

## Evaluation of the Reference Envelope Approach for Assessing Toxicity in Contaminated Surficial Urban Freshwater Sediments

The reference envelope (RE) has been proposed as an alternative approach to assess sediment toxicity to overcome limitations imposed by the use of control sediments including differences in non-contaminant characteristics and low statistical power when many test sediments are compared to a single control. In the proposed RE approach, tests sites are classified as toxic if their control or median normalized toxicity falls below the lower 5<sup>th</sup> percentile of similarly normalized reference sites, selected such that the mean Probable Effects Concentrations Quotient (PECQ) is <0.2 and standard toxicity test control acceptability criteria (TAC) are met. We evaluated 3 reference site selection criteria for calculating the RE: (1) PECQ <0.1 or <0.2 and survival TAC of 80% (*Hyalella azteca*) and 70% (*Chironomus dilutus*); (2) PECQ <0.1 or 0.2 and survival TAC of 85% (*H. azteca*) and 80% (*C. dilutus*); and (3) same as in 2 plus minimum TACs for weight of 0.15 and 0.60 mg/individual for *H. azteca* and *C. dilutus*, respectively. These criteria were used to classify toxicity in surficial sediments from 7 urban localities (98 sites) across the United States contaminated with metals, PAHs, polychlorinated organic compounds, and pyrethroids using control and median-normalized survival and biomass. The number of sites classified as reference declined by about 20% and 10% for *H. azteca* and *C. dilutus*, respectively, when the PECQ was reduced from 0.2 to 0.1 but this change had only a small effect (<10% difference) on the number of sites classified as toxic for either control or median-adjusted data. Increasing the survival criterion or adding a weight criterion did not affect the number of sites classified as reference or the RE value, and therefore test site classification, when all reference sites were used to establish the RE. When the RE was calculated separately for each urban location, a similar result was found but some groups had  $\leq 2$  sites designated as reference. This study indicates that determination of the RE is more affected by the PECQ criterion than toxicity criteria but this does not appear to affect site classification. *This abstract does not necessarily reflect US EPA policy.*