



6560-50-P

## **ENVIRONMENTAL PROTECTION AGENCY**

**[EPA-HQ-OW-2017-0260; FRL-9988-42-OW]**

### **Aquatic Life Ambient Water Quality Criteria for Aluminum in Freshwater**

**AGENCY:** Environmental Protection Agency (EPA).

**ACTION:** Notice of availability.

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**SUMMARY:** The Environmental Protection Agency (EPA) is announcing the availability of Aquatic Life Ambient Water Quality Criteria for Aluminum in Freshwater. The EPA first released freshwater criteria for aluminum in 1988 to protect aquatic life from harmful effects of aluminum toxicity. The EPA updated its recommended aluminum criteria to reflect the latest science and to provide users the flexibility to develop criteria based on site-specific water chemistry. The document provides a scientific assessment of ecological effects and is not a regulation. The EPA submitted the draft document for external expert peer review and edited the document considering peer review comments. The EPA subsequently released the draft criteria document for a 90-day public comment period in July 2017. The EPA has considered the public comments and revised the document based on consideration of those comments. The final criteria document provides recommendations for states and authorized tribes to establish water quality standards under the Clean Water Act. The recommendations found in this document supersede the EPA's 1988 national recommended criteria for aluminum in ambient water.

**FOR FURTHER INFORMATION CONTACT:** Diana Eignor, Health and Ecological Criteria Division, Office of Water (Mail Code 4304T), Environmental Protection Agency, 1200

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## **SUPPLEMENTARY INFORMATION:**

### **I. General Information**

#### *A. How Can I Get Copies of This Document and Other Related Information?*

*1. Docket.* EPA has established a docket for this action under Docket ID No. EPA-HQ-OW-2017-0260. Publicly available docket materials are available either electronically through [www.regulations.gov](http://www.regulations.gov) or in hard copy at the Water Docket in the EPA Docket Center, (EPA/DC) EPA West, Room 3334, 1301 Constitution Ave., NW, Washington, DC. The EPA Docket Center Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Water Docket is (202) 566-2426.

*2. Electronic Access.* You may access this Federal Register document electronically from the Government Printing Office under the “Federal Register” listings FDSys (<http://www.gpo.gov/fdsys/browse/collection.action?collectionCode=FR>).

### **II. What is Aluminum and How Does It Affect Aquatic Life?**

Aluminum is found in most soils and rocks and is the third most abundant element and the most common metal in the earth’s crust. Aluminum can enter the water via natural processes, like weathering of rocks and as a result of human based activities, such as drinking and waste water treatment and mining. Aluminum is considered a non-essential metal because fish and other aquatic life do not need it to function. Elevated levels of aluminum can affect some species’ ability to regulate ions and inhibit respiratory functions. Aquatic plants are generally less sensitive than fish and other aquatic life to aluminum.

### **III. What are EPA's Updated Recommended Criteria for Aluminum in Freshwater?**

The recommended criteria concentrations for aluminum in freshwater to protect aquatic life depends on a site's water chemistry parameters. Bioavailability is the measure of whether a substance in the environment is available to affect living organisms like fish. The bioavailability of aluminum is dependent on specific water chemistry parameters. The more bioavailable the aluminum is, the more likely it is to cause a toxic effect. The water chemistry parameters that have the greatest impact on aluminum's bioavailability are pH, dissolved organic carbon (DOC) and total hardness.

The final 2018 recommended national criteria are based upon Multiple Linear Regression (MLR) models for fish and invertebrate species that use pH, DOC, and total hardness to quantify the effects of these water chemistry parameters on the bioavailability and associated toxicity of aluminum to aquatic organisms. The MLR models are used to normalize the available toxicity data to reflect the effects of the water chemistry (pH, hardness, DOC) on the toxicity of aluminum to tested species. These normalized toxicity test data are then used in a criteria calculator to generate criteria for specific water chemistry conditions, yielding the water chemistry specific acute and chronic criteria concentrations. This flexible approach is based on the latest science and allows users to develop site-specific aluminum criteria for freshwaters that appropriately reflect important water chemistry parameters. The recommended acute criteria (known as the criteria maximum concentration or CMC) duration is a one-hour average and the recommended chronic criteria (criteria chronic concentration or CCC) duration is a four-day average. The EPA recommends that the CMC and CCC not be exceeded more than once every three years.

