable sustainability indicators
- Groundwater use in proximity of wells
- Impacts on beneficial uses of groundwater in the Basin

## 4.2 Monitoring Network Objectives and Design Criteria

**§354.34 Monitoring Network.**

**(a) Each Agency shall develop a monitoring network capable of collecting sufficient data to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions, and yield representative information about groundwater conditions as necessary to evaluate Plan implementation.**

**(b) Each Plan shall include a description of the monitoring network objectives for the basin, including an explanation of how the network will be developed and implemented to monitor groundwater and related surface conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the affects and effectiveness of Plan implementation. The monitoring network objectives shall be implemented to accomplish the following:**

**(1) Demonstrate progress toward achieving measurable objectives described in the Plan.**

**(2) Monitor impacts to the beneficial uses or users of groundwater.**

**(3) Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.**

**(4) Quantify annual changes in water budget components.**

**(d) The monitoring network shall be designed to ensure adequate coverage of sustainability indicators. If management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the basin setting and sustainable management criteria specific to that area.**

**(f) The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:**

**(1) Amount of current and projected groundwater use.**

**(2) Aquifer characteristics, including confined or unconfined aquifer conditions, or other physical characteristics that affect groundwater flow.**

**(3) Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.**

**(4) Whether the Agency has adequate long-term existing monitoring results or other technical information to demonstrate an understanding of aquifer response.**

The objectives of the monitoring networks are to identify and select RMS wells to collect data to support monitoring of groundwater conditions and detection of potential undesirable results, and to achieve the sustainability goal. As stated in the SGMA regulations, the monitoring networks will accomplish the following:

- "Demonstrate progress toward achieving measurable objectives described in this Plan.
- 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 recommended monitoring networks for the Basin that are presented in this section are intended to monitor for the sustainability indicators and their associated undesirable results, which are listed below:

1. Chronic lowering of groundwater levels
2. Reduction of groundwater storage
3. Seawater intrusion
4. Degraded water quality
5. Land subsidence
6. Depletion of interconnected surface water

The approach for establishing the monitoring networks is to leverage historical or existing monitoring programs and incorporate, as needed, additional monitoring locations that have been made available by cooperating entities. The monitoring networks are limited to locations with data that are publicly available. The sections below include discussions of data gaps in each monitoring network and proposed locations and methods for filling those data gaps.

## 4.3 Existing Monitoring Networks

**§354.36 Representative Monitoring. Each Agency may designate a subset of monitoring sites as representative of conditions in the basin or an area of the basin, as follows:**

**(a) Representative monitoring sites may be designated by the Agency as the point at which sustainability indicators are monitored, and for which quantitative values for minimum thresholds, measurable objectives, and interim milestones are defined.**

**(b) Groundwater elevations may be used as a proxy for monitoring other sustainability indicators if the Agency demonstrates the following:**

**(1) Significant correlation exists between groundwater elevations and the sustainability indicators for which groundwater elevation measurements serve as a proxy.**

**(2) Measurable objectives established for groundwater elevation shall include a reasonable margin of operational flexibility taking into consideration the basin setting to avoid undesirable results for the sustainability indicators for which groundwater elevation measurements serve as a proxy.**

**(c) The designation of a representative monitoring site shall be supported by adequate evidence demonstrating that the site reflects general conditions in the area.**

### 4.3.1 Groundwater Levels and Groundwater Quality

The SGMA regulations allow the Plan to use existing monitoring sites for the monitoring network. Monitoring of groundwater elevations in the Carpinteria Valley and within the Basin date back to the 1940s. Historical water level data were collected by the USGS and CVWD. In 1994, CVWD established a Groundwater Monitoring Program (GMP) pursuant to AB 3030, which included collection of groundwater levels, groundwater and surface water quality data, precipitation data, and groundwater production data. The Basin GMP also established annual review of and reporting on the data collected. The well network first established through the GMP now includes all of the well types within the Basin, including municipal, private agricultural, and dedicated monitoring wells. A total of 69 wells are included in the existing monitoring networks for the Basin. Of these, 35 wells are monitored for water levels, 46 wells are monitored for basic water quality parameters, and 12 wells are monitored for both. As will be discussed in Section 4.4, several of these wells were selected as RMS wells for the sustainability indicators. Figure 4-1 presents the locations of the existing wells monitored for water levels in the Basin.

Water quality data are derived through the sampling of dedicated monitoring wells and at other selected wells throughout the Basin. Figure 4-1 presents the locations of the existing wells monitored for water quality. These wells have been monitored for total dissolved solids (TDS) and general chemistry (cation/anions) since 2000. Table 4-1 summarizes information for the existing monitoring well network.

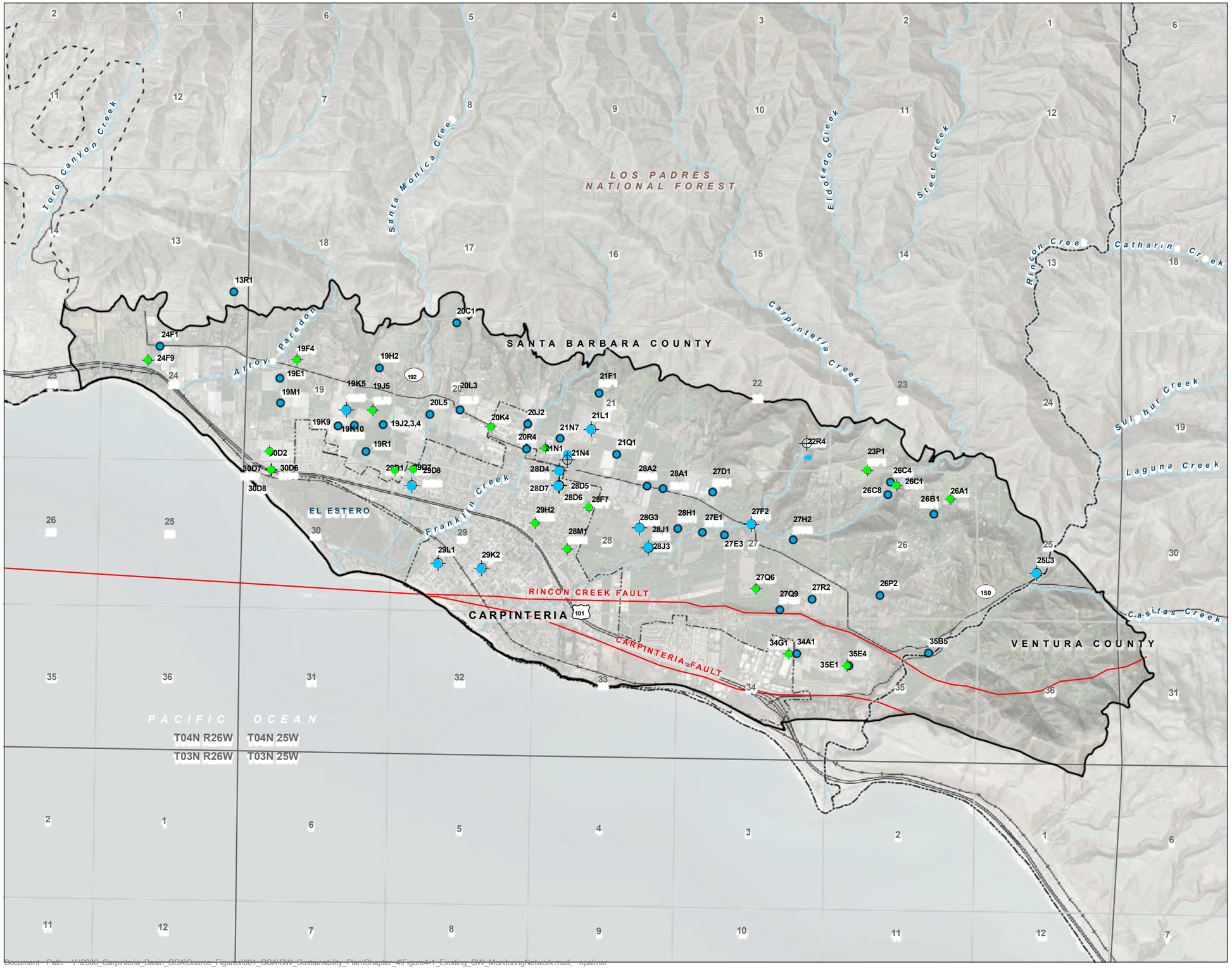
Significant enhancements to the basin monitoring well network have been made in recent years. A cluster of three monitoring wells of discrete depths was drilled and installed in 2019 in the southwestern portion of SU-1 where the Rincon Creek Thrust Fault projects offshore and water bearing units of the Basin are believed to be possibly susceptible to seawater intrusion. These monitoring wells are identified as the Basin "Sentinel Wells," with MW-1, MW-2, and MW-3 completed discretely in the C, B, and A water bearing zones, respectively. Prior to the installation of these Sentinel Wells, the monitoring network did not include any wells that were suitably located or constructed with the purpose of early identification of seawater intrusion. A second cluster of depth-discrete monitoring wells, again completed in the A, B, and C zones, are currently scheduled to be installed in El Carro Park in the summer of 2023, near the central portion of the confined zone.

In April 2021, CVWD conducted an electrical resistivity tomography (ERT) investigation within the Basin. This investigation is discussed in detail in Section 3 of this GSP. The ERT surveys were part of a monitoring program to identify whether or not zones of elevated electrical conductivity exist, which may indicate the presence of seawater intrusion. The ERT profiles were located along the beach and within the Carpinteria Salt Marsh Reserve in the vicinity of the Basin, where it is believed there is vulnerability to seawater intrusion. While the investigation was inconclusive with respect to existing seawater intrusion, the ERT surveys provided a baseline of the subsurface electrical conductivity distribution for comparison with future ERT surveys for monitoring associated with the Plan. Four ERT profiles were collected along lines shown on Figure 3-35, and the ERT profile results are shown on Figures 3-36 through 3-39. Appendix E presents the full technical report documenting the survey.

