

US EPA ARCHIVE DOCUMENT

Technical Support for Adopting and Implementing EPA's 2016 Selenium Criterion in Water Quality Standards

Draft

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This document provides information on the adoption and implementation of the 2016 selenium criterion. While this document cites statutes and regulations that contain requirements applicable to water quality standards, it does not impose legally binding requirements on EPA, states, tribes, other regulatory authorities, or the regulated community and its content might not apply to a particular situation based upon the circumstances. EPA, state, tribal, and other decision makers retain the discretion to adopt approaches on a case-by-case basis that differ from those provided in this document as appropriate and consistent with statutory and regulatory requirements. EPA could update this document as new information becomes available. In addition to this document, EPA has other documents which provide considerations and recommendations on implementing the selenium criterion and can be found at EPA’s selenium website: <https://www.epa.gov/wqc/aquatic-life-criterion-selenium>.

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Background

The U.S. Environmental Protection Agency (EPA) updated its national recommended chronic aquatic life criterion for selenium in freshwater to reflect the latest scientific information, which indicates that toxicity to aquatic life is driven by dietary exposures. The criterion has four elements: (1) a fish egg-ovary element, (2) a fish whole-body and/or muscle element, (3) a water column element (one value for lentic and one value for lotic aquatic systems), and (4) a water column intermittent element to account for potential chronic effects from short-term exposures (one value for lentic and one value for lotic aquatic systems). EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016* contains a recommendation that states and authorized tribes¹ adopt into their water quality standards (WQS) a selenium criterion that includes all four elements.²

1.0 Adopting EPA's Selenium Criterion Recommendations

1.1 The Four-Part Criterion

As described in EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*,³ the Agency recommends that states and authorized tribes adopt into WQS one selenium criterion composed of four elements: two fish tissue elements (i.e., egg-ovary and whole-body and/or muscle) and two water column elements (i.e., 30-day average and intermittent exposure). EPA recommends that states and authorized tribes clearly express all four elements as a single criterion composed of multiple parts and clearly indicate that the whole-body/muscle element supersedes the two water column elements and that the egg-ovary element supersedes any other element. The egg-ovary element supersedes all other elements because it was derived from extensive toxicity data and served as the basis for deriving all the other elements. Including all four elements of the selenium criterion in state or tribal WQS ensures protection from excessive selenium when egg-ovary data are unavailable.

States and authorized tribes also can develop, adopt, and submit for EPA approval site-specific criteria for individual sites (see section 1.2 for more information on options for developing and adopting site-specific criteria).

EPA no longer recommends an acute criterion for short-term ambient exposures because aquatic organisms are exposed to selenium primarily through their diet. Selenium has the potential to bioaccumulate in aquatic food webs where it might continue to pose a risk to fish after short-term

¹ Throughout this document and in the [CWA](#), the term “states” means the fifty states, the District of Columbia, the Commonwealth of Puerto Rico, the United States Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands. The term “authorized tribe” means those federally recognized Indian tribes with authority to administer a CWA WQS program.

² USEPA (U.S. Environmental Protection Agency). 2016. *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*. EPA 822-R-16-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. <https://www.epa.gov/wqc/aquatic-life-criterion-selenium-documents>.

³ Ibid.

elevated ambient levels return to normal. Therefore, EPA recommends an intermittent element to provide protection from long-term chronic effects caused by short-term elevation of selenium in aquatic systems.

For information on how to use the four-part criterion for the purposes of National Pollutant Discharge Elimination System (NPDES) permitting and waterbody assessment, listing, and total maximum daily load (TMDL) development, see *Frequently Asked Questions (FAQs): Implementing WQS that Include Elements Similar or Identical to EPA's 2016 Selenium Criterion in Clean Water Act Section 402 NPDES Programs* and *Frequently Asked Questions (FAQs): Implementing the 2016 Selenium Criterion in Clean Water Act Sections 303(d) and 305(b) Assessment, Listing, and Total Maximum Daily Load (TMDL) Programs*, respectively.^{4 5}

Table 1. Summary of the Recommended Freshwater Selenium Ambient Chronic Water Quality Criterion for Protection of Aquatic Life

