

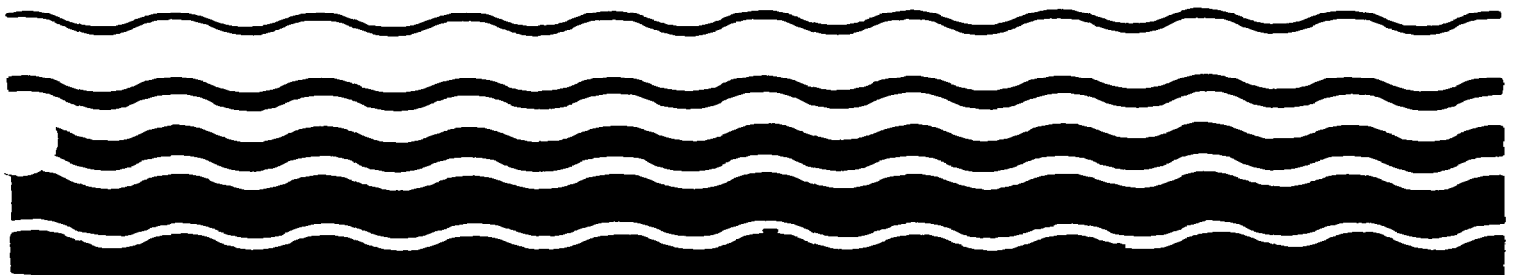
United States
Environmental Protection
Agency

Office of Water
Office of Science & Technology
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Interim Guidance on Determination and Use of Water-Effect Ratios for Metals





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

MEMORANDUM

SUBJECT: Use of the Water-Effect Ratio in Water Quality Standards

FROM: Tudor T. Davies, Director
Office of Science and Technology

TO: Water Management Division Directors, Regions I - X
State Water Quality Standards Program Directors

PURPOSE

There are two purposes for this memorandum.

The first is to transmit the Interim Guidance on the Determination and Use of Water-Effect Ratios for Metals. EPA committed to developing this guidance to support implementation of federal standards for those States included in the National Toxics Rule.

The second is to provide policy guidance on whether a State's application of a water-effect ratio is a site-specific criterion adjustment subject to EPA review and approval/disapproval.

BACKGROUND

In the early 1980's, members of the regulated community expressed concern that EPA's laboratory-derived water quality criteria might not accurately reflect site-specific conditions because of the effects of water chemistry and the ability of species to adapt over time. In response to these concerns, EPA created three procedures to derive site-specific criteria. These procedures were published in the Water Quality Standards Handbook, 1983.

Site-specific criteria are allowed by regulation and are subject to EPA review and approval. The Federal water quality standards regulation at section 131.11(b)(1) provides States with the opportunity to adopt water quality criteria that are "...modified to reflect site-specific conditions." Under section 131.5(a)(2), EPA reviews standards to determine "whether a State has adopted criteria to protect the designated water uses."

On December 22, 1992, EPA promulgated the National Toxics Rule which established Federal water quality standards for 14 States which had not met the requirements of Clean Water Act Section 303(c)(2)(B). As part of that rule, EPA gave the States discretion to adjust the aquatic life criteria for metals to reflect site-specific conditions through use of a water-effect ratio. A water-effect ratio is a means to account for a difference between the toxicity of the metal in laboratory dilution water and its toxicity in the water at the site.

In promulgating the National Toxics Rule, EPA committed to issuing updated guidance on the derivation of water-effect ratios. The guidance reflects new information since the previous guidance and is more comprehensive in order to provide greater clarity and increased understanding. This new guidance should help standardize procedures for deriving water-effect ratios and make results more comparable and defensible.

Recently, an issue arose concerning the most appropriate form of metals upon which to base water quality standards. On October 1, 1993, EPA issued guidance on this issue which indicated that measuring the dissolved form of metal is the recommended approach. This new policy however, is prospective and does not affect the criteria in the National Toxics Rule. Dissolved metals criteria are not generally numerically equal to total recoverable criteria and the October 1, 1993, guidance contains recommendations for correction factors for fresh water criteria. The determination of site-specific criteria is applicable to criteria expressed as either total recoverable metal or as dissolved metal.

DISCUSSION

Existing guidance and practice are that EPA will approve site-specific criteria developed using appropriate procedures. That policy continues for the options set forth in the interim guidance transmitted today, regardless of whether the resulting criterion is equal to or more or less stringent than the EPA national 304(a) guidance. This interim guidance supersedes all guidance concerning water-effect ratios previously issued by the Agency.