# FIGURE 4-1

## Existing Groundwater Monitoring Network

Carpinteria Basin
Groundwater Sustainability Plan




**LEGEND**

- Water Level Monitoring Well
- Water Quality and Water Level Monitoring Well
- Water Quality Monitoring Well
- Carpinteria Groundwater Basin

**All Other Features**

- City Boundary
- County Boundary
- Montecito Groundwater Basin
- Fault
- Railroad
- Major Road
- Watercourse

N

0 ½ 1
Miles

Date: September 22, 2023
Data Sources: BLM, ESRI, USGS, Maxary Imagery (2020), DWR Bulletin 118

CARPINTERIA GSA
GROUNDWATER SUSTAINABILITY AGENCY

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**Table 4-1. Existing Groundwater Monitoring Network Well Information Summary**

| Well Number | Short Name | Owner | Use[1] | Water Level Monitor | Water Quality Monitor | Year Drilled | Casing Depth (feet) | Water Level Data Start |
|---|---|---|---|---|---|---|---|---|
| 4N/25W-19K5 | 19K5 | Private | A | yes | yes | 1921 | 98 | 1946 |
| 4N/25W-21L1 | 21L1 | Private | A | yes | yes | 1991 | 732 | 1992 |
| 4N/25W-21N4 | 21N4 | Private | A | yes | yes | 1947 | 406 | 1949 |
| 4N/25W-22R4 | 22R4 | Private | A | yes | yes | 1946 | 504 | 1949 |
| 4N/25W-25L3 | 25L3 | Private | C | yes | yes | — | 190 | 196 |
| 4N/25W-27F2 | 27F2 | CVWD | A | yes | yes | 1975 | 825 | 1975 |
| 4N/25W-28D4 | 28D4 | CVWD | A | yes | yes | 2010 | 1210 | 2010 |
| 4N/25W-28G3 | 28G3 | Private | A | yes | yes | 1994 | 300 | 1995 |
| 4N/25W-28J1 | 28J1 | Private | I | yes | yes | 1919 | 175 | 1940 |
| 4N/25W-29D8 | 29D8 | CVWD | A | yes | yes | 2002 | 958 | 2005 |
| 4N/25W-29K2 | 29K2 | CVWD | M | yes | yes | 1989 | 320 | 1992 |
| 4N/25W-29L1 | 29L1 | Private | M | yes | yes | — | 110 | 1946 |
| 4N/26W-13R1 | 13R1 | Private | A | no | yes | 1990 | 294 | — |
| 4N/25W-19E1 | 19E1 | Private | A | no | yes | 1992 | 400 | — |
| 4N/25W-19H2 | 19H2 | Private | A | no | yes | 2007 | 560 | — |
| 4N/25W-19J4 | 19J4 | Private | A | no | yes | — | — | — |
| 4N/25W-19K10 | 19K10 | Private | A | no | yes | 2017 | 602 | — |
| 4N/25W-19K9 | 19K9 | Private | A | no | yes | — | — | — |
| 4N/25W-19M1 | 19M1 | Private | A | no | yes | — | 204 | — |
| 4N/25W-19R1 | 19R1 | Private | A | no | yes | — | 146 | — |
| 4N/25W-20C1 | 20C1 | Private | A | no | yes | 2006 | 710 | — |
| 4N/25W-20J2 | 20J2 | Private | A | no | yes | 1984 | 377 | — |
| 4N/25W-20L3 | 20L3 | Private | A | no | yes | 1940 | 403 | — |
| 4N/25W-20L5 | 20L5 | Private | A | no | yes | 2008 | 860 | — |
| 4N/25W-20R4 | 20R4 | Private | A | no | yes | 1984 | 403 | — |
| 4N/25W-21F1 | 21F1 | Private | I | no | yes | 1991 | 450 | — |
| 4N/25W-21N7 | 21N7 | Private | A | no | yes | 2008 | 875 | — |
| 4N/25W-21Q1 | 21Q1 | Private | A | no | yes | 1991 | 740 | — |
| 4N/26W-24F1 | 24F1 | Private | A | no | yes | 1922 | 146 | — |
| 4N/25W-26B1 | 26B1 | Private | A | no | yes | 1944 | 552 | — |
| 4N/25W-26C4 | 26C4 | Private | A | no | yes | 1947 | 586 | — |
| 4N/25W-26C8 | 26C8 | Private | A | no | yes | 1947 | 360 | — |
| 4N/25W-26P2 | 26P2 | Private | A | no | yes | 1990 | 350 | — |
| 4N/25W-27D1 | 27D1 | Private | A | no | yes | 1990 | 870 | — |
| 4N/25W-27E1 | 27E1 | Private | A | no | yes | 1930 | 280 | — |
| 4N/25W-27E3 | 27E3 | Private | A | no | yes | 2016 | 805 | — |
| 4N/25W-27H2 | 27H2 | Private | A | no | yes | 2016 | 515 | — |
| 4N/25W-27Q9 | 27Q9 | Private | A | no | yes | 2003 | 800 | — |
| 4N/25W-27R2 | 27R2 | Private | A | no | yes | — | 421 | — |
| 4N/25W-28A1 | 28A1 | Private | A | no | yes | 1990 | 580 | — |
| 4N/25W-28A2 | 28A2 | Private | A | no | yes | 2017 | 800 | — |
| 4N/25W-28H1 | 28H1 | Private | A | no | yes | 1992 | 500 | — |
| 4N/25W-28J3 | 28J3 | Private | A | no | yes | 2016 | 860 | — |
| 4N/25W-34A1 | 34A1 | Private | A | no | yes | — | 250 | — |
| 4N/25W-35B5 | 35B5 | Private | A | no | yes | 1990 | 280 | — |
| 4N/25W-35E4 | 35E4 | Private | A | no | yes | 2002 | 460 | — |
| 4N/25W-19F4 | 19F4 | Private | M | yes | no | 1929 | 250 | 1941 |
| 4N/25W-19J5 | 19J5 | Private | M | yes | no | 1939 | 100 | 1941 |
| 4N/25W-20K4 | 20K4 | CVWD | I | yes | no | 1989 | 903 | 1989 |
| 4N/25W-21N1 | 21N1 | Private | I | yes | no | 1936 | 405 | 1938 |
| 4N/25W-23P1 | 23P1 | Private | I | yes | no | 1945 | 465 | 1948 |
| 4N/26W-24F9 | 24F9 | Private | A | yes | no | 1990 | 440 | 2022 |
| 4N/25W-26A1 | 26A1 | Private | M | yes | no | 1941 | 480 | 1946 |
| 4N/25W-26C1 | 26C1 | Private | M | yes | no | — | 250 | 1949 |
| 4N/25W-27Q6 | 27Q6 | Private | M | yes | no | — | 580 | 1989 |
| 4N/25W-28F7 | 28F7 | CVWD | I | yes | no | 1976 | 1100 | 1976 |
| 4N/25W-28M1 | 28M1 | Private | M | yes | no | — | 152 | 1941 |
| 4N/25W-29D1 | 29D1 | Private | M | yes | no | — | 147 | 1938 |
| 4N/25W-29D7 | 29D7 | CVWD | DM | yes | no | 1972 | 982 | 1977 |
| 4N/25W-29H2 | 29H2 | Private | M | yes | no | 1912 | 98 | 1941 |

| Well Number | Short Name | Owner | Use[1] | Water Level Monitor | Water Quality Monitor | Year Drilled | Casing Depth (feet) | Water Level Data Start |
|---|---|---|---|---|---|---|---|---|
| 4N/25W-30D2 | 30D2 | Private | M | yes | no | 1947 | 232 | 2015 |
| 4N/25W-34G1 | 34G1 | Private | M | yes | no | 1990 | 278 | 1991 |
| 4N/25W-35E1 | 35E1 | Private | M | yes | no | 1939 | 385 | 1949 |
| 4N/25W-28D5 | 28D5 | CGSA | DM | yes | no | 2023 | 1040 | 2023 |
| 4N/25W-28D6 | 28D6 | CGSA | DM | yes | no | 2023 | 925 | 2023 |
| 4N/25W-28D7 | 28D7 | CGSA | DM | yes | no | 2023 | 360 | 2023 |
| 4N/25W-30D6 | 30D6 | CGSA | DM | yes | no | 2019 | 1130 | 2019 |
| 4N/25W-30D7 | 30D7 | CGSA | DM | yes | no | 2019 | 870 | 2019 |
| 4N/25W-30D8 | 30D8 | CGSA | DM | yes | no | 2019 | 340 | 2019 |

**Notes**

[1] Use categories: A – Active production well; I – Inactive production well; M – Monitoring well; DM – Dedicated monitoring well

— = not applicable

CGSA = Carpinteria Groundwater Sustainability Agency

CVWD = Carpinteria Valley Water District

### 4.3.2 Streamflow Monitoring Network

In addition to groundwater samples, surface water samples are collected at six locations (i.e., Toro Creek, Arroyo Paredon Creek, Santa Monica Creek, Carpinteria Creek, Gobernador Creek, and Rincon Creek) (see Figure 4-2) when surface water flows occur during the sampling periods. The laboratory analytical program for the samples includes TDS and basic inorganic chemical constituents, including chloride and nitrates. Staff from CVWD perform the water quality sampling.

