Santa Maria Groundwater Basin

Recent Litigation

Litigation regarding the status and use of groundwater in the Santa Maria Basin was initiated in 1997. This litigation may affect the rights of water users within the basin and may result in development of a management process. Records of these proceedings are available at the website:

http://www.sccomplex.org/home/index.htm.

When final judgment is entered in this litigation, a subsequent ground-water report will contain a discussion of its implications to the groundwater resources monitored by the County.

Overdraft is defined as more water being taken out the basin than is being recharged, over a long period of time. In other words overdraft can be defined as exceeding the safe yield of the basin (please see groundwater terms section, page 3).

The Water Agency has evaluated the status of the basin, as well as the USGS, DWR, and private entities. Most all parties have agreed historically that the basin is in overdraft to a small, but significant amount. Any amount of overdraft in the basin **is** significant because overdraft may contribute to water quality changes; not only the buildup of nitrates, sulfates and total dissolved solids, but the threat of salt-water intrusion.

SBCWA has an extensive network of water level monitoring wells throughout the basin and when utilized to calculate the storage of groundwater they show that there is indeed a long-term decline in the amount of stored water above sea level in the basin. SBCWA has used a 1943-1999 base period that is believed by staff to be the most representative of the basins long-term climate. **Recharge to the system, and thus the base period used, is the dominant factor when evaluating the water budget of a basin, and by moving the base period around one can show any result of an analysis desired, either overdraft, balance, or surplus.**

Whatever the outcome of the litigation, SBCWA staff will continue monitoring the basin and sharing any information collected to all parties interested in protecting its water supply for the continuation of the extensive and historical agricultural base as well as urban usage and development.

Physical Description

The *Santa Maria Main Groundwater Basin* is an alluvial basin of 170 mi^2 that is bordered by the Nipomo Mesa and Sierra Madre Foothills to the north, the San Rafael Mountains to the east, the Solomon-Casmalia Hills to the south and the Pacific Ocean to the west. The Basin is situated in the northwest portion of Santa Barbara County and extends into the southwest portion of San Luis Obispo County. The Valley is approximately 28 miles long and 12 miles wide. Average rainfall varies from about 12 to 16 inches per year within the basin. Surface drainage is primarily from the Sisquoc and Santa Maria Rivers that traverse the north side of the basin from east to west. Orcutt Creek, Bradley

Canyon, Cat Canyon and Foxen Canyon are the primary drainages on the south side of the basin. The aquifer is considered to be essentially continuous hydrologically with the exception of clay lenses that cause localized confinement. Depressions of the water table occur in areas of heavy pumping.

The Santa Maria Groundwater Basin has three distinguishable units that appear to have only limited interaction: the Main Basin unit, the Nipomo Mesa unit, and the Arroyo Grande unit. In previous reports by SBCWA only the Main Basin unit has been addressed. The California Department of Water Resources (DWR) has recently released Water Resources of the Arroyo Grande – Nipomo Mesa Area which focuses on the Arroyo Grande, Nipomo Mesa and Valley, and Oso Flaco areas. This report has not yet been thoroughly reviewed by SBCWA staff. The report concludes that no overdraft currently exists in the areas of the study using a climatic base period of 1984-1995..

