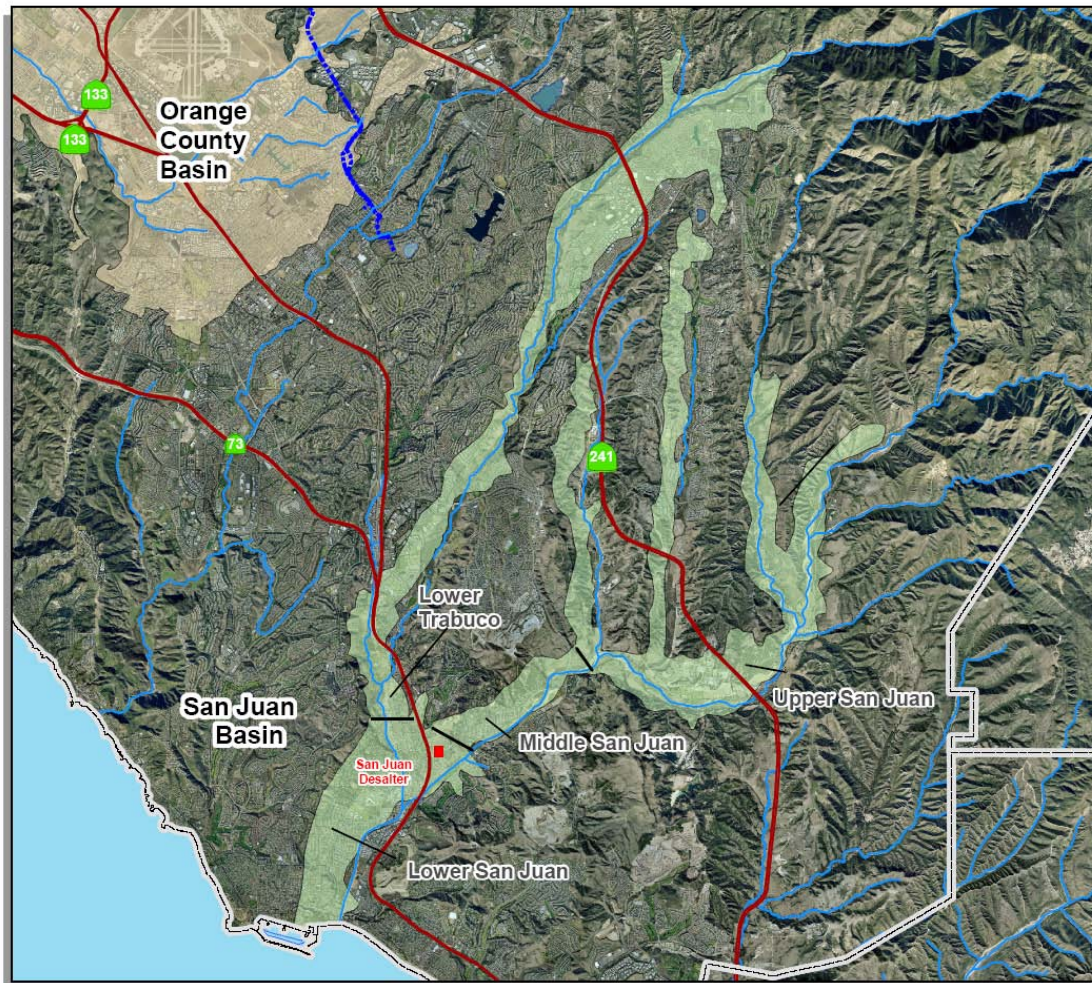


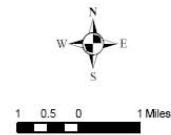
Chapter IV – Groundwater Basin Reports Orange County Basins - San Juan Basin

The San Juan Basin is located in southern Orange County within the San Juan Creek Watershed. The basin is comprised of four subbasins: Upper San Juan, Middle San Juan, Lower San Juan and Lower Trabuco. The San Juan Basin is within the service area of Metropolitan member agency Municipal Water District of Orange County (MWD) and underlies portions of the communities of Mission Viejo, San Juan Capistrano, Dana Point, and unincorporated areas of southern Orange County. A map of the basin is provided in **Figure 11-1**.

