UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
WATER

MEMORANDUM

SUBJECT: Implementation of Metals Criteria

FROM: Martha G. Prothro
Acting Assistant Administrator for Water

TO: Water Management Division Directors
Regions I-X

Since the issuance of the May 1992, Interim Metals Guidance ("Interim Metals Guidance"), we have continued to work on the issue of implementation of metals criteria for the protection of aquatic life. We have also sought the opinion of those outside EPA. On January 25-27, 1993, EPA held an open meeting in Annapolis, Maryland, to discuss metals. The purpose of this memorandum is to provide an overall description of our activities, and to place the Annapolis meeting in context. I encourage you to share it with your State and Tribal Water Quality Managers. A subsequent memorandum will provide our best technical recommendations as shaped by all information gathered since the Interim Metals Guidance. This memorandum will be submitted to you in draft for comment by the end of March, and we intend to issue it in final by April 15.

There were 34 participants at the Annapolis meeting, drawn from academics, consultants, the regulated community, States, EPA laboratories, EPA Regions, and EPA Headquarters. Approximately 120 observers attended, and offered comments. After this meeting, the participants met on January 28-29, in closed session to discuss short and long-term recommendations for EPA. They have prepared a document listing their short-term recommendations ("recommendations", attached).

The results of the meeting and the recommendations were positions of the participants, and the recommendations were not subject to formal EPA review. They are not EPA policy, but we will consider them carefully in preparing our guidance.

The Annapolis meeting brought together a group of experienced scientists who thoughtfully dealt with the issues. The group supported several areas of our existing approach but also recommended changes in some specific areas. The memorandum which we expect to release on April 15 will provide our initial response to the recommendations. Our preliminary plans for metals guidance are to provide specific recommendations on the current best methods for regulating metals, and to provide decision factors for use of other than the specific recommended methods. Our intent is to develop guidance that will maintain the protection intended by the water quality criteria for aquatic life.

We have been communicating with the Regions extensively, including a series of conference calls on metals implementation. At Headquarters, we have formed a group of OW Branch Chiefs to take an integrated look at the problem, develop an overall strategy, and coordinate development of guidance in various areas of the water quality program. The people involved are Bob April (202-260-6322, criteria), Elizabeth Jester (202-260-7046, monitoring), Russ Kinerson (202-260-1330, modeling), Bruce Newton (202-260-7074, Total Maximum Daily Loads), Jim Pendergast (202-260-9537, permits), Dave Sabock (202-260-1315, standards), and Bill Telliard (202-260-7134, analytical methods).

The Office of Water is preparing additional guidance in several areas that we expect to issue in draft during the next year. This guidance will address:

Clean Analytical Methods - Guidance on methodology to gather accurate analytical data on low levels of trace metals.

Data Evaluation and Analysis - Guidance on how to evaluate old data and associated QA/QC data, so as to judge the data's reliability.

Translators - Guidance on models to translate between water quality standards and permits.

Standards Modifications - Guidance memorandum on how to modify State water quality standards, where a State chooses to make changes.

Revision of the Interim Metals Guidance

Criteria to Permits Assumptions - Guidance on the risk management consequences of various assumptions made in developing water quality based controls.

Water-effect Ratio - Detailed guidance on methodologies to determine the water-effect ratio.

Metals Strategy - The strategy will address these issues and integrate others, such as metals in sediments and sludge.

Our long-term goal is to understand fully the toxicity and chemistry, and to develop appropriate methodologies based on that understanding. We are conducting research in these areas. In the near term, we will provide the above listed guidance documents on how to utilize the best present science while the science continues to evolve. Regions, States, and Tribes should continue all aspects of their water quality programs, including regulation of metals, while the additional guidance discussed above is being prepared. We believe this guidance will be consistent with the concepts expressed in the National Toxics Rule and have no plans to amend the rule.

If you have any questions concerning this memorandum, please telephone me or have your staff telephone Bob April (202-260-6322). We will also be soliciting public comments on the recommendations. You may send your comments on the recommendations to Margarete Heber, Mail Code WH-586, USEPA, Washington, DC 20460, and should inform any interested parties that such comments should be submitted to her.

Attachment

Workshop on Aquatic Life Criteria for Metals
Short Term Recommendations

These are the overall short-term recommendations of the experts invited to the Workshop on Aquatic Life Criteria for Metals held January 25-29, 1993 in Annapolis, Maryland. The group also recommended that the Agency should fund (or co-fund) some basic integrated longer term research to determine what controls the bioavailability of metals. A separate document will detail the long-term research recommended.

This workshop was organized by EPA, however, the following short-term recommendations were developed and submitted to EPA by the experts invited to the workshop. These recommendations should not be considered EPA's recommendations or policy. EPA is in the process of evaluating these recommendations and revising its national policy on metals.

This workshop explicitly excluded mercury and selenium from discussion because they bioaccumulate and their mode of action differs from most other metals.

