

**California Regional Water Quality Control Board  
Santa Ana Region**

**[DATE-TBD]**

**ITEM: [TBD]**

**SUBJECT: Public Hearing to Consider Proposed Basin Plan Amendment to Revise  
the Water Quality Objective for Nitrate-Nitrogen in the Chino-South  
Groundwater Management Zone**

## EXECUTIVE SUMMARY

Federal law requires states to establish water quality standards (beneficial uses, water quality criteria, and an antidegradation policy) for all surface water bodies within the state's jurisdiction and to review those standards at least once every three years. The Porter-Cologne Water Quality Control Act (Division 7, "Water Quality," of the California Water Code) establishes similar requirements in state law for both surface waters and groundwaters. For the Santa Ana Region, these standards are established in the Water Quality Control Plan for the Santa Ana River Basin (aka "Basin Plan"). In California, water quality criteria are known as "water quality objectives."

Regional Board staff recommends that Table 4-1 in the Basin Plan be amended to revise the water quality objective for Nitrate as nitrogen in the Chino-South Groundwater Management Zone (GMZ) from its current value of 4.2 mg/L to a new value of 5.0 mg/L.

The proposed Basin Plan amendment is consistent with the state's antidegradation policy (State Water Resources Control Board [SWRCB] Resolution No. 68-16). The proposed change to the objective would not result in adverse impacts on municipal and domestic supply or other beneficial uses. Best practicable treatment and control of wastewater discharges that results in water quality consistent with the maximum benefit to the people of the state would continue to be required and implemented. Implementation of the revised objective in National Pollutant Discharge System (NPDES) permits issued for discharges of pollutants to surface waters that recharge the Chino South GMZ will be consistent with applicable federal anti-backsliding regulations since the nitrogen effluent limitations would not be less stringent than those currently in place for permitted wastewater discharges.

The current nitrate-nitrogen objective of 4.2 mg/L was established by the Regional Board as part of a larger Basin Plan update in 2004 (adopted under Resolution No. R8-2004-0001) and is intended to represent the best water quality attained since the state antidegradation policy was established in 1968. This "antidegradation objective" was computed as the volume-weighted average nitrate-nitrogen concentration in the Chino-South GMZ using water quality sampling data collected between 1954 and 1973.

As part of the same 2004 Basin Plan amendment, the Regional Board approved updated Waste Load Allocations (WLA) for nitrogen (and total dissolved solids [TDS]) to prevent degradation of water quality in the Chino-South GMZ (and other GMZs) that are recharged by flows in the Santa Ana River system. These WLAs are the basis for NPDES permit effluent limitations on nitrogen (and TDS) in treated municipal effluent (recycled water) discharges to those segments of the Santa Ana River that overlie the Chino-South GMZ. All affected NPDES permits include effluent limitations that are consistent with the approved WLAs. This includes a limit for total inorganic nitrogen (TIN) of 10 mg/L.<sup>1</sup>

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<sup>1</sup> The concentration of Total Inorganic Nitrogen (TIN) can be approximated (in the range of pH conditions normally observed in the Santa Ana stream system) as the sum of Nitrate-Nitrogen + Ammonia + Nitrite. Ammonia and

Nevertheless, over time, the average nitrate-nitrogen concentration in the Chino-South GMZ has been rising. The most recent estimate, based on sampling data collected between 1993 and 2012, indicates that the volume-weighted average nitrate-nitrogen concentration now stands at about 28 mg/L. The long-term increase is caused by legacy loads of nitrogen that resulted from past agricultural/livestock practices and are moving through the vadose zone. Urbanization has since displaced most of these former agricultural operations but water quality in the Chino-South GMZ may continue to be adversely affected for many years until nitrates are flushed from the vadose zone. Prior experience in the Pomona area, where urban development displaced the once-dominant agricultural land used, suggests that it takes about 50 years to purge the vadose zone.

Until then, the discharge of large quantities of treated municipal effluent at no more than 10 mg/L TIN to Reach 3 of the Santa Ana River, which overlies and recharges the Chino-South GMZ, will help reduce the average nitrate-nitrogen concentration in the Chino-South GMZ. The proposed Basin Plan Amendment will accommodate these ongoing discharges without requiring significant expenditures to provide additional treatment that might otherwise be required to assure objective compliance during drought periods. This additional treatment and associated costs are not justified by the marginal water quality improvements that might result. These marginal water quality improvements are not necessary to assure the continued protection of beneficial uses. In short, the proposed amendment would assure that the best practicable treatment and control facilities now in place would continue to provide the highest water quality consistent with the maximum benefit to the people of the state, as required by the antidegradation policy.

At present, a detailed fate and transport analysis is required to demonstrate that the current effluent limits controlling the average nitrogen concentration in recycled water are adequate to prevent water quality degradation in the Chino-South GMZ. A sophisticated Wasteload Allocation Model (WLAM), which was reviewed and approved by the Regional Board when the Basin Plan was updated in 2004, is used to make this demonstration. The WLAM is also used to make adjustments to the effluent limits, if necessary.

The WLAM keeps track of all the recycled water discharged to the Santa Ana River system and accounts for all of the added runoff from precipitation in the watershed. The model also makes appropriate adjustments for natural physical and biological processes that tend to reduce nitrate-nitrogen concentrations as water flows downstream or percolates to groundwater.

