# Santa Clara River Valley Groundwater Basin, Oxnard Subbasin

- Groundwater Basin Number: 4-4.02
- County: Ventura
- Surface Area: 58,000 acres (90.6 square miles)

## Basin Boundaries and Hydrology

Oxnard Subbasin is a subbasin of the Santa Clara River Valley Basin, located in southern Ventura County. The northern boundary of the subbasin is the Oak Ridge fault. The southern boundary is formed by contact of permeable alluvium with the semi-permeable rocks of the Santa Monica Mountains (CSWRB 1956). The eastern edge of the subbasin lies against the Pleasant Valley and Las Posas Valley Basins (CSWRB 1956; Panaro 2000a). The western edge of the subbasin is the Pacific Ocean. Ground surface elevations range from sea level in the west to about 150 feet above sea level (CSWRB 1956). Calleguas Creek and other tributary creeks drain the surface waters of the area westward into the Pacific Ocean and the Santa Clara River provides recharge along the northern border of the subbasin (CSWRB 1956). Average precipitation ranges from 14 to 16 inches per year.

## Hydrogeologic Information

### *Water Bearing Formations*

The groundwater system in the Oxnard Subbasin includes a main recharge area termed the forebay, and a confined aquifer system that extends throughout the main part of the subbasin and under the Pacific Ocean (CSWRB 1956). Five aquifers are recognized in this subbasin, with the Oxnard Aquifer and the Fox Canyon Aquifer as the two primary freshwater-bearing units (Panaro 2000ab). The Oxnard Aquifer consists of late Pleistocene to Holocene age sands and gravels that were deposited in a coalescing alluvial fan setting that forms the Oxnard alluvial plain. These sediments are coarse and very permeable within the forebay, but include thicker deposits of fine material toward the coast (CSWRB 1956). The silt and clay deposits reach 150 feet thick and form a low permeability cap over the high permeability sand and gravel (Oxnard Aquifer). These confining clays are absent in the Point Mugu area, allowing direct recharge to the gravel deposits in the southern part of the subbasin (Panaro 2000ab). Sand and gravel layers up to 50 feet thick overlie the silt and clay deposits forming a semi-perched aquifer of poor quality water (CSWRB 1956).

The upper Pleistocene alluvial gravels lie unconformably over folded lower Pleistocene San Pedro Formation (CSWRB 1956). The San Pedro Formation contains relatively thin sand and gravel deposits in its upper portion, a thick (up to 1,000 feet) silt and clay dominated middle section, and a widespread 100 to 300 foot thick permeable gravel member at the base of the formation called the Fox Canyon Aquifer (CSWRB 1956). These deposits are in contact with the upper Pleistocene gravels in the forebay, but separated from them throughout most of the subbasin by silts and clays within the San Pedro Formation (CSWRB 1956). Permeable deposits within the upper Santa Barbara Formation underlie the Fox Canyon member in the eastern portion of

the subbasin and contain fresh groundwater of minor importance (CSWRB 1956).

The permeable deposits of the Oxnard and Fox Canyon Aquifers extend westward offshore and may crop out on the ocean floor in direct contact with seawater (CSWRB 1956). Intrusion of saline water has been observed in the Port Hueneme and Point Mugu areas (CSWRB 1956). The storage capacity of the offshore reservoir of freshwater in the Oxnard Aquifer is likely about the same size as the onshore capacity (CSWRB 1956; Panaro 2000a).
The specific yield of the gravels of the Oxnard Aquifer is about 16 percent in the forebay, and estimated at about 10 percent offshore (CSWRB 1956). Panaro (2000a) uses an average specific yield for all aquifers onshore of about 16 percent. Well yields average about 900 gal/min (Panaro 2000a).

### *Restrictive Structures*

The Oak Ridge and Saticoy faults restrict groundwater movement along the northern edge of the subbasin. The Saticoy fault is considered either an extension or branch of the Oak Ridge fault and both faults are covered by a thin amount of Holocene alluvial gravel (CSWRB 1956). The Oak Ridge fault places water-bearing alluvium against older semi-permeable formations in the sub-surface (CSWRB 1956). The Saticoy fault creates a 50 to 100 foot drop in water level in its eastern portion, but apparently loses effectiveness as a barrier toward the west (CSWRB 1956).

