

San Joaquin Valley Groundwater Basin Turlock Subbasin

- Groundwater Basin Number: 5-22.03
- County: Stanislaus, Merced
- Surface Area: 347,000 acres (542 square miles)

Basin Boundaries and Hydrology

The San Joaquin Valley is surrounded on the west by the Coast Ranges, on the south by the San Emigdio and Tehachapi Mountains, on the east by the Sierra Nevada and on the north by the Sacramento-San Joaquin Delta and Sacramento Valley. The northern portion of the San Joaquin Valley drains toward the Delta by the San Joaquin River and its tributaries, the Fresno, Merced, Tuolumne, and Stanislaus Rivers. The southern portion of the valley is internally drained by the Kings, Kaweah, Tule, and Kern Rivers that flow into the Tulare drainage basin including the beds of the former Tulare, Buena Vista, and Kern Lakes.

The Turlock Subbasin lies between the Tuolumne and Merced Rivers and is bounded on the west by the San Joaquin River and on the east by crystalline basement rock of the Sierra Nevada foothills. The northern, western, and southern boundaries are shared with the Modesto, Delta-Mendota, and Merced Groundwater Subbasins, respectively. The subbasin includes lands in the Turlock Irrigation District, the Ballico-Cortez Water District, the Eastside Water District, and a small portion of Merced I.D. Average annual precipitation is estimated as 11 to 13 inches, increasing eastward, with 15 inches in the Sierran foothills.

Hydrogeologic Information

The San Joaquin Valley represents the southern portion of the Great Central Valley of California. The San Joaquin Valley is a structural trough up to 200 miles long and 70 miles wide. It is filled with up to 32,000 feet of marine and continental sediments deposited during periodic inundation by the Pacific Ocean and by erosion of the surrounding mountains, respectively. Continental deposits shed from the surrounding mountains form an alluvial wedge that thickens from the valley margins toward the axis of the structural trough. This depositional axis is below to slightly west of the series of rivers, lakes, sloughs, and marshes that mark the current and historic axis of surface drainage in the San Joaquin Valley.

Water Bearing Formations

The primary hydrogeologic units in the Turlock Subbasin include both consolidated and unconsolidated sedimentary deposits. The consolidated deposits include the Ione Formation of Miocene age, the Valley Springs Formation of Eocene age, and the Mehrten Formation, which was deposited during the Miocene to Pliocene Epochs. The consolidated deposits lie in the eastern portion of the subbasin and generally yield small quantities of water to wells except for the Mehrten Formation, which is an important aquifer. The Mehrten Formation is composed of up to 800 feet of sandstone, breccia, conglomerate, tuff siltstone and claystone (Page 1973).

Unconsolidated deposits include continental deposits, older alluvium, younger alluvium, and flood-basin deposits. Lacustrine and marsh deposits, which constitute the Corcoran or E-clay aquitard, underlie the western half of the subbasin at depths ranging between about 50 and 200 feet (DWR 1981). The continental deposits and older alluvium are the main water-yielding units in the unconsolidated deposits. The lacustrine and marsh deposits and the flood-subbasin deposits yield little water to wells. The younger alluvium, in most places, probably yields only moderate quantities of water.

There are three ground water bodies in the Turlock Subbasin: the unconfined water body; the semi-confined and confined water body in the consolidated rocks; and the confined water body beneath the E-clay in the western Subbasin. The estimated average specific yield of the subbasin is 10.1 percent (based on DWR San Joaquin District internal data and Davis 1959).

Restrictive Structures

Groundwater flow is primarily to the southwest, following the regional dip of basement rock and sedimentary units. Based on recent groundwater measurements (DWR 2000), a paired groundwater mound and depression appear beneath the city of Turlock and to its east, respectively. The lower to middle reaches of the Tuolumne River and the reach of the San Joaquin River in the subbasin appear to be gaining streams during this period also. No faults have been identified that affect the movement of fresh groundwater (Page 1973).