Media Type	Fish Tissue ¹		Water Column ⁴	
	Egg-ovary ²	Fish Whole-body or Muscle ³	Monthly Average Exposure	Intermittent Exposure ⁵
Magnitude	15.1 mg/kg dw	8.5 mg/kg dw whole-body or 11.3 mg/kg dw muscle (skinless, boneless filet)	1.5 µg/L in lentic aquatic systems 3.1 µg/L in lotic aquatic systems	$WQC_{int} = \frac{WQC_{30-day} - C_{bkgrnd}(1 - f_{int})}{f_{int}}$
Duration	Instantaneous measurement ⁶	Instantaneous measurement ⁶	30 days	Number of days/month with an elevated concentration
Frequency	Not to be exceeded	Not to be exceeded	Not more than once in three years on average	Not more than once in three years on average

1. Fish tissue elements are expressed as steady-state.
2. Egg-ovary supersedes any whole-body, muscle, or water column element when fish egg-ovary concentrations are measured.
3. Fish whole-body or muscle tissue supersedes water column element when both fish tissue and water concentrations are measured.
4. Water column values are based on dissolved total selenium in water and are derived from fish tissue values via bioaccumulation modeling. Water column values are the applicable criterion element in the absence of steady-state condition fish tissue data.
5. Where WQC_{30-day} is the water column monthly element for either lentic or lotic waters; C_{bkgrnd} is the average background selenium concentration; and f_{int} is the fraction of any 30-day period during which elevated selenium concentrations occur, with f_{int} assigned a value ≥ 0.033 (corresponding to 1 day).
6. Fish tissue data provide instantaneous point measurements that reflect integrative accumulation of selenium over time and space in fish population(s) at a given site.

⁴ USEPA (U.S. Environmental Protection Agency). 2016. *Frequently Asked Questions (FAQs): Implementing WQS that Include Elements Similar or Identical to EPA's 2016 Selenium Criterion in Clean Water Act Section 402 NPDES Programs*. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

⁵ USEPA (U.S. Environmental Protection Agency). 2016. *Frequently Asked Questions (FAQs): Implementing the 2016 Selenium Criterion in Clean Water Act Sections 303(d) and 305(b) Assessment, Listing, and Total Maximum Daily Load (TMDL) Programs*. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

EPA recommends that states and authorized tribes adopt all four elements of the criterion, as laid out in Table 1, into their WQS. Footnote 1 indicates that, for a fish tissue measurement to be meaningful, the system from which the sample is taken should not be experiencing recent new inputs of selenium. In EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*,⁶ *new inputs* are defined as new activities resulting in the release of selenium into a lentic or lotic aquatic system. New inputs will likely result in a greater concentration of selenium in the food web and a relatively slow increase in the selenium concentration in fish until the new selenium input achieves a *quasi-steady-state* balance in the aquatic system. EPA estimates that the concentration of selenium in fish tissue will not reach steady-state for several months in lotic systems and for longer time periods (e.g., 2–3 years) in lentic systems. Achievement of steady-state in an aquatic system also depends on the hydrodynamics of the aquatic system (particularly reservoirs with multiple riverine inputs), the location of the selenium input, and the particular food web. EPA expects the time needed to achieve steady-state with new or increased selenium inputs to be site-specific. Thus, EPA recommends that fish tissue criterion elements not take precedence over the water column criterion elements until the aquatic system achieves steady-state. In the interim, EPA recommends sampling and using site-specific data to gain a better understanding of the selenium bioaccumulation dynamics in a receiving water and to determine when steady-state conditions have been reached.

Footnotes 2 and 3 describe the structure of the criterion and explain that the criterion explicitly affirms the primacy of the whole-body and/or muscle element over the water column elements, and the egg-ovary element over any other element. This means when assessing a waterbody against EPA's recommended criterion, egg-ovary measurements are the ultimate arbiter followed by whole-body and/or muscle measurements, and lastly by water column measurements (see *Frequently Asked Questions (FAQs): Implementing the 2016 Selenium Criterion in Clean Water Act Sections 303(d) and 305(b) Assessment, Listing, and Total Maximum Daily Load (TMDL) Programs*).⁷

Footnote 4 indicates that EPA's recommended water column elements were derived from the egg-ovary element via mechanistic bioaccumulation modeling (Presser and Luoma 2010).⁸ Footnote 4 also indicates that, absent steady-state fish tissue data, the recommended water column element should be used to implement the criterion. There are a few situations in which

⁶ USEPA (U.S. Environmental Protection Agency). 2016. *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*. EPA 822-R-16-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. <https://www.epa.gov/wqc/aquatic-life-criterion-selenium-documents>.