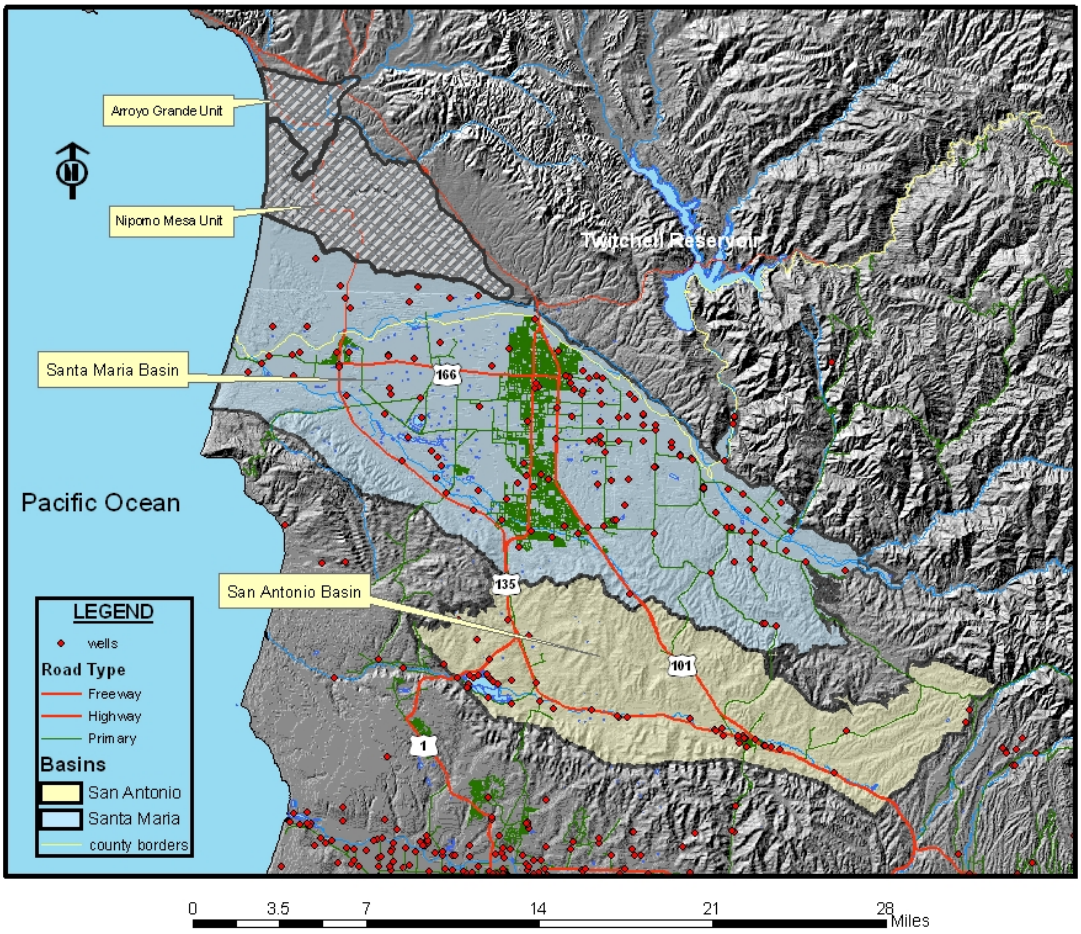
The *Nipomo Mesa* and *Arroyo Grande* units are completely within San Luis Obispo County, and as previously mentioned have not been the subject of previous investigation or analysis by SBCWA. The Nipomo Mesa consists of older dune sands and alluvial deposits resting atop the Paso Robles formation that thins north of the Santa Maria River and the *Santa Maria Main Basin*. The Arroyo Grande unit consists of well-sorted alluvial deposits resting atop a thin veneer of the Paso Robles formation, terminating in the 5 cities area in San Luis Obispo County

The following sections pertain to only the *Santa Maria Main Basin* in Santa Barbara County and the *Oso Flaco* area in the southwest corner of San Luis Obispo County.

History and Analyses

The Basin is best described by Worts (1947,1951), Miller and Evanson (1966), SBCWA (1977) and Naftaly (1994). As one of the largest agricultural and historically important oil producing coastal valleys of California, this basin has been studied extensively. Modern exploration began in 1888 when the State mineralogist arrived in the area for the purpose of geological mapping in conjunction with the University of California Geology Program and the USGS. In 1903 development of the area rapidly intensified for oil, and in 1907 the first comprehensive report on the area was published, USGS Bulletin 322 which focused on the geology as well as some mention of water resources. Water resources examined in this report were limited to surface water diversions, springs, and artesian wells in the western part of the basin.

Santa Maria Groundwater Basin



In 1921 the first soil survey of the basin was made. Examination of the basin continued to be limited to oil until 1931 when Lippincott established baseline hydrologic conditions for consideration of federal and state funding towards a project to curb runoff problems on wet years and establishing a need for water conservation practices.

In 1946 USGS Bulletin 222 was released, mentioning a 12,000 AF annual overdraft. The period of the *most comprehensive evaluation* of the basin began in 1947 and continued until 1966 with work by Worts, Miller and Evanson. During this period the perennial yield of the basin was established to be 70,000 AF (revised from 57,000 AF) and an approximate annual overdraft of 20,000 AF was calculated. In 1976 the Toups Corporation was hired by the City of Santa Maria to perform a thorough Water Resources study of the basin. This report concluded that in 1976 the annual average overdraft of the basin was 6,000 AF and projected to be 25,000 AF by the year 2025 without implementation of additional water sources. The USGS did a report in 1976 focusing of water quality of the basin, specifically increasing nitrogen levels. This report listed the calculated average annual overdraft to be 10,000 AF.

In 1977 the Water Agency (Ahlroth et al) completed a comprehensive report of the basin using all of the latest data and climate trends that concluded an average annual overdraft of 20,000 AF existed and projected a 30,000 AF overdraft by the year 2000. In

1985 the USGS produced report 85-4129 which focused on recharge of the basin. In 1994 the Water Agency (Naftaly) assembled the “Santa Maria Valley Water Resources Report” which updated and organized all information from previous reports and studies on the basin. This very thorough report served as a precursor to a water management plan for the basin. It presented no new information, but to this day serves as the most complete overview of the groundwater resources of the basin.

In 1991 the Water Agency with the help of Boyle Engineering produced the report “Santa Barbara County Growth Inducement Potential of State Water Importation” to consider growth inducement potential at the water purveyor level. The report serves as an analysis of 1990 water supply conditions as well as projections for the 21st century. This report calculates the annual average overdraft at about 37,000 AF at 1990 without state water and about 15,700 AF in the year 2000 with the implementation of state water.

