SUSTAINABLE GROUNDWATER MANAGEMENT (SGM)
GRANT PROGRAM

Project Newsletter

Groundwater Recharge Identification and Feasibility Analysis - November 2025

Butte County CALIFORNIA

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1. Component 5 – Vina GSA SGM Grant

Butte County is administering a Sustainable Groundwater Management (SGM) Grant awarded to the Vina Groundwater Sustainability Agency (GSA) by the California Department of Water Resources (DWR) that includes identification and assessment of potential groundwater recharge sites throughout the Vina groundwater subbasin (Vina). Figure 1 shows the outline of the Vina subbasin.

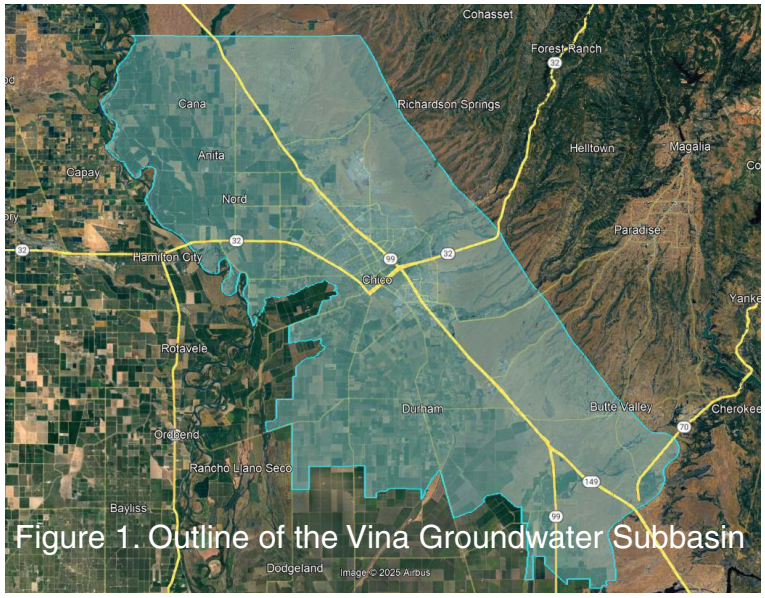

Figure 1. Outline of the Vina Groundwater Subbasin

Geosyntec consultants

As part of this project, Butte County retained Geosyntec Consultants, Inc. (Geosyntec) to identify potential groundwater recharge sites, conduct field investigations to assess actual amounts of water that could be recharged, conduct pilot tests to assess different methods that could be used for groundwater recharge, and prepare a feasibility analysis of at least one project site that could be used to attain future funding.

2. Recharge Project Identification

To identify potential groundwater recharge sites throughout the Vina Subbasin this task included the review of previous studies, discussions with stakeholders, site visits and interviews with landowners and relevant water purveyors, and analysis of potential groundwater recharge concepts at identified sites. Sites were also evaluated using the goals laid out in Butte County's February 2024 Recharge Action Plan that included spreading out and slowing down flood flows, retaining stormwater runoff on agricultural fields and managing flows in natural channels. Potential sites were also evaluated for addressing specific needs within the Subbasin including declining water levels in domestic wells and support of groundwater dependent ecosystems. The results of these assessments will be presented in a Technical Memorandum scheduled to be available in November 2025. Figure 2 shows the general areas that have been assessed and were used to select areas for field investigations and pilot tests as discussed below.

