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**Central Coast Regional Water Quality Control Board**

**Via Electronic Mail**  
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**DATE:** August 6, 2014

**TO:** Ms. Jeanine Townsend  
Clerk to the Board  
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**FROM:** Kenneth A. Harris Jr.  
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**CENTRAL COAST REGIONAL WATER QUALITY CONTROL BOARD**

**SUBJECT: CENTRAL COAST WATER BOARD COMMENTS TO THE AGRICULTURAL  
EXPERT PANEL DRAFT REPORT**

The Central Coast Regional Water Quality Control Board (Central Coast Water Board) has reviewed the Agricultural Expert Panel's (hereafter Panel) draft report released on July 7, 2014, *Conclusions of the Agricultural Expert Panel*. We appreciate the opportunity to provide the following comments on the draft report.

Overall Comment

The Panel's draft report provides useful information to improve and advance our collective efforts to protect drinking water sources and reduce nitrate loading to groundwater. However, the draft report, as it stands today, would be improved by additional technical recommendations. The draft report includes social and policy-level commentary regarding issues not within the charge of the Panel, critical reviews of Water Boards' efforts and existing studies, and discussion of the difficulties associated with measuring the effectiveness of agricultural practices in reducing nitrate loading to groundwater. The draft report contains a limited number of technical recommendations that are relevant to the questions the Panel was directed to answer. We encourage the Panel to redirect the focus of the draft report towards the development of technical recommendations.

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The lack of specific technical recommendations is particularly problematic for the Central Coast Water Board because many of the questions posed to the Panel are associated with various requirements of our Agricultural Order (Order No. R3-2012- 0011) (Agricultural Order) that were removed when the State Water Resources Control Board (State Board) tasked the Panel to address them per Order WQ 2013-0101. We are referring to conditions 74, 77, and 78 and their associated time schedules, and monitoring and reporting requirements in our Agricultural Order. These conditions required growers to comply with specific metrics developed to maximize implementation of specific management practices and measures to minimize nitrogen loading to groundwater. They refer to the determination of the Typical Nitrogen Crop Uptake, reporting of specific elements of the Irrigation and Nutrient Management Plan requirement (INMP), and reporting progress towards achieving the Nitrogen Balance Ratios of 1.0 and 1.2 respectively (Total Nitrogen Applied compared to the Typical Nitrogen Crop Uptake). Without alternative improved metrics, Central Coast Water Board will reconsider the possibility to reinstate the same and/or similar metrics in the current or next Agricultural Order.

The Central Coast Water Board would like to reiterate the need for the Panel to fulfill their charge by providing a more thorough analysis and long-term statewide recommendations regarding many of the issues implicated in State Water Board Order WQ 2013-0101, including indicators and methodologies for determining risk to surface and groundwater quality, targets for measuring reductions in risk, and the use of monitoring to evaluate practice effectiveness. We also emphasize the need to provide technical answers to the key question number 9:

What measurements can be used to verify that the implementation of management practices for nitrogen are as effective as possible?

### Challenges

Irrigated agricultural lands are complex systems with many processes and functions that are not fully understood, and still considered data gaps. The role of the Panel was to consider and propose solutions to issues related to complex agricultural systems, provide technical recommendations addressing the questions, and recommend the development of new tools and methodologies to increase our collective ability to minimize nitrogen loading to groundwater. We ask the panel to continue to work on developing appropriate objectives, timelines, indicators, and performance measures that can be used to facilitate and document progress towards minimizing nitrogen loading.

For example, the draft report could provide recommendations for how to develop the following:

- Tools and methods to more effectively and accurately measure or estimate the amount of harvested nitrogen for a wide range of crop types (very well documented on almonds and a few other crops).
- Well thought out and workable Nitrogen Application Target(s) comparing the amount of nitrogen applied with the typical amount of nitrogen the crops uptake, the amount of nitrogen removed at harvest, or any other proposed parameter, to be used as a milestone or objective. A target comparing nitrogen applications with the amount of nitrogen removed at harvest would be consistent with the target adopted by the Central Valley Dairy Order<sup>1</sup> and recommended by the University of California committee of experts.

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<sup>1</sup> Chang, A., T. Harter, J. Letey, D. Meyer, R. D. Meyer, M. Campbell-Mathews, F. Mitloehner, S. Pettygrove, P. Robinson, R. Zhang, 2006. Managing Dairy Manure in the Central Valley of California; University of California  
(Footnote continued on next page)

- Timeframe to achieve the above mentioned Nitrogen Applications Target(s) by crop type, area, variety, rainfall, or other.
- The identification of the growth cycles and associated nitrogen needs for individual crop types that can be used to target nitrogen applications during specific periods of the crop growth cycle.
- Tools and methods to more effectively evaluate the performance of various irrigation and nutrient management practices.
- Tools and methods to measure or estimate nitrogen mass fluxes below the root zone, including the use of all the different type of lysimeters, some capable of measuring water fluxes.
- Templates for nutrient balance determinations and nitrogen budgets.