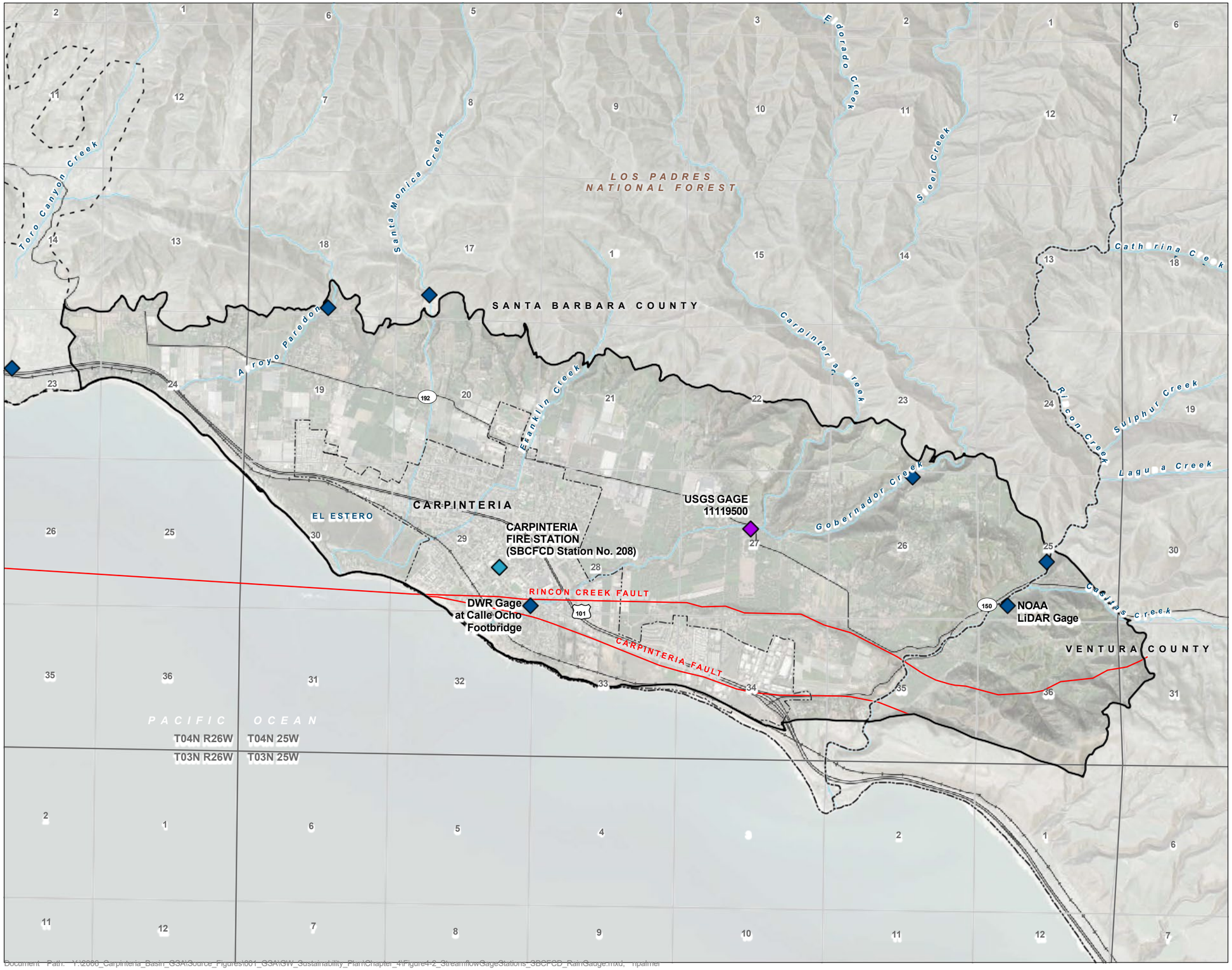
Until recently, there was only one active stream gage in the Basin with a significant period of record. The USGS Carpinteria Creek gage (Gage no. 11119500) is located immediately downstream of the confluence of Gobernador and Carpinteria Creeks (see Figure 4-2). This gage has a period of record from January 1941 through the current period, and data is available through the USGS National Water Information System (NWIS) web interface.

DWR installed a second streamflow gage on Carpinteria Creek in November 2021. The gage was installed as part of an outreach effort by SGMA's technical assistance team to install stream gaging stations in key groundwater basins in Southern California. The DWR Station ID for this gage is CPA, and it is located at the Calle Ocho Footbridge southwest of Carpinteria Avenue. Data from the Calle Ocho gage is available on DWR's California Data Exchange Center (CDEC); however, the gage has yet to be calibrated and placed into operation.

Researchers at the National Oceanic and Atmospheric Administration (NOAA) National Severe Storms Laboratory installed a non-contact stream gage on Rincon Creek in 2017. The gage was installed as part of NOAA's Automated Non-Contact Hydrologic Observations in Rivers (ANCHOR) project. The project focused on three non-contact technologies to improve the observational and monitoring capabilities in rivers: streamflow radar, scanning light detection and radar (LiDAR), and interferometric stream radar (ISRad). The gage on Rincon Creek used the LiDAR to measure speed, depth, and the flow rate. NOAA has compared discharge rates using this technology to USGS stream flow gages and determined them to be within 10 percent of the conventional gages. The ANCHOR project has been completed, but it has been confirmed that the LiDAR unit is still in place on Rincon Creek (as of September 23, 2022). NOAA researchers have indicated a willingness to assist the Carpinteria GSA in restoring the functionality of the gage for use in the Plan at nominal costs.[3] Reactivation of the LIDAR gage is not part of the monitoring network at this time but may be added later.

Precipitation data for the Basin is provided through the SBCFCD's gage at the Carpinteria Fire Station (SBCFCD Station No. 208). A period of recorded data from 1949 to the present exists for Gage No. 208. Precipitation data are available at the SBCFCD's website.[4] Figure 4-2 shows the locations of the streamflow gaging stations and the SBCFCD rain gage.

[3] Personal communication, J.J. Gourley, NOAA, September 28, 2022.
[4] County of Santa Barbara Public Works. Monthly & Yearly Rainfall. Available at https://www.countyofsb.org/2322/Monthly-Yearly-Rainfall.




# FIGURE 4-2

## Existing Surface Water Monitoring Network

Carpinteria Basin
Groundwater Sustainability Plan

**LEGEND**

- Precipitation Station
- Surface Water Sample Location
- USGS Stream Gage
- Carpinteria Groundwater Basin

**All Other Features**

- City Boundary
- County Boundary
- Montecito Groundwater Basin
- Fault
- Railroad
- Major Road
- Watercourse

**NOTES**

SBCFCD: Santa Barbara County Flood Control District
USGS: United States Geological Survey

N

0 ½ 1
Miles

Date: September 22, 2023
Data Sources: BLM, ESRI, USGS, Maxary Imagery (2020), DWR Bulletin 118, Pueblo Water Resources (2022)

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GROUNDWATER SUSTAINABILITY AGENCY

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## 4.4 Sustainability Indicator Monitoring Networks

**§354.34 Monitoring Network.**

**(e) A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.**

**(g) Each Plan shall describe the following information about the monitoring network:**

**(3) For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.**

**(h) The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.**

**(j) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.**

A total of 35 wells are proposed for monitoring water level conditions within the Basin (see Figure 4-1). SGMA's BMPs document for water level monitoring networks recommends that for basins like the Basin, where pumping is between 1,000 and 10,000 AFY, there should be a density of two wells per 100 square miles (DWR, 2016). The well density for the basin water level monitoring network significantly exceeds the BMP recommendation. There are 2.25 water level monitoring wells and water quality monitoring wells per square mile within the Basin. Table 4-1 presents a summary of information pertaining to these wells.

The proposed monitoring wells include active and inactive CVWD production wells, active and inactive private agricultural wells, and dedicated monitoring wells. The wells are spatially distributed throughout the confined and recharge areas of the Basin. Most of these wells have been monitored by CVWD prior to and during the AB 3030 GMP. CVWD continues to monitor water levels in these wells in the interim period between the termination of the AB 3030 program and implementation of the Plan and will continue to do so on behalf of the Carpinteria GSA. In recent years, CVWD and the Carpinteria GSA have made significant enhancements to the monitoring well network by drilling and installing two monitoring well clusters, with three wells each at depth discrete completion zones, which allow for monitoring in the upper, middle, and deepest portions of the Basin. The Sentinel Well cluster was installed in 2019, and the El Carro Park monitoring well cluster was installed in fall of 2023.

### 4.4.1 Chronic Lowering of Groundwater Levels

**§354.34 Monitoring Network.**

**(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:**

**(1) Chronic Lowering of Groundwater Levels. Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features by the following methods:**

**(A) A sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals to characterize the groundwater table or potentiometric surface for each principal aquifer.**

**(B) Static groundwater elevation measurements shall be collected at least two times per year, to represent seasonal low and seasonal high groundwater conditions.**

**(g) Each Plan shall describe the following information about the monitoring network:**

**(1) Scientific rationale for the monitoring site selection process.**

**(2) Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.**

The SGMA regulations require a network of monitoring wells sufficient to demonstrate groundwater occurrence, flow directions, and vertical hydraulic gradients. To the degree possible, the four factors of (1) groundwater use, (2) aquifer characteristics that affect groundwater flow, (3) impacts to beneficial uses and users, and (4) adequate monitoring results to demonstrate an understanding of aquifer response, were central to the development of the water level monitoring network, within the limits of the available data.

To monitor conditions related to chronic lowering of groundwater levels, the groundwater monitoring network must be structured to accomplish the following:

- Track short-term, seasonal, and long-term trends in water elevation.
- Demonstrate groundwater elevations in mid-March and mid-October for the principal aquifer.
- Record groundwater elevations in key wells in which minimum thresholds and measurable objectives have been identified to track progress toward the sustainability goals for the Basin.

It is preferable that wells in the water level monitoring network be dedicated monitoring wells, but this is not always feasible. Municipal and agricultural wells are also used, and the data collected from such wells is screened so that pumping and residual drawdown-impacted water levels do not become part of the record. It is also important and preferable that well depth and construction details of the wells in the monitoring network are known and documented to ensure that the construction features and well depths do not compromise the data collected. As shown in Table 4-1, some of the well completion information is missing from wells included in the network. For consistency with past monitoring and for the sake of continuity with historical monitoring, the wells were included and well construction details will be ascertained (via video

surveys) if possible as part of GSP implementation. If well construction details cannot be ascertained, the Carpinteria GSA will consider whether a replacement monitoring site is needed.