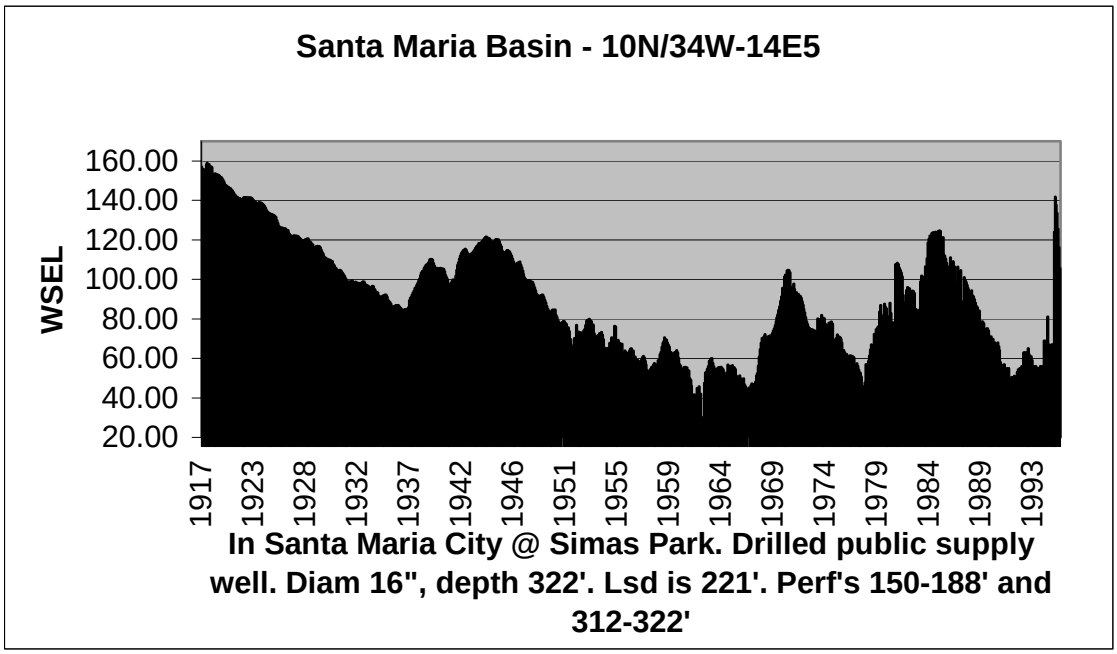
In 1997 the Santa Maria Valley Water Conservation District (SMVWCD) hired Luhdorff and Scalmanini Engineers (L&S) to do a report on “Special Assessments of Groundwater Management” for the district as proposition 218, approved by the voters of California in 1996 required such a report before new assessments could be levied on property owners. This report states that the hydrologic conditions of the basin imply a long-term stability comprised of periodic groundwater level declines and recoveries, as versus an average annual overdraft. Luhdorff and Scalmanini were again hired by the SMVWCD to expand on their investigation of the basin and in March 2000 released a report utilizing a numerical flow model to establish an up-to-date perennial yield of the basin based on most recent recharge and discharge conditions. This report concluded that the basin was essentially in balance, relying on a base study period of 1968 to 1989. SBCWA had concerns about the base period and methodology of this report, and requested that Luhdorff and Scalmanini furnish basis for some of the calculations that differ from previous work done on the basin. A letter was sent to SMVWCD in July 2000 requesting the additional information and initiation of discussion between L&S and SBCWA but no response was received by SBCWA to this invitation. Thus, SBCWA has not formally adopted the conclusions found in this report.

Vegetable Crops being 'Flood' irrigated near Guadalupe, Fall 2003

In 2001 SBCWA was commissioned by the Santa Barbara County Administrators Office to update the 1991 "Santa Barbara County Growth Inducement Potential of State Water Importation" report as part of the strategic scan of resources the County was going through (the title of this report is "Santa Barbara County Water Supply and Demand Comparisons 2002 Update"). Analyses generated for this report show that a 2,368 AF groundwater overdraft exists (Ahlroth, 2001) and under current trends of usage and climate by 2020 a slightly higher overdraft will exist (the reduction in overdraft from previous SBCWA analyses is mainly due to State Water importation). This analysis is a model result quantifying all inputs and outputs from the basin and using a 1943-1999 base period. The results of this modeling effort are confirmed by water level readings made throughout the basin by the County and USGS. Due to the conflicting conclusions and significance of such previous work SBCWA hired Hopkins Groundwater Consultants Inc. to perform an unbiased evaluation of the methodologies and conclusions of SBCWA work on this basin. Hopkins concluded the overdraft is indeed somewhere between 2,000 to 3,000 AF per year and that the SBCWA methodologies, including use of the SBCWA Santa Maria Valley water budget model (SMVWBM) to assess basin conditions, to be both effective and comprehensive. **It should be noted that a overdraft of 3,000 AF per year lies in the "gray area" of groundwater calculations and as well as previous work which implies the basin is in surplus or balance, is a function of climate, which nobody really can predict. In all the *analyses* of groundwater conditions, the parameter of "base period" of climate is the dominant variable, and by using different "base periods" the analysis shows a range deficit or surplus conditions**. Certainly, the importation of state water takes considerable pressure off of the resource of groundwater in this basin.