Figure 11-1
Map of the San Juan Basin



San Juan Basin



BASIN CHARACTERIZATION

The following section provides a physical description of the San Juan Basin including its geographic location and hydrogeologic character.

Basin Producing Zones and Storage Capacity

Groundwater exists in generally narrow, shallow unconfined alluvium that has been deposited in the San Juan Canyon area and its tributaries: Arroyo Trabuco, Oso, and other smaller canyons. The basin is bounded on the southwest by the Pacific Ocean and otherwise by Tertiary marine sedimentary rocks, which underlie the surrounding hills and the alluvium. The alluvium consists of a heterogeneous mixture of sand, silt, and gravel in the eastern portion of the basin, to coarse sand near the center, to silts, clays, coarse sand, fine gravel and sediments in the southern portion of the basin (DWR, 2004, MWDOC, 2006a). The alluvium ranges in depth from about 200 feet at the coast to essentially zero at the upper ends of the small alluvial tributaries to the main canyons (NBS Lowry, 1994). A summary of the basin characteristics is provided in **Table 11-1**.

Table 11-1
Summary of Hydrogeologic Parameters of San Juan Basin

Parameter	Description
Structure	
Aquifer(s)	Unconfined alluvium; confined zones near the coast.
Depth of groundwater basin	< 20 feet to >200 feet
Yield and Storage	
Safe Yield	7,300 to 7,800 AFY
Total Storage	63,220 to 90,000 AF
Unused Storage Space	Unknown
Portion of Unused Storage Available for Storage	Unknown

Sources: County of Orange, 2006; DWR, 1972; NBS Lowry, 1994

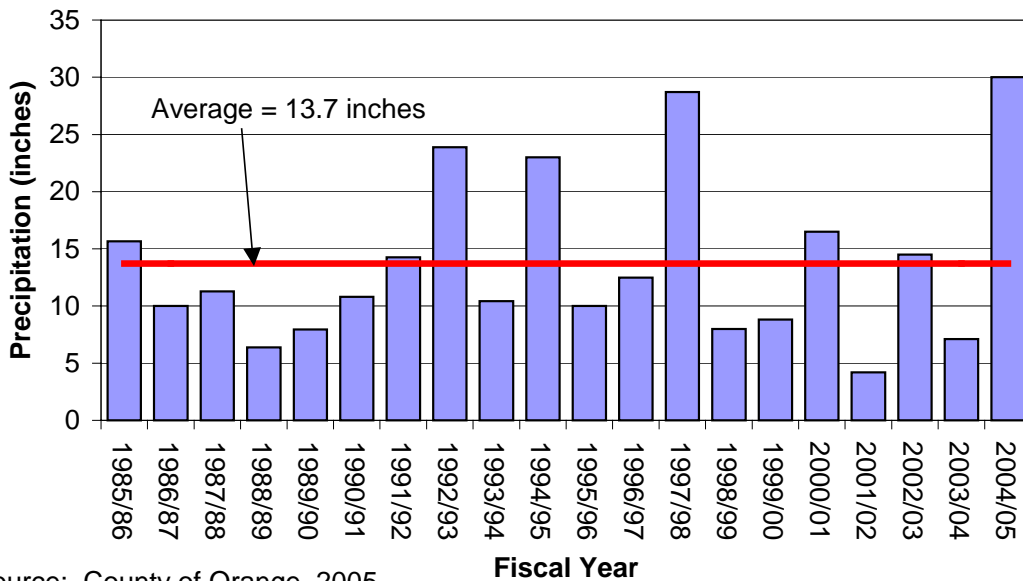
The main structural feature influencing groundwater movement is the Cristianitos Fault, which crosses San Juan Canyon in a north-south direction where it forms a narrow section at the confluence of San Juan Creek and Canada Chiquita. At the fault and canyon narrows, groundwater is forced to the surface, and the Upper Basin is separated from the Lower Basins. As shown on **Figure 11-1**, the Lower Basins include the Lower Trabuco, Middle San Juan, and the Lower San Juan subbasins.

