Appendix K

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Frequently Asked Questions: Implementing the EPA's 2016 Selenium Criterion in Clean Water Act Sections 303(d) and 305(b) Assessment, Listing, and Total Maximum Daily Load Programs

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While this document cites statutes and regulations that contain requirements applicable to water quality standards, it does not impose legally binding requirements on the EPA, states, authorized Tribes, other regulatory authorities, or the regulated community, and may not apply to a particular situation based upon the circumstances. The 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 technical support document as appropriate and consistent with statutory and regulatory requirements. The EPA may update this document as new information becomes available. In addition to this document, the EPA has related documents that provide considerations and recommendations on implementing criteria based on the national CWA section 304(a) recommended selenium criterion for freshwater, which are available at the EPA's selenium website: https://www.epa.gov/wqc/aquatic-life-criterion-selenium.

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List of Acronyms and Abbreviations

µg/L	micrograms per liter
CFR	Code of Federal Regulations
CWA	Clean Water Act
FAQ	Frequently Asked Question
mg/kg	milligrams per kilogram
NPDES	National Pollutant Discharge Elimination System
TMDL	Total Maximum Daily Load
USEPA	U.S. Environmental Protection Agency
WQBEL	Water Quality-based Effluent Limit
WQC	Water Quality Criterion
WQS	Water Quality Standard

Definitions[1]

Bioaccumulation
The uptake and retention of a chemical by an aquatic organism from all surrounding media (e.g., water, food, sediment).[2]

Dissolved total selenium
All species of selenium that are dissolved into the water column and that would be measured in a water sample after it has been passed through a 0.45 µm membrane filter.[3]

Performance-based approach
A water quality standard that is a transparent process, rather than a specific outcome (such as the concentration portion of a criterion for a pollutant). This process or methodology is sufficiently detailed and has suitable safeguards that ensure predictable, repeatable outcomes. Approval of this process or methodology by the EPA would also serve for CWA purposes as the approval under CWA section 303(c)[4] of each outcome generated from following that process or method.[5]

Steady-state
An organism is in steady-state when the rates of chemical uptake and depuration are equal and tissue concentrations remain constant over time.[6] For the purposes of the national CWA section 304(a) recommended selenium criterion, steady-state refers to conditions where sufficient time has passed after the introduction of a new or increased input of selenium into a waterbody or watershed of a waterbody such that fish tissue selenium concentrations are no longer increasing.

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[1] This glossary is meant to provide plain language definitions for key terms used in this document. Individuals should consult the Clean Water Act and the EPA's implementing regulations to identify whether there are legal definitions of these terms.

[2] USEPA. 2003. *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000) Volume 2: Development of National Bioaccumulation Factors.* EPA-882-R-03-030. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://nepis.epa.gov/Exe/ZyPDF.cgi/P1005EZQ.PDF?Dockey=P1005EZQ.PDF

[3] Protho, M.G. USEPA. 1993. Memorandum: Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria. Office of Water, Washington DC. https://www.epa.gov/sites/production/files/2019-03/documents/metals-criteria-interpret-aqlife-memo.pdf

[4] Approval by the EPA includes WQS promulgated by the EPA.

[5] *EPA Review and Approval of State and Tribal Water Quality Standards* 65 Fed. Reg. 24641 (Apr. 27, 2000).

[6] USEPA. 2003. *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000) Volume 2: Development of National Bioaccumulation Factors.* EPA-882-R-03-030. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://nepis.epa.gov/Exe/ZyPDF.cgi/P1005EZQ.PDF?Dockey=P1005EZQ.PDF

Water quality criterion element
A magnitude, frequency, and duration for a particular media type (e.g., fish tissue, water column), which are individual components of the overall water quality criterion. The water quality criterion elements for selenium are related through a hierarchy; with fish tissue criterion elements having primacy over water column criterion elements, and the egg-ovary fish tissue criterion element having primacy over all other criterion elements.