The following criteria were considered in selecting wells for the water level RMS monitoring network:

- The well is part of an existing monitoring network
- The well was completed in a principal aquifer
- The well has is part of a network with adequate spatial coverage
- The position of the well with respect to upgradient and downgradient conditions
- The suitability of the well for tracking sustainability goals
- The available access for monitoring the well

Figure 4-3 presents the Basin RMS monitoring network for the chronic lowering of groundwater level sustainability indicator. Table 4-2 presents pertinent data for the nine water level and storage reduction RMS wells. These wells were selected based on spatial distribution within the Basin, acceptable period of record for historical data, access, and suitability for monitoring sustainability goals. Additional detail on these wells is provided in Section 5 in the discussion of sustainability management criteria (SMCs).

**Table 4-2. Summary of Water Level and Storage Reduction RMS Wells**

| Well Number | Short Name | Owner | Use[1] | Year Drilled | Drilled Depth (feet) | Casing Depth (feet) | Log Type[2] | Water Level Data Start |
|---|---|---|---|---|---|---|---|---|
| 4N/25W-19F4 | 19F4 | Private | M | 1930 | 250 | Unknown | — | 1941 |
| 4N/25W-20K4 | 20K4 | CVWD | I | 1989 | 1,988 | 903 | D | 1989 |
| 4N/25W-21L1 | 21L1 | Private | A | 1991 | 810 | 732 | DE | 1992 |
| 4N/25W-26A1 | 26A1 | Private | M | 1941 | 228 vs 480? | Unknown | D | 1946 |
| 4N/25W-27F2 | 27F2 | CVWD | A | 1975 | 1,150 | 825 | DE | 1975 |
| 4N/25W-28F7 | 28F7 | CVWD | A | 1976 | 1,271 | 1,240/980 | DE | 1976 |
| 4N/25W-28J1 | 28J1 | Private | A | 1919 | 175 | 175 | D | 1940 |
| 4N/25W-29D7 | 29D7 | CVWD | DM | 1972 | 982 | 950 | DE | 1977 |
| 4N/25W-34G1 | 34G1 | Private | M | 1990 | 279 | 278 | D | 1991 |

**Notes**

[1] Use categories: A – Active production well; I – Inactive production well; M – Monitoring well; DM – Dedicated monitoring well

[2] Log type: D – Driller; E – E-log

— = not applicable

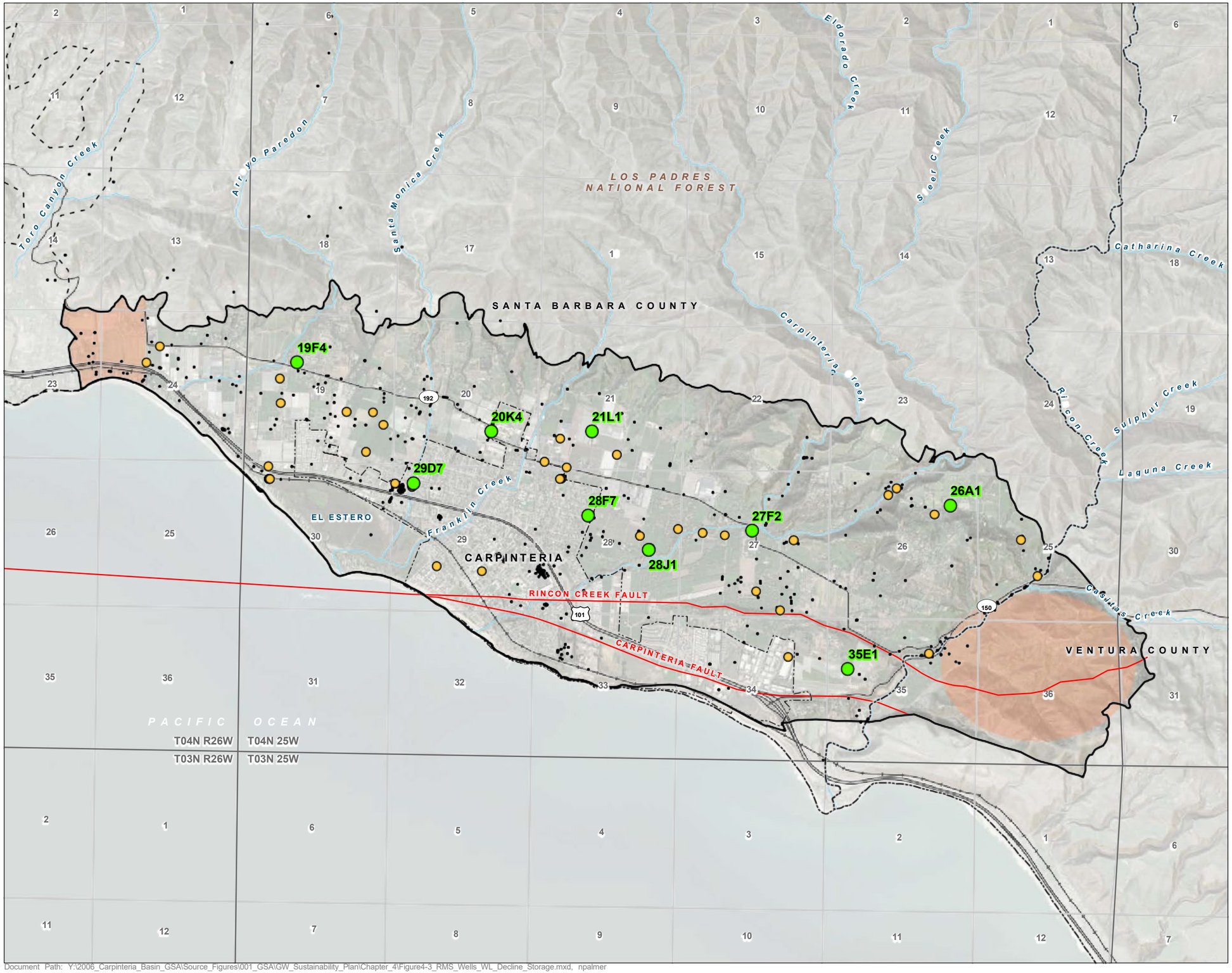
CVWD = Carpinteria Valley Water District

RMS = representative monitoring site

# FIGURE 4-3

## RMS Wells for Water Level Decline and Reduction of Storage

Carpinteria Basin
Groundwater Sustainability Plan




**LEGEND**

- Water Level RMS Well
- GSA Monitoring Well
- GSA Database Well
- Data Gap Area
- Carpinteria Groundwater Basin

**All Other Features**

- City Boundary
- County Boundary
- Montecito Groundwater Basin
- Fault
- Railroad
- Major Road
- Watercourse

**NOTES**

GSA: Groundwater Sustainability Agency
RMS: representative monitoring well

N

0 ½ Miles

Date: October 18, 2023
Data Sources: BLM, ESRI, USGS, Maxary Imagery (2020), DWR Bulletin 118

CARPINTERIA GSA
GROUNDWATER SUSTAINABILITY AGENCY

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#### 4.4.1.1 Monitoring Protocols

**§354.34 Monitoring Network.**

**(i) The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.**

The Carpinteria GSA selected monitoring protocols using guidelines in the SGMA regulations and BMPs published by DWR on monitoring protocols (DWR, 2010 and 2016). Appendix G contains monitoring protocols and data collection methods for groundwater level monitoring. These protocols incorporate SGMA BMPs, USGS data collection methods, and published CASGEM protocols.

Since completion of the Sentinel Well project, induction logs have been recorded on the deepest of the three Sentinel Wells (Sentinel Well MW-1) on a quarterly basis. The induction logs allow for assessment and tracking of the electrical conductivity (a measure of salinity) of all of the strata penetrated by the well and act as a comparative tool to monitor for the onset of seawater intrusion.

#### 4.4.1.2 Assessment and Improvement of Monitoring Network

**§354.38 Assessment and Improvement of Monitoring Network.**

**(a) Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.**

**(b) Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.**

**(c) If the monitoring network contains data gaps, the Plan shall include a description of the following:**

**(1) The location and reason for data gaps in the monitoring network.**

**(2) Local issues and circumstances that limit or prevent monitoring.**

**(d) Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.**

**(e) Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:**

**(1) Minimum threshold exceedances.**

**(2) Highly variable spatial or temporal conditions.**

**(3) Adverse impacts to beneficial uses and users of groundwater.**

**(4) The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.**

This section summarizes several portions of the groundwater level monitoring network that constitute data gaps, focused primarily on those data gaps that could affect the ability of the Plan to achieve the sustainability goal. Per the SGMA regulations, a "'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."

The following improvements would enhance the water level monitoring network:

1. **Collect information regarding well construction.** As shown in Table 4-1, there is missing well completion data for several of the wells in the monitoring network. As part of the Plan, the Carpinteria GSA should endeavor to eliminate unknown information about the wells by performing video surveys as funds and availability for access allow. At a minimum, it may be possible to determine the depth of the well casing with a depth sounder. Such activities would have to be coordinated with well owners.

2. **Install additional dedicated, depth-discrete well clusters.** The installation of the Sentinel Wells and the El Carro Park Monitoring Wells have improved the monitoring well network substantially. The Carpinteria GSA has plans to install additional depth-discrete monitor well clusters along the coast. This is discussed in Section 4.4.3.

3. **Install additional monitoring wells where data gaps exist.** The historical service area of CVWD, and the area referenced in the AB 3030 monitoring, does not include the eastern part of the Basin bordering the MGB or the western part of the Basin in Ventura County. Therefore, these areas do not have the same historical period of record as the wells in the central portion of the Basin. It is anticipated that wells will be identified in these areas to collect water level data during the SGMA implementation period.

