

## **Soquel Valley Groundwater Basin**

- Groundwater Basin Number: 3-1
- County: Santa Cruz
- Surface Area: 2,500 acres (4 square miles)

### **Basin Boundaries and Hydrology**

The Soquel Valley Groundwater Basin is bounded to the south by Monterey Bay, and to the north by a series of hills that define the contact of Quaternary and Pliocene deposits (Purisima Formation) at or near the Zayante Fault. The western boundary coincides with the western boundary of the Soquel Creek Water District. The eastern boundary is generally the coastward projection of the drainage divide between the Soquel and Aptos Creek watersheds. In addition to the areas of Quaternary deposits, the eastern limit of the Soquel Creek and Central Water District's service area may be considered the basin boundary for the purposes of managing and monitoring groundwater resources in the area. Soquel Creek is the major drainage in the Basin. Average annual precipitation is 25 inches along the coast to 29 inches inland.

The adjoining basins include West Santa Cruz Terrace to the west and the Pajaro Valley to the southeast.

### **Hydrogeologic Information**

Water-bearing sediments consist of the Pliocene Purisima Formation, which is overlain by Quaternary terrace deposits, and the Pleistocene Aromas Red Sands Formation. The Purisima and Quaternary terrace deposits have been locally incised by streams filled with Quaternary alluvium (Muir 1980). The Purisima Formation is exposed along Monterey Bay where it is a cliff-forming unit. The Aromas Red Sands Formation extends into the Pajaro Valley Basin.

### ***Water Bearing Formations***

The Purisima Formation, of Pliocene geologic age, is a sequence of gray, sometimes described as blue, moderately consolidated, silty to clean, fine to medium sandstone containing siltstone and claystone interbeds (Greene 1977). It has not been explored to basement north of the Soquel Creek Water District's (SCWD) boundaries but is thought to terminate at or near the Zayante Fault. The granite basement surface, which is uniformly sloping to the southeast, is approximately 450 feet beneath sea level at the western SCWD boundary, and approximately 1,300 feet beneath sea level at approximately Valencia Creek. Farther to the southeast, the Purisima continues to dip at the same rate, but is overlain by predominantly unconfined Aromas Red Sands (SCWD 2003).

Based on the lithologic and geophysical logs developed during the installation of SCWD's network of production wells and monitoring wells, combined with other water well logs and a few geophysical logs of oil and gas borings in the vicinity, seven distinct subunits of the Purisima Formation have been identified and designated AA, A, B, C, D, E, and F, from deepest to shallowest (LSCE 1984). Groundwater occurs in all the subunits of the Purisima beneath the Soquel-Aptos area. Except in the vicinity of its outcrop

at the surface, the Purisima subunits are confined by claystone or siltstone interbeds. In general, fresh water is introduced into the various Purisima subunits through the recharge areas, or outcrop locations, of the subunits and then flows through the respective subunits generally toward Monterey Bay (SCWD 2003).

The Aromas Red Sands Formation is brown to red, poorly consolidated, fine to coarse-grained sandstone containing lenses of silt and clay (LSCE 1996). The formation consists of upper eolian and lower fluvial sand units that are separated by confining layers of interbedded clays and silty clay (RMC 2001). Based on limited lithologic and geophysical logs and other geologic data, the Aromas is underlain by the Purisima Formation throughout the eastern third of the Soquel-Aptos area, although the exact depth of the contact has not been identified. Essentially unconfined throughout the Soquel-Aptos area, the Aromas Red Sands contain fresh water above a wedge-shaped intrusion of seawater which is about 200 feet below sea level at the coastline and slopes away from the coast to nearly 500 feet below sea level in the vicinity of the SCWD Seascape and Altivo supply wells (SCWD 2003).

### ***Restrictive Structures***

There are no known restrictive structures in the Soquel Valley Basin. Groundwater flow in the Soquel Valley portion of the confined Purisima Formation is southward, toward and beneath Monterey Bay.

