Proposed Approach for Evaluating and Regulating Nitrate Discharges to Groundwater in the Central Valley Region

Applicable Water Quality Standards

1) With limited exceptions, *"all ground waters in the Central Valley region are considered suitable, or potentially suitable, at a minimum, for municipal and domestic water supply (MUN)."*[1] The MUN beneficial use applies to *"community, military, or individual water supply systems including, but not limited to, drinking water supply."*

2) The Water Quality Control Plans for the Central Valley region state that, *"at a minimum, ground waters designated for domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs) specified in Title-22 of the California Code of Regulations."* And, the California Department of Public Health established the MCL for Nitrate at 45 mg/L (as NO3).[2]

3) The California State Legislature has established a statewide policy that *"every human being has the right to safe, clean, affordable and accessible water adequate for human consumption, cooking and sanitary purposes. The legislature also declared that "all relevant state agencies … shall consider this state policy when revising, adopting or establishing policies, regulations, and grant criteria … pertinent to the uses of water described above."*[3]

4) In a recent Report to the Legislature, the State Water Board made the following commitment with respect to regulating nitrate discharges to groundwater:

> *"The Water Boards will evaluate all existing Waste Discharge Requirements to determine whether existing regulatory permitting is sufficiently protective of groundwater quality at these sites. The Water Boards will use the findings to improve permitting activities related to nitrate."*[4]

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[1] Central Valley Regional Water Quality Control Board. Water Quality Control Plan (Basin Plan) for the Sacramento River Basin and the San Joaquin River Basin – 4th Ed. Pg. II-3.0 Note: the exceptions are also identified in the Basin Plan. The Tulare Lake Basin Plan contains identical text.

[2] 22 CCR §64431(a); see Table 64431-A (Maximum Contaminant Levels for Inorganic Chemicals)

[3] AB 685 adding §106.3 to the California Water Code. Signed by Gov. Brown on September 25, 2012.

[4] State Water Resources Control Board. Report to the Legislature: Recommendations for Addressing Nitrate in Groundwater (February, 2013). See recommendation #15 at page 43 of the report.

Water Quality Conditions and Permitting Considerations:

5) Several independent studies have reported that nitrate concentrations exceed the established MCL at numerous well locations throughout the Central Valley.[5] This conclusion is also supported by recent technical reports prepared by CV-SALTS.[6]

6) The State Water Board has determined that: *"most nitrate detected in drinking water wells today was originally applied to the surface decades ago… [and] nitrate problems will likely worsen for decades."*[7]

7) Where nitrate concentrations already exceed the applicable water objective, or are likely to do so in the near future due to legacy loads in the vadoze zone, requiring current dischargers to meet the nitrate objective probably won't eliminate the existing groundwater impairment or restore the MUN beneficial use to full attainment.[8]

8) "Pump-and-Treat" technologies traditionally used to remediate groundwater contamination (e.g. MTBE, TCE or PCB plumes from discrete industrial discharges), *"are not technically feasible for large groundwater basins"* that have been adversely affected by widespread and diffuse non-point sources over a prolonged period of time.[9]

9) The State Water Board has concluded that, for some locations, *"pollution prevention and cleanups … may not be feasible. Consequently, any practical solution to groundwater contamination must also focus on strategies to provide safe drinking water to consumers through treatment and alternative water supplies."*[10] And, the State Water Board has declared that *"the single most important action that can be taken to help ensure safe drinking water for all Californians is to provide a stable, long-term source(s) of funding to assist those impacted by nitrate-contaminated groundwater."*[11]

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[5] See, for example, Thomas Harter, et al. Addressing Nitrate in California's Drinking Water: Report to the California State Water Resources Control Board. U.C. Davis Center for Watershed Sciences. January, 2012. See, also, Communities that Rely on Contaminated Groundwater. State Water Resources Control Board Report to the Legislature. January, 2013.

[6] Initial Conceptual Model (ICM) Technical Services Tasks 7 and 8 – Salt and Nitrate Analysis for the Central Valley Floor Final Report. December, 2013. See Fig 7-18 on page 7-25.

[7] State Water Resources Control Board. Report to the Legislature: Recommendations for Addressing Nitrate in Groundwater. February, 2013; pg. 5 (citing the UC-Davis Report identified in Footnote #3, above).