⁷ USEPA (U.S. Environmental Protection Agency). 2016. *Frequently Asked Questions (FAQs): Implementing the 2016 Selenium Criterion in Clean Water Act Sections 303(d) and 305(b) Assessment, Listing, and Total Maximum Daily Load (TMDL) Programs*. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

⁸ Presser, T.S. and S.N. Luoma. 2010. A methodology for ecosystem-scale modeling of selenium. *Integrated Environmental Assessment and Management* 6:685-710.

Presser, T.S. and S.N. Luoma. 2010. *Ecosystem-Scale Selenium Modeling in Support of Fish and Wildlife Criteria Development for the San Francisco Bay-Delta Estuary, California*. U.S. Geological Survey, Reston, Virginia.

this might happen: (1) in fishless waters, defined as waters with insufficient instream habitat and/or flow to support a population of any fish species on a continuing basis, or waters that once supported populations of one or more fish species but no longer support fish (see the executive summary of EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*⁹), (2) in waters with new inputs of selenium where steady-state fish tissue data cannot be collected, or (3) when fish tissue data are not available because they were not collected or did not meet state or tribal quality assurance procedures.

Footnote 5 describes the equation and input parameters for the intermittent element. For more information, see section 3.3 of EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*.¹⁰

Footnote 6 explains the duration component of the fish tissue elements. These elements were developed to protect fish populations from impacts caused by selenium. Fish tissue data provide instantaneous point measurements that reflect integrative accumulation of selenium over time and space in the fish at a given site. States and authorized tribes have flexibility in how they interpret a discrete fish sample to represent a population. Generally fish collected to calculate average tissue concentrations for a site are collected in one sampling event, or over a short time interval due to logistical constraints and costs for obtaining samples. The *Technical Support for Fish Tissue Monitoring for Implementation of EPA's 2016 Selenium Criterion* contains additional information on sampling fish populations.¹¹

The frequency component of the fish tissue elements of the selenium criterion differs from the typical “once-in-three years on average” frequency of water column criteria. Selenium is a bioaccumulative pollutant; therefore elevated levels in various ecological compartments (e.g., biota, surficial sediments) require a long period to decrease, and the associated aquatic community requires a long time to recover following reduction or removal of an elevated selenium exposure to a given system. Thus, the typical criteria return frequency is not appropriate for selenium in fish tissue, as this could lead to sustained ecological impacts. For additional information regarding duration and frequency, see sections 2.7.6 and 2.7.7 of *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*.¹²

⁹ USEPA (U.S. Environmental Protection Agency). 2016. *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*. EPA 822-R-16-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. <https://www.epa.gov/wqc/aquatic-life-criterion-selenium-documents>.

¹⁰ Ibid.

¹¹ USEPA (U.S. Environmental Protection Agency). 2016. *Technical Support for Fish Tissue Monitoring for Implementation of EPA's 2016 Selenium Criterion*. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

¹² USEPA (U.S. Environmental Protection Agency). 2016. *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*. EPA 822-R-16-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. <https://www.epa.gov/wqc/aquatic-life-criterion-selenium-documents>.

