

DEVELOPMENT OF SALT AND NUTRIENT MANAGEMENT PLANS IN CALIFORNIA IN ACCORDANCE WITH THE STATE RECYCLED WATER POLICY

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Salt and Nutrient Management Planning Goals and Implementation

Goals

The Recycled Water Policy (Policy) adopted by the State Water Resources Control Board (State Water Board, 2013a) states that local stakeholders, including municipalities, water and wastewater agencies, and others, will develop salt and nutrient management plans (SNMPs) for every groundwater basin in California. The SNMPs are due by May 2014, with a potential extension to May 2016 if significant progress has been made by May 2014. The development of SNMPs is consistent with the Policy goals to increase the use of recycled water from municipal wastewater sources, and streamline permitting of recycled water projects by the Regional Water Quality Control Boards (Regional Water Boards) while maintaining the quality of groundwater supplies. Another goal, as stated in the State Water Board's Draft Groundwater Workplan Concept Paper (State Water Board, 2013b) is to manage groundwater with regional leadership backed by State support and oversight.

General Elements

SNMPs are to include the following elements: a hydrogeologic overview of the basin, groundwater inventory, water quality, water balance, and a salt and nutrient balance. The plans should also include management strategies, plans for storm water and recycled water use, a monitoring program, and antidegradation analysis. Cost analysis and an implementation schedule are also important plan elements.

Implementation of Plans

Within one year of receipt of a SNMP, the Regional Water Boards will consider amending implementation plans for groundwater basins where water quality objectives (WQOs or groundwater quality standards) for salts and/or nutrients are being, or are threatening to be, exceeded (State Water Board, 2013a). Water Quality Control Plan (Basin Plan)¹ amendments should be designed to facilitate effective management of salt and nutrient inputs to groundwater on a watershed basis and allow efficient permitting of recycled water projects. Regional Water Boards may amend beneficial uses, WQOs, and monitoring plans as well as implementation plans. The State Water Board (2013b) encourages incorporation of the thresholds contained in the SNMPs into the Basin Plans.

¹Each Regional Water Board has at least one Basin Plan, which is a regulatory document that designates beneficial uses of water bodies and groundwater within the Regional Water Board's jurisdiction, and establishes water quality standards for protection of those beneficial uses. Basin Plans also include regional policies implemented by Regional Water Boards in permitting and regulation of wastewater treatment plants, water recycling plants, and other facilities that discharge waste to land or water bodies.

Roles of State Agencies

State Water Board

The State Water Board is responsible for establishing general policies that allow permitted activities while protecting groundwater quality and sustaining water supplies, and has taken a lead role in meeting the recycled water use goals set in the Recycled Water Policy. The State Water Board oversees the statewide general permitting of recycled water projects and was charged by statute with developing a general permit for irrigation uses of recycled water; this general permit was completed in July 2009. Additional responsibilities of the State Water Board include tracking of SNMP progress, providing support to Regional Water Boards, providing the public with information and approving Basin Plan amendments.

Regional Water Boards

Regional Water Boards are charged with protecting surface and groundwater resources, and issuing permits that include recommendations from the California Department of Public Health (CDPH). Regional Water Boards are to encourage the use of recycled water to the full extent of their authority. Regional Water Board functions which promote the use of recycled water include working with stakeholder groups toward SNMP completion, providing guidance to the public and stakeholder groups, reviewing SNMPs, issuing permits, and amending Basin Plans.

Interaction with other Agencies

The CDPH is responsible for protection of public health and drinking water supplies. CDPH is developing uniform water recycling criteria for indirect potable reuse and surface water augmentation, and is investigating the feasibility of direct potable reuse. The State Water Board and CDPH entered into a 1996 memorandum of understanding which states that CDPH is required to review and comment on each water recycling project and proposed use area prior to the Regional Water Board issuing a permit.

The California Department of Water Resources (DWR) reviews and updates the California Water Plan every five years. This plan includes evaluation of the amount of recycled water currently used and the potential for future recycled water use. The State Water Board and DWR jointly have the authority to distribute bond funding, which can be used to provide incentives for the use of recycled water.