1.0 Introduction

1.1 The EPA's National CWA Section 304(a) Recommended Chronic Aquatic Life Selenium Criterion in Freshwater

In 2016, the U.S. Environmental Protection Agency updated its national Clean Water Act (CWA) section 304(a) recommended chronic aquatic life criterion for selenium in freshwater systems to reflect the latest scientific information and, in 2021, issued an erratum, *2021 Revision to: Final Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016,* US EPA, Office of Water, EPA 822-R-21-006, August 2021.[7] The EPA's national CWA section 304(a) recommended selenium criterion still reflects the latest science and the EPA is not aware of any updated scientific information that would change this recommendation. The latest scientific information indicates that selenium toxicity to aquatic life is driven by dietary exposures and that the reproductive life-stages of egg-laying vertebrates are the most sensitive to the toxic effects of selenium. The recommended criterion has four criterion elements: (1) a fish egg-ovary criterion element; (2) a fish whole-body and/or muscle criterion element; (3) a water column criterion element (one value for lentic and one value for lotic aquatic systems); and (4) a water column intermittent criterion element (to account for potential chronic effects from short-term exposures to high concentrations in lentic and lotic aquatic systems) (see Table 1). Under the EPA's 2016 national CWA section 304(a) recommended selenium criterion, the fish tissue criterion elements have primacy over water column elements, except where there are no fish, where fish tissue data are not adequate, or for waterbodies with new or increased discharges where selenium concentrations in fish tissue might not have stabilized and reached steady-state. The EPA also recommends that the egg-ovary tissue criterion element has primacy over whole-body and muscle tissue criterion elements.

Toxicity data indicate that the selenium concentration in fish eggs and ovaries is the most robust and consistent measurement endpoint directly tied to adverse reproductive effects in aquatic organisms. Toxicity to developing embryos and larvae is directly linked to egg selenium concentration.[8] The EPA derived the whole-body, muscle tissue, and water column elements from the egg-ovary element so that states and authorized Tribes could more readily implement their water quality criteria (WQC) based on the EPA's national CWA section 304(a) recommended selenium criterion. The assessment of the available data on chronic selenium

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[7] In 2021, the EPA identified that the following text was missing from the second sentence in footnote 4 in the selenium criterion table: "When selenium inputs are increasing" and issued an erratum. The EPA corrected footnote 4 to state: "4. Water column values are based on dissolved total selenium in water and are derived from fish tissue values via bioaccumulation modeling. When selenium inputs are increasing, water column values are the applicable criterion element in the absence of steady-state condition fish tissue data."

[8] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf

exposure for fish, invertebrates, and amphibians indicates that a criterion element derived from fish is expected to be protective of the aquatic community in a waterbody, since other taxa appear to be less sensitive to selenium than fish. The EPA did not develop an acute criterion for selenium when it updated the chronic criterion. Although selenium may cause acute toxicity at high concentrations, the most deleterious effects on aquatic organisms are due to selenium's bioaccumulative properties.

In the case of bioaccumulative compounds like selenium, acute toxicity studies do not address risks that result from chronic exposure to chemicals via the diet (through the food web pathway). Such studies also do not account for the accumulation kinetics of many bioaccumulative compounds, such as selenium, and may underestimate effects from long-term accumulation in some types of aquatic systems. Therefore, since acute studies do not address the primary exposure pathway for organisms to selenium and because chronic toxicity occurs at lower concentrations, an acute criterion was not included in the national CWA section 304(a) recommended selenium criterion. As described in the EPA's *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016* (hereafter referred to as *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*), the EPA also included an intermittent exposure criterion element to provide protection from the most significant chronic effects of selenium toxicity, reproductive toxicity, by protecting against selenium bioaccumulation in the aquatic ecosystem resulting from short-term, high concentration exposure events.[9]

The EPA recommends, as stated in the *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*, that states and authorized Tribes[10] adopt into their water quality standards (WQS) a selenium criterion that includes all four criterion elements.[11] For more information see the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–*

[9] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf

[10] 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.

[11] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf

Freshwater 2016, which can be found at https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

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]	
Criterion Element	**Egg-ovary[2]**	**Fish Whole-body or Muscle[3]**	**Monthly Average Exposure**	**Intermittent Exposure[5]**
Magnitude	15.1 mg/kg dry weight	8.5 mg/kg dry weight whole-body or 11.3 mg/kg dry weight muscle (skinless, boneless fillet)	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, except as noted in footnote 4 below.
3. Fish whole-body or muscle tissue supersedes water column element when both fish tissue and water concentrations are measured, except as noted in footnote 4 below.
4. Water column values are based on dissolved total selenium in water and are derived from fish tissue values via bioaccumulation modeling. When selenium inputs are increasing, water column values are the applicable criterion element in the absence of steady-state condition fish tissue data.
5. Where $WQC_{30\text{-}day}$ 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.

1.2 Selenium Technical Support Materials

The EPA has prepared a four-volume set of documents to provide recommendations to states, authorized Tribes, and other agencies for implementing their WQC based on the national CWA section 304(a) recommended selenium criterion for aquatic life.[12] These four documents

[12] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf

constitute the Technical Support Materials for the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*.[13] Each document of the set focuses on a specific aspect of implementation of WQC based on the national CWA section 304(a) recommended selenium criterion. Together, these four EPA documents provide information to assist states and authorized Tribes with adopting WQC based on the EPA's national CWA section 304(a) recommended selenium criterion and implementing it in various CWA programs.