Fluctuations in Basin "Water in Storage"

The conditions of the basin can be assessed by looking at the hydrograph below from observation well 10N/34W-14E5:



Note how during the early part of the record whether the basin storage is increasing or decreasing (as depicted here by water level elevation), the slope is less than that of the later part of the century. The higher rate of *filling* in the later part of the century is a function of the presence of the Twitchell Reservoir Project, which adds on average an additional 18,000 AF per year recharge to the basin. The higher rate of *dewatering* is due to increased pumpage of the basin. One can expect that given an extreme drought such as the 1987-1991 or 1945-1951 droughts that the basin would be dewatered at an alarming rate, and may result in the lowest water levels in the history of the basin.

The gross perennial yield of the basin is estimated to be approximately 125,000 acre-feet per year. Water storage above sea level within the Santa Maria Groundwater Basin was estimated to be about 2.5 million AF (MAF) in 1984 and 1.97 MAF in 1991, and now, in 2002 probably greater than 2.5 MAF (Ahlroth, 2002). The maximum storage level of record occurred in 1918 and was estimated to be over 3 MAF. The portion of the groundwater basin located in San Luis Obispo County in 1975 was estimated by the Department of Water Resources to contain about 226,000 AF, a part of which is included in the SBCWA estimate.

The utilization of transplants and drip irrigation systems has substantially increased water efficiency in the Santa Maria Basin

Water Supply and Usage

The basin supplies groundwater to the City of Santa Maria, the California Cities Water Company, the City of Guadalupe, the Casmalia Community Services District, oil operations and private agriculture throughout the Valley. Groundwater was previously the only source of water used within the Valley, however State Water has been providing an additional source since the end of 1997.

Groundwater Production in the Santa Maria Basin by Purveyor Acre-Feet				
Year	City of Santa Maria	California Cities Water Company	City of Guadalupe	Casmalia Community Services District
1990	12,057	8,691	724	no data
1991	11,478	8,210	685	no data
1992	11,636	8,381	718	no data
1993	11,835	8,174	653	no data
1994	12,133	8,572	668	no data
1995	12,265	8,447	662	no data
1996	12,323	9,906	585	no data
1997	8,011	9,375	622	no data
1998	410	8,113	303	no data
1999	454	9,026	265	no data
2000	547	9,130	300	no data
2001	2,698	8,750	434	no data
2002	468	9,210	384	no data
2003	1,178	8,862	no data	22
2004	1,223	9,141	no data	no data
2005	897	9,890	415	29

The table above lists groundwater extractions from the water purveyors within the Santa Maria Basin. Note that the town of Casmalia lies outside the Santa Maria Basin but the water supplied to the town is drawn from just within the Basin boundaries. In addition,

agricultural, oil industry and farmstead usage is estimated to be around 120,000 Acre-Feet per year (gross amount).

The Cities of Santa Maria and Guadalupe, and California Cities Water Company (formally Southern California Water Company) of Orcutt have contracted to receive a combined total of 17,250 AFY from the State Water Project (SWP). Actual deliveries in 2003 were 12,317 AF to the City of Santa Maria, 329 AF to the City of Guadalupe and 205 AF to California Cities Water Company. Santa Maria holds 16,200 AFY of entitlement. (Please see State Water Project, page 6). According to the City of Santa Maria Water Master Plan, approximately two-thirds of its SWP supply is designated for blending purposes to meet established City water quality objectives and will not be used to support new development. Thus, this use of SWP water represents a corresponding reduction in long-term pumpage (and overdraft) of the basin. Another benefit of SWP water importation is the relative high quality of return flows from water use in the City. This serves to improve overall water quality in the basin.