Status of Statewide Salt and Nutrient Management Planning

Currently, approximately 91 percent by area of groundwater basins designated as priority basins by the State Water Board's Groundwater Ambient Monitoring and Assessment (GAMA) program (United States Geological Survey and State Water Board, 2003) are covered by inclusion in a stakeholder-managed salt and nutrient management planning group (Figure 1). The groups are headed mainly by municipalities, publicly owned treatment works, water agencies, and watermasters. The central valley salinity alternatives for long-term sustainability (CV-SALTS) is led by a collaboration of the State Water Board, the Central Valley Regional Water Board, and the Central Valley Salinity Coalition. Participants in salt and nutrient management planning groups include representatives from agriculture, cities, industry, environmental groups, and regulatory agencies. Funding for the plans is provided by the

planning group participants, DWR grants for integrated regional water management, and the State Water Board cleanup and abatement fund. A summary of SNMP progress is shown in Table 1.



Figure 1. Salt and Nutrient Management Plan Progress in California Groundwater Basins

Table 1. Salt and Nutrient Management Plan Summary

Region	Total SNMP Groups	Draft or final SNMPS Received	% Number of GAMA Priority Basins Covered	% Area of GAMA Priority Basins Covered	SNMPS Expected by 2014	SNMPS Expected by 2016 (Includes Expected by 2014)
North Coast	1	1	100 ¹	100 ^{1,2}	1	1
SF Bay	3	1	24	40 ³	3	3
Central Coast	10	1	34	57	5	7
Los Angeles	7	0	81	86	7	7
Central Valley	1	0	100 ¹	100 ¹	0	1
Lahontan	7	0	90	81	4	7
Colorado River	5	0	100 ¹	100 ¹	3	4
Santa Ana	1	1	100	100	1 (Completed 2004)	1 (Completed 2004)
San Diego	9	5	90	88	8	9
State Total	44	9	95	91	32	40

1 Regional Water Board plans to address basins not covered by SNMPS programmatically

2 Areas of Alexander subbasin and Ukiah Valley basin not available and not included in area percentage

3 Does not include volcanic aquifer

Statewide Challenges and Solutions

Coverage of Basins

Currently, approximately 91 percent by area of GAMA priority basins, and 47 percent by area of all basins, are covered by a SNMP. Preparation of SNMPS is voluntary, and stakeholder groups have not been formed for every basin in the state. Emphasis should continue to be placed on priority basins where data is available, salts and nutrients exceed or threaten to exceed WQOs, and the highest potential for water recycling benefits exists. Implementation of the GeoTracker GAMA assessment module recommended in the Groundwater Work Plan concept paper by State Water Board (2013b) will aid in data availability. The State and Regional Water Quality Control Boards (Water Boards) will continue to encourage and provide guidance for stakeholder groups. Some Regional Water Boards plan to cover salt and nutrient management of the remaining groundwater basins programmatically in their basin plans.

Antidegradation

In order for a recycled water project to be permitted, the proponent must show that the project will satisfy the requirements of the State Antidegradation Policy (State Water Board, 1968). These requirements include maintenance of high quality water until it is demonstrated that any change will be consistent with maximum benefit to the people of the state, not unreasonably affect present and anticipated beneficial use of the water, and not result in water quality less than that prescribed in policies as of the date on which such policies became effective. Best practicable treatment and control must also be implemented such that pollution or nuisance will not occur. Stakeholders are requesting guidance from the Regional Water Boards regarding how to perform antidegradation analysis for SNMPs. Some basin plans lack numerical WQOs, and stakeholders are questioning some existing WQOs. Other issues needing clarification include the determination of baseline concentrations, how to allow for the complex flow patterns and slow mixing rate of groundwater, level of effort for low-threat discharges, definitions of maximum benefit and best practicable treatment and control, and monitoring of compliance. As discussed in the Groundwater Workplan Concept Paper (State Water Board, 2013b), the State Water Board has made it a priority to clarify how the Antidegradation Policy applies to groundwater. Focused stakeholder group meetings were held during the fall of 2013 to receive input on the issues needing clarification, and the project is in the scoping stage now. Until clarification is made, Regional Water Boards will continue to work with stakeholders to propose solutions.

Peer Review

The Health and Safety Code Section 57004 requires Cal/EPA organizations to submit for external scientific review the scientific basis and scientific portion of proposed policies, plans and regulations to determine if these policies, plans and regulations are based on sound scientific knowledge, methods, and practices. SNMPs that are used as the scientific bases for basin plan amendments will require external scientific review along with the related basin plan amendment. Because this is a large undertaking and all of the SNMPs are due within a relatively narrow time period, the State Water Board is tracking quarterly the estimated completion dates of SNMPs that will require review and is planning accordingly. Regional Water Boards are reviewing the SNMPs prior to their submittal for external review.