1) *Technical Support for Adopting and Implementing the EPA's Selenium 2016 Criterion in Water Quality Standards*: Provides recommendations for the adoption and implementation of criteria based on the national CWA section 304(a) recommended selenium criterion, including the various flexibilities available to states and authorized Tribes using WQS tools.
2) *Technical Support for Fish Tissue Monitoring for Implementing the EPA's 2016 Selenium Criterion*: Provides an overview of how to establish or enhance existing fish tissue monitoring programs to facilitate implementation of fish tissue criterion elements based on the national CWA section 304(a) recommended selenium criterion.
3) *Frequently Asked Questions: Implementing Water Quality Standards Based on the EPA's 2016 Selenium Criterion in Clean Water Act Section 402 National Pollutant Discharge Elimination System Permits*: Provides information to help National Pollutant Discharge Elimination System (NPDES) permit writers understand what permitting guidance (i.e., state or Tribal implementation procedures) may be appropriate to implement state and authorized Tribal WQS based on the EPA's national CWA section 304(a) recommended selenium criterion. This set of FAQs also provides recommendations on how to establish water quality-based effluent limits (WQBELs) in NPDES permits.
4) *Frequently Asked Questions: Implementing the EPA's 2016 Selenium Criterion in Clean Water Act Sections 303(d) and 305(b) Assessment, Listing, and Total Maximum Daily Load Programs*: Provides information on how to complete assessments, list impaired waters, and develop total maximum daily loads (TMDLs) to implement the EPA-approved[14] WQS that are based on the EPA's national CWA section 304(a) recommended selenium criterion.

[13] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf

[14] EPA-approved includes both WQS adopted by states, territories, or authorized Tribes and approved by the EPA and WQS promulgated by the EPA.

Q1: How should states and authorized Tribes implement criteria based on the national CWA section 304(a) recommended selenium criterion in their assessment and CWA section 303(d) listing programs?

A1: The national CWA section 304(a) recommended selenium criterion is structured to enable assessment of waterbodies using existing and readily available water quality-related data and information for any element of the criterion. Table 2 provides an assessment matrix indicating whether available data and information support a CWA section 303(d) listing determination for WQS approved by the EPA that are based on the national CWA 304(a) recommended selenium criterion. Nine aquatic life use assessment scenarios are presented in Table 2 and further explained below.

The assessment matrix does not address waterbody conditions when selenium inputs are new or increasing and steady-state fish tissue data are absent. Information on how to perform assessments for this scenario are provided in Q10. Information on performing assessments for fishless waters is provided in Q6.

Assessment Scenario Descriptions

Assessment scenarios 1 through 6 describe water quality situations for which data and information (hereafter referred to as data) are available to assess the fish tissue criterion elements and data are either available, not available, or insufficient to assess the water column criterion elements.

> Scenarios 1, 2, and 3: Available data indicate that the fish tissue concentrations in the waterbody do not exceed the fish tissue criterion elements. The recommended criterion is structured such that the fish tissue criterion elements supersede the water column criterion elements. Hence, if the results for the fish tissue and water column criterion elements do not agree or if water column data are insufficient or not available, the assessment decision should be based on results for the fish tissue criterion elements. The national CWA section 304(a) recommended selenium criterion is met in all three scenarios.
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> Scenarios 4, 5, and 6: Available data indicate that the fish tissue concentrations in the waterbody exceed the fish tissue criterion elements. The recommended criterion is structured such that the fish tissue criterion elements supersede the water column criterion elements. Hence, if the results for the fish tissue and water column elements do not agree or if water column data are insufficient or not available, the assessment decision should be based on the results for the fish tissue criterion elements. The national CWA section 304(a) recommended selenium criterion is not met in all three scenarios and the waterbody-pollutant combination is impaired.

Table 2. Matrix of Assessment Scenarios for WQS Approved by the EPA Based on the National CWA Section 304(a) Recommended Selenium Criterion.[1]

		Water Column Elements[5]		
		Not Exceeded	**Exceeded**	**Insufficient or Not Available**
Fish Tissue Elements[2, 3, 4]	**Not Exceeded**	(Scenario 1) Criterion Met	(Scenario 2) Criterion Met	(Scenario 3) Criterion Met
	Exceeded	(Scenario 4) Criterion Not Met	(Scenario 5) Criterion Not Met	(Scenario 6) Criterion Not Met
	Insufficient or Not Available	(Scenario 7) Criterion Met	(Scenario 8) Criterion Not Met	(Scenario 9) Not Assessed

[1] The assessment matrix does not address waterbody conditions when selenium inputs are new or increasing and steady-state fish tissue data are absent.