Total storage capacity estimates range from 63,220 AFY to 90,000 AF (NBS Lowry, 1994; DWR, 1972). Useable groundwater storage is approximately 60,000 AF (MNWD, 2006). Unused storage capacity is unknown. However, following the heavy rains of the 1997/98 winter season, the basin was essentially full (USACE, 2002). Water levels in various locations in the basin since 2004 are less than 50 feet below ground surface. As a result, available storage space is limited in most areas (Psomas, 2006).

Safe Yield/Long-Term Balance of Recharge and Discharge

Recharge consists of streambed percolation from the mainstream San Juan and Arroyo Trabuco Creeks, rainfall infiltration and subsequent deep percolation to the water table, deep percolation of applied water from landscape and agricultural irrigation, and subsurface inflow from the tributary alluvial stream areas. The average annual precipitation in the lower portion of the basin ranges from 11 to 15 inches (DWR, 2004). **Figure 11-2** provides the historical precipitation data in the lower portion of the basin for the fiscal years from 1985/86 to 2004/05. Average precipitation during this time period was about 13.7 inches. It is important to note that precipitation is highly variable in this basin with lower rainfall in the lower basins and higher rainfall in the upper basins. For example, the 40-year average precipitation (1965 to 2004) in the upper portions of the basin is as much as 20 inches (County of Orange, 2005).

Figure 11-2
Historical Precipitation in the San Juan Basin



Source: County of Orange, 2005
Station 186

Discharge from the basin includes well extractions, losses to transpiration by phreatophytes, rising groundwater resulting in surface discharge to the ocean and subsurface outflow to the

Pacific Ocean. Extractions of water from the lower reaches of the basin were limited due to poor water quality until the San Juan Desalter came online in 2004.

In 1993, the sustained yield for the basin was estimated to be 7,800 AFY (NBS Lowry, 1994; USACE, 2002). More recently, the County of Orange has used a 2005 estimate of 7,300 AFY of safe yield in their planning (County of Orange, 2006).

GROUNDWATER MANAGEMENT

The following describes how the San Juan Basin is currently managed. This section includes a discussion of the governing structure and agreements with adjacent basins.

Basin Governance

The San Juan Basin is managed by the San Juan Basin Authority (SJBA), which was created in 1971 as a joint powers authority for the purpose of carrying out water resources development of the San Juan Basin. The members of the SJBA are the Santa Margarita Water District (SMWD), the Moulton Niguel Water District (MNWD), South Coast Water District, and the City of San Juan Capistrano.

Table 11-2 provides a list of management agencies in the San Juan Basin.

**Table 11-2
 Summary of Management Agencies for the San Juan Basin**

Agency	Role
San Juan Basin Authority (SJBA)	Joint Powers Authority established to plan and build facilities to protect the water quality of the San Juan Basin. Operates San Juan Basin Desalter
City of San Juan Capistrano (SJC)	Retail Water Provider and SJBA Member
Santa Margarita Water District (SMWD)	Retail Water District and SJBA Member
Moulton Niguel Water District (MNWD)	Retail Water District and SJBA Member
South Coast Water District (SCWD)	Retail Water District and SJBA Member
Municipal Water District of Orange County (MWDOC)	Wholesale imported water supplier and regional planning agency
California Regional Water Quality Control Board – San Diego Region (RWQCB)	Issuance of permits for discharges
State Water Resources Control Board	Issuance of water rights permits for diversion/extraction of water from the San Juan Basin.

