Joe Karkoski
Unit Chief
Central Valley Pesticide TMDL
Central Valley Regional Water Quality Control Board
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Dear Joe,

On behalf of the Westside San Joaquin River Watershed Coalition and the San Joaquin County and Delta Water Quality Coalition, Pacific EcoRisk is pleased to have the opportunity to provide you with comments on the document entitled *Methodology for Derivation of Pesticide Water Quality Criteria for the Protection of Aquatic Life in the Sacramento and San Joaquin River Basins. Phase II: Methodology Development and Derivation of Chlorpyrifos Criteria (Tenbrook and Tjeerdema, 2006).* Our review has been limited to a few general areas in the Phase II report, and our comments are provided below.

Phase II Report Item 1:
When there is insufficient data to support the use of the Species Sensitivity Distribution (SSD) approach, the authors propose using the Assessment Factor (AF) approach. The AF approach would allow the use as few as 1 to 2 studies, with at least one of the acceptable data derived from the family Daphniidae.

PER Comment 1:
Although Regional Board staff indicated that this approach was more protective than no numeric water quality criteria being established at all (i.e., RWQCB must meet their mandate to protect waters of the State), a more robust data set would surely provide a more scientifically defensible water quality criteria, as the LC50 generated from any one study may prove to be either overly sensitive or insensitive for a whole variety of reasons (e.g., acceptable Controls but sensitive batch of organisms, as demonstrated via a concurrent reference toxicant test). As the LC50 is obtained via a best fit line for a single dilution series exposure, this best fit line can readily be skewed to produce a hyper sensitive or hyper insensitive LC50; the LC50 could be significantly different if the study was repeated. There is no requirement in the literature rating system (Table 3.6) proposed by the authors to protect against this anomalous test result issue, or to have repeated measures (i.e., at a minimum, repeat the study to provide some measure of variability about the LC50) to assure that the 1 or 2 values that could be used in the AF approach actually are soundly produced values. Although protecting the waters of the State is in the best interest for all involved, clearly the water quality criteria should be

scientifically defensible so as to justify any financial burden that may result for stakeholders.

Phase II Report Item 2:

The literature rating system proposed by the authors in Table 3.6 provides a rating system for reviewed literature with a maximum score of 100. The score is based on the following parameters:

- **Acceptable standard (or equivalent) method uses - (max score = 10)**
- **Endpoint linked to survival/growth/reproduction - (max score = 15)**
- **Freshwater - (max score = 15)**
- **Chemical ≥80% pure - (max score = 15)**
- **Species in a family that resides in North America - (max score = 15)**
- **Toxicity value calculated or calculable (e.g., LC50) - (max score = 15)**
- **Controls are:**
  - **Described - (max score = 7.5)**
  - **Response reported and meets acceptability requirements - (max score = 7.5)**

The authors propose that a study with a score of ≥70 would be included in the database used to generate a water quality criteria.

PER Comment 1:

As noted above, the rating system lacks the following measures:

- *A score for characterization of organism sensitivity (i.e., additional "points" for study with concurrent reference toxicant study)*
- *A score for repeated measures (i.e., study repeated to provide some measure of variability about the LC50).*

Further potential problems with the rating system can be readily demonstrated as follows. The following examples would produce a literature value that would be used to generate a water quality criteria (i.e., the score is ≥70):

- *A score of 85 can be obtained form a study that has a chemically impure spiking standard, which most scientists would consider an unacceptable study. Impure standards are impure due to contamination from constituents during the manufacturing process. Contaminants may include a whole variety of chemicals that may affect the outcome of a toxicity test, potentially producing a sensitive LC50 that is not due to the chemical of interest, or may be due to additive or synergistic effects between contaminants in the standard and the chemical of interest. It is our opinion that studies that use an impure chemical standard should not be included in the database used to generate a water quality criteria.*
- *A score of 85 could be obtained by a study with no "link" to survival/growth/reproduction. The science of toxicology has produced a dramatic increase in the number of endpoints reported in the literature over the last decade. These endpoints include a variety of biomarkers (e.g., enzyme regulation,*

protein affects, tissue lesions, etc.) that the scientific community is still struggling with to understand the implications for organism survival, growth, and reproduction. Such endpoints are often included in chemical effects databases that can be used to generate water quality criteria. Such "sublethal" markers of exposure can also occur at concentrations far lower than those required to produce a LC50 (lethal effect) or growth/reproduction EC50 or IC50. If there were no other problems with such a study, the score used in the Phase II report could be 85, and the effect concentration could then be used for the generation of a water quality criteria. Until the scientific community has a better understanding of such sublethal endpoints, it is our opinion that studies that do not report toxicological endpoints of survival, growth, or reproduction (e.g., standard EPA endpoints) should not be used to generate water quality criteria.

- *A score of 92.5 could be obtained for a study that does not describe the controls. A standard scientific principle involves a description of controls in any experiment. Without the use of controls, the quality of the test organisms used in the study cannot be assessed. It is our opinion that studies that do not describe the controls should not be used to generate water quality criteria.*
- *A score of 85 could be obtained by a study using saltwater organism to establish a water quality criteria for freshwater environments. Wheeler et al., (2002) used a widely available aquatic toxicity database (i.e., EPA AQUIRE) to compare species sensitivity distributions for freshwater and saltwater organisms exposed to the same chemical. They concluded that for pesticides and narcotic compounds, saltwater species tended to be more sensitive; biological and physiochemical factors contribute to such differences. In essence, saltwater species could tend to produce overly sensitive water quality criteria for freshwater environments. In our opinion, only data from freshwater organisms should be used to produce water quality criteria for freshwater environments.*

We acknowledge the task that Tenbrook and Tjeerdema have undertaken is a daunting task. We hope that our comments will be addressed in their forthcoming revision and will result in a more scientifically defensible process for the development of freshwater water quality criteria.

Please feel free to contact us should you have any questions in regards to our comments.

Our Regards,

Stephen L. Clark
Vice President

Scott Ogle, Ph.D.
CEO