[2] Fish tissue criterion elements include the following: (a) fish egg-ovary element and (b) fish whole-body and/or muscle tissue element.

[3] There is no primacy between fish whole-body and muscle criterion elements.

[4] The fish egg-ovary criterion element supersedes the fish whole-body and/or muscle criterion element when both types of data are available.

[5] Water column criterion elements include the following: (a) monthly average exposure criterion element and (b) intermittent exposure criterion element. The duration component of both of these elements applies to any 30-day period.

Note that the national CWA section 304(a) recommended selenium criterion is structured such that the fish egg-ovary criterion element has primacy over the fish whole-body and/or muscle element. Hence, if the results for the fish egg-ovary criterion element and the fish whole-body and/or muscle criterion elements do not agree, the assessment should be based on the results for the fish egg-ovary criterion element. There is no primacy between the fish whole-body and the muscle criterion elements. Hence, if either the fish whole-body and or muscle criterion elements are exceeded, the criterion would not be met unless fish egg-ovary criterion element is met.

Assessment scenarios 7 through 9 describe water quality assessment situations for which data are insufficient or not available to assess the fish tissue criterion elements and data are either available, not available, or insufficient to assess the water column criterion elements.

> Scenario 7: Available data indicate that the water column concentrations of the waterbody do not exceed the water column criterion elements and data are insufficient or not available to assess the fish tissue criterion elements. The recommended criterion is structured such that water quality assessments can be made in the absence of fish tissue data using the water column criterion elements. The national CWA section 304(a) recommended selenium criterion is met in this scenario.

Scenario 8: Available data indicate that the water column criterion elements are exceeded, and data are insufficient or not available to assess the fish tissue criterion elements. The national CWA section 304(a) recommended selenium criterion is not met in this scenario and the waterbody-pollutant combination is impaired.

Scenario 9: Data are insufficient or not available to assess the water column and the fish tissue criterion elements. Therefore, the national CWA section 304(a) recommended selenium criterion cannot be assessed. The EPA recommends that states and authorized Tribes collect fish tissue and/or water column data so that an assessment decision can be made.

Q2: What data should states and authorized Tribes assemble and evaluate to complete water quality assessments with criteria based on the national CWA section 304(a) recommended selenium criterion?

A2: States and authorized Tribes are required under Title 40 of the *Code of Federal Regulations* (CFR) section 130.7(b)(5) to assemble and evaluate all existing and readily available water quality-related data and information when conducting water quality assessments to determine which waters belong on their CWA section 303(d) lists. Existing and readily available data and information relevant for conducting assessment determinations for criteria based on the national CWA section 304(a) recommended selenium criterion includes water column and fish tissue selenium data and information relevant to the jurisdictions, including such data and information collected by stakeholders. States and authorized Tribes must use such data and information in making listing decisions unless they provide a rationale for not doing so. 40 CFR 130.7(b)(6)(iii). The EPA will evaluate whether a state or authorized Tribe provides a technical, science-based rationale for decisions not to use data or information.[15]

Q3: What should states and authorized Tribes include in their assessment methodology for evaluating selenium data?

A3: States and authorized Tribes are required under 40 CFR 130.7(b)(6)(i) to submit to the EPA Regional Administrator a "description of the methodology used to develop the list" as part of their CWA section 303(d) list submissions. An assessment methodology constitutes the decision-making process that a state or authorized Tribe plans to use to determine the water quality attainment status of waters within their jurisdiction. The methodology should describe how data are evaluated and used to make water quality attainment determinations, including data quality, quantity, and representativeness considerations. Additional information regarding data quality, quantity, and representativeness considerations are available in the EPA's

[15] USEPA. 2023. Information Concerning 2024 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions. https://www.epa.gov/system/files/documents/2023-03/2024IRmemo_032923.pdf

Integrated Reporting memo for the 2006 reporting cycle.[16] States and authorized Tribes must use available data and information in making listing decisions unless they provide a rationale for not doing so (40 CFR 130.7(b)(6)(iii)). The EPA will evaluate whether a state or authorized Tribe provides a technical, science-based rationale for decisions not to use data or information.[17] The EPA encourages states and authorized Tribes to make the assessment methodology available to the public for review and comment prior to, or along with, solicitations for data. Such engagement helps facilitate stakeholder input to the state's or authorized Tribe's assessment of water quality status, including assessments for selenium. In reviewing state lists submitted under section 303(d), the EPA will evaluate whether the state's approach for use of fish and water column data is reasonable, including issues of data quality, quantity, and representativeness.

Q4: Should states and authorized Tribes include the collection of fish tissue and water column data in their monitoring programs to assess for selenium?

