Santa Clara Valley Groundwater Basin, San Mateo Subbasin

- Groundwater Basin Number: 2-9.03
- County: San Mateo
- Surface Area: 48,100 acres (75 square miles)

Basin Boundaries and Hydrology

The San Mateo subbasin occupies a structural trough, sub-parallel to the northwest trending Coast Ranges, at the southwest end of San Francisco Bay. San Francisco Bay constitutes its eastern boundary. The Santa Cruz Mountains form the western margin of the San Mateo basin. The Westside basin bounds it on the north and its southern limit is defined by San Francisquito Creek. The basin is composed of alluvial fan deposits formed by tributaries to San Francisco Bay, that drain the basin (CRWQCB 2001). Precipitation ranges from less than 16 inches in the southeast to more than 24 inches in the northwest.

Hydrogeologic Information

Water Bearing Formations

The water bearing formations of the San Mateo subbasin are comprised of two groups: the Santa Clara Formation of Plio-Pleistocene age and the Quaternary age alluvial deposits (DWR 1967). The Quaternary alluvium constitutes the most important water bearing formation of this basin and basically all larger yielding wells acquire their water from it (DWR 1967).

The Santa Clara Formation. The Santa Clara Formation is Plio-Pleistocene age. It underlies the Quaternary alluvium and unconformably overlies non-water bearing formations (DWR 1967). It is composed of gravel, sand, silt and clay with various mixtures of grain sizes. The Santa Clara Formation dips consistently toward the east in the range between 10 and 30 degrees (DWR 1967). Well data indicates that permeability tends to increase from west to east and that beneath the valley proper sediments tend to decrease in grain size and permeability with increasing depth (DWR 1967). This implies that the formation became coarser grained and more permeable with time. The Santa Clara Formation is likely present under the alluvium in most of the San Mateo groundwater basin but lithologic similarities with the Quaternary alluvium makes distinction difficult on the basis of available well log data (DWR 1967).

The Quaternary Alluvium. The Quaternary alluvium is composed of gravel, sand, silt, and clay with various grain size distributions dependent on the depositional environment. Maximum thickness attained by the Quaternary alluvium is approximately 1250 feet (CRWQCB 2001). The proximal edge of the alluvial fans is formed at the margin of the Santa Cruz Mountains. The alluvium is coarse grained and is generally unconfined. It thins out in the upslope areas. A permeable alluvium deposited by the many streams that converge and flow eastward out of the basin underlies the central portion of the valley (DWR 1967). Here the stream channels are typically confined within natural levees. Characteristically, coarser grained channel sediments shift laterally to silty and clay rich material (CRWQCB

2001). Streams have altered course through time, particularly in near proximity to the bay. This has allowed gravel, sand, and clay layers to interfinger and become laterally discontinuous (CRWQCB 2001). A relatively shallow water table aquifer overlies confined and semi-confined aquifers in this lowland area (DWR 1967). Most of the wells in the basin draw water from the deeper confined and semi-confined aquifers (Fio and Leighton 1995).

Recharge Areas

Natural recharge occurs by infiltration of water from streams that enter the valley from the upland areas within the drainage basin and by percolation of precipitation that falls directly on the valley floor.

Groundwater Level Trends

Historically groundwater resources were developed to meet irrigation needs. Atherton, particularly has been a heavily pumped area since the beginning of the 20th century (Rogge 2001). Groundwater pumpage sufficiently affected the hydrology of the region as early as the 1920's enough to reverse artesian conditions along the San Francisco Bay and create an inland water gradient along Willow Road (Killingsworth and Hyde 1932). The City of San Francisco began delivering surface water from Hetch Hetchy Reservoir in 1940 and the State of California began delivering surface water in 1965 to supplement supplies. Maximum groundwater overdrafts generally occurred in 1965 (Fio and Leighton 1995). After 1965 increases in surface water deliveries were used to reduce demand for groundwater restoring water levels to pre-1960 conditions (Fio and Leighton 1995). Imported surface water currently meets approximately 90 % of the demand in San Mateo County (Bawua 1997-1998).

Groundwater Storage

Groundwater Storage Capacity. No published reports addressing groundwater storage capacity were found for the San Mateo groundwater basin.

Groundwater in Storage. No published reports addressing groundwater in storage were found for the San Mateo groundwater basin.

Groundwater Budget (Type C)

Not enough data was found to provide either an estimate of the basin's groundwater budget or the groundwater extraction from the basin.

Groundwater Quality

Characterization. In a study conducted by the US Geological Survey in conjunction with the Town of Atherton in 1997 most well water samples were designated calcium magnesium carbonate bicarbonate waters. The water is slightly alkaline with a mean pH value of 7.3 based on 20 samples. Hardness for the 20 wells sampled averaged 471 milligrams per liter (mg/L) as CaCO3, in excess of the 180 mg/L minimum value for water to be classified as very hard (Metzger and Fio 1997).

Impairments. Some wells produce water that can induce soil problems due to high concentrations of sodium when used for irrigation (Fio and Leighton 1995). One groundwater sample showed a nitrate-nitrogen concentration of 12 mg/L, which exceeds the primary maximum contaminant level, set by the California Department of Health Services and the U.S. Environmental Protection Agency (DWR 1995). Nitrate-Nitrogen concentrations in excess of 10 mg/L are considered hazardous and may result in methemoglobinemia (blue-baby syndrome) for small children (Hem 1985).

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	10	0
Radiological	11	0
Nitrates	10	0
Pesticides	11	0
VOCs and SVOCs	9	0
Inorganics – Secondary	10	2

[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 Production characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range: 15 – 50	Average: (Based on 2 Wells)
	Total depths (ft)	
Domestic	Range: 58 - 505	Average: 203 (Based on 13 Wells)
Municipal/Irrigation	Range: 45 - 935	Average: 219 (Based on 72 Wells)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
	Groundwater levels	
DWR	Miscellaneous water quality	2 Wells
Department of Health Services and cooperators	Title 22 water quality	14 Wells

Basin Management

Groundwater management:

Water agencies

Public	Belmont CWD, City of Millbrae WSA, City of Palo Alto Service Area, City of San Bruno WSA, East Palo Alto Co. Waterworks, Estero MID, Menlo Park MWD, Santa Clara Valley WD., County of San Mateo Health Services Division
Private	Burlingame Water Services, California Water Service Co.

References Cited

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Errata

Changes made to the basin description will be noted here.