Coachella Valley Groundwater Basin, Indio Subbasin

- Groundwater Basin Number: 7-21.01
- County: Riverside, San Diego, Imperial
- Surface Area: 336,000 acres (525 square miles)

Basin Boundaries and Hydrology

Indio Subbasin is located northwest of the Salton Sea and receives low precipitation, averaging about 6 inches per year, and a wide range of temperatures. The Banning fault bounds the subbasin on the north and the semi-permeable rocks of the Indio Hills mark the northeast boundary. Impermeable rocks of the San Jacinto and Santa Rosa Mountains bound the subbasin on the south. A bedrock constriction separates the Indio Subbasin from the San Gorgonio Pass Subbasin on the northwest. The Salton Sea is the eastern boundary and the subbasin's primary discharge area. A low drainage divide forms a short boundary with the West Salton Sea Groundwater Basin in the southeast.

The Indio Subbasin is drained by the Whitewater River and its tributaries. The Whitewater River rarely flows throughout the year and flow in tributaries such as San Gorgonio River is intermittent. Surface flow is southeastward to the Salton Sea. The Colorado River Aqueduct and the Coachella Branch of the All-American Canal convey imported surface water into the Coachella Valley which overlies the subbasin.

Hydrogeologic Information

Water Bearing Formations

Primary water-bearing materials in the subbasin are unconsolidated late Pleistocene and Holocene alluvial deposits. These deposits consist of older alluvium and the Ocotillo Conglomerate Formation, a thick sequence of poorly bedded coarse sand and gravel. The Ocotillo Conglomerate is greater than 1,000 feet thick in many places and is the primary water-bearing unit in the subbasin (DWR 1964).

In the upper part of the subbasin, groundwater is unconfined, whereas to the south and southeast groundwater is mostly confined except on the edges of the subbasin where unconfined conditions are found. Depth to groundwater varies widely in the southeast part of the subbasin and some wells historically delivered artesian flow (DWR 1964). Confinement begins near Point Happy and continues south to the Salton Sea (Tyley 1974). Tyley (1974) interpreted storage coefficients equivalent to specific yields ranging from 6 to 15 percent for the unconfined parts of the subbasin.

Restrictive Structures

The west-trending Banning and Garnet Hill faults, along with the northwest-trending San Andreas fault, are effective barriers to groundwater because of folded or displaced water bearing deposits and impermeable fault gouge (DWR 1964). The northwestern boundary of the subbasin is a bedrock constriction that projects from the flank of San Jacinto Peak and extends northward beneath the subbasin deposits. Water level data indicate that groundwater cascades over this bedrock constriction. A drop in water level of more than 500 feet over a distance of 8,000 feet was measured in the area in April 1961 (DWR 1964).

Recharge Areas

Surface runoff and subsurface inflow are significant sources of recharge to the subbasin. In addition, the Whitewater River spreading grounds northwest of Palm Springs receives Colorado River Aqueduct water and has a maximum capacity of 300,000 af/year (CVWD 2000a). Colorado River water is conveyed into the subbasin via the Coachella Canal, which also supplies a pilot recharge project facility located in the southeastern part of the subbasin (CVWD 2000b).

Groundwater Level Trends

Prior to 1949, water levels steadily declined because of pumping. After 1949 and into the early 1980s, water levels in the central and southern subbasin area rose as imported Colorado River water begin to recharge parts of the subbasin. Elsewhere in the subbasin during this time water levels continued to decline. Since the 1980s, water levels in the central and southern areas have declined despite Colorado River imports. These declines are largely due to increasing urbanization and groundwater pumping (CVWD 2000).

Groundwater Storage

Groundwater Storage Capacity. DWR (1964) calculated total storage capacity at 29,800,000 af. This capacity is based on 1935-1936 groundwater levels and using a maximum depth below surface of 1,000 feet. The 1935-1936 levels are considered to be steady-state pre-development conditions.

Groundwater in Storage. Tyley (1974) estimated groundwater storage of 10,200,000 af in the first 700 feet of saturated deposits. This value does not include 1,520,000 af of groundwater in storage for the Garnet Hill area (DWR 1964).

Tyley (1974) also computed average annual decrease of groundwater storage based on water level changes for the period of 1953 to 1967 as 33,000 af/yr. This average annual decrease of groundwater storage is probably more at present time due to increased population and development of the Coachella Valley. CVWD (2000) estimates the decrease in freshwater in storage in the Coachella Valley Groundwater Basin for 1999 to be 136,700 af of which the Indio Subbasin is the largest part.