1.2 Options for Site-specific Water Column Elements of the Criterion

As stated above, EPA recommends that when states and authorized tribes adopt this criterion, they adopt all four elements, including the 30-day average water column element. The relationship between the concentration of selenium in the tissues of fish and the concentration of selenium in the water column, however, can vary substantially among aquatic systems. The species of fish, the species and proportion of prey, and a variety of site-specific biogeochemical factors affect selenium bioaccumulation and thus determine the allowable concentration of selenium in ambient water that is protective of aquatic life. Because of the site-specific nature of this relationship, EPA provided two methodologies for deriving site-specific water column translations. One is the mechanistic model used by EPA to derive its default water column criterion elements;¹³ the other uses an empirical bioaccumulation factor approach. Both are described in detail in appendix K of *Aquatic Life Ambient Water Quality Criterion for Selenium—Freshwater 2016*.¹⁴ Both methodologies provide acceptable approaches to translating the recommended fish tissue criterion elements into site-specific water column criterion elements. The site-specific selenium criteria developed by EPA for the San Francisco Bay and Delta in California are a good example of how to properly derive site-specific water column elements for selenium.¹⁵ Note that the criteria for the San Francisco Bay and Delta were derived to protect aquatic dependent wildlife and aquatic life (i.e., clam eating fish and birds) and were greatly influenced by the presence of an invasive clam species that efficiently accumulates selenium.¹⁶ There are two approaches to adopting and submitting any site-specific selenium criterion elements to EPA: states and authorized tribes may adopt and submit individual criterion elements each time they are derived, or they may adopt and submit a performance-based approach to site-specific criterion element derivation. Both are described more fully below. States and authorized tribes should carefully consider the relative merits of each approach; some considerations are discussed further in *Frequently Asked Questions (FAQs): Implementing the 2016 Selenium Criterion in Clean Water Act Sections 303(d) and 305(b) Assessment, Listing, and Total Maximum Daily Load (TMDL) Programs*.¹⁷

¹³ Presser, T.S. and S.N. Luoma. 2010. A methodology for ecosystem-scale modeling of selenium. *Integrated Environmental Assessment and Management* 6:685-710.

Presser, T.S. and S.N. Luoma. 2010. *Ecosystem-Scale Selenium Modeling in Support of Fish and Wildlife Criteria Development for the San Francisco Bay-Delta Estuary, California*. U.S. Geological Survey, Reston, Virginia.

¹⁴ Ibid.

¹⁵ <https://www.epa.gov/wqs-tech/water-quality-standards-establishment-revised-numeric-criteria-selenium-san-francisco-bay> (81 FR 46042, July 15, 2016)

¹⁶ The site-specific nature of this effort results in components that likely will not be generally applicable. In addition to the clam (prey) tissue element and particulate water column element, the criterion elements are not hierarchical and are independently applicable.

¹⁷ USEPA (U.S. Environmental Protection Agency). 2016. *Frequently Asked Questions (FAQs): Implementing the 2016 Selenium Criterion in Clean Water Act Sections 303(d) and 305(b) Assessment, Listing, and Total Maximum Daily Load (TMDL) Programs*. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

1.2.1 Adoption of Site-specific Water Column Elements Individually

States and authorized tribes can adopt and submit to EPA site-specific water column criterion elements each time they are derived using one of the methodologies described in appendix K or another scientifically defensible approach. These site-specific water column criterion elements must protect the designated use and must be reviewed and approved by EPA before they are applicable for Clean Water Act (CWA) purposes, such as NPDES permitting, waterbody assessment and listing, and TMDL development.

1.2.2 Adoption of Site-specific Water Column Elements through a Performance-Based Approach

States and authorized tribes can choose to adopt into their WQS and submit to EPA a set of procedures to facilitate the translation of the fish tissue criterion concentration elements into site-specific water concentration values. This is considered a *performance-based approach* to developing site-specific criteria. Any translation procedure must be sufficiently detailed and include suitable safeguards to ensure repeatable, predictable outcomes; and result in criterion element values that protect the applicable designated use. Once the state or authorized tribe adopts and EPA approves such a set of procedures, however, each resulting site-specific criterion does not need to be adopted or approved. Importantly, for public transparency, the state or authorized tribe should maintain a list of the resulting site-specific criteria on their publicly accessible website. EPA also encourages states and authorized tribes to coordinate closely with EPA when developing a *performance-based approach* and when conducting the first few studies to develop a site-specific water column element.

If a state or authorized tribe chooses to adopt a performance-based approach, one method for incorporation into their standards could be to add a footnote to EPA's 2016 selenium criterion table (Table 1) and then adopt the table into their standards. By doing this, the state or tribe will have referenced in rule a translation procedure that is scientifically defensible; produces repeatable, predictable outcomes; and results in criterion element values that protect the applicable designated use.