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nitrite may be transformed into nitrate-nitrogen by natural chemical and biological processes in the environment. The Regional Board takes this into consideration by imposing effluent limits for TIN to assure attainment of nitrate-nitrogen objectives in the receiving water.

In the area of the Santa Ana River that overlies the Chino-South GMZ, the Regional Board has determined that 50% of the nitrogen measured at the surface is lost as the water seeps beneath the streambed and into the groundwater. Thus, recycled water that is discharged with an average TIN concentration of 10 mg/L pursuant to existing NPDES permit limits will have an average concentration no greater than 5 mg/L by the time it reaches the Chino-South GMZ. However, to assure that the volume-weighted average nitrate-nitrogen concentration of all water recharged is less than the 4.2 mg/L antidegradation objective, sufficient dilution of recycled water discharges by stormwater must be available. . Prolonged drought and enhanced conservation efforts (e.g. stormwater capture and harvesting) have made it more difficult to demonstrate that there will continue to be adequate natural dilution available to comply with the objective consistently.

If the nitrate-nitrogen objective for the Chino-South GMZ is increased to 5 mg/L, dischargers will no longer need to rely on dilution to meet that objective. Given the 50% nitrogen loss that occurs as water from the Santa Ana River percolates to the Chino-South GMZ, the average nitrogen concentration in recycled water reaching the aquifer will be no greater than 5 mg/L (with or without dilution) as long as the municipal effluent continues to meet the current NPDES permit limits, which prohibit discharges with an average TIN concentration greater than 10 mg/L.

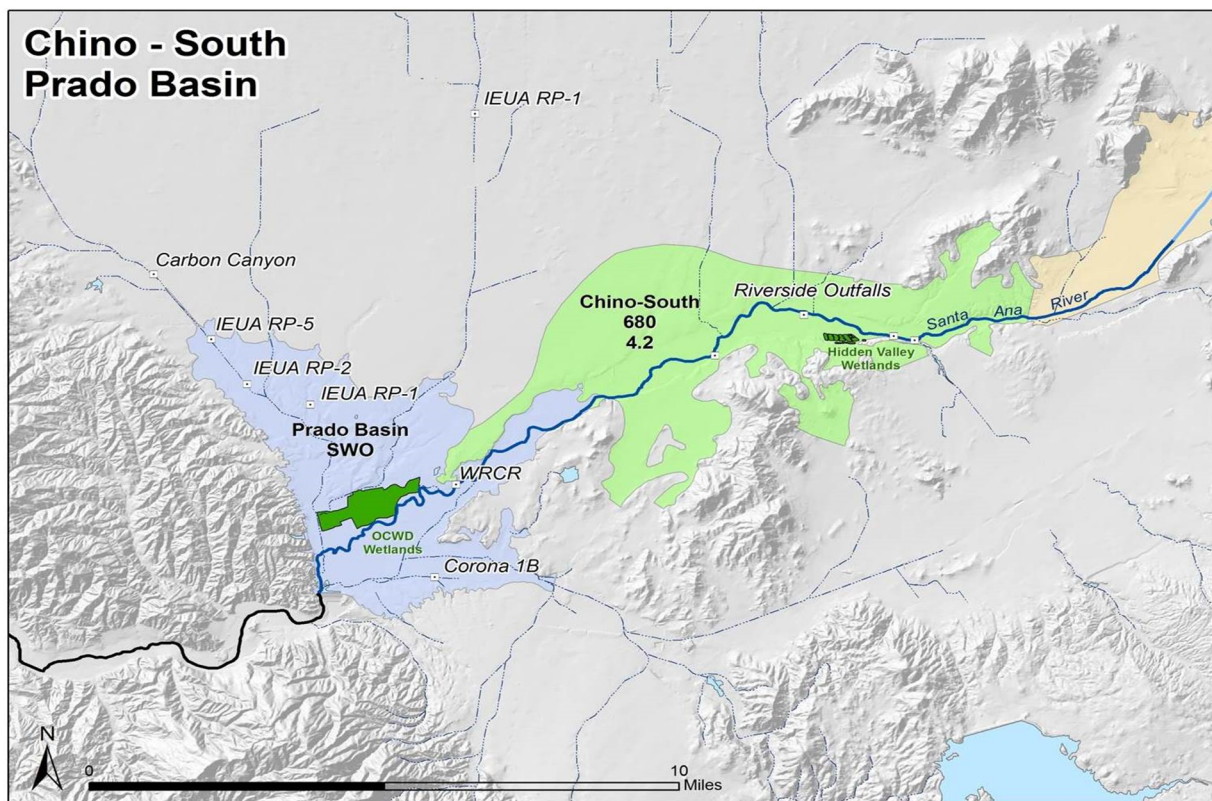
The Chino-South GMZ is designated MUN in the Basin Plan because groundwater from this area is beneficially used as a source for domestic and municipal water supply. The Primary Maximum Contaminant Level (MCL) for nitrate-nitrogen in drinking water is 10 mg/L. The proposed water quality objective of 5 mg/L is one-half this value and, therefore, provides a 100% safety factor. Existing and potential MUN beneficial uses, and other beneficial uses that might be affected by nitrogen concentrations in groundwater, will remain fully protected.

Since the current average nitrate-nitrogen concentration in the Chino-South GMZ is already 28 mg/L, raising the water quality objective to 5 mg/L will not cause existing water quality to degrade. Rather, discharges consistent with the proposed water quality objective of 5 mg/L will help mitigate and reverse the long-term degradation trend caused by other legacy sources of nitrate-nitrogen contaminating the vadose zone and thence underlying groundwater. For these reasons, staff recommends adoption of the proposed Basin Plan amendment to revise the water quality objective for nitrate-nitrogen in the Chino-South GMZ from 4.2 mg/L to 5.0 mg/L.