Each of the three options for deriving a final water-effect ratio presented in this interim guidance meets the scientific and technical acceptability test for deriving site-specific criteria.

Option 3 is the simplest, least restrictive and generally the least expensive approach for situations where simulated downstream water appropriately represents a "site." It is a fully acceptable approach for deriving the water-effect ratio although it will generally provide a lower water-effect ratio than the other 2 options. The other 2 options may be more costly and time consuming if more than 3 sample periods and water-effect ratio measurements are made, but are more accurate, and may yield a larger, but more scientifically defensible site specific criterion.

Site-specific criteria, properly determined, will fully protect existing uses. The waterbody or segment thereof to which the site-specific criteria apply must be clearly defined. A site can be defined by the State and can be any size, small or large, including a watershed or basin. However, the site-specific criteria must protect the site as a whole. It is likely to be more cost-effective to derive any site-specific criteria for as large an area as possible or appropriate. It is emphasized that site-specific criteria are ambient water quality criteria applicable to a site. They are not intended to be direct modifications to National Pollutant Discharge Elimination System (NPDES) permit limits. In most cases the "site" will be synonymous with a State's "segment" in its water quality standards. By defining sites on a larger scale, multiple dischargers can collaborate on water-effect ratio testing and attain appropriate site-specific criteria at a reduced cost.

More attention has been given to water-effect ratios recently because of the numerous discussions and meetings on the entire question of metals policy and because WERs were specifically applied in the National Toxics Rule. In comments on the proposed National Toxics Rule, the public questioned whether the EPA promulgation should be based solely on the total recoverable form of a metal. For the reasons set forth in the final preamble, EPA chose to promulgate the criteria based on the total recoverable form with a provision for the application of a water-effect ratio. In addition, this approach was chosen because of the unique difficulties of attempting to authorize site-specific criteria modifications for nationally promulgated criteria.

EPA now recommends the use of dissolved metals for States revising their water quality standards. Dissolved criteria may also be modified by a site-specific adjustment.

While the regulatory application of the water-effect ratio applied only to the 10 jurisdictions included in the final National Toxics Rule for aquatic life metals criteria, we understood that other States would be interested in applying WERs to their adopted water quality standards. The guidance upon which to base the judgment of the acceptability of the water-effect ratio applied by the State is contained in the attached Interim Guidance on The Determination and Use of Water-Effect Ratios for Metals. It should be noted that this guidance also provides additional information on the recalculation procedure for site-specific criteria modifications.

Status of the Water-effect Ratio (WER) in non-National Toxics Rule States

A central question concerning WERs is whether their use by a State results in a site-specific criterion subject to EPA review and approval under Section 303(c) of the Clean Water Act?

Derivation of a water-effect ratio by a State is a site-specific criterion adjustment subject to EPA review and approval/disapproval under Section 303(c). There are two options by which this review can be accomplished.

Option 1: A State may derive and submit each individual water-effect ratio determination to EPA for review and approval. This would be accomplished through the normal review and revision process used by a State.

Option 2: A State can amend its water quality standards to provide a formal procedure which includes derivation of water-effect ratios, appropriate definition of sites, and enforceable monitoring provisions to assure that designated uses are protected. Both this procedure and the resulting criteria would be subject to full public participation requirements. Public review of a site-specific criterion could be accomplished in conjunction with the public review required for permit issuance. EPA would review and approve/disapprove this protocol as a revised standard once. For public information, we recommend that once a year the State publish a list of site-specific criteria.

An exception to this policy applies to the waters of the jurisdictions included in the National Toxics Rule. The EPA review is not required for the jurisdictions included in the National Toxics Rule where EPA established the procedure for the State for application to the criteria promulgated. The National Toxics Rule was a formal rulemaking process with notice and comment by which EPA pre-authorized the use of a correctly applied water-effect ratio. That same process has not yet taken place in States not included in the National Toxics Rule.

However, the National Toxics Rule does not affect State authority to establish scientifically defensible procedures to determine Federally authorized WERs, to certify those WERs in NPDES permit proceedings, or to deny their application based on the State's risk management analysis.

