Allison Harris - NOAA Comments - Site 40 Mercury Fish Risk Model

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Date: Thu, Aug 24,2000 2:36 PM
Subject: NOAA Comments - Site 40 Mercury Fish Risk Model

Subject comments attached (Word Mac) and pasted below.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF RESPONSE & RESTORATION
COASTAL PROTECTION AND RESTORATION DIVISION
c/o U.S. Environmental Protection Agency , Region 4
Waste Management Division
61 Forsyth Street, Atlanta, GA 30303

MEMORANDUM

TO: PNS NAS Partnering Team

FROM: Tom Dillon, Ph.D.

SUBJECT: NOAA Comments - Mercury Fish Risk Model for Site 40 RI

DATE: August 24,2000

CC: Lynn Wellman, EPA

The U S +Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) appreciates the opportunity to comment on the mercury fish risk model in the Site 40 RI and RI Addendum reports, April, 2000. If you have any questions, please contact me at 404-562-8639, FAX 404-562-8662 or tom.dillon@noaa.gov.

1. Exposure Model

A food web exposure model, developed for fish, shellfish and invertebrates inhabiting a mercury-contaminated estuary (Evans and Engel, 1994), has been successfully adapted for the Site 40 RI (Bayou Grande). The model was parameterized with Site 40 sediment mercury data. Other site-specific inputs were not available (e.g., BSAFs).

2. Mercury Residue-Effects Levels

A mercury residue- effect level of 0.14 mglkg wet weight was used in the RI reports This value, accepted by the PNS NAS partnering team during its August 1999 meeting, is based on the following studies (as cited in the Corps of Engineers* ERED database).

1) whole body, survival and growth NOAEL of 0.14 mg/kg fur rainbow trout (cold water species) during long-term laboratory exposure to mercury-contaminated food

2) whole body, growth NOAEL of 0.135 mglkg for yellow perch (warm water species) during year-long field exposure.

3. Risk Characterization

Coupling the 0.14 mg/kg NOAEL with outputs from the exposure model (run with maximum and mean concentrations) yields the following Hazard Quotients (HQ).

Site 40 Sediment Mercury Concentrations	HQ
Maximum detected = 2.2 mg/kg	40
Mean of detected values (20/143) = 0.36mglkg	7
Mean of alt values (n=143) = 0.0893mglkg	>1

HQs consistently above 1 suggest unacceptable levels of mercury risk for higher trophic level fish based on the Site 40 sediment data+

4. Uncertainty Analysis

a. Exposure Model - The Evans and Engel exposure model accurately predicts red drum tissue mercury concentrations in a south Texas estuary. Therefore, most model uncertainties are likely associated with data inputs to the model rather than the model itself. The only site-specific data input was the Site 40 sediment mercury concentrations. Uncertainty could have been further reduced with additional site-specific data; e.g., BSAFs in prey items (forage fish, crustaceans infaunal invertebrates). Forage fish were collected and chemically analyzed but mercury was deleted from the analyte list.

EPA guidance generally recommends a site foraging factor (SFF) of 1.0 in food web models unless site-specific home-range information supports a lower value. The Navy applied a SFF of 0.425in the June 1999 RI Addendum and a SFF of 0.32in the revised (April 2000) version. It is unclear why these values and the number of significant figures changed between the two versions. In the absence of site-specific home-range information, these alternative, non-conservative SFF should not be used in the Site 40 RI report.

One could even argue, from an ecological perspective, that the SFF of 1.0 is the more appropriate value (EPA guidance notwithstanding). The PNS NAS shoreline is less developed than other parts of Bayou Grande. Less development generally implies habitat more conducive to juvenile fish development and more attractive to their prey species.

b. Residue-Effects Levels - An alternative residue-effects level of 2 mg/kg is offered in the revised Site 40 RI and RI Addendum reports. This value is based on a whole body LOAEL of 2 mglkg in winter flounder injected with mercury. The biological endpoint in the experiment was an increase in ornithine decarboxylase enzyme activity. Justification for this alternative value appears to be a desire to focus on a species which may inhabit Bayou Grande (see revised RI, p 10-79 and titles of Tables 10-31 and 10-32) as well as the presumed uncertainty associated with using an effects value generated from a cold water species (see p I 0 in the revised RI addendum).

This alternative value should not be used in the Site 40 RI reports for the following reasons,

1) Value is based on a LOAEL, not a NOAEL.
2) Value is based on an injection experiment, not long-term dietary exposure.
3) Value is based on altered enzyme activity, not survival! growth or reproduction.
4) Winter flounder are probably not found in Bayou Grande. Per the ERED database, this species ranges from Nova Scotia to Georgia.
5) The agreed to 0.14 mglkg effects level is based on a warm water species (yellow perch) as well as the cold water rainbow trout.

5. Recommendation

Per EPA guidance, ecological risk assessments proceed from conservative, uncertain evaluations (Steps 1-3) to less conservative, more certain risk estimates (Steps 4-7). Reductions in uncertainty are generally achieved by gathering site-specific data. If the uncertainty associated with mercury risk estimates to the upper trophic level fish are unacceptable, NOAA recommends the collection of additional site-specific data. Synoptic collections of sediment and forage fish in the AZs of Bayou Grande would appear to be the most efficient way to reduce uncertainty; i.e., forage fish represent most (67%) of the total ingested mercury dose (crustaceans30%, benthic invertebrates2%).

CC: ENSAFE.GWIA("wellman.lynn@epamail.epa.gov")