## 1. INTRODUCTION

The Chino-South Groundwater Management Zone (GMZ) is located in the extreme northwest corner of Riverside County directly under Reach 3 of the Santa Ana River (see Fig. 1). The Chino-South GMZ was established by the Santa Ana Regional Water Quality Control Board ("Regional Board") when groundwater boundaries were realigned and the Basin Plan was updated in 2004.<sup>2</sup> The GMZ is designated MUN to acknowledge the fact that the aquifer serves as a source of domestic or municipal drinking water supply. Other designated beneficial uses include agricultural supply (AGR) industrial service supply (IND), and industrial process supply (PROC).

**Fig.1 Chino-South Groundwater Management Zone<sup>3</sup>**



<sup>2</sup> Res. No. R8-2004-0001 (January 22, 2004).

<sup>3</sup> Map provided courtesy of Wildermuth Environmental, Inc.

In 2004, the Regional Board also adopted a water quality objective of 4.2 mg/L for nitrate-nitrogen in the Chino-South GMZ. The objective was computed as the volume-weighted average concentration of nitrate-nitrogen based on all sampling data collected beginning in 1954 and ending in 1973 (i.e., the baseline evaluation period).<sup>4</sup>

To minimize the risk of methemoglobinemia (aka "blue baby syndrome"), California has established a Primary Maximum Contaminant Level (MCL) of 10 mg/L nitrate-nitrogen for drinking water.<sup>5</sup> This MCL is commonly applied as a water quality objective where surface or groundwaters are designated MUN. However, because water quality in the Chino-South GMZ during the baseline evaluation period was better than necessary to protect the designated beneficial use, the nitrate-nitrogen objective was set to 4.2 mg/L in order to preserve and maintain this higher quality as is required by the state's antidegradation policy.<sup>6</sup>

In 2004, when the Chino-South GMZ and 4.2 mg/L antidegradation nitrate-nitrogen objective were first established, more recent data showed that water quality was already degrading. Groundwater samples collected for the 20-year period beginning in 1978 and ending in 1997 showed that the nitrate-nitrogen concentration had increased by more than 100% to a volume-weighted average of 8.8 mg/L. Routine reassessments, performed every three years, indicate that nitrate-nitrogen levels continue to rise in the Chino-South GMZ (see Fig. 2). The most recent computation, using data collected in the 20-year period from 1993 to 2012, indicates that the volume-weighted average nitrate-nitrogen concentration is now approximately 28 mg/L.

The pattern of nitrate-nitrogen concentrations evident from comprehensive well monitoring data throughout the Chino-South GMZ indicates that the long-term degradation of water quality is most likely due to past land use practices in the area. Nitrates that originated from widespread use of fertilizer or the dairy operations that were once prevalent in the area have been slowly seeping into the groundwater for many years. Most of these legacy nitrate loads occurred when there was little or no regulatory control over such discharges. Today, most of these agricultural operations have been displaced by urbanization. But, the problem will continue until the excess nitrates are finally flushed from the vadose zone - a process that usually requires several decades.

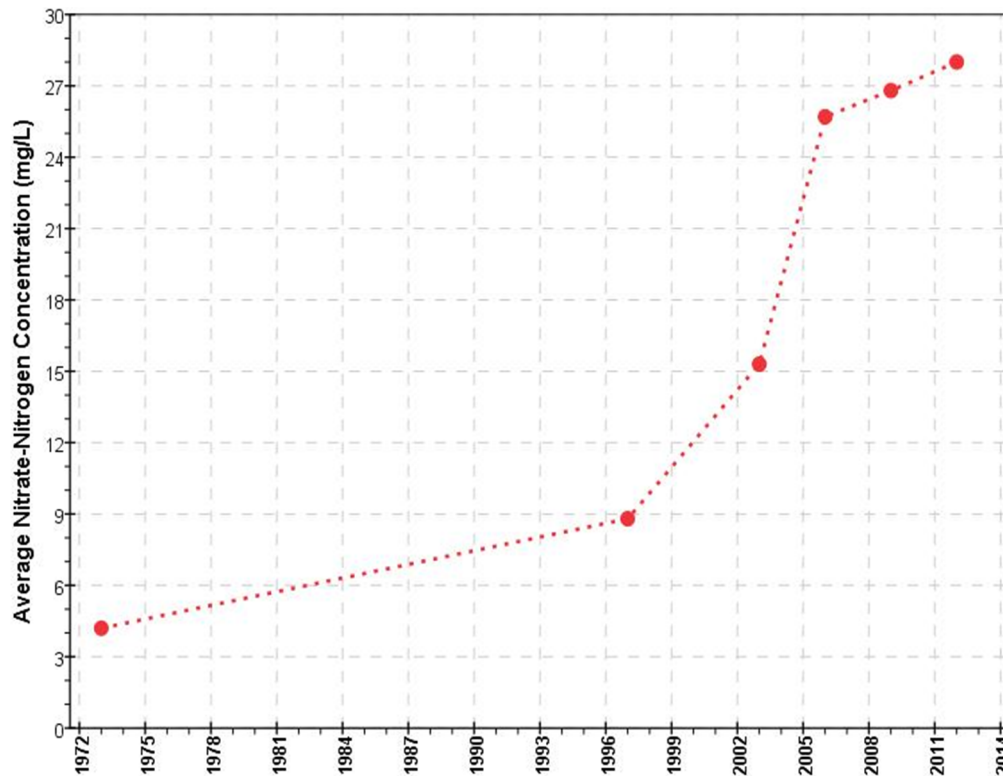
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<sup>4</sup> Wildermuth Environmental, Inc. TIN/TDS Study Phase 2A of the Santa Ana Watershed, Development of Groundwater Management Zones, Estimation of Historic and Current TDS and Nitrogen Concentrations in Groundwater, Final Technical Memorandum. July 27, 2000.