[8] State Water Resources Control Board. Report to the Legislature: Communities that Rely on Contaminated Groundwater. Jan., 2013. See discussion at pages 18-20 in the report. See also the United Nations Report of the Special Rapporteur on the Human Right to Safe Drinking Water and Sanitation. A/HRC/18/33/Add.4 (Aug. 2, 2011); http://www2.ohchr.org/english/bodies/hrcouncil/docs/18session/A-HRC-18-33-Add4_en.pdf

[9] State Water Resources Control Board. Report to the Legislature: Recommendations for Addressing Nitrate in Groundwater. February, 2013; pg. 5 (citing the UC-Davis Report identified in Footnote #3, above).

[10] State Water Resources Control Board. Report to the Legislature: Communities that Rely on Contaminated Groundwater. Jan., 2013; pg. 19.

[11] State Water Resources Control Board. Report to the Legislature: Recommendations for Addressing Nitrate in Groundwater. February, 2013; pg. 24.

Regional Board's Priorities When Permitting Nitrate Discharges

10) Where nitrate-nitrogen concentrations in groundwater are ≤10 mg/L, the Regional Board's primary management ~~permitting~~ strategy will be to protect these high quality waters by regulating ~~prevent~~ existing and future discharges in accordance with the state's Antidegradation Policy (SWRCB Res. 68-16).~~from impairing the designated use.~~

11) Where nitrate-nitrogen concentrations in groundwater already exceed the applicable Basin Plan objective, or are likely to do so in the future as a result of previous pollutant loads to the vadose zone, the Regional Board permitting strategy will be designed to accomplish the following outcomes (in order of priority):

A) The ~~highest and most~~ immediate priority is to provide a safe drinking water alternative for those who are dependent on groundwater where nitrate concentrations are (or soon will be) greater than the Maximum Contaminant Level (MCL).

B) The near-term priority is to minimize further water quality degradation by requiring dischargers to apply "best efforts" ~~and implement "best practicable treatment or controls"~~ to reduce current and future nitrate discharges to groundwater~~loads~~.

C) The long-term priority is to encourage development of systems and infrastructure needed to attain ~~remediate designated uses~~ water quality standards in groundwater through a program of "managed restoration" where it is feasible and practicable to do so. It is acknowledged that existing water quality impairment occurred over several decades and considerable time may be required ~~may require as much or more time~~ to restore some groundwater basins to full attainment.

Minimum Baseline Requirements for ALL Nitrate Discharges to Groundwater

12) ~~All d~~Dischargers to groundwater will be required to:

A) Make "best efforts" to minimize nitrate discharges to groundwater. This includes periodic reassessments, by the discharger, to demonstrate that ~~use of up-to-date~~ Best Management Practices (BMP) are being implemented.

B) Prepare appropriate technical ~~Perform water chemistry~~ analyses to estimate~~determine~~ the concentration and mass of nitrate discharged to groundwater.

C) Characterize the current nitrate concentration in the receiving groundwater unless the nitrate concentration in the discharge is less than the baseline nitrate concentration or is less than 10 mg/L for groundwater basins where the nitrate concentration already exceeds the MCL~~and determine if there is any available assimilative capacity in the groundwaters receiving the discharge~~.

~~D) Estimate the net change in nitrate concentration in the groundwater, including any change in available assimilative capacity, that is likely to occur as a result of the discharge.~~

Proposed Procedure ~~Permitting Strategy~~ for Authorizing Nitrate Discharges to Groundwater

13) The Regional Board will rely on a Stepwise Evaluation and Implementation Process to develop appropriate Waste Discharge Requirements (WDRs) for all future discharges of nitrate to groundwater (see Fig. 1). In all cases, the discharger will ~~always~~ be required to make best efforts to minimize nitrate concentrations as a prerequisite condition.

These steps, which describe a range of Compliance Alternatives, are presented in hierarchical order. If the Regional Board elects to authorize additional nitrate discharges to groundwater, it will develop WDRs using the implementation alternative from the lowest possible level to ensure compliance. However, the availability of one or more ~~-~~compliance options in the Stepwise Procedure does not obligate the Regional Board to authorize any particular discharge. A more detailed explanation of the Stepwise Evaluation and Implementation Process follows Fig. 1.

Figure 1:
Stepwise Process for Issuing Permits to Discharge Nitrate to Groundwater

Level 1: Require nitrate concentration to be <10 mg/L at the point of discharge.