### ***Recharge Areas***

Recharge is from deep percolation of rainfall, especially near the upper watersheds of Soquel, Branciforte, and Arana-Rodeo Creeks. Recharge also occurs along the streambeds of Soquel and Aptos Creeks, and other minor creeks.

### ***Groundwater Level Trends***

Purisima Formation Coastal water levels have declined in the central portion of the Soquel Creek Water District between about New Brighton Beach and Aptos Creek, notably in the Purisima A subunit where water levels have been near historic low and continuously below sea level during the drought periods of the late 1980s and early 1990s. Groundwater levels have since partially recovered such that they fluctuate seasonally above and below sea level (SCWD 2003).

Aromas Red Sands Groundwater levels throughout SCWD's Aromas well field area remain above sea level. At one monitoring location at the southern end, coastal water levels were essentially at sea level until recently; presently, levels are about five feet above sea level (SCWD 2003).

### ***Groundwater Storage***

**Groundwater Storage Capacity.** The total storage capacity of the basin has not been determined.

### Groundwater Budget (Type C)

There are not enough data to estimate a budget for this basin. Within the Soquel-Aptos area, pumpage in the Purisima Formation was estimated by the Santa Cruz County Environmental Health Department in October 1999 to be about 6,890 acre-feet, including 2,200 acre-feet for private pumping, about 910 acre-feet for the Central Water District and the City of Santa Cruz, and 3,780 acre-feet for the Soquel Creek Water District (SCWD 2001a). Pumpage from the Aromas Red Sands was estimated by SCWD in December 1998 to be about 6,240 acre-feet, including 3,650 acre-feet for private pumping, 490 acre-feet by Central Water District, and 2,100 acre-feet by SCWD (SCWD 2003).

### Groundwater Quality

**Characterization.** Groundwater in the Purisima formation can generally be classified into two water quality types. In the Purisima A subunit, groundwater is a calcium-bicarbonate water; in the upper Purisima subunits, groundwater is generally a calcium-magnesium bicarbonate water (LSCE 1996). Based on data for the SCWD water supply wells, TDS values in the Purisima formation range from 310 to 850 mg/L, with an average value of 492 mg/L (based on 11 wells; SCWD 2001b). EC values range from 440 to 1,000  $\mu\text{mhos/cm}$ , with an average value of 721 (SCWD 2001b). TDS values in the Aromas Red Sands Formation range from 160 to 290 mg/L, with an average value of 237 mg/L (based on 6 wells; SCWD 2001b). EC values range from 240 to 425  $\mu\text{mhos/cm}$ , with an average value of 348  $\mu\text{mhos/cm}$  (SCWD 2001b).

**Impairments.** Declining coastal groundwater levels in the area between New Brighton Beach and Aptos Creek are of concern. The Purisima Formation aquifer produces water with elevated levels of iron and manganese. Most municipal wells are treated for manganese and iron at the wellhead (SCWD 1999a and 2000b).

### Water Quality in Public Supply Wells

Constituent Group <sup>1</sup>	Number of wells sampled <sup>2</sup>	Number of wells with a concentration above an MCL <sup>3</sup>
Inorganics – Primary	14	0
Radiological	10	0
Nitrates	10	0
Pesticides	8	0
VOCs and SVOCs	8	0
Inorganics – Secondary	14	8

<sup>1</sup> 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).

<sup>2</sup> Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000.

<sup>3</sup> 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: 276 – 1,373	Average: 662 (16 SCWD wells)
Total depths (ft)		
Domestic		
Municipal/Irrigation	Range: 316 – 930	Average: 607 ( 16 SCWD wells)

## Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
SCWD	Groundwater levels	10 Monthly 34 Varies
SCWD	Mineral, nutrient, & minor element.	10 Annually 34 Varies
Department of Health Services and cooperators	Title 22 water quality	16 Varies

## Basin Management

Groundwater management:	SCWD Adopted AB 3030 Plan, April 1996
Water agencies	
Public	SCWD and Central Water District
Private	None

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## Errata

Changes made to the basin description will be noted here.