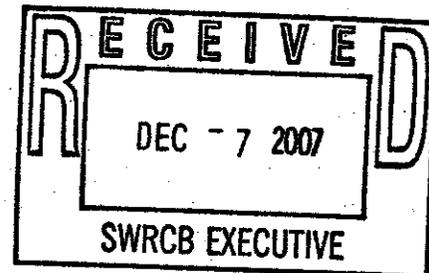




UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105



December 7, 2007

Jeanine Townsend
Acting Clerk to the Board
By email at commentletters@waterboards.ca.gov

RE: San Francisco Bay Copper Site-Specific Water Quality Objective

Dear Ms. Townsend:

Thank you for the opportunity to comment on the Proposed Amendment to the Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) for site-specific objectives (SSOs) for copper in San Francisco Bay. There are many aspects of the proposed SSOs that we support. However, we recommend that the water effect ratio (WER) be recalculated to account for seasonality.

On Wednesday, June 13, 2007, the San Francisco Bay Regional Water Quality Control Board adopted Site Specific Objectives for Copper for San Francisco Bay. The newly adopted chronic and acute copper SSOs for San Francisco Bay include both a WER and new (recalculated) acute and chronic values based on a new lower FAV. This new FAV results from adding the reference toxicant test EC50 values from the WER study to the EPA FAV data. EPA appreciates the large study effort that was undertaken to develop these SSOs, given the size and variable conditions in the San Francisco Bay and Estuary.

The toxicity studies and use of the new FAV appear to be consistent with EPA guidance, and we support their use. However we are concerned that the final WERs may not be fully consistent with our guidance. EPA guidance recommends that WERs be developed that are protective of critical periods. The WER adopted for San Francisco Bay is not based on the critical dry period samples, but is a geometric mean of samples for San Pablo Bay across all four seasonal sampling events. For this reason, EPA believes it may be higher and less protective than it should be. Preliminary calculation of the final WER based on critical dry period samples results in an approximate 20% lowering of both chronic and acute criteria values (from 6.0 to 4.8 ug/L for chronic, and 9.4 to 7.4 ug/L for acute).

In our comment letter to the San Francisco Bay Regional Water Quality Control Board, dated April 16, 2007, we requested more information about how the WER analysis took into account seasonal effects, and asked for a more detailed discussion of seasonal

variability in the staff report. In the response to our comment, it was pointed out that the toxicity study was designed to investigate the possibility of seasonal differences in WERs. The response states that the WERs for the two dry season sampling events were consistent with one of the wet season events, although the other wet season event WERs were markedly higher. The response goes on to state that, therefore, there was no clear evidence of a seasonal pattern, and the entire data set was used to compute the geometric mean WER for the SSO.

We could not find the statistical test results supporting these statements in the study report, and have therefore followed up with additional statistical analysis by an EPA contractor. The analysis of variance carried out by the contractor indicates that there is a significant difference between wet event WERs and dry event WERs. The contractor carried out pairwise comparisons of means of event log WERs (i.e. event 1 compared with event 2; event 1 compared with event 3, etc.). The mean for event 2 (the February wet event) is significantly higher ($p < .0001$) than the means for events 1 and 4 (both dry events). The mean for event 3 (the April wet event) is also significantly higher ($p < .05$) than the means for events 1 and 4. According to our contractor, log transformed data should be used for this analysis, consistent with the use of geometric means. We note that seasonal effects as well as interannual effects are highly variable in a large estuary such as San Francisco Bay, and four sampling events may not be fully adequate for developing a protective WER. However, given the limited data and the results of our statistical analysis, we recommend that the WERs be based on the dry season sampling events. We would also note that the WER for copper in Mugu Lagoon developed by the Los Angeles Regional Water Quality Control Board was based on the critical season.

Our analysis finds that the WERs for the dry events are consistent with each other, and can be used to develop a final WER which is representative of the critical period in the Bay. Although the two "wet" events show statistical differences from each other, they are not consistent with the "dry" events. From a cursory examination of hydrological information from both the February and April sampling periods, it appears that the difference may be due to the source of river flow into the Estuary. The calculated outflow index from the Sacramento-San Joaquin Delta is similar for the two events, but the San Joaquin River provides a much larger portion of the inflow in April. Without more research into the difference in dissolved organic carbon or other chemical conditions between sources, it is difficult to understand the difference between the two wet event WERs.

To be protective under all weather conditions and for the entire Bay North of Hayward Shoals, we recommend that a WER calculated for the critical conditions (both spatial and temporal) be used to calculate the final WER for San Francisco Bay north of Hayward Shoals. Given the analysis of variance results, we suggest that the copper WER that is protective of San Francisco Bay should be calculated as a geometric mean of San Pablo Bay values (consistent with the San Francisco Bay Regional Water Quality Control Board's decision to use the basin with the lowest WER values) excluding the Petaluma River delta site, and only from the "dry" events. The WERs for the Petaluma River site were consistently higher than the other San Pablo Bay sites, and there is evidence from

prior water and sediment quality studies that this site has different conditions and constituents than other sites in San Pablo Bay.

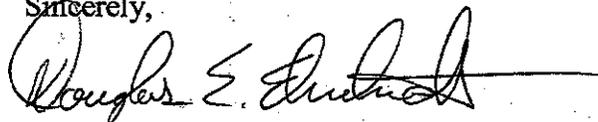
EPA guidance discusses in some detail the development of site specific criteria and WERs for an estuary. This guidance is discussed in terms of sites (spatial variables), but is equally pertinent to seasonal effects (temporal variables). Seasonal, as well as interannual effects are especially important for San Francisco Bay where seasonal freshwater inflow from two large rivers has a large effect on hydrology, chemistry and biology of the entire system.

The EPA guidance recommendation (*Interim Guidance on Determination and Use of Water-Effect Ratios for Metals*, Feb. 1994, P 82) is as follows: "If all the WERs were sufficiently similar, one site-specific criterion could be derived to apply to the whole estuary. If the WERs were sufficiently different, either the lowest WER could be used to derive a site-specific criterion for the whole estuary, or the data might indicate that the estuary should be divided into two or more sites, each with its own criterion." Fortunately, the San Francisco Bay study dry season sampling was undertaken during one of the drier recent water year periods. This means that the dry event WERs are likely to adequately represent the critical period in the Bay.

In summary, we believe that the information gathered so far to develop site specific objectives for copper for San Francisco Bay suggests that seasonal effects should be taken into account in the development of the copper WERs for San Francisco Bay. We recommend that the final WER for the Bay be based on the dry season samples, unless there is additional information supporting use of more than one final WER, or that the WERs are sufficiently similar both spatially and temporally across the major variables characteristic of the San Francisco Bay and Estuary. Because no interannual information was used to develop the copper SSOs, it may be important to implement a targeted sampling program to ensure that the WERs and SSOs are protective, especially if the WERs are not modified as we suggest.

Thank you for your consideration of these comments. If you have any questions, please contact me at (415) 972-3420 or Susan Hatfield at (415) 972-3520.

Sincerely,



Douglas E. Eberhardt, Chief
CWA Standards and Permits Office

Cc: Naomi Feger, San Francisco RWQCB
Richard Looker, San Francisco RWQCB