A4: The national CWA section 304(a) recommended selenium criterion includes a flexible approach that states and authorized Tribes may want to follow in designing monitoring plans for selenium. This flexibility stems from the fact that both the fish tissue and water column criterion elements are designed to protect against chronic selenium effects. States and authorized Tribes should consider a variety of factors when deciding how to monitor for selenium, including assessment and implementation needs, representativeness of the results, available resources, and public input.

When possible, the EPA recommends that states and authorized Tribes collect fish tissue data to support assessments of the recommended selenium criterion. Fish tissue data reflect an integrative accumulation of selenium over time and space (see section 2.7.6 of the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*).[18] Measurements of selenium in fish tissue are most closely linked to the chronic adverse effects of selenium, since chronic selenium toxicity is based on the food-chain bioaccumulation route, not a direct waterborne route.

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[16] USEPA. 2005. Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act. https://www.epa.gov/sites/production/files/2015-10/documents/2006irg-report.pdf

[17] USEPA. 2024. Information Concerning 2024 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions. https://www.epa.gov/system/files/documents/2023-03/2024IRmemo_032923.pdf

[18] USEPA. 2016. *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-16-006. U.S. Environmental Protection Agency, Office of Water, Office of Science and Technology, Washington, DC, https://www.epa.gov/sites/production/files/2016-07/documents/aquatic_life_awqc_for_selenium_-_freshwater_2016.pdf.

States and authorized Tribes that want to collect fish tissue data should take into consideration species specific factors such as selenium sensitivity, bioaccumulation, mobility (including anadromous and potamodromous species), spawning period, and fish stocking rates when designing their monitoring plan. The document *Technical Support for Fish Tissue Monitoring for Implementing the EPA's 2016 Selenium Criterion*[19] provides additional information to support the collection, evaluation, and assessment of fish tissue data for selenium. Section 3.1 of the document discusses that many states and authorized Tribes have existing fish tissue monitoring programs that can be leveraged to collect fish tissue data to assess against the fish tissue criterion elements of the recommended selenium criterion.

Q5: How should states and authorized Tribes complete assessments and CWA section 303(d) listings for waterbodies that only have selenium water column data?

A5: The national CWA section 304(a) recommended selenium criterion is structured to enable the assessment of waterbodies with data related to any element of the criterion. Hence, states and authorized Tribes that adopt criteria based on the national CWA section 304(a) recommended selenium criterion should complete water quality assessments for waterbodies that only have selenium water column data (and no selenium fish tissue data) by comparing that data to the water column criterion element. Additional information about completing assessments for these scenarios is available in Q1 (see Scenarios 7 and 8). After a waterbody is added to a CWA section 303(d) list based on water column data alone, states and authorized Tribes may consider collecting fish tissue data to confirm the assessment determination before developing a restoration plan (e.g., TMDL).

Q6: How should states and authorized Tribes complete selenium assessments and CWA section 303(d) listings for fishless waters?

A6: The national CWA section 304(a) recommended selenium criterion is structured to enable assessment of waterbodies with data related to any element of the criterion. Hence, states and authorized Tribes that adopt criteria based on the national CWA section 304(a) recommended selenium criterion should complete water quality assessments using the water column criterion elements for fishless waters.[20]

Note that the national CWA section 304(a) recommended selenium criterion is designed to protect all freshwater aquatic life, including populations of fish, amphibians, aquatic

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[19] USEPA. 2024. *Technical Support for Fish Tissue Monitoring for Implementing the EPA's 2016 Selenium Criterion.* EPA 820-R-24-003. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2024-03/selenium-fishtissue-tsd.pdf.

[20] The EPA describes *fishless waters* 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 (e.g., extirpation) due to temporary or permanent changes in water quality (e.g., selenium pollution), flow, or instream habitat.

invertebrates, and plants. The criterion elements were derived from fish toxicity values to be protective of the entire aquatic community, not solely fish species. The criterion elements, including the water column criterion elements, are designed to protect aquatic life from the chronic effects of exposure to selenium in waters both inhabited by fish and not inhabited by fish.

Q7: How should states and authorized Tribes complete selenium assessments and CWA section 303(d) listings when there are data for multiple fish species?

A7: The national CWA section 304(a) recommended selenium criterion is designed to protect all freshwater aquatic life. Hence, for states and authorized Tribes that adopt criteria based on the national CWA section 304(a) recommended selenium criterion, if available data and information from one or more fish species for a waterbody exceeds the criterion, then the criterion is not met and the waterbody-pollutant combination is impaired. The criterion is not met even if one or more other fish species for a waterbody is meeting the criterion. States and authorized Tribes should not composite or average data from multiple species. Also, the hierarchy of the fish tissue criterion elements (i.e., egg-ovary data supersedes muscle/whole-body) apply within each fish species. States and authorized Tribes should not apply the hierarchy across species, as this would be inconsistent with the procedure used to derive the fish tissue criterion elements,[21] which used species-specific conversion factors to calculate toxicity values.