<sup>5</sup> 22 CCR §64431(a); see Table 64431-A: Maximum Contaminant Levels for Inorganic Chemicals.

<sup>6</sup> State Water Resources Control Board Resolution No. 68-16: Statement of Policy with Respect to Maintaining High Quality Waters in California. (October 28, 1968).

**Fig. 2: Long-term Trend for Average Nitrate-Nitrogen Concentrations in the Chino-South GMZ<sup>7</sup>**



Because the current ambient average concentration (28 mg/L) is greater than the applicable water quality objective (4.2 mg/L), the Regional Board has determined that there is no assimilative capacity for nitrate-nitrogen in the Chino-South GMZ. When permitting waste discharges to such basins, the State Water Board has declared that:

"Where the constituent in a groundwater basin is already at or exceeding the water quality objective, the Regional Board must set [effluent] limitations no higher than the objectives set forth in the Basin Plan. Exceptions to this rule may be granted where it can be shown that a higher discharge limitation is appropriate due to system mixing or removal of the constituent through percolation through the ground to the aquifer."<sup>8</sup>

<sup>7</sup> Wildermuth Environmental, Inc. Recomputation of Ambient Water Quality in the Santa Ana Watershed for the Period 1993 to 2012. Technical Memorandum prepared for the Santa Ana Watershed Project Authority Basin Monitoring Program Task Force. August, 2014. (see Table 3-2 in original).

<sup>8</sup> SWRCB Order No. WQ-81-5: In the Matter of the Petition of the City of Lompoc for Review of Order No. 80-03 (NPDES Permit No. CA 0048127), California Regional Water Quality Control Board, Central Coast Region. (March 19, 1981).

The Regional Board relies on a Waste Load Allocation Model (WLAM) to derive appropriate discharge limitations for recycled water discharges to the Santa Ana River system while taking into account the nitrate-nitrogen reductions that occur through system mixing or as a result of percolation through the streambed sediments.<sup>9</sup> The Regional Board accepted and approved the WLAM as part of the 2004 Basin Plan update.<sup>10</sup>

The WLAM takes into account system mixing using more than 60 years of daily precipitation and streamflow data to estimate the volume and quality of stormwater runoff draining to the Santa Ana River. The WLAM also accounts for the nitrate-nitrogen removal that occurs as water flows downstream and percolates through the vadose zone. The Regional Board has approved a site-specific nitrogen loss coefficient of 50% for streambed recharge to groundwater where the Santa Ana River overlies the Chino-South GMZ.<sup>11</sup>

The WLAM is periodically updated and re-run to adjust for changes in land use, wastewater discharges and precipitation patterns. The most recent update, completed in early 2015, shows that the long-term (63-year) average concentration of Total Inorganic Nitrogen (TIN)<sup>12</sup> in water recharging the Chino-South GMZ from Reach 3 of the Santa Ana River ranges from 4.03 mg/L to 4.14 mg/L, depending on how much recycled water is discharged.<sup>13</sup> This suggests that the current NPDES permit limits, which specify an average annual TIN concentration no greater than 10 mg/L, will assure compliance with the nitrate-nitrogen objective for the Chino-South GMZ over the long run.<sup>14</sup>

Data from the most recent WLAM analysis also indicates that the highest average concentration of TIN in water recharging to the Chino-South GMZ corresponds to periods with lower than average precipitation (droughts) and, therefore, less dilution from the related runoff. Review of the results show that during the driest 10-year portion of the entire 63 year meteorological simulation period, the maximum average concentration of TIN in water recharging to the Chino-South GMZ is expected to range from 4.25 mg/L to 4.34 mg/L depending on how much treated effluent is recycled vs. discharged (see Table 1).<sup>15</sup>

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<sup>9</sup> Wildermuth Environmental, Inc. TIN/TDS Study - Phase 2B of the Santa Ana Watershed, Wasteload Allocation Investigation Technical Memorandum. October, 2002.

<sup>10</sup> Res. No. R8-2004-0001 (January 22, 2004).

<sup>11</sup> See Basin Plan, Chapter 5 Implementation, TDS and Nitrogen Management, III. TDS/Nitrogen Management Plan, B. TDS and Nitrogen Regulation, 3 Nitrogen Loss Coefficients.

<sup>12</sup> The concentration of Total Inorganic Nitrogen (TIN) can be approximated (in the range of pH conditions normally observed in the Santa Ana stream system) as the sum of Nitrate-Nitrogen + Ammonia + Nitrite. Ammonia and nitrite may be transformed into nitrate-nitrogen by natural chemical and biological processes in the environment. The Regional Board takes this into consideration by imposing effluent limits for TIN to assure attainment of nitrate-nitrogen objectives in the receiving water.