As an example, the footnote could say:

Site-specific water column criteria elements will be derived using the mechanistic model and associated procedures laid out in appendix K of *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*.¹⁸ To derive scientifically defensible site-specific water column criteria elements, appropriate input parameters (as described in Appendix K) will be selected to adequately represent the water body of interest.

See appendix A for an example criterion table that could be used to incorporate a performance-based approach. A state or authorized tribe might want to include both translation procedures in their performance-based approach but should specify in what circumstances they would use one or the other.

¹⁸ Ibid.

States and authorized tribes should consider the tradeoffs associated with these different approaches to site-specific water column element derivation. The adoption and EPA approval of individual site-specific water column elements could potentially be easier to apply in assessment, listing, and TMDL development, as well as NPDES permit development.

On the other hand, the performance-based approach provides states and authorized tribes the flexibility to adaptively derive site-specific water column targets to account for the most up-to-date data and information for the site without making it necessary for states and authorized tribes to adopt and for EPA to approve site-specific criteria elements each time those elements are derived. Under the performance-based approach, stakeholders would have the opportunity to provide comments on the derivation process (e.g., translator mechanisms) during the water quality standards adoption process under section 303(c). However, comments on the site-specific water column elements derived through the performance-based approach would be received in response to individual actions through each of the implementing programs. The performance-based approach likely involves more coordination among the implementation programs to ensure that they are aiming to achieve the same desired condition in the water body.

EPA discussed the performance-based approach to setting water quality standards at *EPA Review and Approval of State and Tribal Water Quality Standards*, 65 Fed. Reg. 24641, at 24648 (Apr. 27, 2000).

1.3 Relationship of EPA's 2016 Selenium Criterion to the Great Lakes Initiative

EPA's recommendations for the freshwater selenium criterion do not supersede the requirements applicable to the Great Lakes at Title 40 of the *Code for Federal Regulations* (CFR) Part 132. Those requirements, known as the *Great Lakes Initiative* (GLI), apply to all streams, rivers, lakes, and other bodies of water within the U.S. portion of the Great Lakes drainage basin. For those waters, a state or authorized tribe must adopt requirements (including water quality criteria [WQC]) that are *consistent with (as protective as)* regulations EPA promulgated on March 23, 1995 (see 60 FR 15366, March 23, 1995, and 40 CFR 132.1(b) and 132.4).

Under the Great Lakes system-specific regulations, if a state or authorized tribe adopts a revised criterion for selenium, EPA in its review must determine if the new criterion is as protective as the selenium chronic criterion (5 µg/L) promulgated in 40 CFR 132.6, Table 2, and whether all binding implementation procedures are as protective as the GLI procedures (see 40 CFR 132.5(g)). EPA makes its approval/disapproval decisions on a case-by-case basis depending upon the supporting information. However, EPA expects that GLI states and authorized tribes would likely be able to demonstrate that the revised selenium criterion is as protective as the GLI chronic criterion, if they adopt the EPA recommended 304(a) selenium criterion. If a state or authorized tribe uses a site-specific translation to derive site-specific water column elements for a particular waterbody, translated water concentrations could, in some cases, be higher than the 5 µg/L promulgated in 40 CFR 132.6 and could, in other cases, be lower, depending on local conditions. EPA expects that they generally would be considered as protective as the GLI selenium criterion. Additionally, a site-specific water column element would take into account a

broad range of factors, including local conditions, and would include additional data and a more refined understanding of the mechanisms through which selenium accumulates and causes toxicity at that site.

2.0 Options for Implementing EPA's Selenium Criterion

There is some flexibility available to states and authorized tribes when they adopt EPA's 2016 selenium criterion. Options include deriving site-specific fish tissue criterion elements, adopting WQS variances, revising designated uses, providing for dilution allowances, and granting compliance schedules. This document describes how each option can fit within a state's or authorized tribe's WQS adoption and implementation processes.