As described in Section 131.36(b)(iii) of the water quality standards regulation (the official regulatory reference to the National Toxics Rule), the water-effect ratio is a site-specific calculation. As indicated on page 60866 of the preamble to the National Toxics Rule, the rule was constructed as a rebuttable presumption. The water-effect ratio is assigned a value of 1.0 until a different water-effect ratio is derived from suitable tests representative of conditions in the affected waterbody. It is the responsibility of the State to determine whether to rebut the assumed value of 1.0 in the National Toxics Rule and apply another value of the water-effect ratio in order to establish a site-specific criterion. The site-specific criterion is then used to develop appropriate NPDES permit limits. The rule thus provides a State with the flexibility to derive an appropriate site-specific criterion for specific waterbodies.

As a point of emphasis, although a water-effect ratio affects permit limits for individual dischargers, it is the State in all cases that determines if derivation of a site-specific criterion based on the water-effect ratio is allowed and it is the State that ensures that the calculations and data analysis are done completely and correctly.

CONCLUSION

This interim guidance explains and clarifies the use of site-specific criteria. It is issued as interim guidance because it will be included as part of the process underway for review and possible revision of the national aquatic life criteria development methodology guidelines. As part of that review, this interim guidance is subject to amendment based on comments, especially those from the users of the guidance. At the end of the guidelines revision process the guidance will be issued as "final."

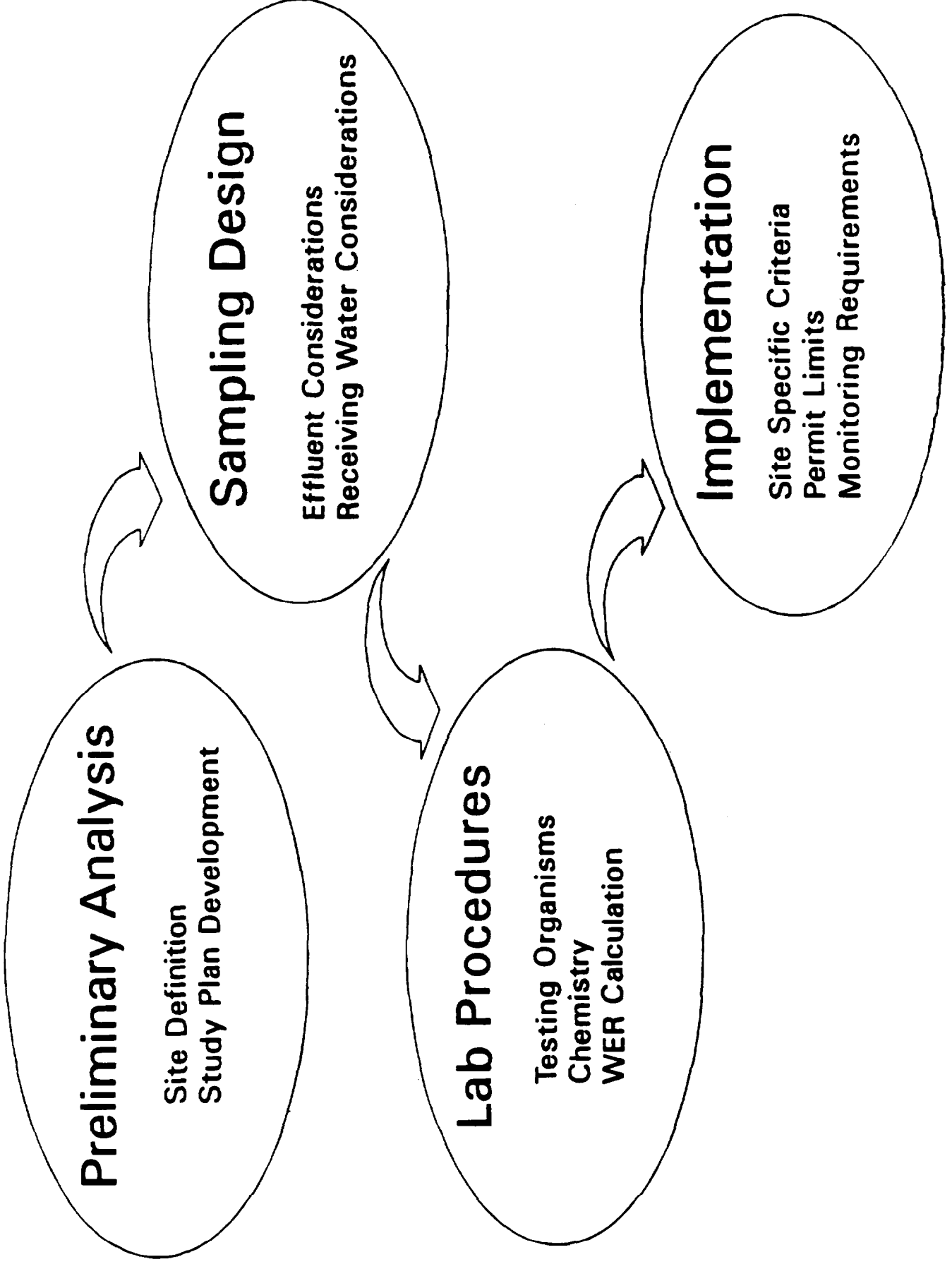
EPA is interested in and encourages the submittal of high quality datasets that can be used to provide insights into the use of these guidelines and procedures. Such data and technical comments should be submitted to Charles E. Stephan at EPA's Environmental Research Laboratory at Duluth, MN. A complete address, telephone number and fax number for Mr. Stephan are included in the guidance itself. Other questions or comments should be directed to the Standards and Applied Science Division (mail code 4305, telephone 202-260-1315).