<sup>13</sup> Wildermuth Environmental, Inc. Addendum to the 2008 Santa Ana River Wasteload Allocation Model Report: Scenario 8. Technical Memorandum. January 5, 2015.

<sup>14</sup> On average, nitrate-nitrogen comprises approximately 85% of the TIN measured in municipal effluent.

<sup>15</sup> Wildermuth Environmental, Inc. Addendum to the 2008 Santa Ana River Wasteload Allocation Model Report: Scenario 8. Technical Memorandum. January 5, 2015.



**Table 1: Average TIN Concentrations in Water Recharged to the Chino-South GMZ from Reach-3 of the Santa Ana River (2020 land use conditions)\***

<b>Metric</b>	<b>Scenario 8d: Max. Recycle</b>	<b>Scenario 8e: Intermediate</b>	<b>Scenario 8f: Max. Discharge</b>
<b>Long-term Average (63 years)</b>	4.03 mg/L	4.10 mg/L	4.14 mg/L
<b>Single Highest 10-year Average</b>	4.25 mg/L	4.31 mg/L	4.34 mg/L
<b>Probability that average recharge quality will exceed 4.2 mg/L in any 10-yr. period</b>	11.1%	30.2%	44.4%
<b>Maximum amount the Basin Plan objective is exceeded</b>	0.05 mg/L 1.1%	0.11 mg/L 2.6%	0.14 mg/L 3.3%

*\*All discharge scenarios were evaluated under a wide range of precipitation conditions similar to those that occurred between 1950 and 2012.*

Although the exceedance of the nitrate-nitrogen objective is relatively small when it occurs, and the long-term average still complies with the Basin Plan objective, results from this WLAM analysis complicate the process of issuing permits for wastewater discharges flowing into Reach 3 of the Santa Ana River. Federal and state law requires the Regional Board to establish effluent limits that will ensure that these discharges will not cause or contribute to an exceedance of water quality objectives. The permit limits must ensure compliance under all conditions that may reasonably occur, including multiple years of lower than normal precipitation. Since there is no way to accurately predict at the time the permits are issued what the future rainfall pattern will be, more restrictive effluent limitations may be deemed necessary to assure consistent compliance with the objective.

At present, all of the NPDES permits for wastewater discharges to Reach 3 of the Santa Ana River restrict the average TIN concentration to not more than 10 mg/L<sup>16</sup>. However, because the recent WLAM analysis indicates that imposition of this current effluent limit does not assure consistent short-term compliance with the water quality objective in the Chino-South GMZ during droughts, the Regional Board may be obligated to impose more stringent effluent limits unless some other adjustment is made to address the short-term compliance issue. The various regulatory options are evaluated in the following Alternatives Analysis.

<sup>16</sup> NPDES permits specify the TIN limitation as a running 12-month flow-weighted average.

## 2. ALTERNATIVES ANALYSIS<sup>17</sup>

In order to ensure that wastewater discharges to Reach 3 of the Santa Ana River do not cause or contribute to an exceedance of the nitrate-nitrogen objective in the Chino-South GMZ under drought conditions, the Regional Board may elect to use one or more of the following options:

### **Option 1: Impose more stringent effluent limits for TIN in relevant NPDES permits.**

Results from the recent WLAM analysis indicate that an exceedance is most likely to occur during prolonged periods of below average rainfall when there is less instream dilution available. At such times, the maximum average concentration of TIN in water percolating from the Santa Ana River to the Chino-South GMZ will range from 1.1% to 3.3% higher than the applicable water quality objective (depending on how much of the treated effluent is recycled vs. discharged).

Short-term compliance could be assured, without relying on dilution from runoff that occurs during subsequent wetter-than-normal years (e.g. El Niño winters), by reducing the current effluent limit for TIN to from 10 mg/L to 8.4 mg/L. Since 50% of the nitrogen is presumed lost through biological transformation as the water percolates through the vadose zone, wastewater discharged at 8.4 mg/L TIN will enter the underlying groundwater with an average TIN concentration no greater than 4.2 mg/L even if there is no stormwater dilution available.

This option would likely require some permittees discharging to the Santa Ana River to upgrade their wastewater treatment plants to assure consistent compliance with the more stringent effluent limits.<sup>18</sup> An economic analysis, undertaken as part of this Alternatives Analysis, indicates the total cost to implement the necessary improvements would likely exceed \$XXX million.<sup>19</sup>

Regional Board staff do not believe this cost bears a reasonable relationship to the water quality benefit that would result. While the volume-weighted average TIN concentration in the recharge water may be reduced by 0.8 mg/L, this reduction would hardly be noticeable in a groundwater basin where the current average nitrate concentration is already 28 mg/L. Moreover, this reduction is not necessary to assure the protection of the beneficial uses of the GMZ.

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<sup>17</sup> This Alternatives Analysis summarizes a review of the regulatory policy issues. A separate more detailed Alternatives Analysis is presented in the Substitute Environmental Document (SED) prepared for the proposed Basin Plan Amendment to comply with applicable requirements of the California Environmental Quality Act (CEQA).

<sup>18</sup> Permittees most likely to be affected include: The cities of Colton, Rialto, Riverside and San Bernardino.