These final 2018 recommended national aluminum criteria are expressed as total

recoverable metal concentrations. The use of total recoverable aluminum includes monomeric (both organic and inorganic) forms, polymeric and colloidal forms, as well as particulate forms and aluminum sorbed to clays. However, toxicity data comparing toxicity of aluminum using total recoverable aluminum and dissolved aluminum demonstrated that toxic effects increased with increasing concentrations of total recoverable aluminum even though the concentration of dissolved aluminum was relatively constant. If aluminum criteria were based on dissolved concentrations, toxicity would likely be underestimated, as colloidal forms and hydroxide precipitates of the metal that can dissolve under natural conditions and become biologically available would not be measured. The criteria document contains more discussion of the studies that informed the choice to use total recoverable aluminum as the basis for the final 2018 recommended national criteria. The current EPA-approved Clean Water Act Test Methods<sup>1</sup> for aluminum in natural waters and waste waters measure total recoverable aluminum.

The numeric outputs of the 2018 recommended National Aluminum Criteria Calculator will depend on the specific pH, DOC, and total hardness concentrations entered into the models. The model outputs (CMC and CCC) are numeric values that are protective for the set of input conditions. Criteria can be determined in two ways: use the provided Aluminum Criteria Calculator V.2.0 to enter the pH, DOC, and total hardness conditions at a specific site to calculate the numeric aluminum CMC and CCC corresponding to those local input water-quality conditions, or 2) use the look-up tables provided in the criteria document, developed using the calculator, to find the numeric aluminum CMC and CCC most closely corresponding to the local conditions for pH, DOC, and total hardness. In order to calculate numeric water quality criteria for aluminum that will protect the aquatic life designated uses of a site over the full range of

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<sup>1</sup> 40 CFR Part 136.3 and Appendix C

ambient conditions and toxicity, multiple model outputs will need to be considered.

See Table 1 for a comparison of the EPA’s 1988 criteria and the updated 2018 criteria for aluminum.

**Table 1: Summary of the EPA National Recommended Aquatic Life Criteria for Aluminum**

<b>EPA Aquatic Life Criteria for Aluminum</b>	<b>Freshwater Acute<sup>a</sup></b> (1 hour, total recoverable aluminum)	<b>Freshwater Chronic<sup>a</sup></b> (4-day, total recoverable aluminum)
2018 Updated Criteria (Vary as a function of a site’s pH, total hardness, and DOC)	1 - 4,800 µg/L <sup>b</sup>	0.63 - 3,200 µg/L <sup>b</sup>
1988 Criteria (pH 6.5 – 9.0, across all total hardness and DOC ranges)	750 µg/L	87 µg/L

<sup>a</sup> Values are recommended not to be exceeded more than once every three years on average.

<sup>b</sup> Values will be different under differing water chemistry conditions.

#### **IV. What are Recommended Water Quality Criteria Developed by the EPA?**

Section 304(a)(1) of the Clean Water Act directs the EPA to develop and publish and, from time to time, revise criteria for water quality accurately reflecting the latest scientific knowledge. Water quality criteria developed under section 304(a) are based solely on data and scientific judgments on the relationship between pollutant concentrations and environmental and human health effects. Section 304(a) criteria do not reflect consideration of economic impacts or the technological feasibility of meeting pollutant concentrations in ambient water.

Section 304(a) criteria provide guidance to states and authorized tribes in adopting water quality standards that ultimately provide a basis for controlling discharges of pollutants. Under the Clean Water Act and its implementing regulations, states and authorized tribes are to adopt water quality criteria to protect designated uses (*e.g.*, aquatic life, recreational use). The EPA water quality criteria recommendations are not regulations. Thus, the EPA recommended criteria do not constitute legally binding requirements. States and authorized tribes may adopt other

scientifically defensible water quality criteria that differ from these recommendations. As part of the water quality standards triennial review process defined in section 303(c)(1) of the Clean Water Act, the states and authorized tribes are responsible for maintaining and revising water quality standards. Standards consist of designated uses, water quality criteria to protect those uses, a policy for antidegradation, and may include general policies for application and implementation. Section 303(c)(1) requires states and authorized tribes to review and modify, if appropriate, their water quality standards at least once every three years. Consistent with the EPA regulations at 40 CFR 131.11(a), protective criteria must be based on a sound scientific rationale and contain sufficient parameters or constituents to protect the designated uses. Criteria may be expressed in either narrative or numeric form. States and authorized tribes have four options when adopting water quality criteria for which EPA has published section 304(a) criteria. They may: (1) Establish numerical values based on recommended section 304(a) criteria; (2) Adopt section 304(a) criteria modified to reflect site-specific conditions; (3) Adopt criteria derived using other scientifically defensible methods; or (4) Establish narrative criteria where numeric criteria cannot be established or to supplement numeric criteria (40 CFR 131.11(b)).

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