### 4.4.2 Reduction of Groundwater Storage

**§354.34 Monitoring Network.**

**(e) A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.**

**(g) Each Plan shall describe the following information about the monitoring network:**

**(3) For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.**

**(h) The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.**

**(j) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.**

Groundwater storage and water levels are directly correlated. Chronic lowering of groundwater levels is an indication of the Reduction of Groundwater Storage sustainability indicator. Change in groundwater storage will be monitored using the overall monitoring network presented in Figure 4-1 and Table 4-1, while the selected representative wells displayed in Figure 4-3 and detailed in Table 4-2 will be used to track the sustainability indicator reduction of groundwater storage.

#### 4.4.2.1 Attainment of Monitoring Objectives and Other Requirements

**§354.34 Monitoring Network.**

**(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:**

**(2) Reduction of Groundwater Storage. Provide an estimate of the change in annual groundwater in storage.**

**(g) Each Plan shall describe the following information about the monitoring network:**

**(1) Scientific rationale for the monitoring site selection process.**

**(2) Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.**

The requirements for documenting reduction in groundwater storage are similar to those for chronic lowering of groundwater levels, because these two sustainability indicators are interrelated. The 31 wells in the existing monitoring network will be used to contour groundwater elevations. The Carpinteria GSA will continue to use the existing groundwater level monitoring network to monitor conditions related to reduction of groundwater storage. The spatial and temporal density of groundwater elevation data necessary to document groundwater storage changes in the aquifers of the Basin is the same as that necessary to document groundwater elevation changes. The current network of wells is capable of documenting changes to both sustainability indicators.

#### 4.4.2.2 Monitoring Protocols

**§354.34 Monitoring Network.**

**(i) The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.**

The groundwater level monitoring network will be used to address the groundwater storage monitoring network needs. Therefore, the protocols described in Appendix G for the groundwater level monitoring network are applicable to the groundwater storage monitoring network.

#### 4.4.2.3 Assessment and Improvement of Monitoring Network

**§354.38 Assessment and Improvement of Monitoring Network.**

**(a) Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.**

**(b) Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.**

**(c) If the monitoring network contains data gaps, the Plan shall include a description of the following:**

**(1) The location and reason for data gaps in the monitoring network.**

**(2) Local issues and circumstances that limit or prevent monitoring.**

**(d) Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.**

**(e) Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:**

**(1) Minimum threshold exceedances.**

**(2) Highly variable spatial or temporal conditions.**

**(3) Adverse impacts to beneficial uses and users of groundwater.**

**(4) The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.**

As has been demonstrated in the past, spatial and temporal density of the existing monitoring network is sufficient for determination of groundwater storage changes in the Basin. Nonetheless, the recommended improvement to the water level monitoring network of installing additional depth-discrete monitoring well clusters along the coast in the northwestern portion of the Basin also applies to the groundwater storage monitoring network. Additionally, the data gaps identified in Ventura County and near the boundary with the MGB will also be addressed during the SGMA implementation period.

### 4.4.3 Seawater Intrusion Monitoring Network

**§354.34 Monitoring Network.**

**(e) A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.**

**(g) Each Plan shall describe the following information about the monitoring network:**

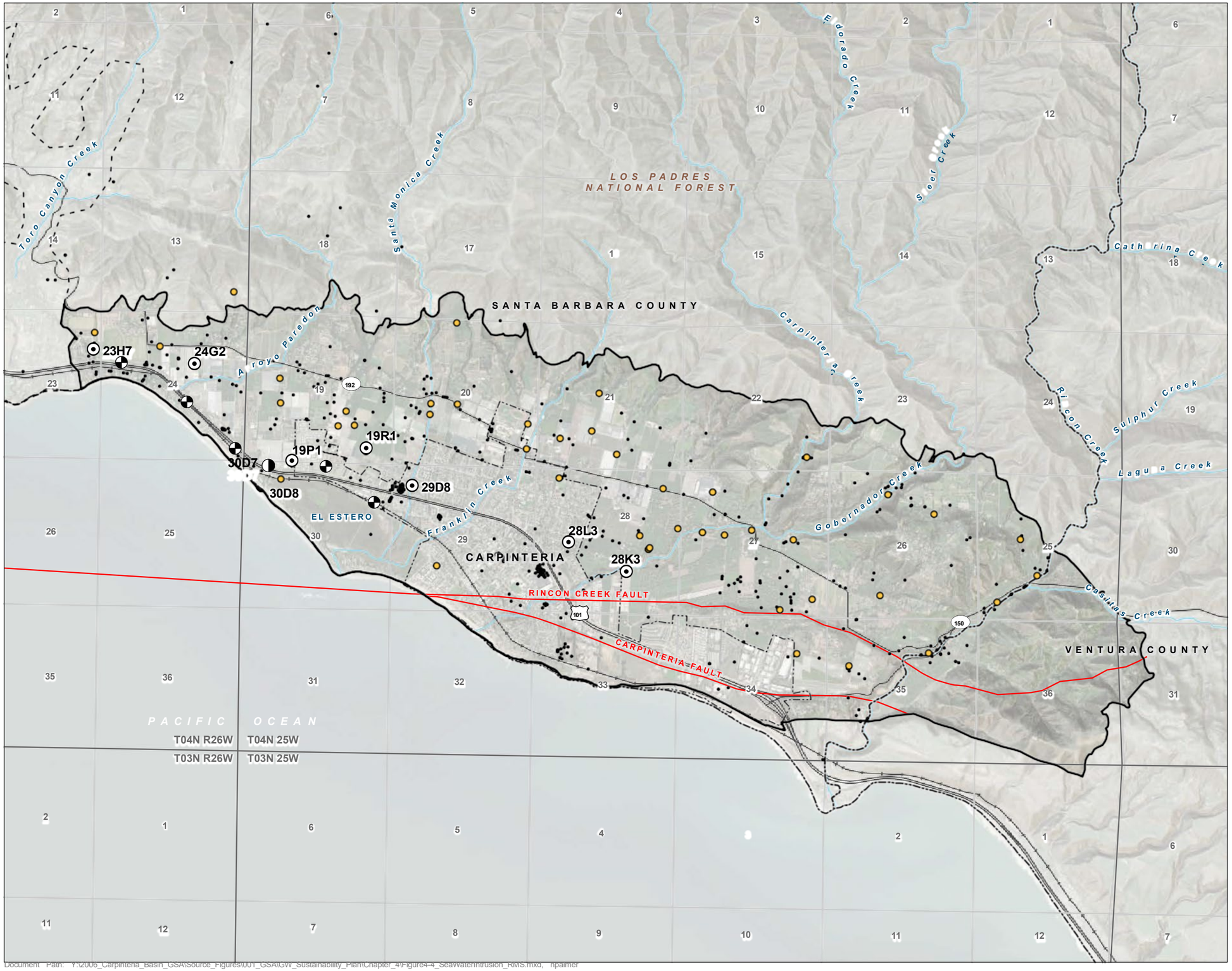
**(3) For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.**

**(h) The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.**

**(j) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.**

Seawater intrusion into the Basin is considered one of the primary threats to groundwater resources with the potential to negatively impact beneficial uses and users. As discussed in Section 3, the primary producing zones of SU-1 north of the Rincon Creek Fault and in the vicinity of Serena Park are believed to be exposed to the Pacific Ocean and, therefore, are at potential risk for seawater intrusion.

Figure 4-4 presents the 8 RMS wells for the seawater intrusion sustainability indicator. A line connecting these wells represents the location of the chloride isocontour required as the SMC for seawater intrusion in the SGMA regulations. Additional depth-discrete monitor wells are planned along the coast in the general locations displayed on Figure 4-4. Additional discussions of the minimum thresholds and measurable objectives, as well as rationale for these RMS well locations, are presented in Section 5. Table 4-3 presents known information on the construction details of the 8 seawater intrusion RMS wells.




# FIGURE 4-4

## RMS Wells for Seawater Intrusion Monitoring

Carpinteria Basin
Groundwater Sustainability Plan

**LEGEND**

- Seawater Intrusion RMS Well
- Existing Monitoring Well
- Proposed Seawater Intrusion Monitor Well
- Water Quality Monitoring Well
- GSA Database Well

**All Other Features**

- City Boundary
- County Boundary
- Carpinteria Groundwater Basin
- Montecito Groundwater Basin
- Fault
- Railroad
- Major Road
- Watercourse

**NOTES**

GSA: Groundwater Sustainability Agency
RMS: representative monitoring well

N

0 ½ 1
Miles

Date: September 22, 2023
Data Sources: BLM, ESRI, USGS, Maxary Imagery (2020), DWR Bulletin 118

CARPINTERIA GSA
GROUNDWATER SUSTAINABILITY AGENCY

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**Table 4-3. Summary of Seawater Intrusion RMS Wells**

| Well Number | Short Name | Owner | Use[1] | Year Drilled | Drilled Depth (feet) | Casing Depth (feet) | Log Type[2] |
|---|---|---|---|---|---|---|---|
| 4N/26W-23H7 | 23H7 | Private | I | Unknown | Unknown | Unknown | — |
| 4N/26W-24G2 | 24G2 | Private | A | 1990 | 450 | Unknown | — |
| 4N/25W-19M5 | 19M5 | Private | — | Unknown | Unknown | Unknown | — |
| 4N/25W-19P1 | 19P1 | Private | A | 2006 | 330 | 230 | — |
| 4N/25W-19R1 | 19R1 | Private | A | Unknown | 146 | Unknown | — |
| 4N/25W-29D8 | 29D8 | CVWD | A | 2002 | 978 | 958 | DE |
| 4N/25W-28L3 | 28L3 | Private | I | Unknown | 150 | Unknown | — |
| 4N/25W-28K3 | 28K3 | Private | I | 1993 | 505 | 500 | — |

**Notes**

[1] Use categories: A – Active production well; I – Inactive production well; M – Monitoring well; DM – Dedicated monitoring well

[2] Log type: D – Driller; E – E-log

— = not applicable

CVWD = Carpinteria Valley Water District

RMS = representative monitoring site

#### 4.4.3.1 Attainment of Monitoring Objectives and Other Requirements

**§354.34 Monitoring Network.**

**(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:**

**(3) Seawater Intrusion. Monitor seawater intrusion using chloride concentrations, or other measurements convertible to chloride concentrations, so that the current and projected rate and extent of seawater intrusion for each applicable principal aquifer may be calculated.**

**(g) Each Plan shall describe the following information about the monitoring network:**

**(1) Scientific rationale for the monitoring site selection process.**

**(2) Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.**

Monitoring objectives will be attained through regular collection of water quality samples from both the existing seawater intrusion monitoring wells (i.e., Sentinel Wells) and the RMS wells displayed in Figure 4-4.