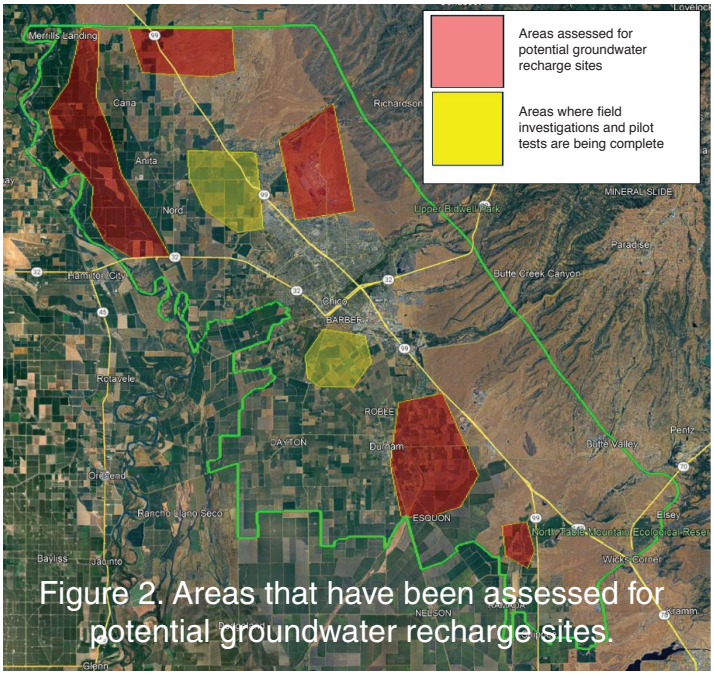

Figure 2. Areas that have been assessed for potential groundwater recharge sites.


Photograph 1. The tTEM setup

3. Groundwater Recharge Investigations

Based on the results of the project identification, field investigations have been started at three sites within the areas outlined in yellow on Figure 2. To date, investigations have included towed transient electromagnetic surveys (tTEM), cone penetrometer testing (CPT), and infiltration testing. The tTEM is the ground-based version of the airborne electromagnetic (AEM) conducted

by DWR using a helicopter over the basin that provides characterizations of electrical properties of earth materials that can be used to assess how water moved underground (i.e. subsurface hydrogeology). Photograph 1 shows the tTEM instrumentation being pulled behind an all-terrain vehicle (ATV). The data acquired from these surveys are being used to map out distributions of clays, silts, sands, and gravels to select areas that would be conducive to successful groundwater recharge projects. Figure 3 provides an example of the results of a tTEM survey conducted to date. Colors on Figure 3 represent electrical resistivity values reported as ohm-meters (ohm-m). Above the water table, values above 20 ohm-m (yellow to reddish colors) suggest more permeable areas good for recharge. Based on the tTEM surveys, all three potential project sites appear to have areas where water placed near the surface will migrate to the upper groundwater surface.