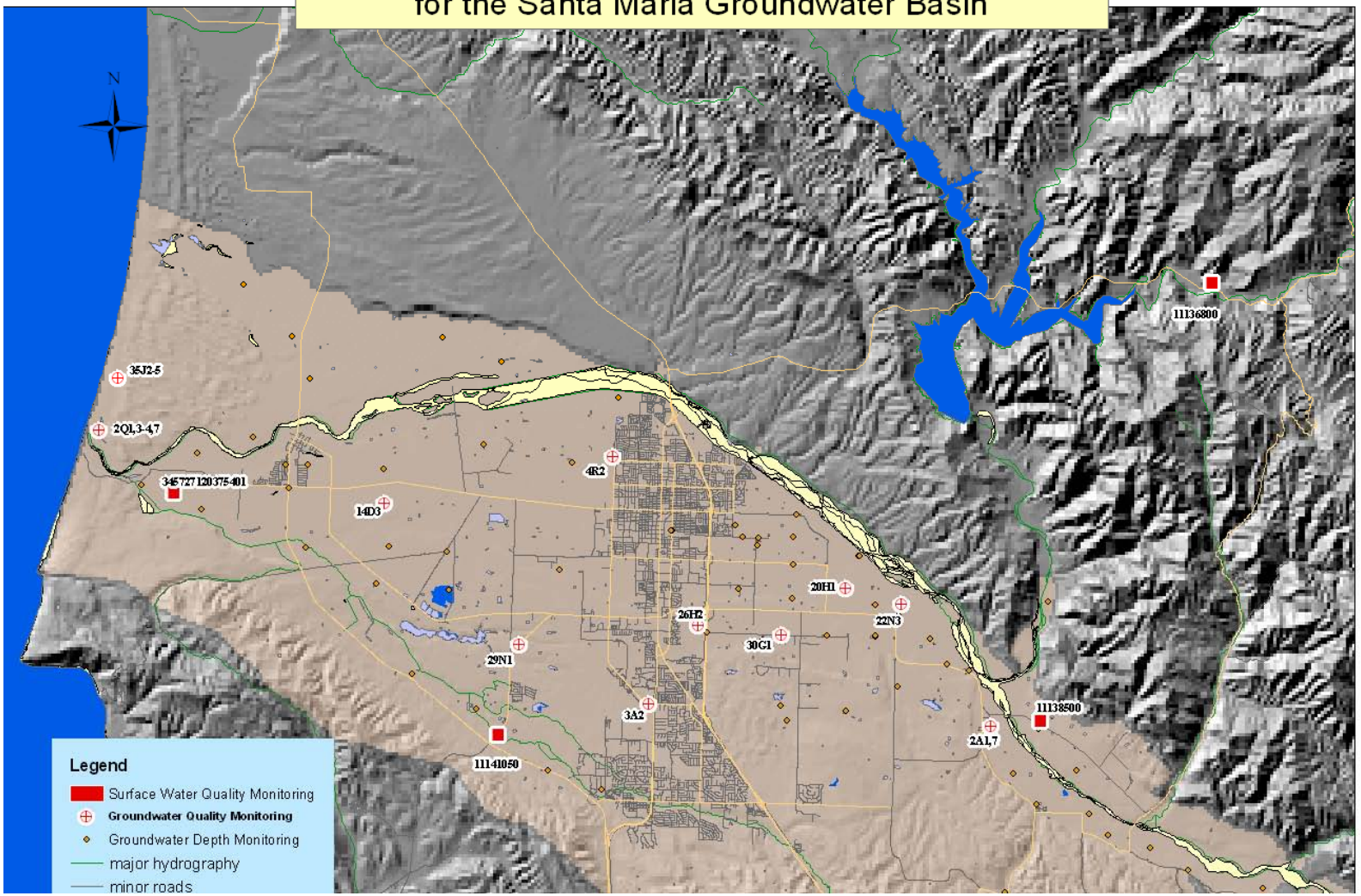
Water Quality

Reports by Worts (1951), Toups Corporation (1976), Brown and Caldwell (1976) and Hughes (USGS, 1976) best describe the conditions of water quality within the Basin. Also, the Cachuma Resource Conservation District (CRCD) produced the *Santa Maria Watershed Non-point Source Pollution Management Plan* in September 2000, which serves as a mitigation plan for water quality impairments in the basin and summarizes water quality conditions. To a large degree water quality within the basin has been affected by the operations of Twitchell Reservoir in a positive manner as Sulfate and Salt loading have been reduced since “low flows” emanating from the Cuyama Valley have been intercepted and replaced by releases from Twitchell which includes runoff from the Huasna and Alamo watersheds (Note that the recharge from Twitchell has been revised from 20,000 AF per year to 18,000 AF per year due to siltation and thus loss of storage of the reservoir and also not accounting for the cloudseeding program and surcharging of the reservoir as they are not long-term approved programs). It is important to realize, as with most groundwater basins that there is a significant difference between the quality of water extracted from the shallow or water table aquifer as versus the deeper or confined aquifer; the shallow zones *usually* contain the most water quality impairments. The importation of State Water, better quality water than the local sources, provides for higher quality “return flows” and thus helps the basin water quality. In addition to improvements provided by the operations of Twitchell Reservoir and state water importation, the Laguna Sanitation District helps improve water quality in the basin by utilizing a reverse osmosis process to remove and a **deep** injection well to dispose of approximately 8000 lbs. per day of salts, which would otherwise accumulate in the basin system. Water quality data is currently collected as part of the County Water Resources-USGS monitoring program as well as from area specific programs, such as the City of Santa Maria and Laguna Sanitation District sewage treatment plants and also Southern California Water Company, which serves water to the Orcutt area.

Total Dissolved Solids

Data collected from observation wells in a *1976-1977 USGS study* indicated that TDS concentrations generally increase from east to west, with the highest levels occurring in the western part of the basin and TDS concentrations near Guadalupe at over 3,000 mgl. It must be noted that these measurements most likely were made from wells

Surface and Ground Water Quality Monitoring Stations for the Santa Maria Groundwater Basin



Water Quality Monitoring in the Santa Maria Basin Conducted through the United States Geological Survey - Santa Barbara County Water Agency Cooperative Program

Depth and Screen/Perforation Information
For Groundwater Monitoring Sites

(Listed East to west)

