Redding Groundwater Basin, Anderson Subbasin

- Groundwater Basin Number: 5-6.03
- County: Shasta
- Surface Area: 98,500 acres (154 square miles)

Basin Boundaries and Hydrology

The Anderson Subbasin comprises the portion of the Redding Groundwater Basin bounded on the west and northwest by bedrock of the Klamath Mountains, on the east by the Sacramento River, and on the south by Cottonwood Creek. Annual precipitation ranges from 27- to 41-inches, increasing to the north and west.

Hydrogeologic Information

Water-Bearing Formations

The Anderson Subbasin aquifer system is comprised of continental deposits of late Tertiary to Quaternary age. The Quaternary deposits include Holocene alluvium and Pleistocene Modesto and Riverbank formations. The Tertiary deposits include Pliocene Tehama and Tuscan formations. Helly and Harwood (1985) reports that the Tehama Formation interfingers with the Tuscan Formation in the region between Interstate Highway 5 and the Sacramento River north of the city of Red Bluff. The following descriptions are from Helley and Harwood (1985) unless otherwise noted.

Holocene Alluvium. The alluvium consists of unconsolidated gravel, sand, silt and clay from stream channel and floodplain deposits. These deposits are found along stream and river channels. The thickness ranges up to 30 feet. This unit represents the perched water table and the upper part of the unconfined zone of the aquifer. Although the alluvium is moderately permeable, it is not a significant contributor to groundwater usage.

Pleistocene Modesto and Riverbank Formations. The Modesto and Riverbank formations consist of poorly consolidated gravel with some sand and silt deposited during the Pleistocene time. They are usually found as terrace deposits near the surface along the Sacramento River and its tributaries. Modesto Formation deposits are observed along parts of Cottonwood Creek, Dry Creek, and along the Sacramento River. Riverbank terrace deposits are observed along all major creeks. The thickness ranges up to 50 feet. These deposits are moderately to highly permeable and yield limited domestic water supplies.

Pliocene Tehama Formation. The Tehama Formation consists of locally cemented silts, sand, gravel, and clay of fluviatile origin derived from the Klamath Mountains and Coast Ranges and is the principal water-bearing formation west of the Sacramento River. The formation is exposed over approximately 60 to 70 percent of the subbasin surface area. Thickness of the formation ranges from 1,000 to 4,000 feet from the northern subbasin boundary at the Sacramento River to Cottonwood Creek in the vicinity of Interstate Highway 5 (DWR 1964). Much of the deposit west of Anderson has a uniform thickness of approximately 500 feet which thins to the western subbasin boundary where the Great Valley Sequence daylights. The permeability of the formation is moderate to high with yields of 100- to 1,000-gpm.

Pliocene Tuscan Formation. The Tuscan Formation is thought to interfinger with the Tehama Formation between the Sacramento River to the east and Interstate Highway 5. The formation consists of volcanic gravel and tuff-breccia, fine- to coarse-grained volcanic sandstone, conglomerate, tuff, tuffaceous silt and clay predominantly derived from andesitic and basaltic source rocks. The formation is described as four separate but lithologically similar units, Units A through D (with Unit A being the oldest), which in some areas are separated by layers of thin tuff or ash units.

Unit A is the oldest water-bearing unit of the formation and is characterized by the presence of metamorphic clasts within interbedded lahars, volcanic conglomerate, volcanic sandstone and siltstone. Unit B is composed of a fairly equal distribution of lahars, tuffaceous sandstone, and conglomerate. Coarse cobble to boulder conglomerate predominates the deposit in the eastern and northern parts of mapped unit. Unit C consists of several massive mudflow or lahar deposits with some interbedded volcanic conglomerate and sandstone. Unit D consists of fragmental deposits characterized by large monolithologic masses of andesite, pumice, and fragments of black obsidian in a mudstone matrix. The unit has limited areal extents and may not occur within the Redding Basin.

Permeability is moderate to high with yields of 100- to 1,000-gpm except for beds of tuff-breccia which are essentially impermeable.

Recharge Areas

Recharge to the principal formation is mostly by infiltration of streamflows at the margins of the subbasin. Infiltration of applied water and streamflows, and direct infiltration of precipitation are the main sources of recharge into the alluvium (Pierce 1983).

Groundwater Level Trends

Review of hydrographs for long-term comparison of spring-spring groundwater levels indicates a slight decline in levels associated with the 1976-77 and 1987-94 droughts, followed by a gradual recovery to pre-drought conditions of the early 1970's and 1980's. Generally, the seasonal fluctuation ranges from 1- to 10-feet for normal and dry years. Overall, there does not appear to be any increasing or decreasing trends in groundwater levels.

Groundwater Storage

Groundwater Storage Capacity. The storage capacity for the entire Redding Basin is estimated to be 5.5 million acre-feet for 200 feet of saturated thickness over an area of approximately 510 square miles (Pierce 1983). Specific yield data for the Anderson Subbasin aquifer system is not available to estimate storage capacity at the subbasin level.

Groundwater Budget (Type B)

Estimates of groundwater extraction are based on surveys conducted by the California Department of Water Resources during 1994 and 1995. Surveys included land use and sources of water. Estimates of groundwater extraction for agricultural and municipal/industrial uses are 3,000, and 20,000 acre-feet respectively. Deep percolation of applied water is estimated to be 5,700 acre-feet.

Groundwater Quality

Characterization. Groundwater in the basin is characterized as magnesium-sodium bicarbonate and sodium-magnesium bicarbonate type waters. Total dissolved solids concentrations range from 109- to 320-mg/L, averaging 194 mg/L (DWR unpublished data).

Impairments. Localized areas with high iron, manganese, and nitrate occur in the subbasin.

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	19	0
Radiological	31	0
Nitrates	20	0
Pesticides	13	0
VOCs and SVOCs	17	0
Inorganics – Secondary	19	1

[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)	
Irrigation	Range: 0 – 1800	Average: 46 (40 Well Completion Reports)
	Total depths (ft)	
Domestic	Range: 11 – 805	Average: 140 (2239 Well Completion Reports)
Irrigation	Range: 32 – 558	Average: 302 (48 Well Completion Reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR	Groundwater levels	11 wells semi-annually
DWR	Miscellaneous Water Quality	6
Department of Health Services	Miscellaneous Water Quality	69

Basin Management

Groundwater management:	Shasta County adopted a groundwater management ordinance in 1998.
Water agencies	
Public	Redding Area Water Committee, Anderson-Cottonwood ID, Clear Creek ID, City of Anderson, Keswick Community Service District, City of Redding, Rio Alto WD, Shasta Community Service District and Shasta County Water Agency, IGO-ONO C.S.D.
Private	

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Errata

Changes made to the basin description will be noted here.