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If there is no reasonably feasible or practicable means for achieving compliance at Level 1…

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Level 2: Require nitrate concentration to be <10 mg/L at confluence with saturated zone.

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If there is no reasonably feasible or practicable means for achieving compliance at Level 2…

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Level 3: Allocate available assimilative capacity to ensure discharge does not cause receiving water to exceed 10 mg/L nitrate-nitrogen.

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If there is insufficient assimilative capacity available to ensure compliance at Level 3…

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Level 4: Require discharger to implement an offset program.

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If there is ~~groundwater is already impaired for nitrate, and~~ no reasonably feasible or practicable means of ~~meeting the applicable water quality standard~~ implementing ~~or providing~~ an adequate or acceptable offset program at Level 4…

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Level 5: Authorize a temporary, conditional exception to allow the discharge.

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If the ~~groundwater is already impaired for nitrate and the~~ Regional Board is unable or unwilling to authorize a temporary, conditional exception at Level 5…

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Tier 6: Develop a site-specific water quality objective for nitrate-nitrogen.

14) **Level 1 - Comply at Point-of-Discharge:** the traditional approach for protecting the MUN beneficial use is to require nitrate concentrations in discharges to be less than 10 mg/L. And, this remains the Regional Board's preferred permitting strategy for controlling nitrate loads. Discharges will be expected to meet the Basin Plan objective for nitrate-nitrogen when there exists a reasonably feasible and practicable means for doing so by implementing "Best Efforts". The Regional Board may consider authorizing a compliance schedule where necessary to provide time for the discharger to implement adequate nitrate control measures. In addition, even when the nitrate concentration in the discharge meets the applicable water quality objective, an antidegradation analysis will be required if that concentration is higher than the nitrate concentration in the receiving groundwater.

15) **Level 2 - Comply at Confluence w/ Receiving Groundwater:** if the discharger can demonstrate that there is no reasonably feasible or practicable means to reduce nitrate concentrations below 10 mg/L at the point-of-discharge, the Regional Board may still authorize the discharge provided the discharger can demonstrate compliance with the Basin Plan objective at the confluence with the receiving groundwater. This approach is appropriate where the discharger can demonstrate that other factors (e.g. chemical or biological transformation, soil binding, or dilution by natural or man-made recharges ~~in the vadose zone~~) will reduce the nitrate concentrations sufficiently to ensure that compliance with water quality standards. The Regional Board will require discharges permitted at Level 2 to demonstrate the ~~high~~ reliability for all such mitigation factors and to perform routine monitoring to confirm on-going effectiveness. And, as with Level 1, an antidegradation review will be required if the discharge is likely to lower water quality in the groundwater even if other factors reduced nitrate concentrations in the discharge sufficiently to meet the objective.

16) **Level 3 - Comply Using Assimilative Capacity:** if there is no reasonably feasible or practicable means to ensure nitrate concentrations in the discharge meet the water quality objective prior to its confluence with the saturated zone, and nitrate concentration in the receiving groundwater basin or sub-basin is <10 mg/L, then the Regional Board may (but is not obligated to) allocate some or all of the ~~any~~ available assimilative capacity as needed to authorize the discharge provided that all of the following conditions are met:

a) The discharge will not unreasonably affect beneficial uses or cause the nitrate concentration in the receiving water to exceed 10 mg/L. This determination will be made using the same methods and metrics that were used to demonstrate the initial availability of assimilative capacity. The Regional Board will also require adequate water quality monitoring to evaluate long-term trends in available assimilative capacity~~confirm the validity of these determinations~~. A nitrate discharge budget (aka "wasteload allocation" ~~in surface waters~~) may be needed to allocate available assimilative capacity across multiple dischargers.

b) The discharger will be required to implement Best Practicable Treatment or Control (BPTC) to ensure that a pollution or nuisance does not occur and the highest level of

water quality consistent with maximum benefit to the people of the state will be maintained.

Note: the rules governing compliance demonstrations made under Level 3 remain the same regardless of how Assimilative Capacity is calculated. However, the method selected to make this calculation will affect the number of discharges eligible for permitting at Level 3 because it governs the threshold determination as to whether or not any assimilative capacity exists. If the calculation is based on nitrate concentrations in first encountered groundwater, then there are likely to be fewer groundwater basins found to have assimilative capacity available. If the calculation is based on a volume-weighted average concentration of the larger ~~entire~~ subsurface production zone, then there are likely to be more groundwater basins identified as having some assimilative capacity available.