California Environmental Quality Act (CEQA)

CEQA will need to be followed for the basin plan amendment process, and each situation requiring CEQA is unique. A stakeholder that is a public agency with jurisdiction over the basin(s) can be the lead agency; in that case, the Regional Water Board should actively participate as a responsible agency, and can use the stakeholder CEQA document when adopting the basin plan amendment. The Regional Water Board can also be the lead agency and either request that the stakeholders submit the documentation or prepare it in-house. Scoping meetings should be noticed and held by the Regional Water Boards, but may be conducted jointly with other agencies.

Overview of Stakeholder Process in San Diego Region

The Policy recognizes that salt and nutrient management plans are to be developed and funded by local water and wastewater agencies in collaboration with other identified local stakeholders (State Water Board, 2013a). To kick off salt and nutrient management planning efforts in the San Diego Region, the San Diego Regional Water Quality Control Board (San Diego Water Board) coordinated with the

Southern California Salinity Coalition (SCSC) and the San Diego County Water Authority (SDCWA)² to hold four salt and nutrient management workshops. The salt and nutrient management planning workshops were attended by water and wastewater agencies and other interested stakeholders in the San Diego Region. Topics discussed at the workshops included: overview and goals of the salt and nutrient management planning process, the need to identify additional stakeholders and encourage further stakeholder participation, and how development of salt and nutrient management plans (SNMPs) will affect permitting of recycled water projects. During the workshops, it was concluded that development of SNMPs can help protect groundwater quality and provide San Diego Water Board staff with reliable information to streamline recycled water permits. During the workshops, local agencies also requested additional guidance in development of their SNMPs.

The SCSC and SDCWA together with local stakeholders funded the development of the *Guidelines for Salinity Management Planning in the San Diego Region* (guidelines) to facilitate development of SNMPs in the San Diego Region. The guidelines were endorsed by the San Diego Water Board on November 10, 2010. The guidelines established a standardized framework and approach for development of SNMPs in the San Diego Region. The guidelines also established a management approach for prioritizing the groundwater basins in the San Diego Region. The guidelines grouped the groundwater basins into five tiers, namely Tiers A through E. The tiers are based on factors such as storage volumes and yield, level of municipal water supply use, water quality considerations, and extent to which the basin has been studied. The highest level of effort is required for developing the SNMPs for the Tier A basins, while the lowest level of effort is required for developing SNMPs for Tier D and E basins. This approach is consistent with the Policy, which recognizes that the degree of specificity of the SNMPs should be dependent on factors such as size and complexity of the basin, source water quality, aquifer water quality, etc. (State Water Board, 2013a).

Tiered Approach for Developing Salt and Nutrient Management Plans

The jurisdiction of the San Diego Water Board includes most of San Diego County, and parts of southwestern Riverside and southwestern Orange County. As specified in the guidelines, a tiered approach is being utilized for prioritizing development of SNMPs in the San Diego Region (Welch, 2010). Table 2 provides a description of each of the tiers and identifies the basins in each tier. Figure 2 shows the location of all the groundwater basins within the San Diego Region.

Table 2. Classification of Groundwater Basins in the San Diego Region¹

Tier	Description	Groundwater Basin
A	These basins have a storage capacity of 60,000 acre feet (ac-ft) or more and have significant municipal groundwater use. These basins	San Juan, Lower Santa Margarita, Temecula, San Pasqual/Hodges, Santee

² The SDCWA is a public agency serving the San Diego area as a wholesale supplier of water from the Colorado River and Northern California. The SDCWA's member agencies include municipalities, the United States Marine Corps Base Camp Pendleton, and all of the water and wastewater agencies in San Diego County.

Tier	Description	Groundwater Basin
	have also been extensively studied, and have relatively good water quality.	
B	These basins are moderately sized and have capacities of 50,000 ac-ft or less. Groundwater from Tier B basins is used for irrigation or as a source of municipal supply. WQOs for Total Dissolved Solids (TDS) in these basins range from 500-1,000 milligrams per liter (mg/L), and wastewater and recycled water used within these basins periodically exceeds WQOs. Yield from these basins are less than the Tier A basins.	San Mateo, San Onofre, Las Flores, Pala/Pauma, San Marcos, Escondido, Santa Maria, Poway, Middle Sweetwater
C	These are shallower basins with capacities less than 20,000 ac-ft. WQOs for TDS in these basins range from 500-1,000 mg/L, and wastewater and recycled water used within these basins periodically exceeds WQOs. These basins have relatively small storage capacities and well yields. Yield from these basins are less than the Tier B basins.	Valley Center, Keys Creek, Vista, Miramar, Gower, National City
D	These are coastal or inland groundwater basins in which WQOs for TDS exceed 1,200 mg/L. Recycled water used in these basins is typically below the WQO for TDS.	Oceanside Mission, Mission Valley, Lower Sweetwater, Bonsall/Moosa, Batiquitos, Buena Vista, Agua Hedionda, Encina, San Elijo, Lower San Dieguito, El Cajon, Otay, Lower Tijuana
E	These basins are located in the rural eastern portion of San Diego County in areas where recycled water is currently not being used.	Coahilla, Santa Ysabel, Warner, Pine Valley, Descanso, Potrero, Campo, Cottonwood, and other small similar basins