State Well ID	USGS Number	Depth	Screen Intervals
9N/33W-2A1	345324120184201	48’	
9N/33W-2A7	345325120184201	512’	125’-507’
10N/33W-22N3[1]	345535120204401		
10N/33W-20H1	345552120220001	175’	100’-175’
10N/33W-30G1	345459120232301	662’	325’-662’
10N/34W-26H2	345459120250301	445’	unknown
9N/34W-3A2	345340120261801	331’	247’-331’
10N/34W-4R2	345808120271401	401’	160’-400’
10N/34W-29N1	345441120291301	112’	107’-
10N/35W-14D3[2]	345712120321701	308’	102’-
10N/36W-2Q1*	345823120383901	671’	568’-671’
10N/36W-2Q3*	345823120383903	444’	397’-444’
10N/36W-2Q4*	345823120383904	378’	291’-378’
10N/36W-2Q7*	345823120383907	44.2’	18.5’-46.5’
11N/36W-35J2*	345921120381601	615’	527’-615’
11N/36W-35J3*	345921120381602	495’	247’-495’
11N/36W-35J4*	345921120381603	228’	175’-228’
11N/36W-35J5*	345921120381604	138’	74’-138’

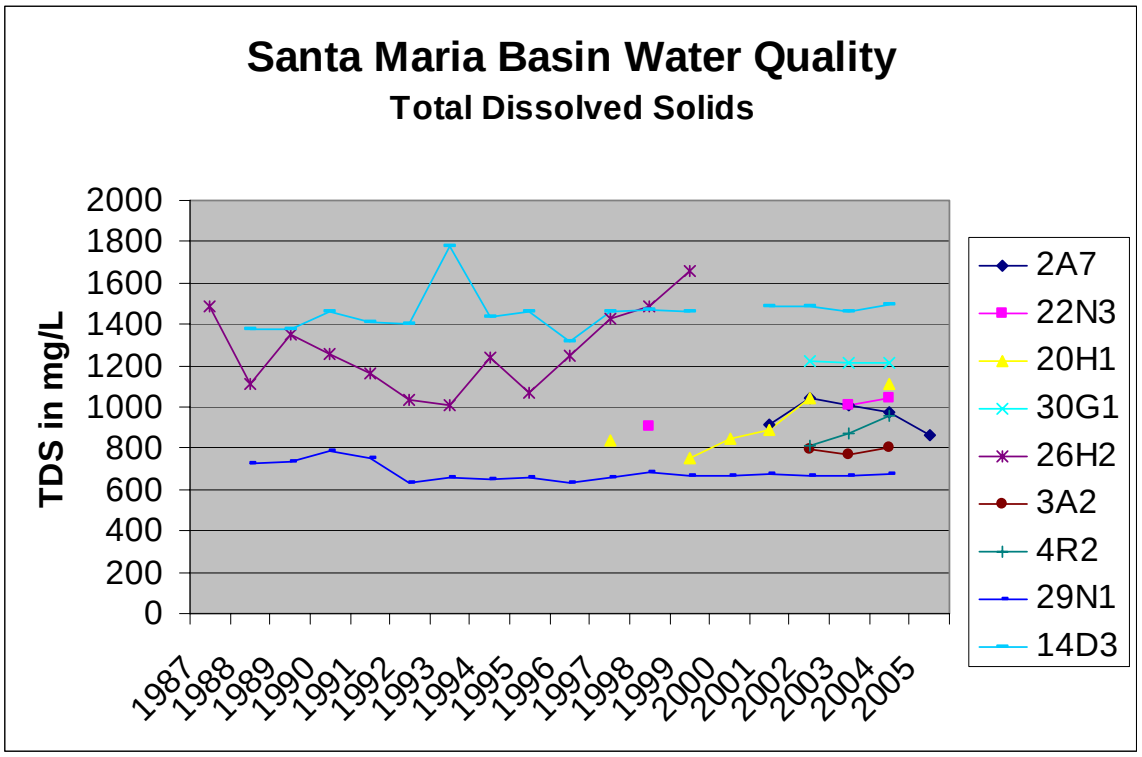
Description of Surface Water Quality Monitoring Sites

Station Number	Description	Watershed Size
11136800	Cuyama River below Buckhorn Canyon	886 sq. mi.
11138500	Sisquoc River near Sisquoc	281 sq. mi.
11141050	Orcutt Creek near Orcutt	18.5 sq. mi.
345727120375401[3]	Green Canyon Creek @ Main St. near Guadalupe	5.28 sq. mi

[1]Still searching for construction information on this site
[2]This information is actually from well 10N/35W-14D1, assumed to be similar to 14D3
[3]This is actually a “site ID” as no “station ID” is listed for this site

drawing from the shallow water table and may not be indicative of the complete aquifer. Currently TDS concentrations near Guadalupe are measured at around 1500 mgl and in the center of the basin under the town of Santa Maria appear to be also be high (well 10N/34W-26H2) but again this is most likely due to recycling of shallow water from irrigation and may not be representative of the aquifer as a whole in that area. At the time of the writing of this report construction records to ascertain *screen* or *perforation* intervals for the water quality wells were not available but are being investigated for future reporting.

