Big Valley Groundwater Basin

- Groundwater Basin Number: 5-4
- County: Lassen, Modoc
- Surface Area: 92,000 acres (144 square miles)

Basin Boundaries and Hydrology

Big Valley is a broad flat plain extending about 13 miles north-to-south and 15 miles east-to-west consisting of a series of depressed fault blocks surrounded by tilted fault block ridges. The basin is bounded to the north and south by Pleistocene and Pliocene basalt and Tertiary pyroclastic rocks of the Turner Creek Formation, to the west by Tertiary rocks of the Big Valley Mountain volcanic series, and to the east by the Turner Creek Formation.

The Pit River enters the valley from the north and exits at the southernmost tip of the valley through a narrow canyon gorge. Ash Creek flows into the valley from Round Valley and disperses into Big Swamp. Near its confluence with the Pit River, Ash Creek reforms as a tributary at the western edge of Big Swamp. Annual precipitation ranges from 13- to 17-inches.

Hydrogeologic Information

Water-Bearing Formations

The primary water-bearing formations in Big Valley are Holocene sedimentary deposits, Pliocene and Pleistocene lava flows, and the Plio-Pleistocene Bieber Formation. The following summary of water-bearing formations is from DWR (1963).

Holocene Sedimentary Deposits. The Holocene sedimentary deposits include basin deposits, intermediate alluvium, and alluvial fans - each having a thickness of up to 150 feet. Basin deposits, located predominately in low-lying areas in the central part of the valley, consist of unconsolidated interbedded clay, silt, and organic muck, all having low permeability. These deposits are not considered to be a significant water-bearing formation. Intermediate alluvium, found along the perimeter of the valley, consists of unconsolidated silt and sand with some clay and gravel. These deposits are generally moderately permeable with gravel zones being highly permeable. Alluvial fans consist of unconsolidated poorly stratified silt, sand, and gravel with some clay lenses. Because the fans occur in only a few small areas, they are not considered a significant source of water. Locally they may yield moderate amounts of water to wells.

Pliocene to Pleistocene Volcanic Rocks. Pliocene volcanic rocks consist of jointed and fractured basalt flows occurring to the north and south of Big Valley. Deposits range in thickness to 1000 feet. The lavas are moderately to highly permeable and serve as recharge areas in the uplands and contain unconfined and confined zones in the valley.
Pleistocene volcanic rocks consist of jointed and fractured basalt flows having moderate to high permeability. Deposits range from 50- to 150-feet thick. These flows serve as recharge areas and yield moderate to large

amounts of confined and unconfined groundwater to wells in the southern part of the valley.

Plio-Pleistocene Bieber Formation. The Bieber Formation consists of lake deposited diatomite, clay, silt, sand, and gravel. These interbedded sediments are unconsolidated to semi-consolidated and are moderately permeable. The formation ranges in thickness from 1000- to 2000-feet and underlies all of Big Valley. The principal water-bearing zones consist of white pumiceous sand and black volcanic sand and yield large amounts of water to wells where there's sufficient thickness and continuity.

Groundwater Level Trends

Water levels of the confined aquifer system declined 12- to 15-feet during the period between the mid-1980's and the early 1990's. Water levels through 1999 had recovered 10- to 12-feet.

Groundwater Storage

Groundwater Storage Capacity. Storage capacity for the Big Valley Groundwater Basin is estimated to be 3,750,000 acre-feet to a depth of 1,000 feet (DWR 1963). DWR (1963) notes that the quantity of useable water in storage is unknown.

Groundwater Budget (Type B)

Estimates of groundwater extraction are based on a survey conducted by the California Department of Water Resources during 1997. The survey included land use and sources of water. Estimates of groundwater extraction for agricultural and municipal/industrial uses are 29,000 and 300 acre-feet respectively. Deep percolation from applied water is estimated to be 7,900 acre-feet.

Groundwater Quality

Characterization. Sodium-magnesium bicarbonate and sodium bicarbonate type waters are present in the basin. The concentration of total dissolved solids ranges between 141- to 633-mg/L, averaging 260 mg/L (DWR unpublished data).

Impairments. Two hot springs and one well with sodium sulfate type water have been identified in the basin east of Bieber. Locally, high nitrates, manganese, fluoride, iron, sulfate, conductivity, calcium, adjusted sodium absorption ratio, and total dissolved solids occur in the basin. Some water is high in ammonia and phosphorus.

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	7	0
Radiological	5	0
Nitrates	9	0
Pesticides	3	0

VOCs and SVOCs	3	0
Inorganics – Secondary	7	4

[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: 100 – 4000	Average: 880 (35 Well Completion Reports)
	Total depths (ft)	
Domestic	Range: 14 – 885	Average: 190 (154 Well Completion Reports)
Municipal/Irrigation	Range: 47 – 1025	Average: 485 (161 Well Completion Reports)

Active Monitoring Data

Agency	**Parameter**	**Number of wells /measurement frequency**
DWR	Groundwater levels	18 wells semi-annually
DWR	Miscellaneous Water Quality	9 wells biennially
Department of Health Services	Miscellaneous Water Quality	10

Basin Management

Groundwater management:	Modoc County adopted a groundwater management ordinance in 2000.
Water agencies	
Public	Lassen County WD No. 1. Lassen-Modoc County Flood Control and Water Conservation District.
Private	

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Errata

Changes made to the basin description will be noted here.