Q8: How should states and authorized Tribes complete selenium assessments and CWA section 303(d) listings when there are multiple samples for a single fish species?

A8: As discussed in section 2.0 of the EPA's *Technical Support for Fish Tissue Monitoring for Implementing the EPA's 2016 Selenium Criterion,*[22] the EPA's national CWA section 304(a) recommended selenium criterion was designed to protect "populations of fish, amphibians, aquatic invertebrates, and plants." Because the selenium criterion establishes population level protection, for states and authorized Tribes that adopt criteria based on the national CWA section 304(a) recommended selenium criterion, the EPA generally recommends implementing these fish tissue criterion elements with a measure of central tendency (e.g., mean, median), as this will represent the level of exposure that the population is experiencing. Note that in section 2.0 of the EPA's *Technical Support for Fish Tissue Monitoring for Implementing the EPA's 2016*

[21] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

[22] USEPA. 2024. *Technical Support for Fish Tissue Monitoring for Implementing the EPA's 2016 Selenium Criterion.* EPA 820-R-24-003. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2024-03/selenium-fishtissue-tsd.pdf.

Selenium Criterion, the EPA also recommends using a measure of central tendency only for characterizing a dataset that was collected during a single sampling event (identified location over a specified period of time (generally less than a week)). For implementation purposes, a measure of central tendency should not be calculated between different sampling events; instead, different sampling events should all be considered as discrete datasets. The EPA recommends that states describe in their assessment methodology how they plan to measure the population of fish species.

Additional information on approaches and factors to consider in collecting, evaluating, and assessing data from individual or composite fish tissue samples is provided in the document *Technical Support for Fish Tissue Monitoring for Implementing the EPA's 2016 Selenium Criterion.*[23]

Q9: How should the selenium fish tissue frequency of "not to be exceeded" be applied in the assessment and CWA section 303(d) listing programs?

A9: As discussed in the *Technical Support for Adopting and Implementing the EPA's Selenium 2016 Criterion in Water Quality Standards,* the frequency of the fish tissue criterion elements (i.e., "not to be exceeded") differs from the typical "once-in-three years on average" frequency of most water column criteria for aquatic life criteria. Selenium is a bioaccumulative pollutant; therefore, elevated levels of selenium in various ecological compartments (e.g., biota, surficial sediments) require a long period of time 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. The time frame to recovery is variable and will be dependent on the biogeochemical processes of the system, including residence time and food web dynamics. Thus, the typical frequency component is not appropriate for selenium in fish tissue, as this could lead to sustained ecological impacts. Therefore, the recommended frequency for the fish tissue criterion elements is "not to be exceeded." For additional information regarding frequency, see sections 2.7.6 and 2.7.7 of *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*.

Although the frequency component is expressed as "not to be exceeded," not meeting the fish tissue criterion elements does not mean that fish populations cannot recover. As such, if a state or authorized Tribe determines that the fish tissue criterion elements are not met and identifies the water as impaired on their CWA section 303(d) list, the state or authorized Tribe may determine in the future that the selenium criterion is met and remove the waterbody-pollutant combination from the list. The EPA recommends that states include in their assessment methodology a discussion of how the fish tissue criterion elements will be implemented,

[23] USEPA. 2024. *Technical Support for Fish Tissue Monitoring for Implementing the EPA's 2016 Selenium Criterion.* EPA 820-R-24-003. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2024-03/selenium-fishtissue-tsd.pdf.

including information on how the criterion will be determined to be met after an exceedance of the fish tissue criterion elements.

Q10: How should states and authorized Tribes complete selenium assessments and CWA 303(d) listings when there are new or increased inputs of selenium?

A10: The national CWA section 304(a) recommended selenium criterion includes fish tissue and water column elements expressed as a single criterion. Within the criterion, the fish tissue elements take primacy over the water column elements, except when, as described in footnote 4 of the criteria recommendation, selenium inputs to the waterbody are increasing and steady-state fish tissue data are absent (see Table 1). For the purposes of the EPA's 2016 national CWA section 304(a) recommended selenium criterion, steady-state refers to conditions where sufficient time has passed after the introduction of a new or increased input of selenium into a waterbody or watershed of a waterbody such that fish tissue selenium concentrations are no longer increasing.[24] New and increased inputs of selenium are referring to the release of a substantial amount of additional selenium from either anthropogenic point or nonpoint sources into a watershed. New or increased selenium inputs do not refer to seasonal variability of selenium that occurs naturally within a system (e.g., spring run-off events or precipitation-driven pulses) or *de minimus* man-made discharges.