1 See Table 3-3 of Guidelines (Welch, 2010)

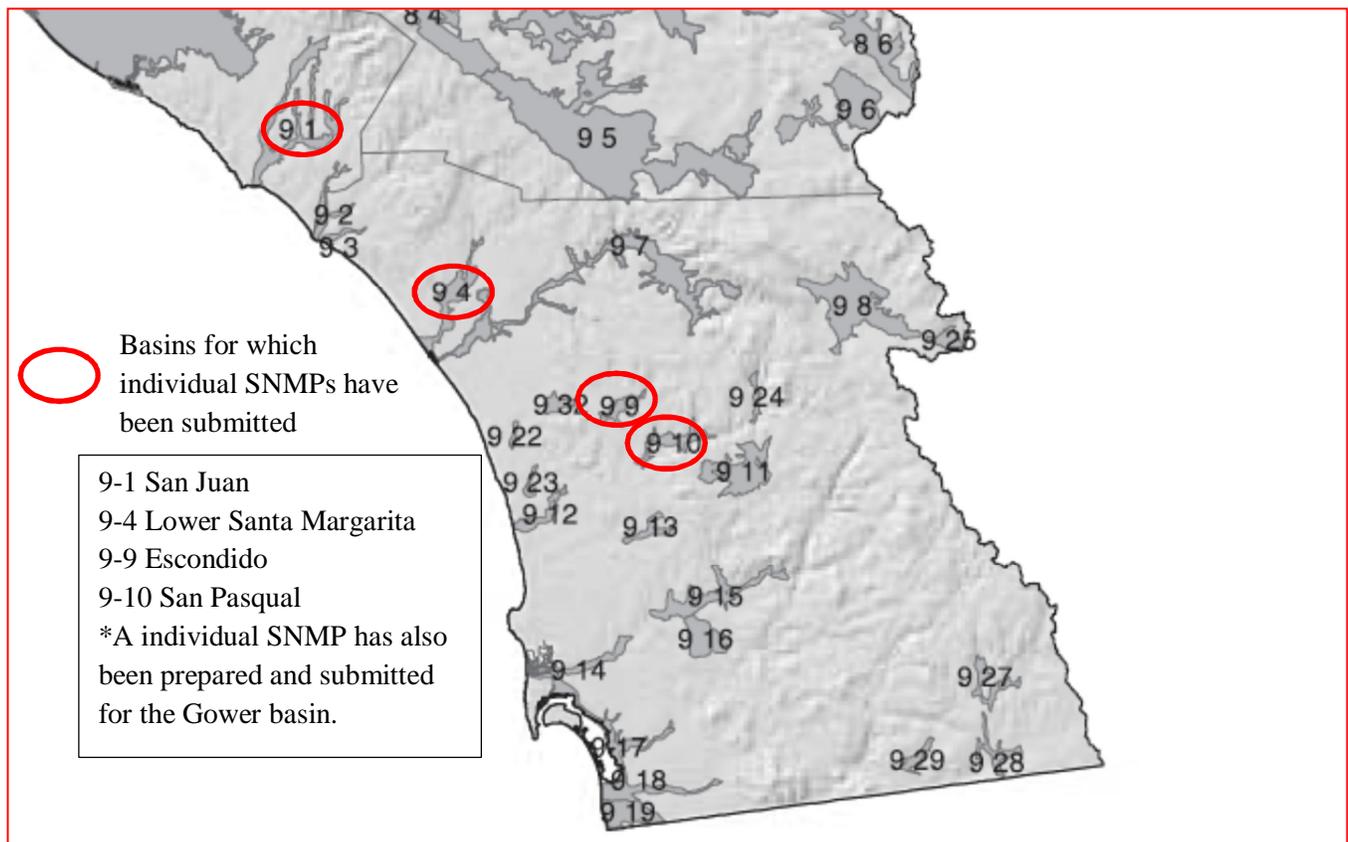


Figure 2. Location of Groundwater Basins in the San Diego Region

Status of San Diego Region Salt and Nutrient Management Plans

Local agencies are in the process of developing SNMPs for all five Tier A basins in the Region. SNMPs are also being developed for three of the nine Tier B basins, and for one of the six tier C basins. The SDCWA has incorporated SNMP elements for Tier D and E basins in the next update of the Integrated Regional Water Management (IRWM) Plan. All the SNMPs being developed are on schedule to be completed by the May 2014 deadline. The San Diego Water Board and the SDCWA have reached out to local agencies operating in the Tier B and C Basins without a planning process to encourage them to begin developing SNMPs; however, no progress has been made to date. These basins are the Pala/Pauma, San Marcos, Santa Maria, Poway, Middle Sweetwater, Valley Center, Keys Creek, Vista, Miramar, and National City groundwater basins. The San Diego Water Board will consider updating Recycled Water Permits for lead local agencies in these basins to include a requirement to develop and submit a SNMP if it is unsuccessful in getting the agencies to voluntarily develop SNMPs.

The guidelines recommend a five step management approach for developing SNMPs in the San Diego Region. These five steps are initial basin characterization, identification and quantification of salt and nutrient sources, supplemental monitoring, salt and nutrient management strategies, and assessment of plan effectiveness. To date, draft SNMPs have been submitted to the San Diego Water Board for the Lower Santa Margarita, San Juan, San Pasqual, Gower, and Escondido basins. Tables 3 and 4 below provide a brief summary of the submitted SNMPs.

Table 3. Basin Characterization Summary of Submitted Salt and Nutrient Management Plans

Basin	Tier	Lead Stakeholder	Constituents of Concern	Groundwater Quality (mg/L)	Water Quality Objectives (mg/L)¹
Lower Santa Margarita (Brown and Caldwell, 2012)	A	USMC Base Camp Pendleton	TDS, chloride, sodium, and nitrate	Average TDS(855), average nitrate (1), average chloride (166), average sodium (123)	TDS (750), nitrate (10)