Hydrological systems are also highly complex, due to the many processes, functions and elements influencing the movement of groundwater. The draft report contains several unsubstantiated hydrogeological generalizations, such as point D on page 21, that are not relevant to the entire Central Coast Region and that undermine the viability of groundwater monitoring as a proven and effective performance measurement.

#### Vulnerability and Risk

The draft report contains almost four pages of discussion regarding the use of the terms risk and vulnerability without clearly defining what these terms mean to the Panel or directly addressing the first four questions provided to the Panel regarding the evaluation of risk and vulnerability. It would be more constructive if the final report could include a consensus set of definitions for these terms with respect to answering the first four questions.

#### Total Nitrogen Reporting

We agree with the Panel's recommendation to report total nitrogen applications by crop type and acreage given these data can be used to help the Water Boards identify higher risk areas and crop types with respect to potential nitrogen over-application and to prioritize actions in those areas.<sup>2</sup> However, the idea that total nitrogen reporting will be used by farmers as a trigger to improve irrigation and nutrient management practices over time is not realistic and could hinder reductions in nitrogen applications. Asking growers to share and compare the amount of total nitrogen they apply without using any metric to compare it to, such as the amount of nitrogen removed at harvest or the amount of nitrogen uptaken by a crop, may reinforce the idea that all of them are doing a great job and create a false sense of efficiency by validating the existing management practices – good or bad. This could result in their applying the same amount of nitrogen for a particular crop type, the same ongoing over application of nitrogen, and nitrogen loading to groundwater.

#### Nitrogen Balance Ratios

The draft report clearly did not evaluate whether the targets proposed in the Agricultural Order (nitrogen applications compared to Typical Nitrogen Crop Uptakes) were appropriate or could

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Committee of Experts on Dairy Manure Management Final Report to the Regional Water Quality Control Board, Region 5, Sacramento, June 2005. 178 pp.

<sup>2</sup> Per the Agricultural Order, we will start receiving total nitrogen application data from growers on October 1, 2014.

be reformulated to document management practice effectiveness in reducing nitrogen loading to groundwater. Although the Panel discussed certain metrics based on nitrogen removed at harvest, the draft report does not include any recommended actions or performance measures that would improve the ability to document nitrogen uptake from crops.

Ratios will provide growers with a target by which to evaluate improvements made over time. We believe the ability of growers to accurately estimate nitrogen balance ratios will improve as new information and tools are developed in support of estimating nitrogen ratios.

#### Verification (i.e., Performance) Measures

The development and ongoing implementation and evaluation of appropriate performance metrics or measures to document effectiveness over time is one of the most critical components of a successful strategy to reduce nitrogen loading to groundwater. Without performance measures, of appropriate spatial and temporal scales, we are merely guessing whether the practices being implemented by growers are effective in the short, mid, and the long terms. Although the draft report acknowledges the Water Board's need for performance measures (i.e., metrics) to evaluate the effectiveness of management practices to reduce nitrogen loading and protect groundwater, the draft report only recommends total nitrogen application reporting by crop type and acreage on an annual and aggregated basis<sup>3</sup> as the only metric to use, while discounting the potential benefits of nitrogen uptake and removal ratios and shallow groundwater monitoring. We also find to be over simplistic the use of total nitrogen application recordkeeping and reporting as the metric recommended to assign risk (prioritize areas and efforts), show progress, trend analysis, and as the mechanism that will trigger practice implementation.

The draft report could have included the potential long-term use and analysis of the total nitrogen application reported data and to develop long-term verification measures. For example, the draft report could have investigated the use of the data by answering a few simple questions, such as:

- How could total nitrogen reporting enable growers or the Water Board to effectively evaluate the performance of agricultural management practices?
- After five years of Total Nitrogen reporting, how could this number provide sufficient information to confirm nitrogen loading to groundwater was minimized?

#### Groundwater Monitoring

Groundwater monitoring is essential to evaluate the effectiveness of agricultural practices and assess groundwater quality over time. Both shallow and deep groundwater monitoring in irrigated agricultural areas are necessary to evaluate the short- and long-term effectiveness of management practices with respect to groundwater quality. More importantly, ongoing groundwater monitoring and assessment are needed to protect public health associated with unregulated drinking water system wells inclusive of water systems below the public water system threshold of 15 service connections and private domestic wells.

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<sup>3</sup> There appear to be inconsistencies or ambiguity between the Key Points (i.e., W, Y, Z and AA) with respect to the type and spatial scale of nitrogen application reporting that should be clarified.

Referring to the Panel comments on page 20 regarding groundwater nitrate monitoring and well users notifications, we want to clarify that it is the Water Boards fundamental responsibility to protect human health (and the health of aquatic habitat) from the discharge of waste and it is within our authority to require discharges to monitor water quality conditions. Moreover, the Agricultural Order currently requires growers to monitor their private wells or participate in a cooperative entity that would monitor their private wells, and to directly notify well users (or task the cooperative entity to provide the notification on their behalf) of nitrate exceedances and the associated human health risks.

