Fall River Valley Groundwater Basin

- Groundwater Basin Number: 5-5
- County: Lassen, Shasta
- Surface Area: 54,800 acres (86 square miles)

Basin Boundaries and Hydrology

Fall River Valley Groundwater Basin is about 7 miles long and 16 miles wide. At an elevation of about 3,300 feet, the valley is bounded on the east by Tertiary basalt of the Big Valley Mountains, and on the west by Pleistocene basalt and Pliocene andesite of Soldier and Saddle Mountains. To the north and south are low relief volcanic plateau areas of Holocene and Pleistocene basalt forming less distinct boundaries (Gay 1958, Lydon 1960).

A series or group of major springs discharge into the valley from the northerly plateau escarpment. These springs are substantial with sustained flows measured at 1,400- to 2,000-cubic feet per second (Waring 1915, Meinzer 1927, CDMG 1966) and provide the bulk of the base flow that sustains most of the streams, ponds and lakes in the area. It has been speculated that the subsurface inflow for these springs originates 50 miles or more to the north at the Tule Lake/ Klamath Lake basins and flows beneath and through the Medicine Lake Highlands. These springs have been extensively appropriated or diverted for irrigation and power development. Fall River is the primary stream draining the northern and central-valley areas, and the Pit River is the primary stream in the easterly and southerly portion of the basin. These rivers converge at the southwestern corner of the valley near Fall River Mills and flow westward out of the valley.

Average annual precipitation within the basin is estimated to be 17- to 27-inches in the valley and 29- to 43-inches in the upland areas to the west.

Hydrogeologic Information

Water-Bearing Formations

The primary water-bearing formations are Holocene sedimentary deposits, Holocene lava flows, Pleistocene lake and near-shore deposits, and Pleistocene to Pliocene volcanic rocks. The following summary of water-bearing formations is from DWR (1963).

Holocene Sedimentary Deposits. Holocene sedimentary deposits include intermediate alluvium and alluvial fans. The intermediate alluvium consists of unconsolidated silt, sand, and gravel up to 100 feet thick. These deposits occur along stream channels and on the floodplain. The permeability of these materials is moderate to high. However, with the exception of some areas along Bear Creek and the Pit River, the alluvial deposits are too thin to be of importance for groundwater development.

The alluvial fans consist of unconsolidated, poorly stratified silt, sand, and gravel to a thickness of 200 feet. These deposits are limited to the eastern margin of the valley and are primarily recharge areas but may yield moderate quantities of groundwater in places. These deposits are moderately permeable and contain confined and unconfined zones.

Holocene Volcanic Rocks. The Holocene volcanic rocks originate from the Medicine Lake Highlands and consist of highly jointed, vesicular basalt flows, scoria, cinder cones and associated lenses of cinders ranging in thickness from 30- to 500-feet. These volcanic rocks are highly permeable. At the north end of the valley, where these deposits mantle the uplands, they serve as a major recharge area and feed numerous streams and springs.

Pleistocene Near-shore Deposits. Pleistocene near-shore deposits consist of partly consolidated clay, silt, and sand up to 300 feet thick. These deposits are moderately permeable and yield fair quantities of groundwater to wells.

Pleistocene Volcanic Rocks. Pleistocene volcanic rocks consist of partly consolidated, bedded cinders and highly jointed basalt flows ranging from 50- to 750-feet in thickness. The cinder beds are highly permeable but are of limited extent and are not significant valley wide. Overall, the basalt flows are moderately to highly permeable and can yield large amounts of confined water where interbedded with lake deposits. There is substantial variation in the water transmitting capabilities of these rocks. Some areas have basalt exposures that are essentially impermeable.

Pliocene Volcanic Rocks. Pliocene volcanic rocks consist of basalt flows interbedded with pyroclastic rocks. Due to weathering and infilling of joints and fractures with fines, these rocks have low to moderate permeabilities and yield lesser amounts of groundwater to wells than the younger volcanic rocks.

Restrictive Structures

Block faulting by northwestward-trending faults of late Pleistocene and possibly Holocene age is the dominant structural feature. There are at least three fault systems that control the complex displacement structure. The basin is a fault trough in which a downthrown group of blocks is situated between two groups of elevated blocks. The volcanic rocks that underlie the valley have also been tilted and broken into several smaller blocks. Faulting has probably created shattered permeable zones for groundwater movement in the volcanic rocks. Within the sedimentary deposits faulting may have created barriers to groundwater movement.

Groundwater Level Trends

Water levels in the basin are variable and are commonly dependent on the topographic elevation of a particular area, proximity to the Pit River, and localized pumping effects. In general, the northern portion of the basin consistently has the shallowest depths to groundwater (10 feet or less). Areas adjacent to the Pit River display more variable conditions.

Groundwater Storage

Groundwater Storage Capacity. The groundwater storage capacity to a depth of 400 feet is estimated to be 1,000,000 acre-feet (DWR 1963). DWR (1963) notes that the quantity of water that is useable is unknown.

Groundwater Budget (Type B)

Estimates of groundwater extraction are based on surveys conducted by the California Department of Water Resources during 1995 and 1997. Surveys included land use and sources of water. Estimates of groundwater extraction for agricultural and municipal/industrial uses are 19,000 and 240 acre-feet respectively. Deep percolation from applied water is estimated to be 4,800 acre-feet.

Groundwater Quality

Characterization. The mineral quality of groundwater in the basin ranges in response to its source. Water from wells in the unconfined volcanic rocks within and adjacent to this basin is quite good with a calcium/magnesium-bicarbonate character and low to moderate total dissolved solids. In the central portion of the basin, where lake deposits are thick, a sodium-bicarbonate character is prevalent. In the western portion of the basin numerous wells produce groundwater with elevated iron concentrations. The concentration of total dissolved solids ranges from 115- to 232-mg/L, averaging 174 mg/L (DWR unpublished data)

Impairments. Some well waters have high iron concentrations. Locally high nitrate, manganese, ammonia, and phosphorus also occur in the basin.

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	1	0
Radiological	2	0
Nitrates	2	0
Pesticides	1	0
VOCs and SVOCs	1	0
Inorganics – Secondary	1	0

[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 – 1500	Average: 266 (114 Well Completion Reports)
	Total depths (ft)	
Domestic	Range: 13 – 460	Average: 150 (356 Well Completion Reports)
Irrigation	Range: 24 – 1000	Average: 341 (114 Well Completion Reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR	Groundwater levels	16 wells semi-annually
DWR	Miscellaneous Water Quality	7 wells biennially
Department of Health Services and Shasta County	Miscellaneous Water Quality	3

Basin Management

Groundwater management:	No known groundwater management plans, groundwater ordinances, or basin adjudications
Water agencies	
Public	None
Private	None

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Errata

Changes made to the basin description will be noted here.