The following short-term recommendations are meant to further implementation of the aquatic life criteria for metals.

I. Clean Analytical Chemistry

Most metals data have <u>not</u> been collected using appropriate clean techniques (both sampling and analytical). Consequently, values for effluents and receiving waters may be suspect and should be verified using appropriate clean sampling and analytical techniques. Metals concentrations in the low parts per billion range that have been collected in previous years have been shown to be unreliable due to various types of sample contamination. This may include effluents, as well as ambient water samples. Therefore, modern methods for clean (ultra-clean techniques for open ocean and lakes, clean techniques for all other water body types) collection, sample handling, and instrumental techniques should be used, and new effluent and receiving water data should be collected.

EPA HQ should prepare guidance for the States, regions, and dischargers to describe clean sampling and analytical laboratory procedures. Guidance should also be provided to permit writers on how to handle pending and previously issued permits (ie. how good is the analytical data that was submitted and is being submitted), and the relationship of clean techniques to existing Part 136 analytical methods and sample handling requirements.

II. Total Recoverable Metal for mass balances and permits

Calculations and modeling to develop TMDLs and permit limits should account for total recoverable loadings because that form of the metal behaves as a conservative parameter in natural waters. Permits should be written in terms of total recoverable metal since this is the only form that can be used to reliably compute the resulting concentrations in the water column and sediments.

III. Dissolved metal to approximate the bioavailable fraction

A. Based on the data presented at the conference, and the opinion of the majority of assembled scientists, the dissolved metal concentration better approximates the bioavailable fraction of waterborne metals than the total recoverable concentration of metals. In some cases, even the dissolved concentration may overestimate the bioavailable fraction for metals that strongly complex to either inorganic or organic ligands (e.g. filterable carbon containing particles). On the other hand, the dissolved concentrations may underestimate the bioavailable fraction where food sources for organisms are shown to be contaminated and represent a significant exposure pathway. On balance, the assembled experts at the workshop recommend that the existing water quality criteria values be applied as a dissolved metal concentration as the dissolved metal concentration is currently the better estimate for bioavailable metal fractions.

B. It is necessary to estimate the dissolved concentration resulting from total metal loadings in the receiving water (the "translation" problem), because the required load allocations calculated from either simple dilution or more elaborate fate models are in terms of total recoverable metal. The best estimate of the ratio of dissolved to total recoverable metal is by direct measurements using clean techniques. These measurements should be taken in the ambient waters at or near the critical conditions (e.g low stream flows) for which the permits are calculated, and around the criteria concentrations. If relationships between the dissolved fraction and other water quality variables, particularly suspended solids, are available, they can be used in more comprehensive modeling frameworks to project the ratio of dissolved to total recoverable (probabilistic/dynamic models).

C. In order to interpret current water quality criteria for metals as a dissolved concentration, it may be necessary to re-test the most sensitive species and measure dissolved and total recoverable metal during the tests, where this information is not available. This appears to be most critical for chronic tests where the organisms are fed. For these new experiments, it is recommended that measurements of ionic metal concentrations also be made.

IV. Water-Effect Ratio (WER)

The water-effect ratio is a biologically based method to estimate the bioavailable fraction of a toxic pollutant in a receiving water. Guidance for this method will be available shortly. The application of WER can be used as a substitute for the dissolved fraction by estimating the bioavailable fraction. For this use, both total recoverable metal and dissolved metal should be measured. If the criteria are expressed as dissolved, then a dissolved WER should be used. Use of a dissolved WER should reduce the dependence of the WER of suspended solids concentrations. If the criteria are expressed as total recoverable, then a total recoverable WER should be used.

V. List of under and over protective factors

EPA should prepare a list of the under and over- protective factors and assumptions in the standards-to-permits process as information for permit writers. This could serve to better insure that the criteria are applied to achieve the intended level of protection. The permit writer should consider both the over and underprotective factors in limits and in considering when a WER is appropriate. These factors and assumptions should at a minimum include:

A. Duration and violation frequency

B. Criteria (applicability of dissolved fraction)

C. Steady state versus dynamic modelling for TMDLs.

D. Permit limits and averaging periods.

VI. Organometallic compounds

There are classes of compounds, for example metalized dyes, that contain metals of concern. However, these chemicals may have characteristics that require additional consideration. Some metalized dyes are designed so that the metal is tightly bound, and they will not break down quickly. However, some treatment processes will enhance the breakdown of these compounds. If these chemicals can degrade rapidly, for example in the treatment plants, then these chemicals would convert to ionic metal, and would be handled as described in the above discussions. If, however, they are resistant to decay, then they should be evaluated as a separate class of chemicals, with specific properties. (It has not been determined exactly what procedures or criteria to use to determine resistance to decay.) Data presented demonstrating the bioavailability or toxicity of these compounds in the effluent should be used in developing permit limits for metal.