SGMA-Meters, Measurement and Management

San Antonio Basin GSA

April 16, 2024, Board of Directors Meeting

Sarge Green, Project Director

FRESNO STATE
CENTER FOR IRRIGATION TECHNOLOGY

Today's Discussion

1. Emphasis on CA Groundwater, specifically implementation of the Sustainable Groundwater Management Act
2. Meters and measurement and how it impacts management
   a. Meters – types and accuracy
   b. Measurement results and value
3. Metering programs developed more recently by GSAs
   a. Madera County GSA
   b. Mid-Kaweah GSA
4. Integrating the results with other management actions and needs, including;
   a. Recharge – natural, basins, farmland, ASR wells and other potential recharge efforts – e.g. Fresno State test site
   b. Water source conditions and watersheds – challenges

Meters

1. Types used for wells
    - What are the most common types?
    - How accurate are they?
    - When do they need to be tested (calibration) to show continued reliable measurements?
    - What equipment is used to test accuracy?

Meter Types

Propeller

Magnetic

Acoustic

Meter Cost Differential – Utah State 2022

Table 5. *Comparison of Potential Flow Meter Accuracy and Equipment Cost*

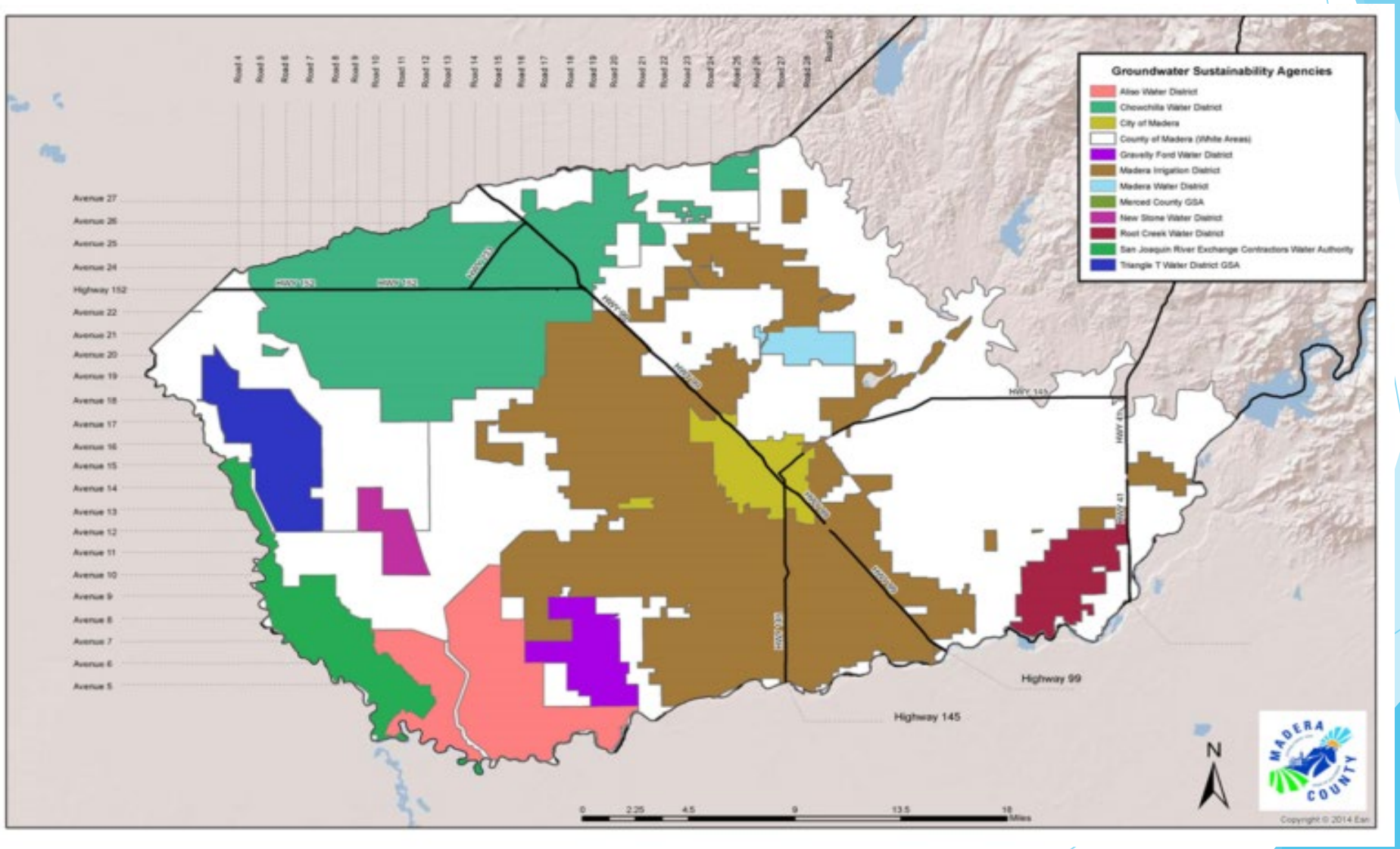
Flowmeter type	Mount type	Claimed accuracy[1]	Potential 2022 cost[4]
Magmeter	Spool	±0.2%–0.75%[a]	$380–$450 per diameter inch[a]
Magmeter	Insertion	±0.5%–10%[2,b]	$1,500–$2,500[a]
Paddle wheel	Insertion	±3%–10%[c]	~$1000[a]
Propeller/Turbine	Saddle	±2%[d]	$1,000 + $80 per diameter inch[b,c]
Propeller/Turbine	Weld-on saddle	±2%[d]	$180 per diameter inch, more for < 8 inches[b]
Propeller/Turbine	Spool	±2%[d]	$370 per diameter inch[b]
Ultrasonic	Exterior	±1%–1.5%[3,e]	$7,100–$11,000[a]
Ultrasonic	Insertion	±1%[g]	~$7,200[d]
Ultrasonic	Interior wall	±1%–2%[f]	$8,200–$11,400[d,e]

[1]As reported by the manufacturers. Accuracies may differ from the manufacturer's statements (see Masasi et al., 2017). Accuracies should be obtained from a qualified, third-party testing facility. Sensors may also be subject to calibration drift. Manufacturers/sources included: [a]Badger Meter, FloCat, Instrumart; [b]George Fischer Signet, Instrumart, Seametrics, McCrometer; [c]George Fischer Signet, Instrumart; [d]Direct Pivot Parts, Geyser, Insrumart, McCrometer: [e]Badger Meter. Fuji Electric. Instrumart. Panametrics: [f]In-Situ. Measuring and Control Equipment.

Meters and Water Management Value

- Meters are more important than ever, mostly to discern how much water is applied to specific crops and fields, it is a management tool for better ROI
- Meters are also important in water trading to make sure what is sold is actually available
- Meters will likely supplant ET and other related methods of water use accounting as such methods need constant updating to remain relevant, for example, last year was wet and the atmosphere was saturated from multiple sources which confounded determining the actual crop ET. Meters reflect actual groundwater use.

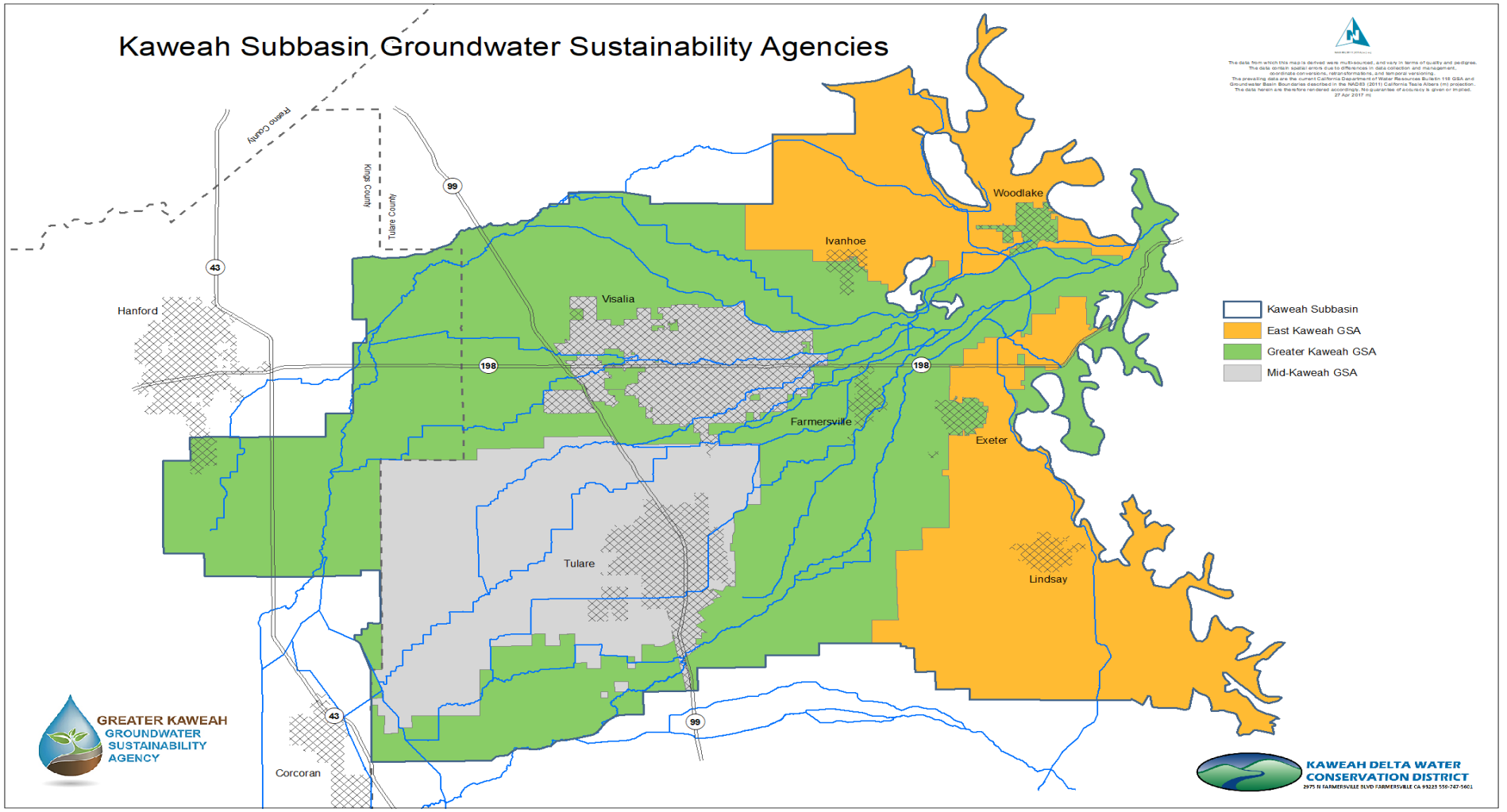
Madera County GSA (white areas)



Madera County GSA Well Metering Ordinance

The following requirements must be met and required documents attached:
A map depicting the exact location of groundwater well(s), meter(s) and parcel(s) and field(s) served by the well(s).
Photographs and a meter installation report(s) for the well(s) serving the parcel(s).
A meter installation report must be completed by a County GSA approved vendor. A list of vendors can be found at www.maderacountywater.com/measurement/.
A compliant meter calibration report(s) or results of a field flow test conducted by a County GSA approved vendor for each well. A list of vendors can be found at www.maderacountywater.com/measurement/.
A written attestation that the designated well(s) only serve the identified parcel(s) or field(s) and of the validity that all submitted information represents current conditions for the well(s).
Make an appointment with Madera County GSA to pick up flowmeter ID sticker(s) and provide serial numbers for each meter approved.
Approved meters shall be recalibrated every 2 years for compliance with Madera County GSA.

Mid Kaweah GSA (gray areas)



Mid Kaweah Well Metering Ordinance

[Board Approved: 08-Aug-2023] Well Metering Appeal
Monthly volumes must be reported for the entire year, considering the lag time between
evapotranspiration (ET) and pumping. Approved meter appeals will be accepted free of charge by the
MKGSA; however, for denied requests for meter appeals made after October 1, 2024, growers will be
responsible for covering the cost of staff time. To ensure the validity of meter appeal data, the following
four deliverables are required:

1. Documentation of a meter calibration report no more than 2 years old
2. List of the Assessor's Parcel Numbers (APNs) served by each well
3. Well Completion Report (WCR) number(s) associated with each well
4. Written attestation confirming the accuracy of the information contained in the appeal

Recharge Summary

Use SAGBI for surface soil recharge suitability = farmland recharge:

https://casoilresource.lawr.ucdavis.edu/sagbi/

1. Natural recharge requires long records of surface flows, stream gauges?
2. Basins = project money and willing landowner(s)
3. ASR Wells – useful in boundary areas such as seawater intrusion
4. Subsurface tile drainage system – tested at Fresno State, very useful to avoid hypoxia of crops and washing of surface applied materials.

SAGBI | Soil Agricultural Groundwater Banking Index

About | Factors | Map Settings

About This App

Background

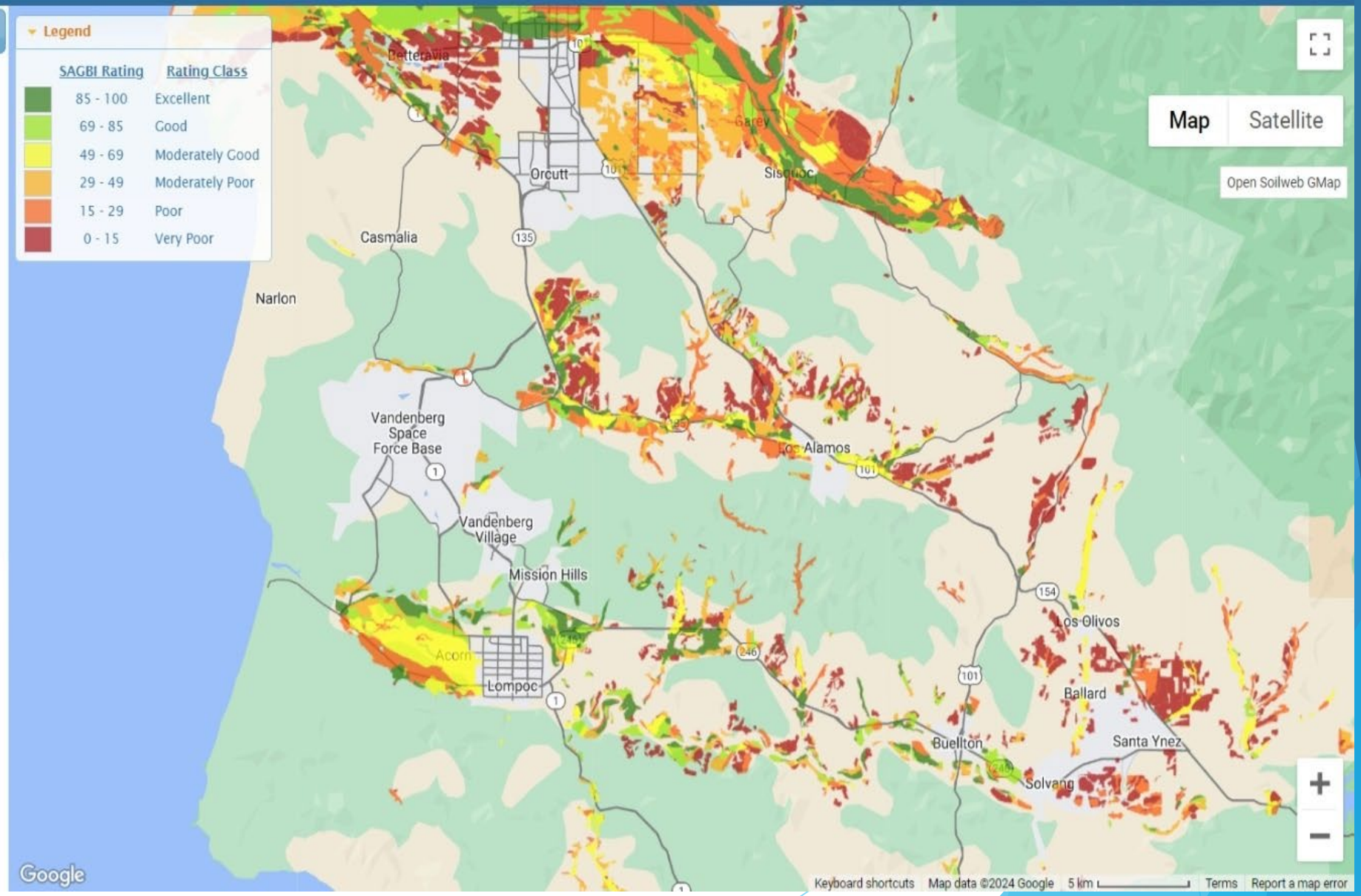
The Soil Agricultural Groundwater Banking Index (SAGBI) is a suitability index for groundwater recharge on agricultural land. The SAGBI is based on five major factors that are critical to successful agricultural groundwater banking: deep percolation, root zone residence time, topography, chemical limitations, and soil surface condition. More details can be found in the SAGBI article in *California Agriculture*.

Using the app

- Click the map to view specific SAGBI ratings at that location.
- Learn more about each SAGBI factor on the 'Factors' tab.
- Use the 'Map Settings' tab to change the SAGBI overlay transparency, or to zoom to a specific area of interest.

This app was developed by the California Soil Resource Lab at UC Davis and UC-ANR.

UCDAVIS | University of California Agriculture and Natural Resources



Watershed Management

1. Runoff issues
   a. Water holding capacity of soils reduced with lack of litter/carbon

   b. Rapid erosion can cause debris flows and impact infrastructure

   c. Slides and sediments can affect water quality and reduce storage in reservoirs or impede percolation in streams

2. Solutions
   a. Consider farm and ranch plans that improve soil health and water holding capacity, stream protection, seek support and f unding through Cachuma RCD and NRCS

   b. Consider “small watershed” grant (PL 566) from USDA to develop upper elevation water holding ponds (below dam safety size)

Groundwater Level Report – Fall 2023 Data

California's Groundwater Live: Groundwater Levels (arcgis.com)