Development of Sediment Quality Objectives for California Bays and Estuaries

Scientific Steering Committee Conference Call
Evaluation of Chemical Indicators
June 23, 2006

Summary of Call and SSC Comments

Call participants (SSC and project representatives)
Peter Landrum (NOAA)
Todd Bridges (U.S. Army Corps of Engineers)
Ed Long (ERL Environmental)
Brock Bernstein
Chris Beegan (SWRCB)
Steven Bay (SCCWRP)

Others present (partial list)
Kevin Buchan (WSPA)
Lisa Haney (Los Angeles County Sanitation Districts)
G. Fred Lee (Lee and Associates)
Susan Paulson (Flow Science)
Kerry Ritter (SCCWRP)
Doris Vidal (SSCWRP)
Paul Hann (RWQCB)
Bruce Thompson (SFEI)
Tom Alo (RWQCB)
Art Barnett (SCCWRP)

Call Summary

The Chair of the SSC, described the goal and format for the call. The purpose of the call was to address two issues regarding the selection of chemical indicators: to review additional analyses of the performance of the chemical indicator for toxicity, and to review the new indicator development results for the benthos. Three SSC members and the Advisory Committee Chair were present for the call. Three other SSC members were unavailable due to schedule conflicts. The SSC Chair asked Chris Beegan whether the call should continue, given the absence of some SSC members. Chris Beegan requested that the call continue as planned. The Chair suggested that a make up conference call should be held in mid-July to provide an opportunity for the other SSC members to comment on the information presented during recent conference calls before the SSC's final comments are provided. The other SSC members agreed with the suggestion.

Steve Bay summarized the information on the evaluation and selection of chemical indicators that was provided prior to the call. The results were organized into three topical areas: bootstrapped analysis, toxicity-based indicators, and benthos-based indicators.

Bootstrapped analysis

Additional information relating to analysis and evaluation methods was provided in response to questions from the SSC.

- The analyses of classification accuracy (e.g., percent agreement) were based on the use of thresholds established for each candidate indicator using a statistical optimization method. This method selected thresholds that resulted in the best overall agreement between the predicted and observed toxicity (or benthos) response categories. Three thresholds were selected for each indicator, which were used to classify each sample into four categories: minimal, low, moderate, and high chemical exposure. These thresholds are generally lower than published thresholds with a similar intent that have been developed for other regions or applications, primarily due to differences in chemical concentrations among data sets. However, this optimization method was poorly described. The document would benefit from having a clearer description of the rationale for this step and how it was performed. Given that there are no performance standards mandated by the State Legislature or other performance standards from other sources to be attained, it is not clear what goals the science team had in mind in this step.

- There are differences in the number and types of chemicals that constitute the various candidate indicators (Table 1 of Appendix document). These differences are due to the use of multiple approaches; each developed using different methods for the selection of chemicals. All of the indicators include the high-priority contaminants identified by SWRCB for which data are available.

- The group of indicators based on national approaches (e.g., NOAA ERM and NatPmax) used all of the chemicals for which California data were available. The science team did not try to improve the performance of the national indicators by modifying the list of chemicals, as this would alter the intent of the comparison. Nevertheless, the chemical indicator documents should recognize that the comparisons among indicator approaches involved testing two variables; namely, the statistical nature of the approach and the list of chemicals accounted for.

- The percent agreement statistic is related to the number of correct sample classifications (relative to the toxicity category). Agreement due solely to chance is approximately 25% due to the use of four toxicity categories. Thus, the reported agreement values in the 30-40% range represent an increased ability to correctly classify the samples based on chemistry concentration. For the weighted kappa statistic, a value of zero indicates no improvement in classification accuracy relative to chance.

Tables showing the results of correlation and classification analyses using both bootstrapped and nonbootstrapped analyses were reviewed. The SSC agreed with the conclusion that the bootstrapped results were representative of the results to be expected using a typical field data set.

Toxicity-based indicators

The results of the performance analyses of the chemical indicators based on toxicity were reviewed. The CAPmax had the best performance of the statewide indicators evaluated in most, but not all, of the analyses.

Clarification of the differences between the statewide and regional indicator analyses was provided. The statewide analyses used the same indicator (i.e., same chemical-specific SQG values, same method to account for mixtures, same thresholds to classify the sample) applied to data from two state regions. Regional analyses were also conducted using the statewide indicators; the only difference in these analyses relative to the statewide analyses is that region-specific thresholds were applied to the north and south data sets. Regional chemical indicators were also included in the regional analyses; these indictors were developed and/or calibrated using regional data sets and also utilized region-specific thresholds.

There was discussion regarding the low classification accuracy for the regional version of CAPmax relative to the statewide version. The difference in performance was related to the use of different sets of thresholds, as the basic indicator and data set used for evaluation was the same for regional and statewide analyses of classification accuracy. The use of a smaller data set to develop the thresholds for the north may have resulted in a less robust set of thresholds compared to the statewide values.

Ed Long remarked that the correlation values shown are consistent with results that have been obtained from other studies throughout the nation and in Australia. The lack of a dramatic increase in correlation between the statewide and regional analyses is probably due to a presence of diverse sources and mixtures of contaminants in the regional data sets.

The SSC requested additional information on the performance of the CAPmax indicator before it would be able to provide a final comment on the indicator selection. A table showing the % incidence of toxicity for each category of classification was requested. This information should also be included in the technical report for the indicator selection process.

Benthos-based indicators
The results of analyses to compare the performance of chemical indicators based on benthic community condition were presented. Additional information regarding the development of the new benthic-based indicator (BCS) and the analysis methods was provided in response to questions from the SSC.

- The use of the BRI vs. the combined benthic index category classification in the analyses was clarified. The BRI values were used to derive the chemical-specific thresholds and weighting factors used to calculate the mean weighted benthic category score (BCS). The combined index category classifications were used to determine the optimum thresholds for each indicator (i.e., BCS and all other indicators evaluated) and also to calculate the correlation and classification accuracy parameters.
- The SSC requested more documentation of the methods used for the benthic indicator development and analysis. A flow chart, and additional descriptions of the BCS indicator development steps and analyses was requested.

The SSC decided to postpone making a recommendation regarding the benthic chemical indicator selection until the additional data are provided and the other SSC members have had a chance to comment on the results. Several tentative dates in July for a conference call to follow up on these issues and other aspects of the SQO program were proposed. Steve Bay will contact the SSC to identify a date for the call.

Additional Comments
- Ed Long referenced a recent paper of his that discussed the limitations of chemical-based sediment quality guidelines. He recommended the inclusion of a similar discussion in the technical report for this portion of the project. Ed will provide copy of the paper for distribution to others. Some of this information on assumptions, limitations, etc of effects-based chemical indices for mixtures is also included in the new SETAC publication on SQGs edited by Wenning and Ingersoll.