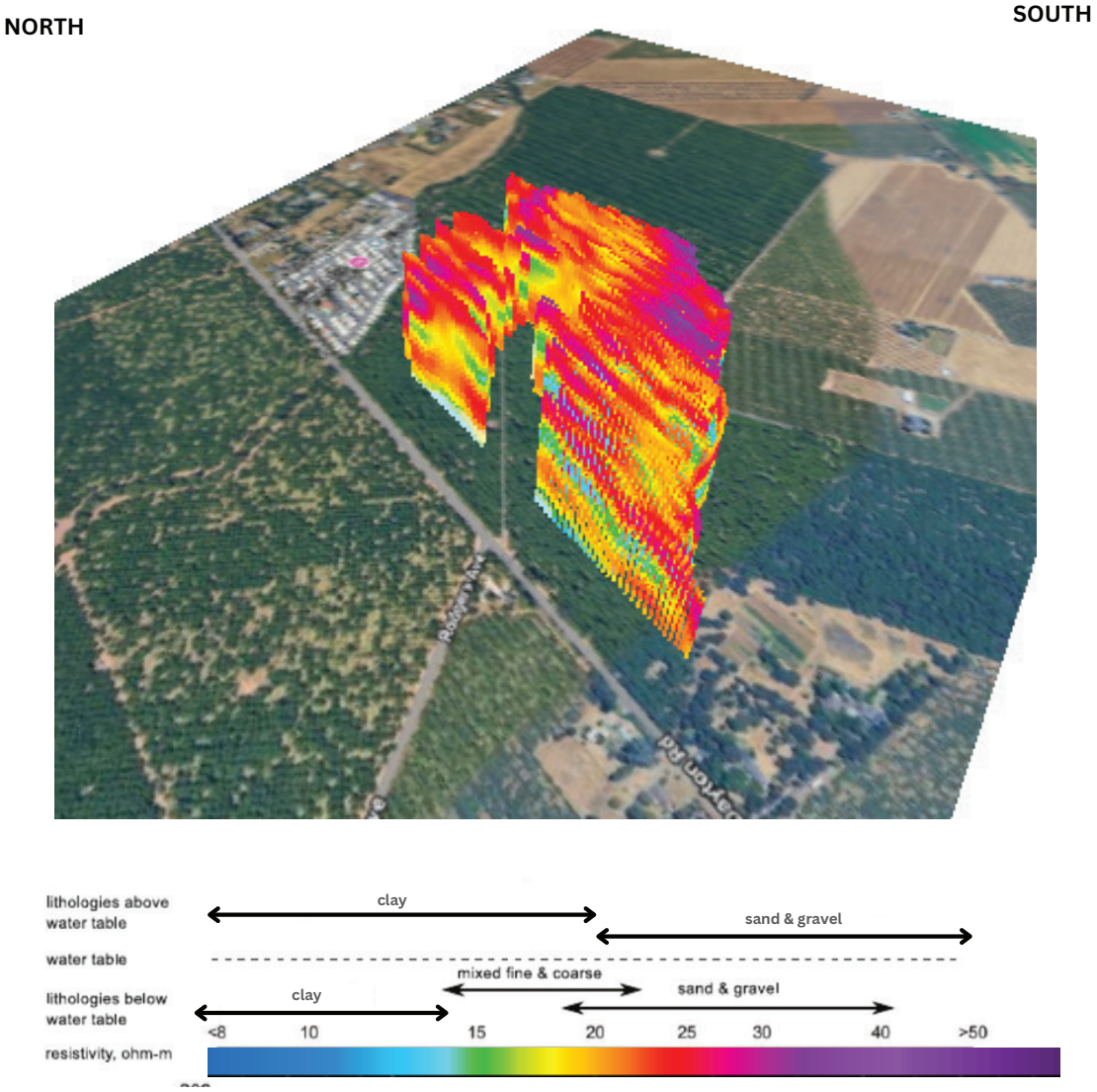

Figure 3. Example of results from tTEM Survey shows multiple depth slices up to 200 feet deep

Using the results of the tTEM survey, CPT points have been completed at two of the sites. The CPT technology is used to further evaluate soil lithology and geotechnical soil properties that provide estimates of infiltration rates that combined with the tTEM results are critical data for understanding recharge potential. The CPT method involves hydraulically pushing a "cone penetrometer" into the ground and recording the resistance. Based on published correlations for the recorded resistance, the data obtained are used to estimate soil types, groundwater depth, and other parameters including hydraulic conductivities that are used to estimate how much water could be recharged as specific sites.

Photograph 2 shows a picture of the CPT rig setup at site south of Chico and Figure 4 provides an example of a CPT sediment log.

Photograph 2. CPT Rig.