Groundwater Level Trends

Changes in groundwater levels are based on annual water level measurements by DWR and cooperators. Water level changes were evaluated by quarter township and computed through a custom DWR computer program using geostatistics (kriging). On average the subbasin water level has declined nearly 7 feet from 1970 through 2000. The period from 1970 through 1992 showed a generally steep decline totaling about 15 feet. Between 1992 and 1994, water levels stayed near this low level. From 1994 to 2000, the water levels rebounded about 8 feet, bringing them to approximately 7 feet below the 1970 levels. Water level declines have been more severe in the eastern portion of the subbasin after 1982. From 1970 to 1982, water level declines were more severe in the western portion of the subbasin.

Groundwater Storage

Estimations of the total storage capacity of the subbasin and the amount of water in storage as of 1995 were calculated using an estimated specific yield of 10.1 percent and water levels collected by DWR and cooperators. According to these calculations, the total storage capacity of this subbasin is estimated to be 15,800,000 af to a depth of 300 feet and 30,000,000 af to the base of fresh groundwater. These same calculations give an estimate of 12,800,000 af of groundwater to a depth of 300 feet stored in this subbasin as of 1995 (DWR 1995). According to published literature, the amount of stored groundwater in this subbasin as of 1961 is 23,000,000 af to a depth of ≤ 1000 feet (Williamson 1989).

Groundwater Budget (Type B)

Although a detailed budget was not available for this subbasin, an estimate of groundwater demand was calculated based on the 1990 normalized year and data on land and water use. A subsequent analysis was done by a DWR water budget spreadsheet to estimate overall applied water demands, agricultural groundwater pumpage, urban pumping demand and other extraction data.

Natural recharge of the subbasin was estimated to be 33,000 af. Artificial recharge and subsurface inflow were not determined. Applied water recharge was calculated to be 313,000 af. Annual urban extraction and annual agricultural extraction were calculated at 65,000 and 387,000 af, respectively. Other extractions and subsurface inflow were not determined.

Groundwater Quality

Characterization. The groundwater in this subbasin is predominately of the sodium-calcium bicarbonate type, with sodium bicarbonate and sodium chloride types at the western margin and a small area in the north-central portion. TDS values range from 100 to 8,300 mg/L, with a typical range of 200 to 500 mg/L. The Department of Health Services, which monitors Title 22 water quality standards, reports TDS values in 71 wells ranging from 100 to 930 mg/L, with an average value of 335 mg/L. EC values range from 168 to 1,000 μ mhos/cm, with a typical range of 244 to 707 μ mhos/cm.

Impairments. There are localized areas of hard groundwater, nitrate, chloride, boron, and DBCP. Some sodium chloride type water of high TDS is found along the west side of the subbasin. Two wells in the city of Turlock have been closed, one for nitrate and one for carbon tetrachloride (Dan Wilde 2001).

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 | 84 | 0 |
| Radiological | 80 | 12 |
| Nitrates | 90 | 8 |
| Pesticides | 89 | 5 |
| VOCs and SVOCs | 86 | 3 |
| Inorganics – Secondary | 84 | 11 |

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: 200 – 4,500 | Average: 1,000 - 2,000 |
| Total depths (ft) | | |
| Domestic | | |
| Municipal/Irrigation | Range: 50 - 350 | |

Active Monitoring Data

| Agency | Parameter | Number of wells /measurement frequency |
|---|------------------------|--|
| DWR (incl. Cooperators) | Groundwater levels | 307 Semi-annually |
| Department of Health Services (including cooperators) | Title 22 water quality | 163 Varies |

Basin Management

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|-------------------------|---|
| Groundwater management: | Turlock District has an adopted AB 3030 ground water management plan. Eastside WD adopted its plan on September 25, 1997. |
| Water agencies | |
| Public | Eastside Water District , Turlock Irrigation District, Ballico-Cortez Water District (inactive), Merced I.D. (portion). |
| Private | |

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Additional References

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Errata

Updated groundwater management information and added hotlinks where applicable.
(1/20/06)