San Pasqual (CH2M Hill, 2013)	A	City of San Diego	TDS and nitrate	TDS range (10-2,160) average TDS (1,282), nitrate range (4-40), average nitrate (40)	TDS (1000), nitrate (10)
San Juan (HDR and Wildermuth Environmental Inc., 2013).	A	South Orange County Wastewater Authority	TDS and nitrate	TDS range (300-2,300), nitrate range (non-detect-15)	TDS(500-1200), nitrate (10 or 45) ²
Escondido (SAIC, 2013)	B	Rincon Del Diablo Municipal Water District	TDS, nitrate, sulfate, chloride, and iron	TDS range (720-4,500), average TDS (1,200), nitrate range (5-160), average nitrate (38), sulfate range (87-1,000), average sulfate (320) chloride range (120-1,700), average chloride (310), iron range (0.004-5.0), average iron (0.2)	TDS (1000), sulfate (400), chloride (300), nitrate (10)
Gower (Todd Engineers, 2013)	C	Ramona Municipal Water District	TDS and nitrate	TDS range (700-1,500) Average nitrate in residential areas (25-30)	TDS (600), nitrate (5)

¹ See Table 3.3 of the Basin Plan (San Diego Water Board, 1994)

² WQOs for TDS range from 500-1200mg/L depending on hydrologic area (HA) within the basin. The WQO for nitrate is 45 mg/L throughout the basin except for the San Joaquin Hills, Prima Deshecha, and Segunda Deshecha HAs in which the WQO for nitrate is 10 mg/L.

The Policy requires that SNMPs include implementation measures to manage salt and nutrient loading in groundwater basins on a sustainable basis (State Water Board, 2013a).³ The Policy also specifies that the SNMPs shall be tailored to address water quality concerns in each groundwater basin and shall implement provisions for all sources of salt and/or nutrients to groundwater basins, including recycled water irrigation projects and groundwater recharge reuse projects (State Water Board, 2013a).⁴ As a result, SNMPs will include proposed implementation measures to manage salts and nutrients,

³ See section 6.b.3.e of the Policy

⁴ See section 6.b.1.b of the Policy

particularly in basins where WQOs are being exceeded or threatened to be exceeded. Table 4 includes a list of proposed management measures that were included in SNMPs submitted to the San Diego Water Board.