### *Recharge Areas*

Recharge to the subbasin is provided by percolation of surface flow from the Santa Clara River, into the Oxnard Forebay. Precipitation and floodwater from the Calleguas Creek drainage percolate into the unconfined gravels near Mugu Lagoon. Subsurface flow from Santa Paula Subbasin makes its way over or across the Oak Ridge fault, and some underflow may come from the Las Posas and Pleasant Valley Basins on the east. Some amount of irrigation and septic system return also occurs.

### *Groundwater Levels Trends*

Hydrographs from the Oxnard Subbasin show a range of up to 80 feet of change in water level elevation since 1975. The hydrographs show an annual cyclic rise and fall of water level of about 20 feet with longer-term variations apparently following precipitation cycles. The subbasin was at a low level in 1991 and 1992, then recovered to moderate levels by 1994 and has remained stable in the upper range of water level since then. In October 1999, the subbasin was estimated to be about 75 percent full (Panaro 2000a).

### *Groundwater storage*

**Groundwater Storage Capacity.** Calculations of storage capacity vary from about 1,800,000 acre feet (CSWRB 1956) to about 10,500,000 af (sum of capacities of the "Oxnard Plain", "Oxnard Forebay" and "Mugu Forebay" Basins from Panaro (2000a)) for total of all aquifers onshore and offshore. The offshore storage capacity is approximately 3,360,000 af (Panaro 2000a). Total calculations of Panaro (2000a) are based on a total area of about 100,000 acres (44,800 acres offshore), about 750 feet of saturated thickness and a specific yield of about 16 percent (10 percent offshore). The most

representative value for the subbasin is likely 7,140,000 af of onshore storage capacity.

**Groundwater in Storage.** An estimated 5,380,000 af of groundwater was in storage in 1999 (Panaro 2000a).

### *Groundwater Budget (Type A)*

For 1997-98, Panaro estimated the applied water recharge to be 10,200 af (recharge to the semi-perched aquifer is not included this estimate). Average annual extraction has an estimated total pumpage of 65,000 af (UWCD 1999).

### *Groundwater Quality*

**Characterization.** Data for 69 public supply wells show a TDS content of 160 to 1,800 mg/L, with an average of 1,102 mg/L.

**Impairments.** Nitrate concentrations can exceed the state Maximum Contaminant Level (MCL) of 45mg/l. Intrusion of seawater has occurred near Pt. Mugu and Port Hueneme (UWCD 1999). Elevated levels of DDT and PCB are found near Pt. Mugu (Panaro 2000a).

## 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 | 73 | 6 |
| Radiological | 69 | 8 |
| Nitrates | 80 | 14 |
| Pesticides | 63 | 1 |
| VOCs and SVOCs | 68 | 2 |
| Inorganics – Secondary | 73 | 49 |

[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: 900 to 1600 (Panaro 2000) | Average: |
| | **Total depths (ft)** | |
| Domestic | Range: | Average: |
| Municipal/Irrigation | Range: | Average: |

## Active Monitoring Data

| Agency | Parameter | Number of wells /measurement frequency |
|---|---|---|
| United Water Conservation District | Groundwater levels | 41 wells/monthly<br>67 wells/bimonthly<br>127 wells/semi-annually<br>(UWCD 1999) |
| United Water Conservation District | Miscellaneous water quality | 41 wells/monthly<br>67 wells/bimonthly<br>127 wells/semi-annually<br>(UWCD 1999) |
| Department of Health Services and cooperators | Title 22 water quality | 69 |

## Basin Management

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| Groundwater management: | Fox Canyon Groundwater Management Agency has an adopted groundwater management plan. |
| Water agencies | |
| Public | Fox Canyon Groundwater Management Agency, Ventura County Department of Public Works, United Water Conservation District |
| Private | |

## References Cited

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California Department of Water Resources (CDWR). 1959. *Water Quality and Water Quality Problems, Ventura County*. Bulletin 75. 195 p.

Jennings, C.W., and Strand, R.G. 1969. *Geologic Map of California: Los Angeles Sheet*, Olaf P. Jenkins Edition: California Division of Mines and Geology, scale 1:250,000, 1 sheet.

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United Water Conservation District (UWCD). 1999. *Surface and Groundwater Conditions Report: Water Year 1998.* 64 p.

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## Errata

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