SCIENTIFIC PEER REVIEW

Total Maximum Daily Load (TMDL) for the Pesticide Diazinon in Chollas Creek, San Diego County, California (Draft of April 28, 2000)

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Overview:

The goal of the draft document is to reduce diazinon concentrations in Chollas Creek (San Diego Co., CA) so as to meet the water quality objectives for both toxicity and pesticides. As stated by the document, there appear to be no applicable numeric water quality objectives for either toxicity in general or diazinon specifically. Therefore as also stated, this TMDL was based on numeric targets for the insecticide that are expected to result in the attainment of the narrative water quality objectives for toxicity and pesticides.

As requested, this review will focus on the adequacy and validity of the technical analysis and the interpretation of the data. In particular, it was requested that the following scientific issues be addressed (from Attachment 2 of the RWQCB peer review request letter, 5/9/01):

Issue 1. The effects of diazinon dissolved in the water column on the beneficial uses (i.e., aquatic life and wildlife) of Chollas Creek. This would include health, reproduction, survivability and diversity.

Issue 2. The selection of the numeric target for diazinon.

Issue 3. Toxicity test protocols.

Issue 4. The assimilative capacity for diazinon in the water of Chollas Creek, given its physical, hydrological and chemical characteristics, which will be protective of the beneficial uses and attain the numeric targets specified by the Regional Water Quality Control Board.

In general, the document is well written, and represents a very good draft. It thoroughly describes the problem at hand, and the lack of available information regarding the observed toxicity in Chollas Creek. The few points that should be addressed below will serve to assist in the strengthening of the TMDL. For additional information on the environmental fate and toxic effects of diazinon, please refer to the following review:

Larkin, D. J. and R. S. Tjeerdema, 2000. Fate and Effects of Diazinon. *Reviews of Environmental Contamination and Toxicology* 166:49-82.

Specific Points:

Issue 1

A. In the Problem Statement it is stated that since 1994 almost all toxicity tests using the water flea *Ceriodaphnia* have shown Chollas Creek storm waters to be toxic. Therefore, the conclusion is made that the creek has not met the applicable water quality objective for toxicity. However, the rationale for using *Ceriodaphnia* as the test species is incomplete (please see the last sentence on page 4). While it is indeed a widely used and approved test organism for aquatic toxicity testing, no attempt was made in the document to determine its suitability as a surrogate for resident arthropods in the Chollas Creek. Is it a good model for resident species and their potential responses to pesticides? Without information on the native insects present, it is difficult to determine how closely *Ceriodaphnia* might predict toxicity in them.

   Therefore, it is suggested that a brief ecological survey of the creek be included in the TMDL to support the adequacy of using Ceriodaphnia *as a model insect in toxicity testing.*

B. It was also indicated in the same section, and also on page 3, that a toxicity identification evaluation (TIE) was conducted to determine the cause of the toxicity in Chollas Creek stormwater, and that the results indicate diazinon as the cause. However, TIE information can be difficult to interpret at times, and the results not always as definitive as portrayed by this TMDL. The entire focus of the document is on diazinon, thus results of the TIE are paramount in determining the importance of this TMDL.

   Therefore, it is suggested that the results of the TIE be briefly summarized and included in the document to clearly strengthen the argument for focusing this TMDL on diazinon.

Issue 2

A. The numeric targets presented on page 6 are assumed based on *Ceriodaphnia* information. However, there is no clear indication as to whether they are based on median-effect concentrations or no-effect concentrations, and whether the toxicity tests used lethality as the endpoint. A brief summary of the revised water quality criterion (WQC) published by Siepmann and Finlayson (2000) would be helpful in placing appropriate confidence in the numeric targets.

   Therefore, it is suggested that a brief summary of the revised WQC for diazinon be included.

B. Numerous other toxicity tests have been conducted on diazinon with other aquatic invertebrates (please see Larkin and Tjeerdema, page 61). Was this information considered in

developing the numeric targets? This again touches upon the rationale for using *Ceriodaphnia* as the model test species for the native Chollas Creek fauna, as stated above.

Therefore, it is suggested that a brief summary of the toxicity of diazinon to other aquatic invertebrates be included to compare and contrast it to the information from Ceriodaphnia. *Both the WQC and additional toxicity information will provide clear rationale for why the targets were set at their reported levels, which appear overly conservative.*

Issue 3

A. The toxicity test protocols are completely lacking in this document. Issues of appropriate model species selection, endpoints, and effect levels have already been addressed above. A brief summary of the test protocols from which the numeric targets were derived would clarify the rationale for the targets and should be included.

Therefore, it is suggested that a summary of the testing protocol for the Ceriodaphnia *tests used in preparing this TMDL be included.*

Issue 4

A. The TMDL presents a very thorough assessment of the sources of diazinon (please see Source Analysis, beginning on page 7). It presents a thorough analysis of the various sources from which the insecticide enters the watershed. In most cases available diazinon use information is reported and integrated into the analysis, and in the cases where the information is unavailable, appropriate assumptions are made and reasonable estimates are derived. However, virtually no attempt was made to model the fate or movement of the insecticide in the creek based upon its physical/chemical properties. For instance, sediment adsorption/desorption of diazinon was barely touched upon as either representing a sink or possible additional source for the insecticide in the water. The properties of diazinon are such that it will sorb to sediments, which may later serve as a source through desorption (please see Larkin and Tjeerdema, 2000, pages 51-56). In addition, it has a significant vapor pressure and Henry's law constant, indicating that volatilization represents a significant route of dissipation from the Chollas Creek (please see Larkin and Tjeerdema, 2000, pages 51-53).

Therefore, it is suggested that partitioning processes should be more thoroughly considered in modeling the ultimate concentrations of diazinon expected in the Chollas Creek.

B. In aquatic systems, diazinon is known to undergo degradation via hydrolysis, photolysis, and bacterial actions, or biodegradation (please see Larkin and Tjeerdema, 2000, pages 51-56). However, no estimate of their impacts on the TMDL for diazinon

was included. Such actions may further influence the dissipation of the insecticide from the creek.

Therefore, it is suggested that an estimate of the impact of environmental degradation processes on diazinon in the Chollas Creek should be included when modeling the ultimate concentrations of diazinon expected in the Chollas Creek.

Conclusion:

The TMDL for the Pesticide Diazinon in Chollas Creek represents a good first draft. However, to strengthen it the suggested revisions above should be incorporated. The resulting final document would include the information necessary to support the assumptions and rationale use, thus strengthening the TMDL for diazinon. As a final comment, the Implementation and Monitoring plan appears to be well designed and presented. However, use of citizen and/or school groups for the routine monitoring of Chollas Creek for sources of toxicity in the future is advised against. Due to their obvious lack of expertise, quality control would potentially be seriously lacking, and data generated by such monitoring would be suspect in terms of quality. Ultimately, management decisions made based on such data would also be compromised.