The San Juan Basin has been categorized as subterranean flowing stream, and therefore groundwater extractions are within the scope of water rights regulations of the State Water Resources Control Board. Permits require the monitoring of groundwater quality and quantity in storage within the groundwater basin and other factors, including potential seawater intrusion and environmental issues. The SJBA conducts the monitoring activities that are needed to comply with its permits and also actively pursues the development of projects within the basin (MNWD, 2006).

Interactions with Adjoining Basins

No subsurface flow has been quantified between the San Juan Basin and adjoining basins. Water not captured by production wells or lost to evapotranspiration flows out of the basin into the ocean.

WATER SUPPLY FACILITIES AND OPERATIONS

The following provides a summary of the facilities within the San Juan Basin. Facilities include 13 groundwater production wells and a desalter.

Active Production Wells

A summary of the municipal production wells within the San Juan Basin is provided in **Table 11-3**. Private wells are not included on this table. Wells in the San Juan Basin typically produce from 450 to 1,000 gpm (DWR, 2004). Historical production for the period between fiscal years 1989/90 and 2004/05 is shown in **Figure 11-3**. The average production during this time period was approximately 2,079 AFY. It is important to note that production increased in 2004/05 as a result of the operation of the San Juan Desalter discussed below.

Groundwater is used principally for agricultural, horticultural, glass sand mining, golf course irrigation and for domestic uses. There are only three agencies within the SJBA actively pumping groundwater for municipal use (City of San Juan Capistrano, TCWD, and Santa Margarita Water District). More than 90 percent of the municipal groundwater production is for domestic use with less than 10 percent for non-domestic use.

Other Production

Data related to the private wells in the basin are not available.

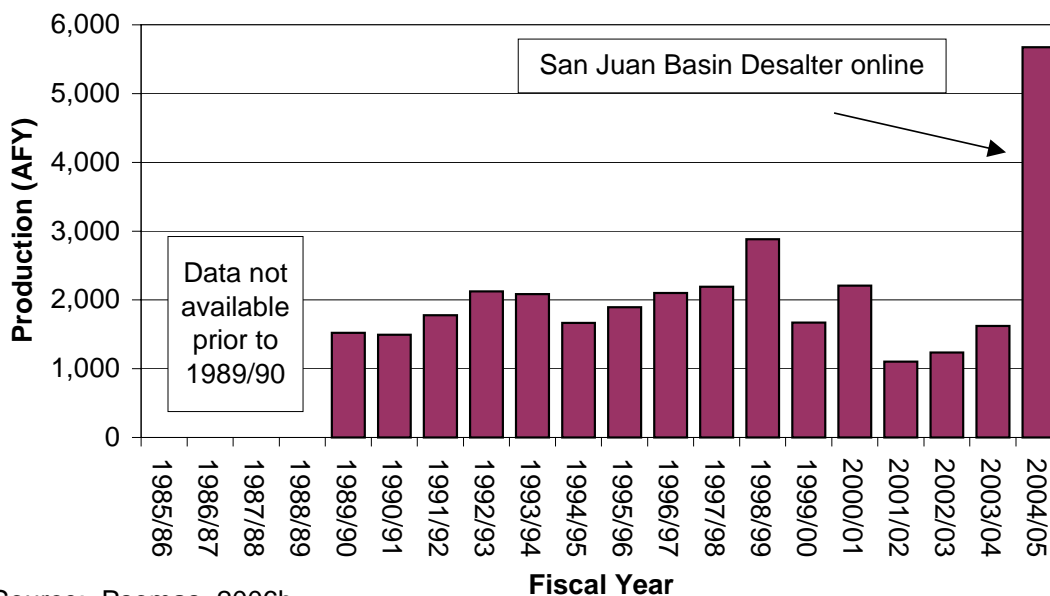
ASR Wells

Currently there are no ASR wells operating within the basin.

Spreading Basins

There are no spreading basins in the San Juan Basin. Recharge occurs mainly in natural streambeds and flood control channels (MNWD, 2006). SJBA plans to develop recharge basins to enhance capture of surface runoff.