17) **Level 4 - Comply by Implementing Offsets:** when nitrate concentrations in the groundwater are already >10 mg/L or are expected to exceed the Basin Plan objective as a result of legacy loads to the vadose zone, and there is no reasonably feasible or practicable means for the ensuring that the discharge meets the water quality standard before its confluence with the receiving water, then the Regional Board may authorize the discharge by requiring the discharger to implement an acceptable "offset program"[12] provided that all of the following conditions are met:

a) The discharge, together with the proposed offset program, does not exacerbate an existing impairment to a degree worse than is likely to occur if the discharge were prohibited, and…

b) ~~The discharge, together with the proposed offset project, will result in better water quality and/or use(r) protection (e.g. risk reduction) than would occur if the discharge was able to meet the nitrate objective at the point of discharge, and…~~

~~c)~~ The discharge, together with the proposed offset program, will result in better water quality or use(r) protection (e.g. risk reduction) than would occur if the discharge was prohibited, and…

d) The proposed offset program is consistent with the long-term nitrate loading budget and the Regional Board's managed restoration strategy.

e) The obligation to implement an offset program is codified as an enforceable provision of the WDRs. It may be necessary to characterize this obligation as an "interim, performance-based requirement~~compliance condition~~" to ensure adequate oversight and enforceability. The Regional Board will endeavor to structure such requirements so that these offset projects remain eligible to receive state and federal grant funds when available.

[12] The Regional Board may approve participation in a regional Mitigation Bank as an acceptable offset program when doing so is in the best interest of the people of California.

f) The Regional Board may require dischargers to provide additional financial assurance, through performance bonds or other similar instruments, to ensure offset projects are completed and continue to be operated as designed in the event dischargers are unable to meet their offset obligations in the future.

18) **Level 5 - Exceptions from Compliance:** the Regional Board may elect to permit a discharge to groundwater with a nitrate concentration >10 mg/L by authorizing a temporary, conditional exception to water quality standards (aka "variance" for surface waters) provided that all of the following conditions are met:

a) The receiving water is already impaired for nitrate and prohibiting the discharge would not eliminate that impairment or restore attainment of the MUN use, and…

b) The discharger demonstrates that is reasonably infeasible or impracticable to meet the nitrate objective at the point-of-discharge or prior to the confluence with receiving waters, and…

c) Authorizing the discharge would not materially increase the human health risk associated with the existing water quality impairment, and…

d) Prohibiting the discharge would cause widespread and substantial adverse socio-economic impacts to people residing in the area ~~most immediately~~ affected by the discharge, and…

e) The discharger agrees to provide water treatment, or an alternate water supply, that ensures a level of use(r) protection functionally-equivalent to that which would occur if nitrate concentrations in the groundwater basin met the applicable water quality objective~~the water quality standard for nitrate was in attainment~~, and…

f) The obligation to provide an alternate water supply is codified as a mandatory condition for authorizing the exception and an enforceable provision of the Waste Discharge Requirements, and…

g) The conditional exception is temporary with a term no greater than 10 years. However, the Regional Board may reauthorize the exception, for additional 10 year terms, provided that the discharger continues to meet all of the same eligibility criteria and has complied with the terms and conditions of the previous exception.

h) The temporary, conditional exception is consistent with the Regional Board's strategy of managed restoration and facilitates reasonable progress toward attainment over the long-term.

19) **Level 6 - Site Specific Objective:** where existing groundwater quality is already impaired by nitrate in excess of the Basin Plan objective, and there is no realistic ~~reasonable~~ prospect of restoring the basin to full attainment in a reasonable time frame, the Regional Board may elect to:

a) Segment the groundwater basin into sub-basins by separating areas of impairment from areas of attainment, and…

b) Subcategorize the impaired sub-basin as "MUN-Limited: requires additional treatment for drinking water purposes," and…

c) Establish a site-specific water quality objective (SSO) based on existing nitrate concentrations in the MUN-Limited sub-basin, and…

d) Implement WDRs to permit discharges with nitrate concentrations >10 mg/L but less than the SSO provided the discharger agrees to provide the necessary treatment for all impaired wells in the affected Management Zone approved by the Regional Board.

e) The discharger must demonstrate that the discharge will not unreasonably affect designated uses in adjacent basins or sub-basins.