We generally agree that the use of shallow groundwater monitoring to evaluate the effectiveness of field- or even farm-scale management practices can be problematic. In more complex aquifer systems this can be due to the lag time in nitrogen fluxes (although shorter than for deeper aquifer zones), potential dilution, or potential or theoretical concentration effects associated with highly efficient irrigation practices and rainfall events and the inherent inability to link water quality conditions at a point in the subsurface with a particular farm or field at the surface. However, this is not always true as has been demonstrated by several case studies in the Central Coast Region where nitrogen signals have been observed in wells over relatively short time frames (less than five years) as result of changes in agricultural practices. Consequently, shallow, or first encountered, groundwater monitoring is a viable performance measurement. Moreover, groundwater monitoring is the defining performance measurement with respect to protecting and improving groundwater quality. The panel disregarded this tool after listening to a speaker explaining that because of irrigation management practices implementation, the amount of irrigation water moving below the root zone (deep percolation) will be reduced. With less deep percolation, the nitrate concentration of shallow groundwater may increase in some localized areas, however, this hypothetical increase in concentration would be mitigated in many cases by higher storage (volume) in the underlying aquifer due to the irrigation efficiency/decreased pumping. Additionally, this hypothetical scenario is just one of many variables that could impact groundwater concentrations (i.e., increased/decreased rainfall due to climate change, changing land use patterns, etc.). The concern expressed in the draft report that positive improvements might be interpreted as a degradation of groundwater is significantly overstated and not well substantiated technically from a hydrogeological perspective. Additionally, the panel members never explored or considered a different scenario that may occur. Nitrate leaching can also be a result of rainfall and not only irrigation deep percolation. In such cases, the implementation of nutrient management practices, rather than irrigation management practices, will result in a reduction of nitrogen loading and improvements in groundwater quality.

Unless more robust vadose zone monitoring tools become available to measure nitrate fluxes beneath the root zone of crops more accurately, shallow groundwater monitoring is the most effective and timely tool we have to evaluate the effectiveness of management practices at reducing nitrate concentrations in groundwater on a broader scale. Shallow groundwater monitoring programs are essential and necessary in evaluating the performance of agricultural practices over time. If the theorized concentration effect manifests as proposed, shallow monitoring will confirm it.

We do not think the Panel can effectively evaluate or address the development of appropriate groundwater monitoring programs, even if the Panel enlists the expertise of more hydrogeologists. This is because one plan or approach will not be appropriate for all the numerous discrete geographic areas and hydrogeological settings for groundwater basins in the State that are characterized by distinctly different hydrogeological conditions and land-use patterns. Effective groundwater monitoring programs need to be addressed and designed on a

case-by-case basis, suited for the regional or localized conditions via the development of a Quality Assurance Project Plans (QAPP). The high-level technical decision making process associated with groundwater monitoring programs needs to occur on a regional and local level, not within the context of the broader charge of the Panel.

#### Irrigation and Nutrient Management Plans

We agree that the implementation of irrigation and nutrient management plans that are developed by appropriately qualified professionals and that are relevant to individual farming operations should be a standard farming practice. We further agree that the management plans must include estimates of nitrogen required, nitrogen applied from all sources (including soil and irrigation water nitrogen), nitrogen removed, irrigation system distribution uniformity, and the volume of applied and infiltrated water.

Unfortunately, there are still data gaps and a lack of specific tools growers will need to implement and document the effectiveness of a management plan. Section 3.2.2.i of the draft report refers to ambiguities associated with Cooperative Extension recommendations regarding nitrogen applications. However, to overcome this issue, the draft report only includes the recommendation of developing a statewide educational program to instruct growers and professionals in how to improve irrigation and nutrient management practices, expecting the growers and professionals to know how much nitrogen to apply and how much is removed at harvest. The panel members pointed out these gaps and the need for more specific guidance, but the draft report does not propose any alternatives to address them or a process for how to overcome them. We have previously listed a set of parameters and ideas that could be considered by the panel.

#### Education and Training

We agree that extensive and ongoing training and education programs are needed to increase the implementation and effectiveness of appropriate and specific agricultural management practices focused on reducing nitrogen loading to groundwater. However, an overreliance on education, either voluntary or required, without timelines, meaningful objectives, targets, and management practice effectiveness monitoring and reporting will likely fall short in achieving reductions in nitrogen loading to groundwater to the maximum extent practicable.

#### Conclusions

We encourage the Panel to further evaluate and improve the draft report to meet its charge in providing the State Water Board with technical recommendations. Specifically we are asking for technical recommendations to develop tools and metrics that will enable us to:

- evaluate and prioritize high-risk areas and agricultural practices;
- evaluate management practice effectiveness in reducing nitrogen loading to groundwater;
- propose monitoring programs and verification measures to ensure that ongoing efforts are protective of groundwater quality.

We appreciate the opportunity to provide these comments and hope they will help facilitate the Panel's efforts in meeting their charge.

If you have any questions regarding our input to the Expert Panel and Advisory Committee, please contact Chris Rose at [chris.rose@waterboards.ca.gov](mailto:chris.rose@waterboards.ca.gov), or (805) 542-4770.

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