Figure 11-3
Historical Groundwater Production in the San Juan Basin



Source: Psomas, 2006b

Table 11-3
Summary of Production Wells in the San Juan Basin

Category	Number of Active Wells	Estimated Production Capacity (AFY)	Average Production 1989/90-2004/05 (AFY)	Well Operation Cost (\$/AF)
Municipal	7	10,000	1,949	Data not available
Desalter ¹	6	4,800	130	
Total	13	14,800	2,079	--

Source: Psomas, 2006b

¹Desalter came online in 2004.

Seawater Barriers

There are no seawater barriers in the San Juan Basin.

Desalters

There is one existing desalter in the San Juan Basin. The San Juan Basin Desalter was constructed by the City of San Juan Capistrano pursuant to the terms of the 1998 San Juan Basin Desalter Project Groundwater Recovery Program Agreement between Metropolitan, MWDOC, and the SJBA, and as modified by First Amendment dated October 15, 2002. The San Juan Basin Desalter was completed in December 2004 and has capacity of about 5 MGD and can currently treat about 4,800 AFY. The plant is currently supplied by six wells located in the Lower San Juan subbasin. The brackish water from these wells is conveyed to the plant where it is treated by reverse osmosis (County of Orange, 2006). Approximately 4,800 AF was produced from the six operating wells during the period December 2004 through December 2005 (Psomas, 2006).

A second desalter, referred to as the Capistrano Beach Desalter Project, is currently under construction in the City of Dana Point by South Coast Water District. This desalter would treat up to 1,300 AFY from the San Juan Basin. Construction is estimated to be completed by March 2007.

GROUNDWATER LEVELS

Groundwater generally flows in a southwesterly direction to the ocean. The SJBA measures the water level in monitoring wells on a regular basis. Groundwater levels within the lower San Juan Creek are relatively close to the ground surface. Depth to water levels measured during 2004 and 2005 were typically less than 20 feet in the Lower and Middle San Juan subbasins. Drops in water levels of about 20 feet were observed in the vicinity of the San Juan Basin Desalter since it began operation. Water levels in the Lower Trabuco subbasin were deeper with an average depth to water of about 50 feet.

Monitoring wells recently installed in the basin are used to measure both water level and electric conductivity. The goal of the SJBA is to produce enough data to determine how the basin can be more effectively used as a water storage facility to increase the use of the groundwater for domestic uses. Water levels in basin wells show seasonal cycles with average declines related to drought cycles that recover during more plentiful seasons (DWR, 2004).

GROUNDWATER QUALITY

The following section describes the existing groundwater quality issues in the San Juan Basin. In general, the groundwater quality of the San Juan Basin ranges from good to poor. For example, although the Upper San Juan subbasin is shallower, it has lower total dissolved solids (TDS) concentrations (less than 500 mg/L) than the lower basins. The lower basins are generally deeper with more abundant supply, but they are brackish and require treatment for use.

Groundwater Quality Monitoring

Active groundwater production wells within the San Juan Basin are sampled in accordance with Title 22. In addition, as described above, monitoring wells installed in the basin are used to measure both water level and electric conductivity in the field and various inorganic constituents in the laboratory on a semi-annual basis.

Groundwater Contaminants

The following section describes the concentrations of key constituents of concern (TDS, iron, manganese, and sulfate) in the San Juan Basin. Concentrations are summarized in **Table 11-4**. In general, TDS content in groundwater increases from below 500 mg/L in the upper stream channels valleys to above 2,000 mg/L near the coast (NBS Lowry, 1994; Psomas 2006a).

