

Comments on draft document “Deriving Sediment Interstitial Water Remediation Goals (IWRGs) at Superfund Sites for the Protection of Benthic Organisms from Direct Toxicity”

This document will be very valuable for the Superfund and NRDA programs as the scientific community moves to use the best available science and technology for developing sediment values to drive decision-making. In general the document is very well written, relies on and references an established knowledge base, and synthesizes this information in an easy to read format. Specific responses to the charge questions are indicated below and followed by general comments.

Response to charge questions

- (1) Is the document written in a style that will be accessible for users with a range of educational and technical backgrounds?

The document does a good job describing the background and fundamentals for measuring interstitial water, relating that water to toxicity data, and developing a useful decision point. There is however, some language used in the examples that should be made simpler, clarified, or described in more detail. For example, there is some interchangeable use of toxicity metrics that are not defined. While the toxicology community is familiar with them, these metrics and their abbreviations will make the document hard to follow (e.g., ER50). I recommend simplifying where possible and maybe including a special text box describing them?

There is also some interchange of words used to describe pore water, interstitial water, etc. If we can use consistent language that will be helpful.

- (2) Is the described methodology sufficiently clear to be performed by Superfund remediation project managers, risk assessors, and consultants for Superfund sites? If not, please provide suggestions on how clarity can be improved.

The section describing how the IWRG should be compared to toxicity data should be strengthened and made a section on its own. This section is currently limited to the bottom of page 32. This section could be expanded to address “how do you evaluate consistency with toxicity data?” Maybe the section could refer to approaches using a weight of evidence/lines of evidence approach? The current section leaves the reader with a question about how to evaluate “consistency”; anything we can do to provide clarity would be helpful.

- (3) Is the document missing any important concepts, sections, definitions, and/or text that should be provided in order to make the methodology truly implementable?

The executive summary should indicate this approach represents an important method/scientific approach for incorporating bioavailability into decision making – of course the document gets into this more in section 1.

There are no important concepts missing or sections that need to be added. Some minor revision and reformatting (adding an uncertainty section) is recommended for section 5.

Minor: Recommend including a small text box of variables defined.

- (4) Are the illustrative examples for determining IWRGs complete enough to demonstrate how the IWRGs are derived?

The figure 4-1 on page 23 could be simplified. The current figure is unclear about the number of steps, yet on page 24 the text refers to step 3 and step 4. Maybe we could make this figure a simple flow diagram (although it loses the concept of returning to sediment concentrations)

Step 1: Collect sediment data and measure IW concentrations

Step 2: Evaluate bioavailability

Step 3: Calculate IWRG

Step 4: Convert IWRG to sediment concentration

- (5) Is the methodology for deriving interstitial water remediation goals scientifically defensible?

Yes. This method is scientifically defensible and grounded in a significant amount of published research.

- (6) In implementing the methodology, site-specific K_{oc} s are used to convert the IWRGs on concentration basis in sediment interstitial water ($\mu\text{g/L}$) to concentrations in bulk sediment ($\mu\text{g/kg}$ dry weight). Is the discussion of the K_{oc} s adequate? Is the discussion of the conversion from concentrations in interstitial water to bulk sediment adequate? Is the discussion of which K_{oc} s should be used in the conversions adequate?

Yes. This is adequate. In particular the use of a simple and a complex (PAH) example helps the user/reader apply this approach to their own site.

- (7) Passive sampling can be performed on any number of samples from a site; for example, on all samples where contaminants are measured in bulk sediment, on only the surface sediments, on the top and bottom of sediments cores, on the top and at the dredge depth of the sediments cores, on surface sediment and based of BAZ (biological active zone), or some other arrangement. Currently, the methodology allows flexibility (makes no recommendation) on which samples are measured using the passive sampling technique and how those data are used in the conversion from interstitial water IWRGs to bulk sediment IWRGs. The extremes in this process are a) perform one passive sampling measurement and assume all sediments are the same across the location of interest (horizontally and with depth) or b) perform passive

sampling on all samples and develop 3-D contour plots with depth based upon concentrations in the interstitial water. Should the methodology make a recommendation on this issue? If so, provide your recommendation.

The greatest benefit of this document is that it is written as guidance and not too prescriptive. Given the wide range of sites and situations this methodology could be applied it is best to provide the fundamental approach that IWRG are developed, allow the user to become educated in the approach and apply it to their specific site/conditions.

There could be some value in including additional discussion describing the scenario above and how a user could approach complex sites and considerations for balancing the cost of IW analysis with the need to characterize the variability at the site. Could we expand on the dieldrin and PAH examples to make this point?

- (8) Section 5 provides information on comparing toxicity test results and developed IWRGs. Is this section sufficiently clear for the non-experts in toxicity testing and/or passive sampling?

This section is somewhat confusing. I'll highlight some specific recommendations below.

- *The discussion on QA is good to put up front (page 32)*
- *Page 32, third paragraph; Consider using this paragraph or section to describe confounding factors in bioassays rather than focus just on variability between batches of test organisms. These confounding factors are already outlined in sediment tox testing guidance and could merely be listed here as other things to consider.*
- *Page 32, fourth paragraph; this section is very important for application of IWRG. Those involved in sediment management decisions are comfortable using toxicity test data. We need to be more explicit about how to use both IWRG AND sediment tox data together. This section could include describing a "weight of evidence" approach and how these two measures could be used to confirm the results of the other/or not. Regardless it should be expanded.*
- *Page 35-36. The use of the Hawthorne data is important. One challenge is to describe what was done in this study so that it makes sense to the reader; a difficult task. At a minimum there needs to be one paragraph describing the study and the figure 5-2 should be explained. The legend on figure 5-2 should indicate the residues were predicted from the pore water concentrations. I'm not sure what other data set could be used to make the point about differences in test organism sensitivity. Alternatively this section could be left out and merely discussed in generic terms while referring the reader to that paper?*
- *Page 37. On this page the guidance discusses situations where the contaminant drivers may not be known or measured. This whole section could be labeled "Addressing*

Uncertainties” after the first paragraph of page 37. Then we could include discussions on bioassay confounding factors, organism sensitivities, challenges in measuring pw, etc.

- *Page 39 last paragraph. Recommend deleting this section on test replicates.*

(9) General Comments

- *Simple edit. Page 11 3rd paragraph. “values are the same”*
- *Minor edit. Page 24. Rather than use the term $K_{oc}s$, refer to them as K_{oc} values so the reader doesn’t get confused with $K_{oc}:ss...$*
- *Consider including a small text box that refers to the variables and defines them?*
- *The appendices might be included in the text above to simplify the document. Appendix 6.1 could be moved to the example on PAH. Appendix 6.2 could be added to the discussion on specific specific data.*