2.1 Site-specific Fish Tissue Criterion Elements Using the Species Recalculation Procedure

The WQS regulation at 40 CFR 131.11(b)(1)(ii) provides states and authorized tribes with the opportunity to adopt WQC that are "...modified to reflect site-specific conditions." As with any criterion, a site-specific criterion must protect the designated use, must be based on a sound scientific rationale, and is subject to EPA review and approval or disapproval. The species recalculation procedure for deriving site-specific criteria is intended to allow site-specific criteria to differ from national criteria recommendations (i.e., concentrations that are higher or lower than national recommendations) when there are demonstrated differences in sensitivity between the aquatic species that occur at the site and those that were used to derive the national criteria recommendations. The national dataset might contain aquatic species that are sensitive to a particular pollutant, but those or comparably sensitive species might not occur at the site. On the other hand, a species that is critical at the site might be sensitive to the pollutant and require site-specific criteria that are lower than the national recommended criteria. Because the selenium criterion is derived based on egg-ovary toxicity data that form the basis for all other criterion elements, a state or authorized tribe developing site-specific fish tissue elements of the criterion using the recalculation procedure would likely start with deriving the egg-ovary element and then other fish-tissue or related water column elements. It is important to note that species not present at the site but included in the national criterion database may be surrogates for other species that may not be in the database.

Note that a state or authorized tribe that wants to adopt EPA's national recommendations for the fish tissue elements, but is interested in developing site-specific water column values, can proceed as described in section 1.2.

As with any criteria, states and authorized tribes using the recalculation procedure should ensure that their site-specific criteria "...provide for the attainment and maintenance of the water quality standards of downstream waters" (40 CFR 131.10(b)). In addition, they should consider how they will demonstrate that the species (or any species for which the sensitive species might be a surrogate) is not present at the site before selecting that approach. For additional information on

the procedure, see EPA's *Revised Deletion Process for the Site-Specific Recalculation Procedure for Aquatic Life Criteria*.¹⁹

For additional information on site-specific WQC, see EPA's *Water Quality Standards Handbook*.²⁰

2.2 Variances

States or authorized tribes that determine it is not feasible to attain a newly adopted selenium criterion and associated designated use should consider using a WQS variance before they consider revising the designated use (described in section 3) for the affected waterbody. The WQS regulations at 40 CFR 131.3(o) define a *WQS variance* as “a time-limited designated use and criterion for a specific pollutant(s) or water quality parameter(s) that reflect the highest attainable condition during the term of the WQS variance.” WQS variances (regulated at 40 CFR 131.14) ensure that progress is made toward improving overall water quality, while ensuring that the conditions of the WQS variance do not lower already-attained ambient water quality. This is accomplished by establishing a highest attainable condition, which serves as the applicable WQS for implementing NPDES permit limits and requirements throughout the term of the WQS variance. Although less stringent than the newly adopted criterion, the highest attainable condition provides a mechanism for incremental progress toward improving water quality and potentially attaining the designated use and associated criterion in the future. It is important to note that these permit limits and requirements are applicable only to the discharger(s), pollutant(s)/parameter(s), and waterbody or waterbody segment(s) identified in the WQS variance. All other applicable standards not specifically addressed by the WQS variance continue to apply.

A state or authorized tribe can choose to adopt a WQS variance that is applicable to a single discharger, multiple dischargers, or an entire waterbody/waterbody segment. Because EPA's 2016 selenium criterion is intended to protect aquatic life (CWA section 101(a)(2)), the state or authorized tribe must provide supporting documentation demonstrating that attaining the designated use and criterion is not feasible throughout the term of the WQS variance because of one of the factors listed at 40 CFR 131.14(b)(2)(i)(A). Such a demonstration, when combined with the other regulatory requirements of 40 CFR 131.14, provide the framework for WQS variances as a water quality improvement tool. The regulations at 40 CFR part 132 provide guidance for states and authorized tribes that regulate waters in or contributing to waters of the Great Lakes System. If the two regulations overlap, the more stringent regulation applies.

¹⁹ USEPA (U.S. Environmental Protection Agency). 2013. *Revised Deletion Process for the Site-Specific Recalculation Procedure for Aquatic Life Criteria*. EPA 823-R-13-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

²⁰ USEPA (U.S. Environmental Protection Agency). 1994. Water Quality Criteria. Chapter 3 in *Water Quality Standards Handbook*. EPA 823-B-94-005a. U.S. Environmental Protection Agency, Office of Water, Washington, DC. <http://www.epa.gov/wqshandbook>.