In 2019, CVWD installed the sentinel monitoring well cluster near the northwestern margin of the Carpinteria Salt Marsh (El Estero), a location considered to be key for the collection of water level and water quality data related to evaluating the potential for seawater intrusion in the Basin. The installation and data collection from the Sentinel Wells is discussed in detail in Section 3 of this GSP.

The GSA has already applied for grant funding to install additional depth-discrete monitor well clusters at locations along the coast (see Figure 4-4). These will be included in the monitoring network for seawater intrusion in the Basin. The monitoring network for seawater intrusion has been established by the Carpinteria GSA and includes:

1. Continuous water level monitoring of the Sentinel Well cluster wells using pressure transducers and data loggers, with quarterly downloads of data and verification of transducer data by manual water level measurements.
2. Quarterly sampling of the Sentinel Wells and analysis for general mineral constituents, including chlorides and electrical conductivities.
3. Induction logging of the deepest Sentinel Well (MW-1) on a quarterly basis.
4. Repetition of the ERT surveying on a 5-year basis (with expanded lines to the northwest).

### 4.4.3.2 Monitoring Protocols

**§354.34 Monitoring Network.**

**(i) The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.**

The BMPs for seawater intrusion monitoring specify that the protocols for the measurement of water levels and the collection and analysis of water quality samples should be adopted. Appendix G includes protocols for collection of water levels and water quality sampling. Additionally, while no specific protocols are described for geophysical techniques related to the identification and mapping of seawater intrusion, the BMPs indicate that professional judgement should be used to determine which geophysical methods are appropriate. The use of ERT surveys and induction surveys satisfy this general recommendation.

#### 4.4.3.3 Assessment and Improvement of Monitoring Network

**§354.38 Assessment and Improvement of Monitoring Network.**

**(a) Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.**

**(b) Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.**

**(c) If the monitoring network contains data gaps, the Plan shall include a description of the following:**

**(1) The location and reason for data gaps in the monitoring network.**

**(2) Local issues and circumstances that limit or prevent monitoring.**

**(d) Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.**

**(e) Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:**

**(1) Minimum threshold exceedances.**

**(2) Highly variable spatial or temporal conditions.**

**(3) Adverse impacts to beneficial uses and users of groundwater.**

**(4) The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.**

The Sentinel Wells are the only depth discrete monitoring wells that are completed through the full thickness of Basin aquifer materials in the Basin most vulnerable to seawater intrusion. Plans are in place to expand the seawater intrusion monitoring well network to new locations along the coast (see Figure 4-4). Discussions have already occurred, and potential well sites have been preliminarily screened for expansion of the well network in this localized portion of the Basin. Final site selection has not yet been completed, but additional monitoring well clusters are necessary to enhance monitoring for seawater intrusion in this susceptible portion of the Basin.

The possibility and utility of installing single wells dedicated solely for induction surveys, and completed through the entire thickness of the Basin, has also been considered. A single deep well completion would be less impactful and less expensive than a conventional three-well cluster, while still allowing for the collection of important and meaningful data. Therefore, for the cost of one three-well cluster, perhaps two or three deep, single casing wells could be constructed at various locations.

Repeated ERT surveys may be considered on an expanded network to improve the overall understanding, considering the stark contrast in electrical conductivities between the two existing ERT profiles.

### 4.4.4 Degraded Water Quality Monitoring Network

**§354.34 Monitoring Network.**

**(e) A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.**

**(g) Each Plan shall describe the following information about the monitoring network:**

**(3) For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.**

**(h) The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.**

**(j) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.**

The groundwater quality monitoring network is intended to track long-term trends in water quality that may impact beneficial uses and users. This monitoring network will allow the Carpinteria GSA to address water quality issues should any trends toward degraded water quality caused by groundwater extraction or Plan implementation projects be identified.

#### 4.4.4.1 Attainment of Monitoring Objectives and Other Requirements

**§354.34 Monitoring Network.**

**(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:**

**(4) Degraded Water Quality. Collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues.**

**(g) Each Plan shall describe the following information about the monitoring network:**

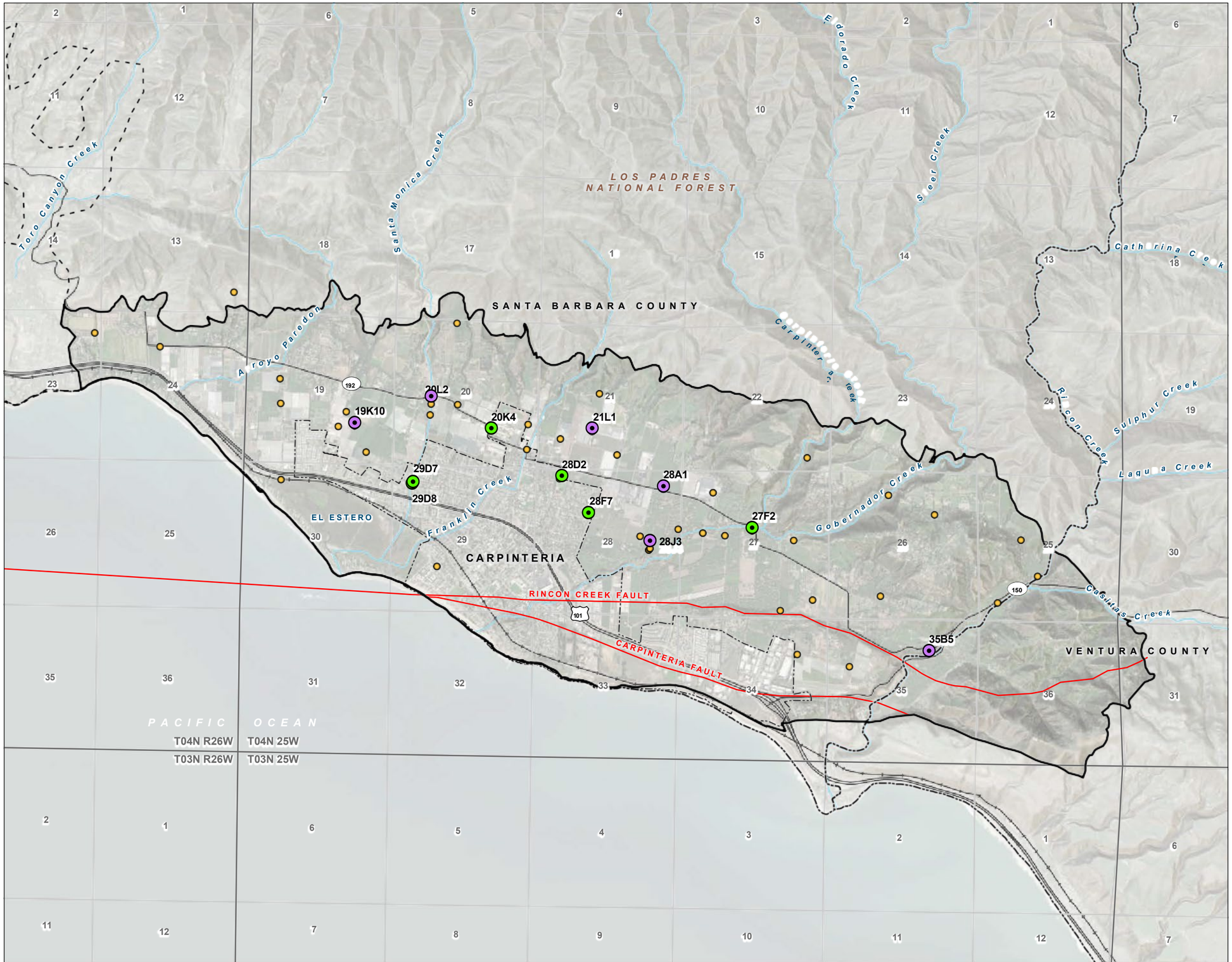
**(1) Scientific rationale for the monitoring site selection process.**

**(2) Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.**

Groundwater quality within the Basin has historically been monitored as part of CVWD's AB 3030 GMP program through the analysis of samples collected from 38 wells located throughout the Basin (see Figure 4-1). The laboratory analytical program for the samples includes TDS and basic inorganic chemical constituents, including chloride and nitrates. A detailed discussion of water quality within the Basin, including water quality characterization and identified trends, is provided in Section 3.1.3.3.

It is recommended that the Carpinteria GSA continue to track water quality using the existing groundwater monitoring network. Table 4-1 identifies existing water quality monitoring wells, and Figure 4-1 shows the locations of these wells. The existing groundwater quality data, and data to be derived through Plan implementation will be used to assess existing or future water quality trends and determine whether degradation of groundwater quality is caused by groundwater extractions and is, hence, a sustainability issue that must be addressed by the Carpinteria GSA.

Figure 4-5 presents the 14 wells selected as RMS wells for the water quality degradation sustainability indicator. Table 4-4 presents pertinent details regarding these 14 wells. Additional discussion regarding the rationale for selection of these wells, and recommended SMCs for degradation of water quality, are included in Section 5.