Additional information on how to determine if the water column criterion elements should take primacy over the fish tissue criterion elements for assessment purposes is provided in the *Technical Support for Adopting and Implementing the EPA's Selenium 2016 Criterion in Water Quality Standards*. Section 2.1 includes examples of what may represent substantial new or increased inputs of selenium, as well as information on how much time it may take for fish tissue to reach steady-state in lentic and lotic systems after the introduction of a substantial new or increased input of selenium. The EPA recommends that states include in their assessment methodology a discussion of how they will determine whether the water column criterion elements take primacy over the fish tissue criterion elements, including information on how they will determine if there are substantial new or increased selenium inputs to the waterbody and if fish tissue has reached steady-state.

[24] This definition of steady-state applies to the national CWA section 304(a) recommended selenium criterion. It does not apply to the discussion of steady-state modeling or conditions in the "Technical Support Document for Water Quality-based Toxics Control" (EPA/505/2-90-001, March 1991).
https://www3.epa.gov/npdes/pubs/owm0264.pdf

Q11: How should states and authorized Tribes implement the selenium water column intermittent element in assessments and CWA section 303(d) listings?

A11: The national CWA section 304(a) recommended selenium criterion includes both an intermittent criterion element and a monthly average water column criterion element (i.e., 30-day average). The intermittent criterion element is a calculation based on the known ambient concentration, the monthly average exposure water column criterion element, and the fraction of any 30-day period during which elevated selenium concentrations occur. As explained in section 3.3 of the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*,[25] the intermittent criterion element is a re-expression of the chronic 30-day average water column criterion element and will yield the same level of protection as the monthly average exposure criterion element, provided that the equation uses (1) the average of the concentrations occurring for the fraction of time defined as being intermittently elevated and (2) the average of the concentrations occurring for the remaining time, defined as being background.

The intermittent criterion element can only be exceeded under the same conditions that would have caused the monthly average exposure criterion element to be exceeded. Thus, evaluating data against the intermittent element and the monthly average exposure criterion element will always result in the same assessment decision. As such, states and authorized Tribes may find it more straightforward to assess selenium water column data using the monthly average criterion element because it does not require knowledge of the background conditions or number of days with an intermittent spike.

Q12: How can states and authorized Tribes remove selenium impairments from their CWA section 303(d) lists?

A12: As with any applicable water quality standard, states and authorized Tribes that adopt criteria based on the national CWA section 304(a) recommended selenium criterion will make assessment decisions based on an evaluation of existing and readily available water quality data against the criterion. The assessment decision informs whether a waterbody should be identified as impaired and included on the state or authorized Tribe's CWA section 303(d) list and assigned a priority ranking for TMDL development. Selenium impairments included on the CWA section 303(d) list may be excluded from subsequent lists (sometimes described as "delisting") for several reasons, including: (1) the water quality standard is met based on the criterion and available data, (2) there were flaws in the original listing, (3) a TMDL was established and approved by the EPA, or (4) other point source or nonpoint source control

[25] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

requirements are stringent enough to implement applicable water quality standards (40 CFR 130.7(b)(1)(iii)).

Q13: Can states and authorized Tribes develop a water column criterion element for selenium that considers site-specific conditions for assessment, 303(d) listing, and TMDL development?

A13: States and authorized Tribes can take one of two approaches for developing a water column criterion element for selenium that considers site-specific conditions. Under the first approach, if a state or authorized Tribe thinks that the default national recommended water column criterion element is not appropriate for a waterbody, that state or authorized Tribe can choose to adopt into its WQS and submit to the EPA for approval a site-specific water column criterion element developed using the procedures provided in Appendix K of the national CWA section 304(a) recommended selenium criterion[26] or another scientifically defensible method that is protective of the aquatic life use. Under the second approach, a state or authorized Tribe can choose to adopt into its WQS and submit to the EPA for approval a set of procedures to translate the fish tissue criterion elements into a site-specific water column criterion element. This is considered a performance-based approach to site-specific criteria development.[27] Information on both approaches is provided in sections 2.2.1 and 2.2.2 of *Technical Support for Adopting and Implementing the EPA's 2016 Selenium Criterion in Water Quality Standards.*[28]

States and authorized Tribes should consider which of the two approaches they want to use when adopting site-specific water column criterion elements. For example, the first approach (i.e., a site-specific water column criterion element) is more straightforward to apply in assessment, 303(d) listing, and TMDL development and will likely reduce workload on those programs. Furthermore, the opportunity for public comment on the site-specific water column criterion element would occur in response to a single CWA section 303(c) action. The second approach (i.e., performance-based) facilitates an opportunity for states and authorized Tribes

