Sacramento Valley Groundwater Basin, Antelope Subbasin

- Groundwater Basin Number: 5-21.54
- County: Tehama
- Surface Area: 18,710 acres (29 square miles)

Basin Boundaries and Hydrology

The Antelope Subbasin comprises the portion of the Sacramento Valley Groundwater Basin bounded on the west by the Sacramento River, on the north by the Red Bluff Arch, on the northeast by the Cascade Range, and the southeast by Antelope Creek. The Antelope Subbasin is contiguous with the Dye Creek Subbasin to the south. Annual precipitation in the subbasin ranges from 23- to 27-inches, increasing to the east.

Hydrogeologic Information

Water-Bearing Formations

The aquifer system in this subbasin is comprised of continental deposits of Tertiary to late Quaternary age. The Quarternary deposits include Pleistocene Modesto and Riverbank Formations. The Tertiary deposits include the Pliocene Tehama Formation and the Tuscan Formation. The Tuscan Formation is the primary water producing zone in the basin.

Pleistocene Modesto Formation. The Pleistocene Modesto Formation (deposited between 14,000 to 42,000 years ago) consists of poorly indurated gravel and cobbles with sand, silt and clay derived from reworking and deposition of the Tehama, Tuscan, and Riverbank Formations. Well logs for wells drilled on the floodplain east of Red Bluff indicate that coarse grained clean sand and gravel extend to a depth of approximately 50 feet below the surface. Below this depth, cemented gravel, sandstone, and hard clay of the Tehama and Tuscan Formations are encountered (Omsted and Davis 1961). The Modesto Formation yields limited groundwater due to its limited thickness (DWR 1987).

Pleistocene Riverbank Formation. The Pleistocene Riverbank Formation (deposited between 130,000 and 450,000 years ago) is observed in the far northern extents of the subbasin. The Riverbank Formation yields limited groundwater due to its limited thickness and areal extents.

Pliocene Tuscan Formation. The Tuscan Formation is composed of volcanic breccia, tuff, tuff breccia, volcanic sandstone and conglomerate, basalt flows, and tuffaceous silt and clay. The formation is mostly consolidated tuff in the area of exposure east of the valley in the Cascade Range foothills. From there tuff breccias grade westerly into volcanic sands, gravels, and clay (DWR 1978). The Tuscan Formation is the major water-bearing aquifer in the northeastern portion of the Sacramento Valley. Thickness of the formation within the subbasin is approximately 1,500 feet (DWR 1987).

Pliocene Tehama Formation. The Tehama Formation interfingers with the Tuscan Formation along the Sacramento River and is exposed in westside

Sacramento River banks. The formation consists of fluvial deposits of predominantly silt and clay with gravel and sand interbeds (DWR 1987). The formation is identified within the subbasin at depths ranging from 100- to 150- feet (DWR 1987).

Recharge Areas

Recharge is from inflow from the Sacramento River, Salt Creek, and Antelope Creek. In an investigation conducted by U.S. Bureau of Reclamation, the upper and intermediate aquifer zones (located between the local groundwater elevation and 150 feet in depth) intercept the Sacramento River. Diurnal fluctuations in river stage produce diurnal water level fluctuations in the deeper aquifer zone (Ely 1994).

Restrictive Structures

The Inks Creek fold system is a series of northeast-trending folds north of the Antelope Subbasin. The system isolates the Redding Groundwater Basin from the Sacramento Valley Basin. The fold system is a hydrologic drainage divide and separates the Red Bluff Arch from the Chico Monocline (DWR 1987).

Groundwater Level Trends

Review of hydrographs for long-term comparison of spring-spring groundwater levels indicates a decline of 5- to 10-feet associated with the 1976-77 and 1987-94 droughts, followed by a recovery to pre-drought conditions of the early 1970's and 1980's. Generally, groundwater level data show a seasonal fluctuation of approximate 2- to 15-feet for normal and dry years. Overall, there does not appear to be any increasing or decreasing trends in groundwater levels.

Groundwater Storage

The storage capacity of the subbasin was estimated based on estimates of specific yield for the Sacramento Valley as developed in DWR (1978). Estimates of specific yield, determined on a regional basis, were used to obtain a weighted specific yield conforming to the subbasin boundary. The estimated specific yield for the subbasin is 7.2 percent. The estimated storage capacity to a depth of 200 feet is approximately 269,179 acre-feet.

Groundwater Budget (Type B)

Estimates of groundwater extraction for the Antelope Subbasin are based on a survey conducted by the California Department of Water Resources in 1994. The survey included landuse and sources of water. Estimates of groundwater extraction for agricultural and municipal/industrial uses are 17,000 and 2,100 acre-feet respectively. Deep percolation of applied water is estimated to be 3,800 acre-feet.

Groundwater Quality

Characterization. Groundwater in the subbasin is characterized as calcium-magnesium bicarbonate and magnesium-calcium bicarbonate. Total dissolved solids (TDS) range from 119- to 558- mg/L, averaging 280 mg/L (DWR unpublished data).

Impairments. High concentrations of boron, chloride, and TDS are found in groundwater in the vicinity of Salt Creek and Little Salt Creek. Nitrate concentrations of 20- to 45- mg/L have been observed within the west-central portion of the basin (DWR 1987).

Water Quality in Public Supply Wells

Constituent Group[1]	Number of wells sampled[2]	Number of wells with a concentration above an MCL[3]
Inorganics – Primary	17	0
Radiological	10	0
Nitrates	17	0
Pesticides	6	0
VOCs and SVOCs	3	0
Inorganics – Secondary	17	3

[1] A description of each member in the constituent groups and a generalized discussion of the relevance of these groups are included in *California's Groundwater – Bulletin 118* by DWR (2003).
[2] Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000.
[3] Each well reported with a concentration above an MCL was confirmed with a second detection above an MCL. This information is intended as an indicator of the types of activities that cause contamination in a given basin. It represents the water quality at the sample location. It does not indicate the water quality delivered to the consumer. More detailed drinking water quality information can be obtained from the local water purveyor and its annual Consumer Confidence Report.

Well Characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range: 300 – 800	Average: 575 (4 Well Completion Report)
	Total depths (ft)	
Domestic	Range: 40 - 450	Average: 104 (702 Well Completion Reports)
Municipal/Irrigation	Range: 40 - 600	Average: 176 (92 Well Completion Reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR	Groundwater levels	4 wells semi-annually
DWR	Miscellaneous water quality	5 wells biennially
Department of Health Services	Miscellaneous water quality	22

Basin Management

Groundwater management:	Tehama County adopted a groundwater ordinance in 1994. Tehama County adopted a countywide AB3030 plan in 1996.
Water agencies	
Public	Tehama County Flood Control and Water Conservation District, City of Red Bluff
Private	

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Errata

Changes made to the basin description will be noted here.