<sup>19</sup> [ADD CITATION TO ECON ANALYSIS]

One possible response to the imposition of more stringent effluent limitations would be the relocation of wastewater outfalls to a point further downstream, such that the nitrate-nitrogen objective for the Chino South GMZ would become irrelevant for permitting purposes. Economic analysis indicates that installing the necessary relocation pipelines would cost much less than upgrading the treatment plants.<sup>20</sup> Should this relocation occur, there would be no water quality benefit to the Chino South GMZ as the result of wastewater discharges. In fact, the result might be *poorer* average water quality in the Chino-South GMZ since recharge from existing wastewater treatment facilities is currently helping to dilute excess nitrate-nitrogen from legacy sources that is seeping out of the vadose zone.

**Option 2: Use a longer averaging period to evaluate compliance with the nitrate-nitrogen objective.**

The WLAM indicates that exceedances that may occur during periods of drought are balanced by dilution that occurs during extremely wet years. So, over the long-run, the current effluent limits may be deemed adequate to not cause or contribute to the ongoing nitrate-nitrogen degradation which is occurring in the Chino-South GMZ. The long-term (63-year) volume-weighted average nitrate-nitrogen concentration in the combined recharge of wastewater and stormwater that percolates from the Santa Ana River into the Chino-South GMZ ranges from 4.03 mg/L to 4.14 mg/L (see Table 1, above). TIN concentrations in this range comply with the applicable water quality objective of 4.2 mg/L for nitrate-nitrogen over the long-term.

Technically, the Regional Board could rely on this finding to conclude that the current effluent limits are adequate, particularly since the existing ambient nitrate-nitrogen concentration in the Chino-South is already 28 mg/L. However, to do so, the Regional Board must assume that average rainfall over the next several decades will be similar to that observed during the last 60 years. In light of statewide concern over potential climate change, it would be imprudent to rely on such an assumption.

Issuing NPDES permits with TIN limitations based on a very long averaging period (e.g. 60+ years) that is significantly longer than the 5-year term of the permits is impractical from a compliance determination standpoint. Moreover, it would be difficult to justify such an extended averaging period when the objective itself is computed using only 20 years of sampling data. Given these circumstances, and the inherent vagaries of weather, Board staff does not recommend Option 2.

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<sup>20</sup> [ADD CITATION TO ECON ANALYSIS]

### **Option 3: Increase the site-specific nitrogen loss coefficient to 56%.**

The Regional Board relied on site-specific studies to approve the current nitrogen-loss coefficient of 50% for areas of the Chino-South GMZ that underlie Reach 3 of the Santa Ana River.<sup>21</sup> These studies indicated that the average measured nitrogen loss was actually closer to 56%. That value was rounded-down to 50% because the 2004 WLAM showed that a 50% nitrogen loss coefficient was sufficient to assure compliance with the nitrate-nitrogen objective in the Chino-South GMZ. The difference between the 56% and 50% loss coefficients was considered an approximate 10% safety factor.

If the site-specific nitrogen loss coefficient were revised to reflect the true average value documented by the original studies, i.e., 56%, then effluent discharged in accordance with the current TIN limit of 10 mg/L would be expected to enter the Chino-South GMZ at concentrations no greater than 4.4 mg/L. Some small amount of stormwater dilution would still be needed to meet the 4.2 mg/L water quality objective.

Board staff believes that maintaining the roughly 10% safety factor in the nitrogen loss coefficient is appropriate since it helps to account for uncertainty, and since the application of the 50% loss coefficient is now well-established. Modifying the nitrogen loss coefficient, while scientifically defensible, may be misperceived as an attempt to manipulate the data in order to demonstrate that existing effluent limitations and treatment processes are sufficient to achieve consistent compliance with the Chino-South nitrate-nitrogen objective. The recommended option (Option 4 below) provides greater public transparency and consistency with respect to established practice in establishing effluent limitations.

### **Option 4) Raise the water quality objective for nitrate-nitrogen to 5 mg/L.**

Raising the water quality objective for nitrate-nitrogen in the Chino-South GMZ from 4.2 mg/L to 5 mg/L would have no adverse impact on the beneficial uses of the GMZ. Most importantly, a 5 mg/L nitrate-nitrogen objective is half of the Primary Maximum Contaminant Level; (MCL) established to protect drinking water uses and prevent methemoglobinemia.

Applying the 50% nitrogen loss coefficient established in the Basin Plan, wastewater discharged at an average TIN concentration of 10 mg/L, as now required, enters the aquifer at no more than 5 mg/L. Thus, continuing to meet the current effluent limits would assure that recycled water could meet a 5 mg/L nitrate-nitrogen objective without needing to rely on any stormwater dilution to make this demonstration.

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<sup>21</sup> Wildermuth Environmental, Inc. Demonstration of Nitrogen Loss in Reach 3 of the Santa Ana River - Technical Memorandum. October, 2005.

Raising the nitrate-nitrogen objective to 5 mg/L would not result in less stringent effluent limitations for the wastewater treatment plants; effluent limitations of 10 mg/L TIN would continue to be specified in relevant NPDES permits pursuant to the established WLAs. Thus, the change in objective would not raise concerns with regard to federal antibacksliding regulations.<sup>22</sup>

Raising the objective would avoid the need to impose more restrictive permit limits in order to address the short-term compliance issues that may arise because of drought conditions, as discussed above. In turn, this would avoid the significant costs associated with meeting such more restrictive limits. These significant costs are not reasonable nor warranted by the marginal water quality improvement in the discharges that would result. This finding takes into account the facts that:

- 1) The existing and reasonably foreseeable future nitrate-nitrogen concentrations in the GMZ are and will be driven by legacy nitrogen loading from the vadose zone;
- 2) Recycled water discharges currently provide dilution and improvement of GMZ quality conditions. Comprehensive water quality sampling data reveal that the lowest nitrate-nitrogen concentrations measured in the Chino-South GMZ are found in those areas of the aquifer closest to the Santa Ana River.<sup>23</sup> The discharge of large volumes of recycled water to Reach 3 of the River is not causing or contributing to the problem in the GMZ; rather, it is part of the long-term solution for improving groundwater quality;
- 3) The beneficial uses of the GMZ would continue to be protected even if the nitrate-nitrogen objective is raised and no treatment beyond that already provided is necessitated.