# FIGURE 4-5

## RMS Wells for Water Quality Degradation

Carpinteria Basin
Groundwater Sustainability Plan

**LEGEND**

- Chloride, Boron, and TDS RMS Well
- Arsenic and Nitrate RMS Well
- Water Quality Monitoring Well
- Carpinteria Groundwater Basin

**All Other Features**

- City Boundary
- County Boundary
- Montecito Groundwater Basin
- Fault
- Railroad
- Major Road
- Watercourse

**NOTES**

GSA: Groundwater Sustainability Agency
RMS: representative monitoring well

N

0 ½ Miles

Date: September 22, 2023
Data Sources: BLM, ESRI, USGS, Maxary Imagery (2020), DWR Bulletin 118

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**Table 4-4. Summary of RMS Wells for Water Quality Degradation**

| Well Number | Short Name | Owner | Use[1] | Water Quality Constituents | Year Drilled | Drilled Depth (feet) | Casing Depth (feet) | Log Type[2] |
|---|---|---|---|---|---|---|---|---|
| 4N/25W-19K10 | 19K10 | Private | A | Chloride, Boron, TDS | 2017 | 602 | 602 | — |
| 4N/25W-20K4 | 20K4 | CVWD | I | Arsenic and Nitrate | 1989 | 1988 | 903 | D |
| 4N/25W-20L2 | 20L2 | Private | I | Chloride, Boron, TDS | Unknown | 434 | Unknown | — |
| 4N/25W-21L1 | 21L1 | Private | A | Chloride, Boron, TDS | 1991 | 810 | 732 | DE |
| 4N/25W-27F2 | 27F2 | CVWD | A | Arsenic and Nitrate | 1975 | 1150 | 825 | DE |
| 4N/25W-28D4 | 28D4 | CVWD | A | Arsenic and Nitrate | 2010 | 1220 | 1210 | DE |
| 4N/25W-28D5,6,7 | 28D5,6,7 | CGSA | DM | Chloride, Boron, TDS | 2023 | 1240 | 360, 925, 1040 | DE |
| 4N/25W-28F7 | 28F7 | CVWD | A | Arsenic and Nitrate | 1976 | 1271 | 1240/980 | DE |
| 4N/25W-28J1 | 28J1 | Private | A | Chloride, Boron, TDS | 1919 | 175 | 175 | D |
| 4N/25W-29D7 | 29D7 | CVWD | A | Arsenic and Nitrate | 1972 | 982 | 950 | DE |
| 4N/25W-29D8 | 29D8 | CVWD | A | Arsenic and Nitrate | 2002 | 978 | 958 | DE |
| 4N/25W-35B5 | 35B5 | Private | A | Chloride, Boron, TDS | 1990 | 285 | 280 | D |

**Notes**

[1] Use categories: A – Active production well; I – Inactive production well; M – Monitoring well; DM – Dedicated monitoring well

[2] Log type: D – Driller; E – E-log

— = not applicable

CGSA = Carpinteria Groundwater Sustainability Agency

CVWD = Carpinteria Valley Water District

RMS = representative monitoring site

TDS = total dissolved solids

#### 4.4.4.2 Monitoring Protocols

**§354.34 Monitoring Network.**

**(i) The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.**

CVWD staff have developed and implemented standard protocols for the purging and sampling of wells for water quality analysis. The protocols include documentation of well conditions, casing volumes, and required purge volumes; measurement and documentation of field water quality parameters (to document water quality stabilization); sample collection, handling, and identification; and chain-of-custody documentation. The Sampling and Analysis Plan (SAP) was developed in 2019 for specific application for water quality sampling of the Sentinel Wells and will be adopted for Carpinteria GSA sampling of all monitoring wells. The current sampling protocols and the SAP are consistent with the protocols for sampling groundwater quality provided in the BMP (DWR, 2016). The SAP is included in Appendix G.

#### 4.4.4.3 Assessment and Improvement of Monitoring Network

**§354.38 Assessment and Improvement of Monitoring Network.**

**(a) Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.**

**(b) Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.**

**(c) If the monitoring network contains data gaps, the Plan shall include a description of the following:**

**(1) The location and reason for data gaps in the monitoring network.**

**(2) Local issues and circumstances that limit or prevent monitoring.**

**(d) Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.**

**(e) Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:**

**(1) Minimum threshold exceedances.**

**(2) Highly variable spatial or temporal conditions.**

**(3) Adverse impacts to beneficial uses and users of groundwater.**

**(4) The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.**

The spatial distribution of existing groundwater quality monitoring wells across the Basin is sufficient to monitor and track water quality conditions. There is a minimum of one monitoring well in most sections of the Basin, excluding peripheral areas where no monitoring wells exist. Where feasible, water quality monitoring will be added to any wells added to the other monitoring networks in the portions of SU-1 that are deemed susceptible to potential seawater intrusion. The Carpinteria GSA will evaluate whether to add groundwater quality monitoring concurrent with the addition of any wells that may be added to the groundwater levels monitoring network in the interior portions of the Basin. Additional water quality monitoring wells would be considered an improvement to the Plan, not a filling of a data gap.

### 4.4.5 Land Subsidence Monitoring Network

**§354.34 Monitoring Network.**

**(e) A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.**

**(g) Each Plan shall describe the following information about the monitoring network:**

**(3) For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.**

**(h) The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.**

**(j) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.**

Land subsidence has been observed in numerous areas throughout California for many decades. Subsidence is the gradual (or sudden) lowering of the land surface. One of the mechanisms that may lead to subsidence is aquifer matrix compaction caused by the withdrawal of groundwater. Subsidence-related impacts due to groundwater pumping have not been historically observed in the Basin.

No monitor well network is proposed to monitor land subsidence in the Basin. Subsidence will be monitored using satellite data curated by DWR, as discussed in Section 5.

#### 4.4.5.1 Attainment of Monitoring Objectives and Other Requirements

**§354.34 Monitoring Network.**

**(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:**

**(5) Land Subsidence. Identify the rate and extent of land subsidence, which may be measured by extensometers, surveying, remote sensing technology, or other appropriate method.**

**(g) Each Plan shall describe the following information about the monitoring network:**

**(1) Scientific rationale for the monitoring site selection process.**

**(2) Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.**

Ground surface elevation monitoring has been conducted since 2015 for the Basin using remote sensing Interferometric Synthetic Aperture Radar (InSAR) data, which tracks vertical elevation changes and is used to measure total vertical displacement of the land surface. These satellite data are collected by the European Space Agency and processed by TRE ALTAMIRA under contract with DWR. Since June 2015, InSAR data and interferograms for numerous medium- and high-priority basins throughout California, including the Basin, have been made publicly available monthly (TRE ALTAMIRA, 2023). These data are used to evaluate and estimate monthly and annual land surface elevation changes since data collection was initiated in 2015.

Numerous boreholes drilled for the construction of water production wells and monitoring wells have penetrated the full thickness of the basin aquifers. State of California Professional Hydrogeologists and Certified Hydrogeologists have professionally logged these boreholes. The geologic properties and depositional structure of the aquifer materials present indicate that land subsidence due to groundwater withdrawal in the Basin is unlikely. Even though low or near low water level conditions occurred in the Basin in the early 1950s and early 1990s, subsidence-related impacts to infrastructure (e.g., roads, bridges, pipelines, channels, power grid, etc.) have not been historically observed in the Basin (personal communications: Scott McGolpin, Public Works Director, County of Santa Barbara, September 20, 2022; Brian King, District Engineer, Carpinteria Valley Water District, September 20, 2022).

Based on these findings, a direct-measurement monitoring network for potential land subsidence is not recommended for the Plan. However, ground surface elevation monitoring using InSAR data will be implemented. Available InSAR coverage for the Basin is deemed sufficient and will be evaluated for indications of ongoing or permanent land subsidence.

#### 4.4.5.2 Monitoring Protocols

**§354.34 Monitoring Network.**

**(i) The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.**

The DWR BMP notes that no standard operating procedures exist for collecting land subsidence data (DWR, 2016). DWR InSAR data will continue to be monitored annually throughout the Plan implementation period. If additional relevant data sets become available, they will be evaluated and incorporated into the monitoring program.

#### 4.4.5.3 Assessment and Improvement of Monitoring Network

**§354.38 Assessment and Improvement of Monitoring Network.**

**(a) Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.**

**(b) Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.**

**(c) If the monitoring network contains data gaps, the Plan shall include a description of the following:**

**(1) The location and reason for data gaps in the monitoring network.**

**(2) Local issues and circumstances that limit or prevent monitoring.**

**(d) Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.**

**(e) Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:**

**(1) Minimum threshold exceedances.**

**(2) Highly variable spatial or temporal conditions.**

**(3) Adverse impacts to beneficial uses and users of groundwater.**

**(4) The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.**

The subsidence minimum thresholds are set to avoid significant and unreasonable subsidence that could substantially interfere with groundwater supply, land uses, infrastructure, and property interests. Available data indicate that subsidence does not appear to be occurring in the Basin that would affect groundwater supply, land uses, infrastructure, and property interests. The adequacy of the subsidence monitoring network in the Basin will be evaluated annually during preparation of the annual report.

### 4.4.6 Depletion of Interconnected Surface Water Monitoring Network

**§354.34 Monitoring Network.**

**(e) A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.**

**(g) Each Plan shall describe the following information about the monitoring network:**

**(3) For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.**

**(h) The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.**

**(j) An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.**

As discussed in Section 3, no interconnected surface water systems have been identified within the Basin. Therefore, no monitoring network for this sustainability indicator has been established at this time.

The GSA will continue to compile and track surface water flow data from the existing monitoring networks discussed in Section 4.3.1 and will review groundwater level data during the required Plan assessments to determine if interconnection is occurring under future conditions as a result of Plan implementation.

This sustainability indicator may be considered a data gap when evaluating conditions during implementation. During the SGMA implementation period, the GSA will assess the need for some additional monitoring locations. The stream segments between the bedrock mountain contributing watershed and the confined area in the southern portion of the Basin are relatively short, However, there is no data in the record that quantifies the water levels in the shallow alluvial deposits and the deeper strata of the principal aquifer in the Basin. If additional data collection and documentation is warranted, coupled shallow and deep piezometers may be considered in future implementation phases in the Basin.