Table 11-4
Summary of Constituents of Concern in the San Juan Basin

Constituent	Units	Range (1999-2005)	Description
TDS Secondary MCL = 500	mg/L	390 to 2,200	TDS in production wells ranges from 390 to 1,250 mg/L. Average is 657 mg/L.
Nitrate (as N) Primary MCL = 10	mg/L	ND to 2	Average in production wells is approximately 0.6 mg/L.
VOCs (TCE and PCE) Primary MCL for TCE = 5 Primary MCL for PCE = 5	µg/L	ND	VOCs are not detected in the San Juan Basin.
Perchlorate Notification level = 6	µg/L	ND	Perchlorate is not detected in the San Juan Basin.
Iron and manganese Secondary MCL for iron = 300 Secondary MCL for manganese = 50	µg/L	Iron ND to 700 Manganese ND to 200	Only 2 groundwater production wells have detections of iron and manganese.
Sulfate Secondary MCL = 250	mg/L	71 to 840	Sulfate in production wells ranges from 71 to 225 mg/L with an average of 150 mg/L.

Source: Regional Board, 2006; Psomas, 2006a

Seawater intrusion could also be a potential problem in the coastal portions of the basin. It is believed that much of the salt content in the groundwater comes from the marine sediments that underlie much of the basin principally from Trabuco Creek (USACE, 2002).

Blending Needs

Blending is not applicable to the San Juan Basin (MNWD, 2006).

Groundwater Treatment

Groundwater is treated by the San Juan Basin Desalter as discussed above. Approximately 2,075 AF was treated in 2004/05, about 58 percent of the total groundwater production.

CURRENT GROUNDWATER STORAGE PROGRAMS

There are currently no groundwater storage programs in the San Juan Basin.

BASIN MANAGEMENT CONSIDERATIONS

Basin management considerations:

- Allowable quantities of water that may be diverted and pumped are specified in the water rights permits administered by the State Water Resources Control Board.
- Except for the Upper San Juan, the TDS of most of the groundwater in storage in the main part of the groundwater basin is too high for domestic water use. Groundwater is treated by the San Juan Basin Desalter, which increases the usability of the basin in the future.
- Shallow groundwater limits the ability to store significant supplies.

References:

- California Department of Water Resources (DWR), 1972, Bulletin No. 104-7, Planned Utilization of Water Resources in the San Juan Creek Basin Area.
- California Department of Water Resources (DWR), 2004. California's Groundwater Bulletin 118 – San Juan Valley Groundwater Basin. Updated 2/27/04. Website: http://www.dpla2.water.ca.gov/publications/groundwater/bulletin118/basins/pdfs_desc/9-1.pdf Accessed 7/9/07.
- California Regional Water Quality Control Board, 2007. Geotracker database. Accessed at: <http://www.geotracker.swrcb.ca.gov/>
- County of Orange Resources and Development Management Department (County of Orange), 2005. Hydrologic Data Report. 2003-2004 Season.
- County of Orange Resources and Development Management Department (County of Orange), 2006. South Orange County Integrated Regional Water Management Plan – May 2006.
- County of Orange Resources and Development Management Department (County of Orange), 2005. Hydrologic Data Report. 2003-2004 Season. Station 186 Data.
- Metropolitan Water District of Southern California (Metropolitan), 2006. Local Resource Program, Summary Report, August 2006.
- Moulton Niguel Water District (MNWD), 2005. Urban Water Management Plan Update, December.
- Moulton Niguel Water District (MNWD), 2006. Groundwater Study Questionnaire.
- Municipal Water District of Orange County (MWDOC), 2006a. Phase 1 and 2 Hydrogeologic Investigation, Dana Point Ocean Desalination Project.
- Municipal Water District of Orange County (MWDOC), 2006b. Urban Water Management Plan.
- NBS Lowry Engineers and Planners (NBS Lowry). 1994. San Juan Basin Groundwater Management and Facility Plan.
- Psomas, 2006b. Annual Integrated Environmental Monitoring Report. Prepared for San Juan Basin Authority.
- Psomas, 2006b. Groundwater production data.
- South Orange County Integrated Regional Water Management Plan (County of Orange), May 2006.