As previously noted, significant additional treatment costs may result in the relocation of wastewater discharges to avoid those costs. Relocation of the discharges would mean that these wastewater discharges would no longer provide dilution of nitrogen (and TDS) concentrations in the Chino-South GMZ and, thus, no improvement in groundwater quality conditions.

Based on these considerations, Board staff recommends Option 4, raising the nitrate-nitrogen objective for the Chino South GMZ to 5.0 mg/L.

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<sup>22</sup> 40 CFR §122.15(i) implementing 33 U.S.C. §1342(o) [§402(o) of the Clean Water Act]

<sup>23</sup> Wildermuth Environmental, Inc. Recomputation of Ambient Water Quality in the Santa Ana Watershed for the Period 1993 to 2012. Technical Memorandum prepared for the Santa Ana Watershed Project Authority Basin Monitoring Program Task Force. August, 2014.

### 3. ANTIDegradation ANALYSIS

Raising the nitrate-nitrogen objective for the Chino-South GMZ to 5.0 mg/L would authorize water quality in the GMZ lower than the established antidegradation objective of 4.2 mg/L, which was based on the selected historical baseline (1954-73). However, as discussed above, ambient quality conditions in the Chino-South GMZ are significantly worse than the established objective due to the influx of legacy nitrogen loads from the overlying vadose zone.

As also discussed previously, raising the nitrate-nitrogen objective would accommodate and encourage continued discharges of recycled water that, under present and projected future conditions, result in dilution of the nitrate-nitrogen (and TDS) concentration in the GMZ. This means that current groundwater quality conditions are expected to improve as the result of these recycled water discharges.

Although raising the nitrate- nitrogen objective would not result in an actual lowering of water quality compared to the current average concentrations in the Chino-South GMZ, it does authorize lower water quality compared to the 1954-73 baseline condition. Pursuant to the state's antidegradation policy, lowering of water quality is permissible provided that: (a) the change in water quality is consistent with maximum benefit to the people of the state and will not unreasonably affect the beneficial uses of the affected receiving waters; and, (b) waste discharges are required to meet requirements that result in the best practicable treatment or control of the discharges necessary to assure that (i) pollution or nuisance will not occur, and (ii) the highest water quality consistent with maximum benefit to the people of the State will be maintained. Each of these antidegradation policy requirements are discussed below to demonstrate conformance of the proposed action.

**(a) Would raising the nitrate-nitrogen objective for the Chino-South GMZ to 5 mg/L be consistent with maximum benefit to the people of the state? Would this change unreasonably affect present or anticipated beneficial uses of the affected receiving waters?**

Raising the nitrate-nitrogen objective for the Chino-South GMZ is consistent with maximum benefit to the people of the state. The basis for this determination is as follows.

The current average nitrate-nitrogen concentration in the Chino-South GMZ is 28 mg/L. This is substantially higher than the current water quality objective (4.2 mg/L), the proposed water quality objective (5 mg/L) or the Primary MCL (10 mg/L) for drinking water. Because of these poor water quality conditions, the Chino Desalter Authority (CDA) operates an extraction and treatment system designed to pump and treat the degraded aquifer so that it meets drinking water standards

CDA has is required to deliver product water with "not more than 25 mg/L nitrate (measured as nitrate)." <sup>24</sup> This is equivalent to approximately 5.6 mg/L nitrate-nitrogen. Thus, the proposed objective of 5.0 mg/L nitrate-nitrogen assures that any recycled water percolating into the Chino-South GMZ will also meet CDA's nitrate specifications before it reaches the aquifer. For this reason, Board staff recommends the current effluent limits for TIN remain unchanged.

The TDS objective for the Chino South GMZ is 680 mg/L. As with the nitrate-nitrogen objective, the TDS objective was established based on the highest water quality that has been attained since 1968 and represents the average TDS concentration during the 1954-73 baseline period. At present, the volume-weighted average TDS concentration in the Chino-South GMZ is 990 mg/L, 50% higher than the Basin Plan objective. <sup>25</sup> Because nitrate also contributes to salinity, Staff also recommends that the current effluent limits for Total Dissolved Solids (TDS) remain unchanged (see Table 2).