#### 4.4.6.1 Attainment of Monitoring Objectives and Other Requirements

**§354.34 Monitoring Network.**

**(c) Each monitoring network shall be designed to accomplish the following for each sustainability indicator:**

**(6) Depletions of Interconnected Surface Water. Monitor surface water and groundwater, where interconnected surface water conditions exist, to characterize the spatial and temporal exchanges between surface water and groundwater, and to calibrate and apply the tools and methods necessary to calculate depletions of surface water caused by groundwater extractions. The monitoring network shall be able to characterize the following:**

**(A) Flow conditions including surface water discharge, surface water head, and baseflow contribution.**

**(B) Identifying the approximate date and location where ephemeral or intermittent flowing streams and rivers cease to flow, if applicable.**

**(C) Temporal change in conditions due to variations in stream discharge and regional groundwater extraction.**

**(D) Other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.**

**(g) Each Plan shall describe the following information about the monitoring network:**

**(1) Scientific rationale for the monitoring site selection process.**

**(2) Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.**

This requirement is not considered to be applicable due to the lack of interconnected surface water systems in the Basin (see Section 3.2.6). If additional wells and piezometers are determined to be necessary during the SGMA implementation phase, standard monitoring objectives will be considered at that time.

### 4.4.6.2 Monitoring Protocols

**§354.34 Monitoring Network.**

**(i) The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.**

Streamflow measurements are managed by the USGS and DWR, the operators of the two streamflow gages on Carpinteria Creek, following their internal protocols. If additional wells or piezometers are determined to be necessary during the SGMA implementation phase, standard monitoring protocols will be defined at that time.

### 4.4.6.3 Assessment and Improvement of Monitoring Network

**§354.38 Assessment and Improvement of Monitoring Network.**

**(a) Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.**

**(b) Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.**

**(c) If the monitoring network contains data gaps, the Plan shall include a description of the following:**

**(1) The location and reason for data gaps in the monitoring network.**

**(2) Local issues and circumstances that limit or prevent monitoring.**

**(d) Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.**

**(e) Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:**

**(1) Minimum threshold exceedances.**

**(2) Highly variable spatial or temporal conditions.**

**(3) Adverse impacts to beneficial uses and users of groundwater.**

**(4) The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.**

This requirement is not considered to be currently applicable due to the lack of interconnected surface water systems in the Basin (see Section 3.2.6). However, the following enhancements to the surface water flow monitoring network will be considered by the Carpinteria GSA:

1. Coordinate with DWR on the installation of additional streamflow monitoring gages within the Basin. As mentioned previously, DWR has indicated a willingness to investigate additional monitoring sites, particularly on Rincon Creek.
2. Coordinate with NOAA regarding the possible reactivation of the non-contact LiDAR gage previously used on Rincon Creek. The gage is still in place but will require the replacement of recording and transmitting equipment. As in the case with DWR, NOAA has expressed interest in assisting the Carpinteria GSA in reactivating this monitoring device.
3. Construct and monitor water levels in paired shallow piezometers and deeper piezometers in the principal aquifer strata to complement surface water flow data from the existing gages in areas where anticipated higher future groundwater levels may result in interconnection. Outside funding programs will be pursued to develop and support new stream flow monitoring.

## 4.5 Reporting Monitoring Data to the Department (Data Management System)

**§352.6 Data Management System. Each Agency shall develop and maintain a data management system that is capable of storing and reporting information relevant to the development or implementation of the Plan and monitoring of the basin.**

**§354.40 Reporting Monitoring Data to the Department. Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department.**

SGMA-related data for the Basin will be incorporated into the Data Management System (DMS). Entities in the Basin that collect and report data will have access and authorization to enter their data into the DMS. The data and information stored in the DMS will be available upon request, and will be uploaded to the DWR-supported SGMA data portal. Once incorporated into the SGMA portal, data will accessible on a web-based map viewer that displays data relevant to SGMA implementation, Plan development, and annual reporting to DWR. The map viewer accommodates data within and outside of GSA monitoring networks. Table 4-5 lists the types of data visualized on the map and available via the map's navigation menu. Appendix H includes details of the DMS.

**Table 4-5. Summary of Data Available for Sustainability Indicators**

| Sustainability Indicator | Data Type |
|---|---|
| Groundwater Levels | Water Level Data and Well Construction Information |
| Groundwater in Storage | Water Level Data |
| Water Quality | Analytical Data from CVWD |
| Seawater Intrusion | Water Level Data, Analytical Data from CVWD, Induction Logs, and ERT Surveys |
| Land Subsidence | InSAR Data |
| Interconnected Surface Water | Stream Gages and Precipitation Data |

**Notes**

CVWD = Carpinteria Valley Water District

ERT = electrical resistivity tomography

InSAR = Interferometric Synthetic Aperture Radar

Table 4-6 lists the data sources used to populate the DMS. Appendix H includes details of the data sources. Data templates are used to standardize the format of the data going into the DMS to support data consistency and provide for quality assurance/quality control (QA/QC) of the data. The templates are Excel documents that include rules restricting formatting and alphanumeric properties. The templates include pop-up windows to describe the type of data that should be entered in each column. As a second level of QA/QC, the compiled data are reviewed by the DMS development team before they are migrated into the database. This review is focused and limited in scope. It includes the following checks:

- Identifying outliers that may have been introduced during the original data entry process.
- Removing or flagging questionable data.
- Visualizing data in various software platforms outside the DMS to further assess the quality of the data.

The automated and manual data checks above make sure data is in an appropriate range but do not confirm the quality of the data for a single observation.

**Table 4-6. Summary of Data Sources**

| Data Type | Source |
|---|---|
| Well and Site Info | DWR, Santa Barbara County Environmental Health, USGS, CVWD |
| Aquifer Properties | CVWD |
| Water Level Data | CVWD |
| Water Quality Data | CVWD, GeoTracker GAMA |
| Precipitation Data | Santa Barbara County Flood Control District |
| Groundwater Pumpage | CVWD |
| Land Subsidence | InSAR |

**Notes**

CVWD = Carpinteria Valley Water District

DWR = California Department of Water Resources

InSAR = Interferometric Synthetic Aperture Radar

USGS = U.S. Geological Survey

Data stored in the DMS are separated into tables by categories. Figure 4-6 shows that each field within the tables holds a specific type of data, such as a number, text, or date. Table 4-7 provides brief descriptions of the main tables and sub tables. Figure 4-6 is color-coordinated to show the relationship between tables:

- Main tables (shown in blue) include point data with a unique identification and unique point location to be added to database (e.g., Well_Info and Station_Info).
- Sub-tables (shown in green) are related to the main table and hold additional details about the well or unique identifier (e.g., correlation of a well point with a water level or water quality).

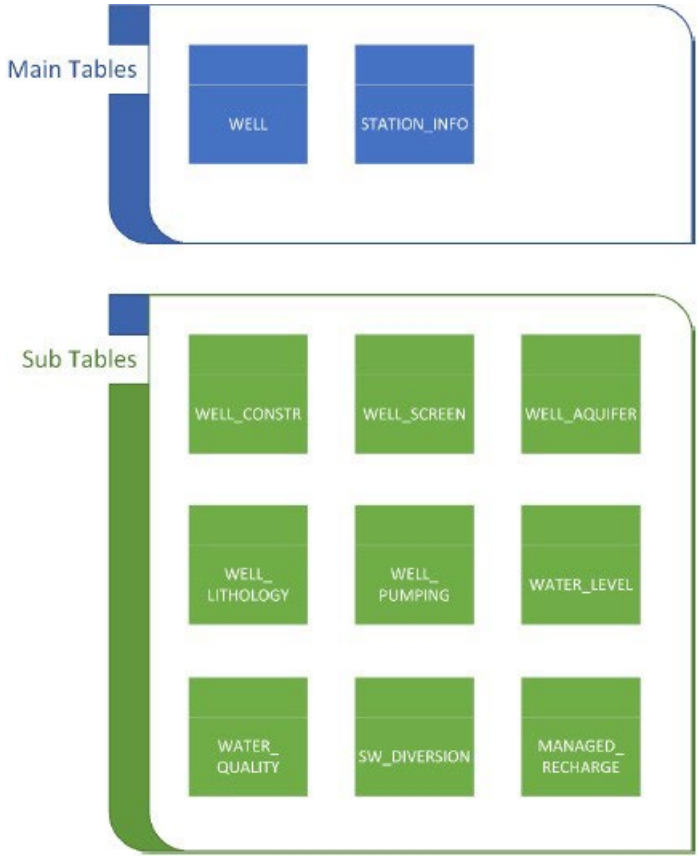


**Figure 4-6. Carpinteria Groundwater Sustainability Plan Data Management Tables**

**Table 4-7. Data Management System Table Descriptions**

| Table | Description |
|---|---|
| **Main Tables** | |
| Station Info | Type of Station (well, gage, etc.) and Location Info |
| Well Info | General Information about Well, including Identifiers by Various Agencies |
| **Sub Tables** | |
| Agencies | Agency Associated with Well or Site |
| Sustainability Indicators | Minimum Thresholds and Measurable Objectives Set for Monitoring Network Sites Tracking Sustainable Management Criteria |
| Well Construction | Well Construction Information, including Depth, Diameter, Screens |
| Well Geologic Aquifer | Aquifer Parameter Info, such as Pump Test Info, Degree of Confinement, and Transmissivity |
| Well Geologic Lithology | Lithology at Well Site, Well Logs |
| Water Level | Water Level Measurements for Wells |
| Well Pumping | Pumping Measurements for Wells, annually or monthly |
| Managed Recharge | Aquifer Storage Volumes Annually or Monthly |
| Water Quality | Water Quality Data for Wells and Surface Water |