To help states and authorized tribes in the process of adopting WQS variances, EPA has developed various support documents such as *Checklist For Evaluating State Submission Of Discharger-Specific Water Quality Standards Variances*²¹ and *Developing Credible Rationales for Variances that Apply to Multiple Dischargers—Frequently Asked Questions*.²² WQS variances are considered new or revised WQS and, therefore, must be reviewed and approved or disapproved by EPA. For this reason, states and authorized tribes are encouraged to coordinate with EPA throughout the WQS variance adoption process to reinforce their WQS variance submissions.

2.3 Revision to Designated Uses

The WQS regulation at 40 CFR 131.10(g) provides that:

[s]tates may designate a use, or remove a use that is *not* an existing use, if the State conducts a use attainability analysis as specified... that demonstrates attaining the use is not feasible because of one of the six factors in this paragraph. If a State adopts a new or revised water quality standard based on a required use attainability analysis, the State shall also adopt the highest attainable use, as defined in §131.3(m).

- (1) Naturally occurring pollutant concentrations prevent the attainment of the use; or
- (2) Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating state water conservation requirements to enable uses to be met; or
- (3) Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or
- (4) Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the waterbody to its original condition or to operate such modification in a way that would result in the attainment of the use; or

²¹ USEPA (U.S. Environmental Protection Agency). 2016. *Checklist for Evaluating State Submission of Discharger-Specific Water Quality Standards Variances*. U.S. Environmental Protection Agency, Office of Water, Washington, DC. <https://www.epa.gov/sites/production/files/2016-03/documents/checklist-evaluating-discharger-specific.pdf>.

²² USEPA (U.S. Environmental Protection Agency). 2016. *Discharger-specific Variances on a Broader Scale: Developing Credible Rationales for Variances that Apply to Multiple Dischargers—Frequently Asked Questions*. EPA-820-F-13-012. U.S. Environmental Protection Agency, Office of Water, Washington, DC. <https://nepis.epa.gov/Exe/ZyPDF.cgi/P100IRYU.PDF?Dockey=P100IRYU.PDF>.

- (5) Physical conditions related to the natural features of the waterbody, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or
- (6) Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.

The state or authorized tribe would make such a demonstration through a *use attainability analysis* (UAA), which is defined under 40 CFR 131.3(g) as "...a structured scientific assessment of the factors affecting the attainment of the use which may include physical, chemical, biological, and economic factors as described in 40 CFR 131.10(g)." A state must conduct a UAA whenever (1) the state designates for the first time, or has previously designated for a waterbody, uses that do not include the uses specified in section 101(a)(2) of the Act; or (2) the state wishes to remove a designated use that is specified in section 101(a)(2) of the Act, to remove a subcategory of such a use, or to designate a subcategory of such a use that requires a criterion less stringent than previously applicable (40 CFR 131.10(j)).

While the WQS regulation allows states and authorized tribes to remove uses that are not feasible to attain, it does not allow states or authorized tribes to remove uses that are feasible to attain. Therefore, states and authorized tribes must retain/adopt such feasible uses (i.e., the highest attainable use) in their state WQS (40 CFR 131.10(g) and (h)).

For additional information on use changes and UAAs, see EPA's *Water Quality Standards Handbook*.²³ Additional information also is available at <http://water.epa.gov/scitech/swguidance/standards/uses/uaa/>.

2.4 Compliance Schedules

If a state or authorized tribe's WQS include a provision authorizing the use of permit compliance schedules, a compliance schedule can be included in a permit with WQBELs for selenium. The NPDES permit regulations allow this if (1) the discharger requires time to install treatment technology or implement other controls necessary to meet the new WQBELs and (2) the permitting authority (the state in most cases, and EPA in some limited cases) determines that a compliance schedule is *appropriate* in light of all the circumstances and that the discharger can ultimately meet its new selenium WQBELs by an *as-soon-as-possible date certain* in the future. See section 502(17) of the CWA for a definition of *schedules of compliance* and 40 CFR 122.47 for more information about the schedules.

²³ USEPA (U.S. Environmental Protection Agency). 1994. Designation of Uses. Chapter 2 in *Water Quality Standards Handbook*. EPA 823-B-94-005a. U.S. Environmental Protection Agency, Office of Water, Washington, DC. <http://www.epa.gov/wqshandbook>.