**Table 2: NPDES Effluent Limits for TDS in Recycled Water Discharges that are Expected to Recharge the Chino South GMZ**

POTW Discharge	TDS Limit
City of Rialto	490 mg/L
Cities of Colton & San Bernardino (RIX)	550 mg/L
City of Riverside	650 mg/L

Thus, the current permit limits for TDS assure that all municipal effluent recharging the Chino-South GMZ complies with the applicable water quality objective at the point-of-discharge without benefit of any dilution from stormwater runoff. It also ensures that recharging recycled water imposes no additional desalination burden on CDA's reverse-osmosis system. At their respective points-of-discharge, the permitted concentration of TDS in all three municipal effluents is well below both the historical and current ambient average TDS concentration in the Chino-South GMZ. And, results from the WLAM analysis indicate that, even during a decade of below normal rainfall, the TDS concentration in the water recharging to Chino-South GMZ from Reach 3 of the Santa Ana River is not expected to exceed 625 mg/L. <sup>26</sup>

<sup>24</sup> Chino Basin Desalter Authority. 2015 Urban Water Management Plan. June, 2016. Appendix C: CDA Joint Exercise of Powers Agreement: Amendment No. 2 to the Joint Exercise of Powers Agreement creating the Chino Basin Desalter Authority (see §K amending Section 5.3 re: "Quality")

<sup>25</sup> Wildermuth Environmental, Inc. Recomputation of Ambient Water Quality in the Santa Ana Watershed for the Period 1993 to 2012. Technical Memorandum prepared for the Santa Ana Watershed Project Authority Basin Monitoring Program Task Force. August, 2014.

<sup>26</sup> Wildermuth Environmental, Inc. Addendum to the 2008 Santa Ana River Wasteload Allocation Model Report: Scenario 8. Technical Memorandum. January 5, 2015 (see Tables 8d-CS, 8e-CS and 8f-CS in original report).

As previously discussed, raising the nitrate-nitrogen objective to 5 mg/L would accommodate ongoing recycled water discharges, without the need for substantial expenditure to achieve a relatively slight improvement in nitrogen water quality. These discharges dilute high nitrate-nitrogen (and TDS) concentrations in the Chino-South GMZ, thereby improving existing groundwater quality. Recycled water discharges also help to preserve groundwater yield by replacing, in part, the groundwater that is extracted by the CDA's groundwater remediation project. The latter benefit is especially noteworthy following the California legislature's enactment of the Sustainable Groundwater Management Act (SGMA) in 2014.<sup>27</sup>

As stated above, raising the nitrate-nitrogen objective to 5 mg/L would avoid the need to impose more restrictive effluent limits and, therefore, the extraordinary expense associated with upgrading wastewater treatment plants to meet such limits. Upgrading the treatment processes to provide more efficient nitrogen removal would assure strict compliance with the current nitrate-nitrogen objective, but the upgrades would not measurably improve existing water quality in the Chino-South GMZ. The high cost of compliance bears no reasonable relationship to the nominal water quality improvements that might result. Avoiding this type of inefficient allocation of scarce public resources provides maximum benefit to the People of the state.

The proposed change would not unreasonably affect beneficial uses. The proposed water quality objective of 5 mg/L is well below the Primary MCL of 10mg/L for nitrate-nitrogen.<sup>28</sup> This is the level required to assure safe drinking water and, in fact, provides a 100% safety factor. Therefore, the municipal and domestic supply (MUN) beneficial use of the Chino-South GMZ would be maintained and protected. Similarly, the change in the objective would have no effect on the other designated beneficial uses of this GMZ, which are agricultural supply (AGR), industrial service supply (IND) and industrial process supply (PROC).

No changes to the TIN limits for recycled water discharges to the Santa Ana River will be needed to assure consistent compliance with the proposed Chino-South GMZ objective. Since the effluent limits will remain unchanged, the WLAM also shows that any recycled water that does not percolate to groundwater in Reach 3 will not lower water quality or adversely affect beneficial uses further downstream (including Reach 2 of the Santa Ana River and the underlying Orange County GMZ).

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<sup>27</sup> AB 1739 and SB 1168 and SB 1319; Sept. 16, 2014. One of the principal goals of the SGMA is to ensure appropriate actions are taken to preserve the safe yield of groundwater basins.

<sup>28</sup> 22 CCR §64431(a); see Table 64431-A: Maximum Contaminant Levels for Inorganic Chemicals.



- (b) **Would raising the nitrate-nitrogen objective for the Chino-South GMZ to 5.0 mg/L affect waste discharge requirements such that pollution or nuisance would occur or such that water quality consistent with maximum benefit to the people of the state would not be maintained?**

No. Raising the nitrate-nitrogen objective would have no impact on waste discharge requirements. Recycled water discharges would continue to be limited to 10 mg/L TIN. Treatment processes in place to comply with this limitation would continue to operate. Compliance with this limitation prevents pollution and nuisance and assures that water quality that is consistent with maximum benefit to the people of the state will be maintained. If the nitrate-nitrogen objective were not modified, then effluent limitations would need to become more stringent to assure compliance with the objective during droughts. As discussed above, the significant costs of providing additional treatment to meet such more stringent limitations are not commensurate with the water quality benefit that would ensue. These additional costs would be contrary to the effective and efficient use of limited resources and, therefore, not in the public interest. Existing waste discharge limitations and the treatment processes necessary to comply will continue to assure the maintenance of water quality that is consistent with the maximum benefit to the people of the state.

In summary, while raising the nitrate-nitrogen objective for the Chino-South GMZ would theoretically authorize a lowering of water quality in that GMZ, the reality is that the change would accommodate ongoing recycled water discharges that improve water quality conditions. The change in the objective would have no effect on beneficial uses, and would not result in changes in waste discharge requirements such that pollution or nuisance would occur or that water quality inconsistent with maximum benefit to the people of the state would not be maintained. Therefore, the proposed action to revise the objective is consistent with the requirements of the antidegradation policy.