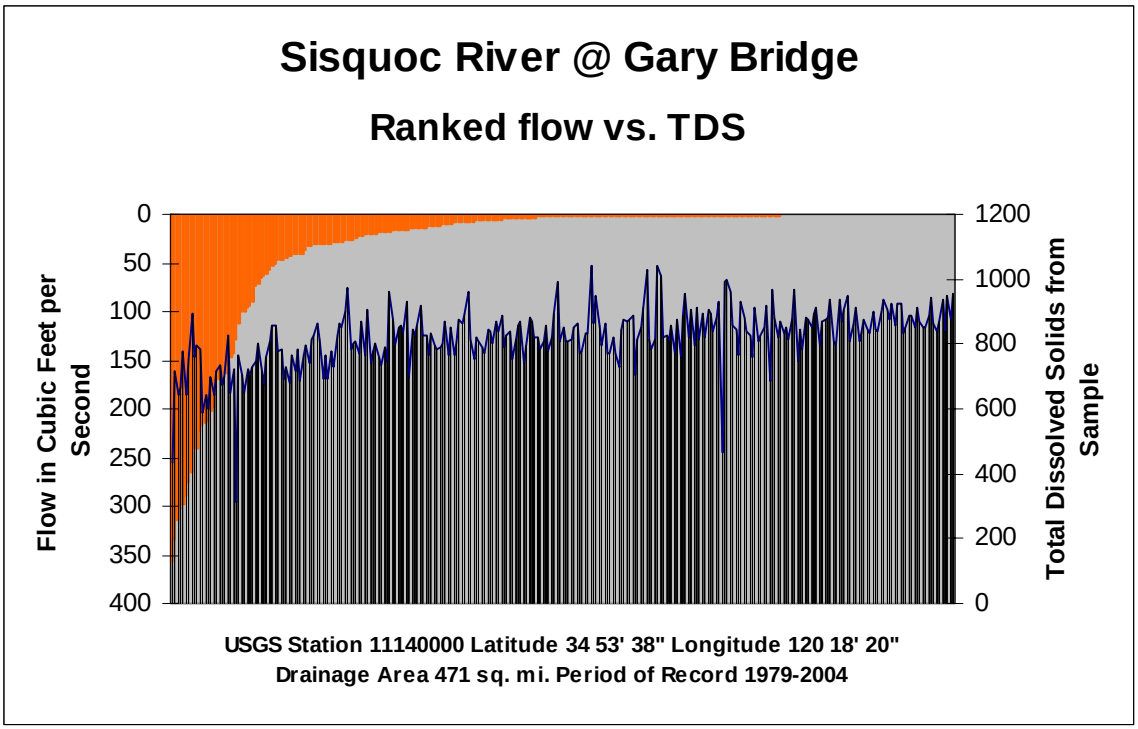
TDS levels increased significantly in Orcutt area wells after the 1930's but have remained relatively stable or even decreased since 1987. The importation and domestic use of State Water Project water now results in better quality discharge water from the City of Santa Maria treatment plant on Black Road and also from Laguna Sanitation District to the south. This may greatly aide future water quality within the basin. The table on the previous page lists recent TDS measurements made as a result for the County Water Resources-USGS monitoring program.