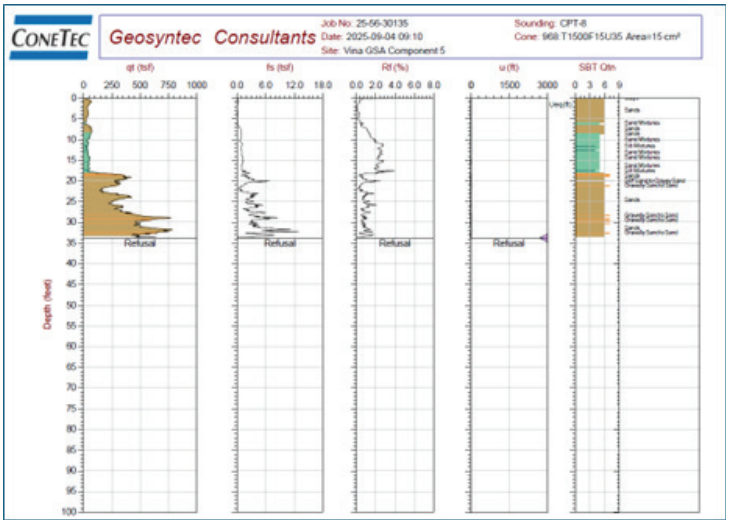

Figure 4. Example of CPT sediment log. The refusal depth is where the CPT could not penetrated through the existing soils.

Photograph 3. Photograph of infiltration test. A instrument to measure changes in water levels is placed with the PVC pipe shown in figure. Water is then added within the pipe and the rate of infiltration is measured over time.

Additional data on potential infiltration rates or how much water could be recharged were conducted by measuring the rate of water that infiltrated within pipes installed at specific depths (see Photograph 3 for example of infiltration test).

Additional tTEM surveys, CPT points, and infiltration tests are planned across the basin (Figure 2). In addition, soil borings will also be completed to visually look at sediments below the surface, collect samples for laboratory testing of permeabilities and install observation points to assess groundwater levels.

3. Groundwater Recharge Pilot Studies

Using the data collected from field investigations, pilot studies will be conducted through the winter months using various groundwater recharge methods. Currently, the infrastructure for two groundwater recharge methods have been constructed to assess the reverse tile drain method and infiltration ponds. The reverse tile drain system was constructed by excavating a trench to approximately 12 feet placing a slotted pipe at the bottom of the trench then backfilling the trench with gravel to about two feet above the slotted pipe and the remaining interval with the excavated material. Photograph 4 shows construction of the trench for the tile drain and photograph 5 shows above ground portion of the tile drain (there are two above ground portions, one at each end of the pipe). The initial pilot test will be conducted by sending water down one end of the pipe and measuring flow and water levels in the pipe during the test. Water levels will be measured by placing electronic recording devices within access points installed along the pipe length (see Photograph 6).

Photograph 4. Construction of trench for installation of reverse tile drain.

Photograph 5. Photograph of one exit point from tile drain.

Photograph 6. Access point along tile drain that will be used to measure water levels during pilot testing.

Recharge Identification and Feasibility

Photograph 7 shows a picture of a portion of the constructed infiltration basin. The pilot test for this method will be conducted by placing water in the basin and measuring the time it takes for the water to infiltrate into the ground surface. For both methods, a temporary observation well will be installed within first water to record groundwater levels during the pilot tests. Water quality samples will also be collected from the recharge water and groundwater during the tests.

Photograph 7. Picture showing portion of infiltration basin that will be used for pilot testing.

NEXT STEPS

Additional field investigations are being planned for sites throughout the Vina GSA that will include additional tTEM surveys and drilling of soil borings to collect additional data on observed soil types and potential infiltration capacities. Select soil borings will be converted to temporary monitoring wells to monitor changes in groundwater levels during groundwater recharge pilot tests. In addition, gauges will be placed in existing or constructed small basins that will be used to measure changes in water levels after the basins are filled with water that will also provide data on potential recharge rates.

Currently, an initial pilot test is being conducted for the constructed reverse tile drain system that will use water from an existing well. This test will provide valuable information for potential recharge rates for full scale systems. The County is currently developing protocol using recently developed State guidelines for using flood waters from local streams to conduct further pilot tests.

The data collected from the tasks described above will be used to develop a project description that can be used for future grant applications.

LEARN MORE ABOUT HOW YOUR GSA IS FOSTERING A MORE EFFECTIVE AND COMMUNITY-DRIVEN APPROACH TO GROUNDWATER MANAGEMENT

VINA GROUNDWATER SUSTAINABILITY AGENCY

THE SUSTAINABLE GROUNDWATER MANAGEMENT ACT

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