There is attached to this memorandum a simplified flow diagram and an implementation procedure. These are intended to aid a user by placing the water-effect ratio procedure in the context of proceeding from at site-specific criterion to a permit limit. Following these attachments is the guidance itself.

Attachments

cc: Robert Perciasepe, OW
Martha G. Prothro, OW
William Diamond, SASD
Margaret Stasikowski, HECD
Mike Cook, OWEC
Cynthia Dougherty, OWEC
Lee Schroer, OGC
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Courtney Riordan, ORD
ORD (Duluth and Narragansett Laboratories)
ESD Directors, Regions I - VIII, X
ESD Branch, Region IX
Water Quality Standards Coordinators, Regions I - X

WER Implementation



WATER-EFFECT RATIO IMPLEMENTATION

PRELIMINARY ANALYSIS & PLAN FORMULATION

- Site definition

- How many discharges must be accounted for? Tributaries? See page 17.
- What is the waterbody type? (i.e., stream, tidal river, bay, etc.). See page 44 and Appendix A.
- How can these considerations best be combined to define the relevant geographic "site"? See Appendix A @ page 82.

- Plan Development for Regulatory Agency Review

- Is WER method 1 or 2 appropriate? (e.g., Is design flow a meaningful concept or are other considerations paramount?). See page 6.
- Define the effluent & receiving water sample locations
- Describe the temporal sample collection protocols proposed. See page 48.
- Can simulated site water procedure be done, or is downstream sampling required? See Appendix A.
- Describe the testing protocols - test species, test type, test length, etc. See page 45, 50; Appendix I.
- Describe the chemical testing proposed. See Appendix C.
- Describe other details of study - flow measurement, QA/QC, number of sampling periods proposed, to whom the results are expected to apply, schedule, etc.

AMPLING DESIGN FOR STREAMS

- Discuss the quantification of the design streamflow (e.g., 7Q10) - USGS gage directly, by extrapolation from USGS gage, or ?

- Effluents

- measure flows to determine average for sampling day
- collect 24 hour composite using "clean" equipment and appropriate procedures; avoid the use of the plant's daily composite sample as a shortcut.

- Streams

- measure flow (use current meter or read from gage if available) to determine dilution with effluent; and to check if within acceptable range for use of the data (i.e., design flow to 10 times the design flow).
- collect 24 hour composite of upstream water.

LABORATORY PROCEDURES (NOTE: These are described in detail in interim guidance).

- Select appropriate primary & secondary tests
- Determine appropriate cmcWER and/or cccWER
- Perform chemistry using clean procedures, with methods that have adequate sensitivity to measure low concentrations, and use appropriate QA/QC
- Calculate final water-effect ratio (FWER) for site.
See page 36.

IMPLEMENTATION

- Assign FWERs and the site specific criteria for each metal to each discharger (if more than one).
- perform a waste load allocation and total maximum daily load (if appropriate) so that each discharger is provided a permit limit.
- establish monitoring condition for periodic evaluation of instream biology (recommended)
- establish a permit condition for periodic testing of WER to verify site-specific criterion (NTR recommendation)