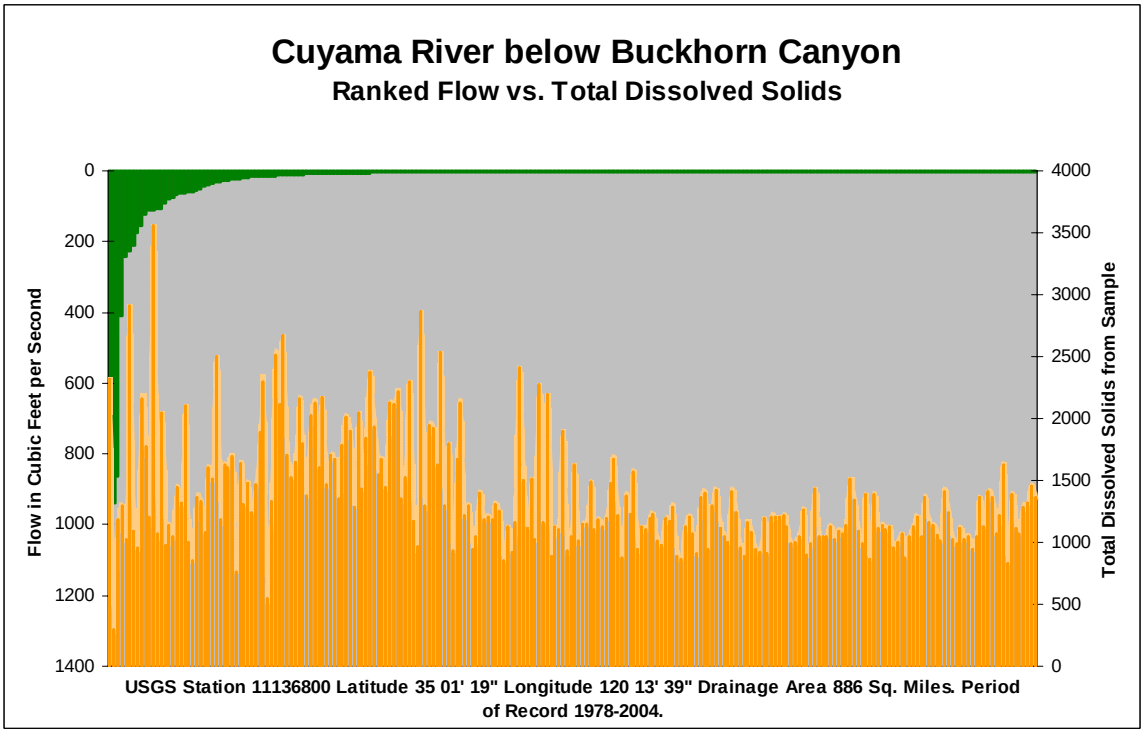


Nitrates-Sulfates

A study conducted by the State of California Regional Water Quality Control Board (1995) indicates that the basin is subject to nitrate contamination, particularly in the vicinity of the City of Santa Maria and in Guadalupe. The study shows that nitrate concentrations have increased from less than 30 mgl in the 1950's to over 100 mgl in the 1990's in some parts of the basin. It is again important to note that there is a significant difference in water quality between shallow and deep water. Movement between these different aquifer zones is not well documented and dependant on many factors.

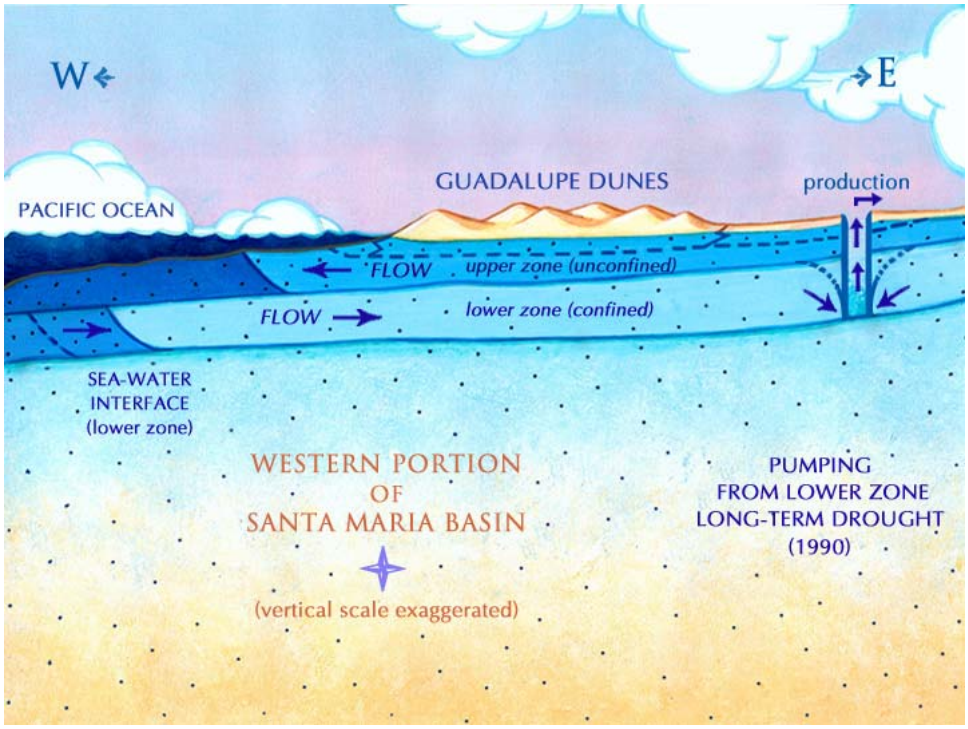
Certainly, the flushing of the basin from a combination of wetter climate and lower usage would help protect against water quality impairments.





Sea Water Intrusion

Coastal monitoring wells are measured biannually for any indication of seawater intrusion, to date there has been no evidence of seawater intrusion.



Conceptual Drawing of Sea-Water Interface Migration, Santa Maria Basin

Salt Water Intrusion Monitoring sites funded by Santa Barbara County-USGS

The concern of seawater intrusion is based on evidence that the Careaga Sand crops out on the ocean floor several miles west and there are no known barriers to seawater intrusion. Although it is possible that the seawater-fresh water interface has migrated shoreward during drought periods, the slope of groundwater has remained to the west in the westernmost part of the basin. The graphic on the previous page describes how this seawater fresh water interface can migrate during periods of basin overdraft:

Basin Wide “Salts Balance”

Sources of salt inflow to the Santa Maria Groundwater Basin include surface runoff, precipitation, M&I accretions and agricultural return flows. Salt disposal from the basin occurs through the processes of surface and subsurface outflow. The Water Agency estimated in 1977 that net salt addition to the basin was about 48,000 tons per year (Ahlroth et al) under 1975 conditions and that by 2000 it would be about 53,000 tons per year. A revised analysis of salt loading is a significant task and the Agency is unaware of any other work in this area to date.

Santa Maria Groundwater Basin Water Surface Contours

Spring 2004