Compliance schedules in NPDES permits can be used to meet WQBELs based on WQS adopted after July 1, 1977, if the state or authorized tribe has indicated clearly in its WQS or implementing regulations that it intends to allow the use of permit compliance schedules.²⁴ To ensure that the compliance schedule is enforceable by the permitting authority, the schedule must consist of a sequence of interim requirements, actions, or operations leading to compliance with the CWA and its implementing regulations (40 CFR 122.2). If the schedule is longer than 1 year, it must include annual interim requirements and dates for their achievement (40 CFR 122.47(a)(3)). Additionally, the permit must include a final WQBEL and a date for its achievement. The decision to include a compliance schedule as well as all of the dates and interim requirements must be supported by the administrative record. The permit fact sheet should include justification for the compliance schedule being determined to be *appropriate* and why the chosen time frame was deemed to be *as soon as possible*. For additional information on compliance schedules, see section 9.1.3 of EPA's *NPDES Permit Writers' Manual*²⁵ (September 2010, EPA-833-K-10-001, <http://www.epa.gov/npdes/pwmanual>) and the memorandum from EPA's Office of Wastewater Management on compliance schedules for water quality-based effluent limitations in NPDES permits dated May 10, 2007.

²⁴ 40 CFR 131.15 states that: "If a State intends to authorize the use of schedules of compliance for water quality-based effluent limits in NPDES permits, the State must adopt a permit compliance schedule authorizing provision. Such authorizing provision is a water quality standard subject to EPA review and approval under section 303 of the Act and must be consistent with sections 502(17) and 301(b)(1)(C) of the Act."

²⁵ USEPA (U.S. Environmental Protection Agency). 2010. *NPDES Permit Writers' Manual*. EPA 833-K-10-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC. <https://www.epa.gov/npdes/npdes-permit-writers-manual>.

Appendix A: Example Criterion Table for States and Authorized Tribes Using the Performance-based Approach

Media Type	Fish Tissue ¹		Water Column ^{4,7}	
	Egg-ovary ²	Fish Whole-body or Muscle ³	Monthly Average Exposure	Intermittent Exposure ⁵
Magnitude	15.1 mg/kg dw	8.5 mg/kg dw whole-body or 11.3 mg/kg dw muscle (skinless, boneless filet)	1.5 µg/L in lentic aquatic systems 3.1 µg/L in lotic aquatic systems	$WQC_{int} = \frac{WQC_{30-day} - C_{bkgrnd}(1 - f_{int})}{f_{int}}$
Duration	Instantaneous measurement ⁶	Instantaneous measurement ⁶	30 days	Number of days/month with an elevated concentration
Frequency	Not to be exceeded	Not to be exceeded	Not more than once in three years on average	Not more than once in three years on average

1. Fish tissue elements are expressed as steady-state.
2. Egg-ovary supersedes any whole-body, muscle, or water column element when fish egg-ovary concentrations are measured.
3. Fish whole-body or muscle tissue supersedes water column element when both fish tissue and water concentrations are measured.
4. Water column values are based on dissolved total selenium in water and are derived from fish tissue values via bioaccumulation modeling. Water column values are the applicable criterion element in the absence of steady-state condition fish tissue data.
5. Where WQC_{30-day} is the water column monthly element, for either a lentic or lotic waters; C_{bkgrnd} is the average background selenium concentration; and f_{int} is the fraction of any 30-day period during which elevated selenium concentrations occur, with f_{int} assigned a value ≥ 0.033 (corresponding to 1 day).
6. Fish tissue data provide instantaneous point measurements that reflect integrative accumulation of selenium over time and space in fish population(s) at a given site.
7. Site-specific water column criteria elements will be derived using the mechanistic model and associated procedures laid out in appendix K of *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*.²⁶ To derive scientifically defensible site-specific water column criteria elements, appropriate input parameters (as described in Appendix K) will be selected to adequately represent the water body of interest.

²⁶ USEPA (U.S. Environmental Protection Agency). 2016. *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*. EPA 822-R-16-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. <https://www.epa.gov/wqc/aquatic-life-criterion-selenium-documents>.