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MEMORANDUM

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TO: Danny McClure
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DATE: January 13, 2009

SUBJECT: REVIEW FOR BIFENTHRIN WATER QUALITY CRITERIA DERIVATION

The bifenthrin water quality criteria were derived by applying a new methodology recently developed by the University of California, Davis. Explicitly following the data evaluation criteria of the methodology, the author(s) sorted out 40 original studies for bifenthrin aquatic toxicity, and identified nine acute and two chronic toxicity studies that were reliable and relevant for criteria derivation. As acute toxicity data were acceptable from five taxa (i.e., a warm water fish, a cold water fish, a planktonic crustacean, a benthic crustacean, and an insect), a species sensitivity distribution (SSD) procedure was applied for the acute water quality criterion derivation that yielded a recommended acute value of 4 ng/L. The chronic criterion calculated by using the acute-to-chronic ratio (ACR) with a default ACR value yielded a value of 0.3 ng/L. Although the chronic criterion had limitations due to the limited data sets and absence of acceptable ACR value, it is likely protective of aquatic organisms given the fact that the value is six times lower than that of the lowest maximum acceptable toxicant concentration (MATC) from most sensitive species tested. The acute criterion, which is discussed below, is arguably underprotective and in need of further considerations. The following comments regarding the water solubility and acute criterion may be worthy of consideration in future revisions:

1. The water solubility data need to be updated. Three values of bifenthrin water solubility provided in the report are extremely varied, i.e., over several thousand folds of difference from each other. This is unusual for a relatively constant parameter like water solubility when the data were measured in relatively standard conditions. The highest value, i.e. 100 µg/L cited from "Agrochemicals Handbook by Kidd & James 1991" might have been outdated. A similar data was reported in "The Pesticide Manual by Tomlin 1994, Tenth Edition" (but not cited for water solubility in the report). However, the recent edition (Twelfth) of "The Pesticide Manual" updated the value equal to 1 µg/L. Similarly, the value 2.5 µg/L cited from FOOTPRINT 2008 could not be found on its website. Instead, a value smaller than 1 µg/L was posted in 2009. The lowest value 0.014 µg/L was referred to a review paper by Laskowski (2002). The actual source was from Herbst (1983a), which is even older than the value from Kidd & James (1991). It may be



beneficial to readers to cite original data sources and to keep citation sources relatively consistent as standard formats in compiling future reports for criteria derivation.

2. The conclusion for the protectiveness of the derived acute toxicity criterion does not seem to be fully supported by the acceptable acute toxicity data sets for the following reasons: 1) As discussed in the report, the criterion likely underestimated the sensitivity of organisms to bifenthrin due to the nominal toxicity values used for the derivation. However, the recommended acute criterion could only be revised until measured data are available (Page 11, the report); 2) The derived criterion is higher than the lowest LC₅₀ value of 2.7 ng/L for *Hyaella azteca* and similar to the LC₅₀ of 3.97 ng/L for *Mysidopsis bahia*. Thus, the discussion for the acute criterion in the report on Section 14 Sensitive Species (Page 13) is irrelevant to support the conclusion “the acute criterion appears to be protective of freshwater organisms”; 3) As shown by empirical data of 219 toxicity tests (discussed in the UC Davis Phase Two report for water quality criteria derivation, Page 2-41), a concentration that is less than approximately half of the mean LC₅₀ values may not cause mortality greater than that in controls. However, the derived bifenthrin criterion (4 ng/L) is greater than the half of the geometric LC₅₀ mean (6.5 ng/L) of five tests for the most sensitive species *Hyaella azteca*. Based on the reasons discussed above, I would recommend considering those factors in the criteria derivation for bifenthrin.