

# Toxicity Reference Values for Mercury and Their Effect on Sediment Cleanup Goals

Phyllis Fuchsmal<sup>1</sup>, Richard Wenning<sup>2</sup>, Elisa Bizzotto<sup>3</sup>, Mary Sorensen<sup>4</sup>, Victor Magar<sup>5</sup>

<sup>1</sup> Ramboll Environ, Cleveland OH, USA

<sup>2</sup> Ramboll Environ, Portland, ME, USA

<sup>3</sup> Ramboll Environ, Milan, Italy

<sup>4</sup> Ramboll Environ, Atlanta, GA, USA

<sup>5</sup> Ramboll Environ, Chicago, IL, USA

<sup>1</sup> Phone: +001 (440) 332-9028

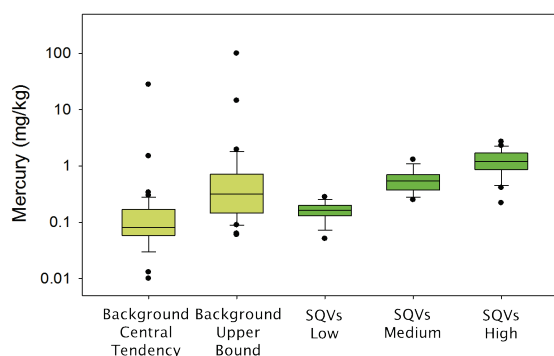
E-mail: pfuchsman@environcorp.com

**Introduction:** In many countries, toxicity reference values (TRVs) and sediment screening values (SQVs) are important determinants of sediment remediation goals for mercury. Sediment remediation goals for mercury vary in different countries, as they are set by different international regulatory authorities to establish so-called “safe” limits in sediments and for protection of aquatic life. In some cases, TRVs and SQVs are based on protection of local or region-specific ecological resources or targeted at certain highly valued species, while in other cases these values are rather non-specific and more broadly focused on screening sediments for protection of sediment benthos or sensitive laboratory species that may, or may not, be present.

We summarize the results of a critical review of mercury TRVs and SQVs derived for protection of benthic invertebrates, fish, and wildlife. The purpose was to determine if sediment and ecological protection goals in different countries and for different regulatory applications were based on current scientific understanding. [1,2]

**Methods:** For benthic invertebrate SQVs, we included consideration of compiled alternative data sources, including published spiked sediment toxicity studies and toxicity or benthic community data from sites where mercury was a predominant sediment contaminant. For fish, we included studies that considered paired fish tissue mercury and fish community assessment data at mercury-contaminated sites and in regional watershed assessments; we also compared wildlife TRVs on a fish tissue basis with information on background concentrations of mercury in fish. For wildlife, we included toxicity studies used as the basis for commonly cited TRVs.

**Results:** The results of this work are intended as a tool for the development of site-specific sediment cleanup goals for mercury based on current scientific understanding of mercury’s behavior in sediments and uptake by fish and other aquatic organisms.



**Fig. 1.** Comparison of low, medium, and high SQVs to background. [2]

**Discussion:** Cleanup goals should not be based on non-specific SQVs for protection of benthic invertebrates; these values are one to several orders of magnitude lower than mercury toxicity thresholds for invertebrates identified from spiked sediment studies and sediment toxicity investigations at mercury-contaminated sites. Figure 1 compares SQVs to background. SQVs that are equivalent to background conditions (especially central tendency background) do not efficiently accomplish the objective of screening because very few sites can “screened out,” regardless of the actual likelihood of toxicity. [2]

Dose-response data are preferable as the basis for TRVs and SQVs; however, wide variation has been observed among species responses, and available fish toxicity data are limited and highly uncertain. Site-specific investigation may be warranted if mercury risks to fish are believed to be potentially significant. Lastly, commonly cited wildlife TRVs are outdated because they incorporate safety factors to address uncertainties that, in some cases, have been resolved by more recent toxicity studies. [1,2]

**References:** [1] Fuchsman et al. (in press). *Environ. Toxicol. Chem.* (accepted for publication ; Manuscript ID ETCJ-Apr-15-00341) [2] Conder et. al. (2015) *Environ. Toxicol. Chem.*, 34 (1) : 6–21.