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[26] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

[27] In addition to the four-part criterion, states or authorized Tribes may want to adopt a method to derive site-specific water column criterion elements, referred to by the EPA in 2000 as a "performance-based approach." The EPA first formalized the concept of a performance-based approach for a WQS in the preamble of the rule *the EPA Review and Approval of State and Tribal Water Quality Standards*. In that document, the EPA describes this approach as a WQS that is a transparent process rather than a specific outcome. The state or authorized Tribe can adopt a process, such as a criterion derivation methodology, rather than a specific outcome, such as a concentration of a pollutant. If a state or authorized Tribe adopts a process or methodology that is sufficiently detailed and has suitable safeguards that ensure predictable, repeatable outcomes, the EPA can approve that process as a WQS and this approval would also serve for CWA purposes as the approval of each outcome generated from following that process or method.

[28] USEPA. 2024. *Technical Support for Adopting and Implementing the EPA's 2016 Selenium Criterion in Water Quality Standards*. EPA 820-R-24-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2024-03/selenium-adopting-tsd.pdf.

to adaptively derive a site-specific water column criterion element to account for the most up-to-date data for the waterbody using the procedures in the EPA-approved criterion. When a performance-based approach is used, however, more coordination will likely be needed between the CWA implementing programs to consistently employ such water column criterion elements, and the opportunity for public comment on the translated site-specific water column criterion element would occur in response to different and multiple program actions (e.g., assessment decisions, or development of TMDLs or permit limits).

Q14: Which criterion elements should be used to develop TMDLs?

A14: States and authorized Tribes that adopt criteria based on the national CWA section 304(a) recommended selenium criterion should consider developing TMDLs for selenium based on the monthly average exposure water column criterion element or a site-specific water column criterion element developed through one of the two approaches described in Q13. As discussed in Q1, four scenarios (i.e., 4, 5, 6, and 8 in Table 2) exist for which a waterbody can be assessed as impaired. For three of the scenarios (i.e., 5, 6, and 8 in Table 2), states and authorized Tribes should consider using the monthly average exposure water column criterion element to develop TMDLs. The EPA recommends the approach of using the monthly average exposure water column criterion element for these scenarios because it was derived to ensure adequate protection of the fish tissue criterion elements. However, for scenario 4 (wherein available data indicate that the fish tissue criterion element is exceeded and the water column criterion element is not exceeded), states and authorized Tribes should consider developing a site-specific water column criterion element and use it for developing the TMDL. Using the monthly average exposure water column criterion element under scenario 4 to develop the TMDL could result in a loading capacity for selenium that exceeds the existing load, which is already resulting in an exceedance of the fish tissue criterion elements in the waterbody. For this scenario, states and authorized Tribes should consider developing a site-specific water column criterion element that would provide adequate protection of the fish tissue criterion elements. The approaches described above are suggestions. Regardless of what approach states and authorized Tribes choose to pursue, they should work closely with the EPA for technical support and to help ensure timely review and action by the federal government.

Q15: How should TMDLs account for the intermittent criterion element?

A15: For states and authorized Tribes that adopt criteria based on the national CWA section 304(a) recommended selenium criterion, developing TMDLs based on the monthly average exposure water column criterion element would also address the intermittent water column criterion element. Section 3.3 of the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016* explains that the intermittent criterion element is a re-expression of

the chronic 30-day average water column criterion element.[29] As such, the monthly average exposure water column criterion element and the intermittent criterion element are intended to provide the same level of protection of the fish tissue criterion elements.

Q16: Does the EPA have recommendations that address whether a receiving waterbody should be considered lentic or lotic for assessments and 303(d) listings?

A16: The national CWA section 304(a) recommended selenium criterion includes water column criterion element values for both lotic and lentic freshwater systems. Lentic waters are waterbodies that consist of standing water, including waterbody types such as lakes and ponds. Lotic waters are water bodies that consist of flowing waters, including waterbody types such as rivers and streams. Generally, classifications of fresh waters into lotic or lentic categories are made by the state or authorized Tribe, based on site-specific information. Although the distinction between lentic and lotic systems is often straightforward, some aquatic systems may possess both lentic and lotic characteristics. For assessment purposes, states and authorized Tribes should use a waterbody segmentation approach that is consistent with water quality standards and other appropriate waterbody-related factors, and capable of providing a spatial scale that is adequate to characterize attainment status. Additional information on lentic and lotic waters is provided in Section 3.2.4 of the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium—Freshwater 2016* and Section 2.1 of *the EPA's Technical Support for Adopting and Implementing the EPA's 2016 Selenium Criterion in Water Quality Standards,*.

[29] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf