Sierra Valley Groundwater Sustainability Plan

Advisory Committee Summary Sheet

SUBSIDENCE

BACKGROUND

The topic of subsidence was introduced at the December 2020 TAC meeting, as one of the Sustainability Indicators for SGMA.

Ground level elevations can be evaluated in a variety of ways:

- Ground surveys (standard surveying of fixed points or monuments)
- InSAR (satellite mapping using radar images)
- Aerial Electromagnetic Mapping (AEM) which uses a helicopter to fly a metal framework over an area of land

What We Know: Available Data

Ground surveys: CalTrans noted two highway survey monuments subsided between 2012 and 2016

- An elevation monument (marker) in the north central portion of the basin (Hwy 70) subsided 1.9 feet
- A monument in the northeastern portion of the basin (Hwy 49) subsided 0.3 feet

In 1983, DWR reported subsidence of 1.5 feet or more in the eastern half of Sierra Valley (between Hwy 70, Hwy 49 and Herriot Lane)

InSAR data: Two different studies were conducted between 2015 and 2019

- The DWR/TRE study shows subsidence of about 0.5 feet from the central to northeast portions of the basin over a period of 4 years and 3 months (with less subsidence in the center of the basin and higher subsidence to the northeast)
- The NASA JPL study shows similar results, with subsidence appearing in the center of the basin and increasing to the northeast – where 1.2 feet of subsidence is seen in the north central area over a period of 4.5 years ~~and 6 months~~

Findings: Based on the studies to date, subsidence rates vary across the basin from less than 1" per year to about 6" per year.

Undesirable Results Relating to Subsidence

Survey respondents held varying ideas as to how much subsidence was "too much." However, all respondents agreed that defining undesirable results should look at impacts to both private and public infrastructure.

Creating a Monitoring Network for Subsidence

All survey respondents supported the use of ground surveys as a component of evaluating subsidence. There were mixed responses regarding other approaches: InSAR, GPS stations, extensometers, and use of groundwater elevations as proxy. Other suggestions include:

- Tracking subsidence trends over time, along with changes in ground surface elevations
- Verifying satellite and aerial data with ground surveys
- Evaluating ecological infrastructure (such as collapsing animal burrows)

PROPOSAL FOR SUBSIDENCE SECTION IN GSP

1. Add groundwater levels as an interim proxy while continuing to collect other sources of data for subsidence.

2. Use multiple approaches in establishing a monitoring network:
   - Install GPS stations with elevation monuments near subsidence areas and sites of previous ground surveys
   - Incorporate InSAR data as long as it is available
   - Incorporate DWR's Aerial Electromagnetic Method as available

3. Establish a ***Maximum Threshold (MT)*** as a function of groundwater elevations, InSAR data and ground surveys: MT= f(GW elevation) + f(InSAR) + f(GPS data). This formula means that the MT for subsidence will be tied and correlated to groundwater levels until more direct ground surface measurements are obtained.

4. Until subsidence dynamics are better understood, ***Measurable Objectives*** and ***Triggers*** for subsidence will be based on groundwater levels as a proxy.