Table 4. Summary of Implementation Measures and Planning Outcomes

Basin	Proposed Implementation Measures	Does Assimilative Capacity Exist?	Does SNMP Recommend Amending Water Quality Objectives?
Lower Santa Margarita (Brown and Caldwell, 2012)	Utilize reverse osmosis for groundwater supply; eliminate water softener use; recycled water injection as a salt water intrusion barrier; groundwater recharge projects; upstream salt reductions; increased recycled water use.	Assimilative capacity exists for nitrate. Small amount of assimilative capacity exists for TDS in a subset of the basin	No
San Pasqual (CH2M Hill, 2013)	Groundwater monitoring; proper abandonment of groundwater wells and inspecting well backflow preventers; periodic inspection of fertigation and chemical injection systems for irrigation operations; adequate septic system maintenance; nutrient management at agricultural and landscape irrigation operations; irrigation water management, stormwater management	No assimilative capacity exists for TDS or nitrate. Average nitrate concentrations, however, are below maximum contaminant level (MCL) of 45 mg/L	No
San Juan (HDR and Wildermuth Environmental Inc., 2013).	Develop and implement a groundwater and surface water monitoring program. Next steps after monitoring include updating the SNMP, performing an antidegradation analysis, selecting best management practices, and proposing basin plan amendments.	Assimilative capacity for TDS only exists in uppermost parts of the basin. Assimilative capacity exists for nitrate in most of the basin.	Recommends raising WQO for TDS for the Middle Trabuco hydrologic subarea (small portion of basin) from 750 to 1,200 mg/L.
Escondido (SAIC, 2013)	Imported water salinity control; expanding recycled water distribution; utilize brine line for salt export; utilize reverse osmosis/microfiltration treatment for recycled water; Indirect Potable Reuse; expand sewage collection system and reduce septic system use; implement best management practices for agricultural fertilizer application.	No assimilative capacity exists for TDS or nitrate. Average nitrate concentrations, however, are below MCL for nitrate.	No

Basin	Proposed Implementation Measures	Does Assimilative Capacity Exist?	Does SNMP Recommend Amending Water Quality Objectives?
Gower (Todd Engineers, 2013)	Repair leaks in sanitary sewer system; increase residential stormwater infiltration; install percolation basins along ephemeral streams; discontinue using reverse osmosis.	No assimilative capacity exists for TDS or nitrate. Average nitrate concentrations, however, are below MCL for nitrate.	Yes. Recommends raising WQO for nitrate from 5 to 45 mg/L.

The Policy requires that Regional Water Boards revise the implementation chapters of their Basin Plans based on the SNMPs for those groundwater basins where WQOs for salts and nutrients are being, or are threatening to be exceeded (State Water Board, 2013a). The San Diego Water Board plans to amend its Basin Plan (San Diego Water Board, 1994) to incorporate elements of the completed SNMPs. As part of the Basin Plan amendment effort, the San Diego Water Board will consider raising the WQO for nitrate to the MCL (45 mg/L) in all hydrologic areas or basins in which the WQO is below the MCL. This change will allow for increased use of recycled water without adversely affecting use of groundwater supplies.

Conclusions

Statewide, stakeholders have put forth a large effort to complete the SNMPs. Approximately 91 percent of GAMA priority basin areas and 47 percent of statewide groundwater basin areas (based on area numbers from the US Geological Survey and State Water Board [2003] and Department of Water Resources [2003]) are covered by SNMPs. Because only a small portion of the SNMPs have been received by Regional Water Boards to date, it remains to be seen what Basin Plan amendments will result from this effort. Based on tracking data collected by the State Water Board, it is anticipated that at least seven Basin Plan amendments will be considered for adoption by the Regional Water Boards.

Information presented in the SNMPs submitted suggests that several of the basins in the San Diego Region have little or no assimilative capacity for additional TDS discharges. The SNMPs also indicate that average concentrations of nitrate in groundwater in several of the groundwater basins exceed the applicable WQO for nitrate, but are below the MCL for nitrate. Most of the SNMPs submitted do not recommend that the San Diego Water Board change its WQOs for TDS. The San Diego Water Board will, however, consider raising the WQO for nitrate to the MCL in basins where the WQO is below the MCL. The SNMPs also include implementation measures to manage salt and nutrient loading to groundwater. The San Diego Water Board plans to amend the implementation section of its Basin Plan to incorporate applicable implementation measures proposed in the SNMPs.

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