Groundwater Budget (Type A)

A detailed budget exists for the subbasin from previous studies, groundwater models and historical data. Total inflows for 1999 total were 392,000 af/yr and total outflows were 465,800 af/yr with a net annual change in freshwater storage of 136,000 af/yr (CVWD 2000b). The Whitewater River spreading grounds recharged 61,200 af/yr in 1999 (CVWD 2000a). Average historical natural recharge is approximately 49,000 af/yr, ranging from 187,000 af/yr in extremely wet years to 10,000 af/yr in dry years with 16,800 af estimated for

1999 (CVWD 2000a). . Tyley (1974) estimated average annual streamflow from gaged and ungaged streams in the subbasin at 31,000 af

Groundwater Quality

Characterization. Native groundwater in Indio Subbasin is predominantly calcium bicarbonate character with TDS content of 300 mg/l. Colorado River water is recharged into the subbasin at the Whitewater River spreading grounds and this water fluctuates between sodium sulfate and calcium sulfate in character. Groundwater mixing occurs adjacent to the Garnet Hill fault and near the southeast end of the Banning fault. This mixing suggests that the faults are less effective barriers to groundwater flow in the southeast than they are in the north (Tyley 1974).

Impairments. A plume of high nitrate concentration groundwater (45 mg/L or greater) was noted extending southeasterly from near Cathedral City toward the city of La Quinta. The nitrate plume is a potential threat to deeper underlying groundwater via improperly constructed, sealed, or abandoned wells (DWR 1979). The net salt addition from Colorado River Aqueduct water to the subbasin is currently 265,000 tons per year (CVWD 2000a). Groundwater near major faults, such as the Banning and San Andreas faults, contains elevated levels of fluoride (DWR 1964).

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	161	2
Radiological	162	7
Nitrates	164	0
Pesticides	163	0
VOCs and SVOCs	161	0
Inorganics – Secondary	161	13

[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: 2-1,880	Average: 647 (872 well completion reports)
	Total depths (ft)	
Domestic	Range:	Average:
Municipal/Irrigation	Range: 47-1420	Average: 431 (927 well completion reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
CVWD	Water Level	30
Deptartment of Health Services	Title 22 Water Quality	204

Basin Management

Groundwater management:	CVWD and DWA recognize the need to manage the Indio Subbasin. The CVWD and DWA management area was developed to encompass the area of groundwater overdraft. A November 2000 draft of the Coachella Valley Water Management Plan outlines current issues and management goals and practices pertaining to the area's groundwater system.
Water agencies	
Public	Coachella Valley Water District, District, Desert Water Agency.
Private	

References Cited

Bigley, Steve, Coachella Valley Water District. 2000. Telephone conversation with D.A. Gamon, Southern District, California Department of Water Resources. October 31.

California Department of Water Resources (DWR). 1964. *Coachella Valley Investigation.* Bulletin 108. 145 p. 13 plates.

_______. 1979. *Coachella Valley Area Well Standards Investigation.* Southern District Memorandum Report. 40 p.

Coachella Valley Water District. 2000a. *Engineer's Report on Water Supply and Replenishment Assessment 2000/2001.* Coachella, California. 46 p.

_______. 2000b. *Coachella Valley Water Management Plan (Draft).* Coachella Valley Water District. 272 p.

Levy, Tom, Coachella Valley Water District. 2002. Letter to Doug Osugi, Division of Planning and Local Assistance, California Department of Water Resources. April 5, 2002.

Mission Springs Water District. 2000. *Mission Springs Water District Urban Water Management Plan 2000.*

Planert, Michael, and John S. Williams. 1995. *Ground Water Atlas of the United States – Segment 1 California Nevada.* U. S. Geological Survey Hydrologic Investigations Atlas 730-B.

Tyley, S.J. 1974. *Analog Model Study of the Ground-Water Basin of the Upper Coachella Valley, California.* U.S. Geological Survey Water Supply Paper 2027.

Additional References

Dutcher, L.C., and Bader, J.S. 1963. *Geology and Hydrology of Agua Caliente Spring Palm Springs, California.* U.S. Geological Survey Water Supply Paper 1605, 43 p.

Mendenhall, W.C. 1909. *Ground Waters of the Indio Region, California.* United States Geological Survey Water Supply Paper 225.

Errata

Changes made to the basin description will be noted here.